Economic and Institutional Landscape

Paper 3

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Contents

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Acronyms and Abbreviations

ADB	Asian Development Bank
ADKN	Afghanistan Disaster Knowledge Network
ADP	Annual Development Program
AIBP	Program and Accelerated Irrigation Benefit Program
ANDMA	Afghanistan National Disaster Management Authority
BAU	Business-as-Usual
BCAS	Bangladesh Centre for Advanced Studies
BCCRF	Bangladesh Climate Change Resilience Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCTF	Bangladesh Climate Change Trust Fund
BIDS	Bangladesh Institute of Development Studies
BWA	Bhutan Water Authority
BWDB	Bangladesh Water Development Board
CAD	Command Area Development
CARDF	Comprehensive Agriculture and Rural Development Facility
CC	Climate Change
CCAFS	Climate Change Agriculture and Food Security
CCAP	Climate Change Action Program
CCC	Climate Change Cell
CCD	Climate Change Division
CCD	Coast Conservation Department
CCKN	Climate Change Knowledge Network
CCPSC	Climate Change Program Steering Committee
CCS	Climate Change Secretariat
CCU	Climate Change Unit
CDF	Clean Development Fund
CDM	Clean Development Mechanism
CDMP	Comprehensive Disaster Management Program
CEA	Central Environment Authority
CEGIS	Centre for Environmental and Geographical Information System
CFF	Climate Fiscal Framework
CFU	Climate Finance Unit
CIF	Climate Investment Fund

CPEIR	Climate Public Expenditure and Institutional Review
CSD	Commission on Sustainable Development
CTF	Climate Trust Fund
DAD	Donor Assistance Database
DANIDA	Danish International Development Agency
DDC	District Development Committees
DFI	Development Finance Institutions
DFID	Department for International Development
DNA	Designated National Authority
DoA&C	Department of Agriculture & Cooperation
DoE	Department of Environment
DoLR	Department of Land Resources
DP	Development Plans
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EIA	Economic Impact Assessment
ESCAP	Economic and Social Council for Asia and Pacific
ETI	Energy Technology Industry
FAO	Food and Agriculture Organization of the United Nations
FOs	Farmer Organizations
FPCO	Flood Plan Coordination Organization
FYP	Five Year Plan
GCCA	Global Climate Change Alliance
GCF	Global Climate Fund
GCISC	Global Change Impact Studies Centre
GDP	Gross Domestic Product
GED	General Economic Division
GEF	Global Environment Facility
GIZ	Gesellschaft für Internationale Zusammenarbeit
GLOF	Glacial Lake Outburst Floods
GNHC	Gross National Happiness Commission
GoB	Government of Bangladesh
GoI	Government of India
GoN	Government of Nepal
GoP	Government of Pakistan
IBFCR	Inclusive Budgeting and Financing for Climate Resilience

ICARDA	International Center for Agricultural Research in the Dry Areas
ICIMOD	International Centre for Integrated Mountain Development
IDA	World Bank
IFAD	International Fund for Agricultural Development
IMED	Implementation Monitoring and Evaluation Division
INCCA	Indian Network for Climate Change Assessment
INCF	Indian National Climate Fund
IPCC	Intergovernmental Panel on Climate Change
IWMI	International Water Management Institute
IWMP	Integrated Watershed Management Program
IWRM	Integrated Water Resources Management
JCS	Joint Country Strategy
JRC	Joint Rivers Commission
LAPA	Local Adaptation Program for Action
LCDF	Least Developed Countries Fund
LCG	Local Consultative Group
LDC	Least Developed Country
LGD	Local Government Division
LGSP/LGSP LIC	Local Government Support Project
MAIL	Ministry for Agriculture Irrigation and Livestock
MASL	Mahaweli Authority of Sri Lanka
MBF	Ministry Budget Frameworks
MCC	Ministry of Climate Change
MCCICC	Multi stakeholder Climate Change Initiatives Coordination Committee
MDG	Millennium Development Goals
MDPR	Ministry of Planning Development and Reforms
MFF	Mangroves for the Future
MoA	Ministry of Agriculture
MoAC	Ministry of Agriculture and Cooperatives
MoAF	Ministry of Agriculture and Forests
MoAFW	Ministry of Agriculture and Farmers' Welfare
MoCC	Ministry of Climate Change
MoCSI	Ministry of Commerce and Small Industry
MoDM	Ministry of Disaster Management
MoE	Ministry of Energy
MoEn	Ministry of Environment

MoEcA	Ministry of Economic Affairs
MoEA	Ministry of External Affairs
MoEF	Ministry of Environment and Forest
MoEFCC	Ministry of Environment Forest and Climate Change
MoEW/MEW	Ministry for Energy and Water
MoF	Ministry of Finance
MoFALD	Ministry of Federal Affairs and Local Development
MoFARD	Ministry of Fisheries and Aquatic Resources Development
MoFDM	Ministry of Food and Disaster Management
MoFSC	Ministry of Forest and Soil Conservation
MoH	Ministry of Health
MoHCA	Ministry of Home and Cultural Affairs
MoI	Ministry of Irrigation
MoIWRM	Ministry of Irrigation and Water Resources Management
MoLGRDC	Ministry of Local Government Rural Development and Cooperatives
MoL	Ministry of Land
MoMDE	Ministry of Mahaweli Development and Environment
MoMI	Ministry of Mines and Industry
MoNDM	Ministry of National Disaster Management
MoNFSR	Ministry of National Food Security and Research
MoPl	Ministry of Planning
MoP	Ministry of Power
MoPDR	Ministry of Planning Development and Reform
MoPH	Ministry of Public Health
MoPIT	Ministry of Physical Infrastructure and Transport
MoRRD	Ministry of Rural Rehabilitation and Development
MoST	Ministry of Science and Technology
MoSTE	Ministry of Science Technology and Environment
MoUD	Ministry of Urban Development
MoUDH	Ministry of Urban Development and Housing
MoWHS	Ministry of Works and Human Settlement
MoWP	Ministry of Water and Power
MoWR	Ministry of Water Resources
MoWR	Ministry of Water Resources, River Development and Ganga Rejuvenation
MoWR	Ministry of Water Resources
MPW	Ministry of Public Works

MSTCCC	Multi-Sectoral Technical Committee on Climate Change
MTBF	Medium Term Budget Framework
NABARD	India's National Bank for Agriculture and Rural Development
NAF	National Adaptation Fund
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NAPCC	National Action Plan on Climate Change
NAST	Nepal Academy of Science and Technology
NCCKM	National Climate Change and Knowledge Management
NCCKMC	National Climate Change and Knowledge Management Centre
NCCP	National Climate Change Plan
NCCSP	National Climate Change Support Program
NCEF	National Clean Environment Fund
N-DB	Non Development Budget
NDMC	National Disaster Management Committee
NEC	National Environmental Commission
NECS	National Environment Commission Secretariat
NEMAP	National Environment Management and Action Plan
NEPA	National Environment Protection Act
NGO	Non-governmental Organisation
NIA	National Implementing Entity
NICCSA	National Institute for Climate Change Studies and Actions
NPC	National Planning Commission
NPDM	National Plan for Disaster Management
NRM	Natural Resource Management
NSAPR	National Strategy for Accelerated Poverty Reduction
NWG	National Working Group
NWP	National Water Plan
NWRC	National Water Resources Council
ODA	Official Development Assistance
ODI	Overseas Development Institute
OECD/DAC	Organisation for Economic Co-operation and Development
PC	Planning Commission
PDMC	Provincial Disaster Management Committee
PECM	Poverty, Environment and Climate Change Mainstreaming
PEPC	Pakistan Environmental Protection Council

PFM	Public Financial Management
PIM	Participatory Irrigation Management
PMCCC	Prime Minister's Council on Climate Change
PMO	Prime Minister's Office
PPCR	Pilot Program for Climate Resilience
PSDP	Public Sector Development Program
RBO	River Basin Organisation
SAARC	South Asian Association for Regional Co-operation
SACEP	South Asia Co-operative Environment Programme
SAPCC	State Action Plans on Climate Change
SAWI	South Asia Water Initiative
SPCR	Strategic Program for Climate Resilience
TERI	The Energy and Resources Institute
TFCC	Task Force on Climate Change
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UP	Union Parishad
VDC	Village Development Councils
WaRPO	Water Resources Planning Organization
WEC	Water and Energy Commission
WECS	Water Energy Commission Secretariat
WUA	Water User Association
WFP	World Food Program

1. Introduction

The development context in South Asia is characterized by complex interactions between a host of drivers such as patterns of population growth, economic development, urbanization and industrialization, availability of technology, economic policy and a vast array of other influencing forces. The consideration of developmental risks posed by climate change need to be viewed within this context, where it is expected to intensify developmental challenges by itself as well as through its interaction with these broader drivers in multiple and complex ways that can either aggravate or attenuate climate risks and impacts. Within this framing, water resources is a critical natural resource given its centrality to a wide range of developmental sectors, including food and energy security, export revenue and livelihood security for a vast majority of the region's population and access to domestic water linked to a range of human health indicators. Water is also at the heart of many climate change impacts, such as floods, droughts, rainfall variation and salinity intrusion, which, in themselves, and combined with other impacts such as temperature changes, are expected to have extensive consequences for agriculture, health, energy and the environment. In fact, according to IPCC Synthesis (2014a), climate change impacts are projected to slow down economic growth, make poverty reduction more difficult and further erode food security. The details of how these impacts will come about, however, are less clear, and this is one of the major findings of the IPCC Fifth Assessment Report (2014b) which identified that studies of climate change and its impacts are still inadequate for many areas of Asia.

This report is part of a series of three papers that collectively seek to take stock of current knowledge of climatic risks in seven countries in South Asia (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka), and to assess their readiness to adapt to these challenges in terms of policy and planning, and the financial and institutional frameworks needed for effective implementation, particularly with respect to climate change risks in water resources management. The existing state of knowledge and information on climate change science and risk is reviewed in Paper 1 (Climate Science) followed by Paper 2 (Climate Policy), which looks at how this knowledge landscape is incorporated into the policy and planning process in the seven countries. Paper 3 examines how these policy frameworks and responses are translated into financial and institutional structures, and assesses the strengths and weaknesses of these structures in dealing with climate change and climate risks in the water sector.

This report draws on qualitative and quantitative research methods as well as a comprehensive literature review. A detailed explanation of the information sources used and methodology followed is provided in Annex 1.

The paper begins with a brief summary of the major drivers of the economy at both national and regional levels, emphasizing the economic importance of the main water-related sectors; a summary of climate change impacts on water resources, and the economic consequences thereof. It then discusses current trends in financing and institutional frameworks for climate change adaptation, including structural factors influencing the targeting of climate finance to key needs, and the strengths and weaknesses that define each country's ability to cope with different climate risks, emphasizing the role that water resources management plays. The conclusion highlights key findings and lessons to emerge from the study.

2. Development, Water Resources and the Economic Implications of Climate Change in South Asia

As a region, South Asia experienced the fastest economic growth rate of any developing region globally, with an average growth rate of 8% over the past five years, which is expected to continue in 2016 (World Bank, 2016c). Most countries in South Asia have benefitted from falling oil prices, a consistent input of remittances and low inflation. India, South Asia's largest economy, is projected to grow at a rate of 7.6% in the fiscal year 2016/2017 and comprises approximately 82% of this region's economy (World Bank, 2016c). Despite 67% of the region's population being rural[1], the economic growth of South Asia is largely driven by the services sector (Table 1) and private consumption (aggregate demand). However, as also evident from Table 1, agriculture accounts for approximately just under a fifth of South Asia's gross domestic product (GDP) and half of its employment (World Bank, 2013), while over a fifth of the population lives in poverty in all but two countries.

Table 1. Snapshot of country development context

	Afghanistan	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Population (million)[2]	32.52	161	0.775	1,311	28.51	188.9	20.88
Rural population[3]	80%	70%	61.4%	67.3%	81.4%	61.2%	81.6%
GDP (USD billion, 2014[4])	20.04	172.9	1.959	2,048	19.77	243.6	78.82
GDP growth (2015)	2.5%	6.6%	5.9%	7.5%	5%	4.4%	6.9%
Poverty[5]	35.8%	24.8%	12%	21.9	25.2%	29.5%	6.7%
Sector contributions to GDP	Services (54%); Industry (22%); Agriculture (2%)	Industry with a (31.27%); Agriculture (19.29%); Remittances (11.01%)	Hydropower exports (25%); Tourism (20%); Agriculture (12%)	Services (57%); Industry (26%); Agriculture (17%)	Services (45%); Agriculture (35%); Remittances (29%); Industry (20%)	Services (53.1%); Agriculture (25.3%); Industry (20.1%)	Services (56%); Industry (33%); Agriculture (11%)
Contributions to employment	Agriculture (60%)	Agriculture (47.5%)	Agriculture (62%)	Agriculture (over 50%)	Agriculture (67%)	Agriculture (64%)	Agriculture almost 30%

[1] http://data.worldbank.org/topic/agriculture-and-rural-development
[2] http://data.worldbank.org/country
[3] http://www.geohive.com/earth/pop_urban.aspx
[4] http://data.worldbank.org/country
[5] http://povertydata.worldbank.org/poverty/region/SAS

Table 1. Snapshot of country development context							
	Afghanistan	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Other key development factors	Poor infrastructure Rapid rural and urban development	Rapid urbanization	Rapid development of hydropower sector. Increasing rural-urban migration	Rapid urbanization. Serious energy deficits.	Rapid development of hydropower sector. Rapid urbanization	Heavy focus on energy development. Moderate Urbanization	Decreasing share (though still high) of water related sectors on GDP. Moderate rural-urban migration
Surface water	Primary Water Source	Dependent on transboundary flows for 90%.	Primary water source	Pollution a serious threat. Demand expected to exceed availability by 2025.	Primary water source	Primary but rapidly falling	Primary
Groundwater	Secondary water source but growing rapidly	Provides 85% of irrigation – supports 54% of rice production.	Negligible due to mountain terrain	Under severe stress, with major impact on energy demand in several states	Secondary supplier for domestic use and significant for irrigation.	Secondary source, however rapid depletion of groundwater has led to lower stocks	A source that is developing rapidly, although extent of withdrawal not assessed

Source: Authors' compilation from various sources.

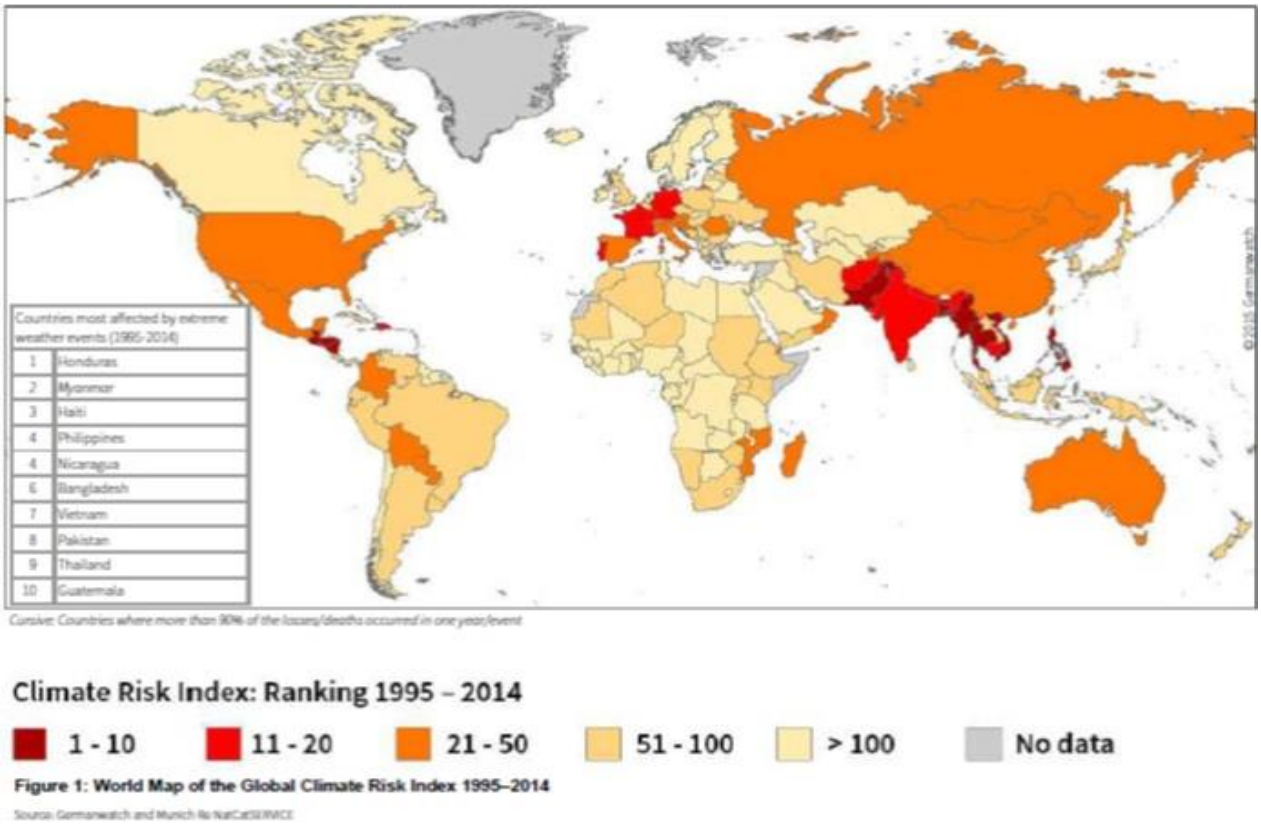
Water plays a key role in advancing South Asia's economic goals. For instance, increasing food and energy security for much of the region is seen as a primary goal in improving the living conditions of the population, and in order to accomplish this increase in security water is essential. As most of the population is employed in the agriculture sector and South Asia is primarily an agrarian economy, water is seen as a catalyst in ensuring future employment and growth in the agriculture sector. Additionally, countries such as Bhutan and Nepal are focusing on ramping up hydropower generation capacities, leading to increasing withdrawals of water to meet demand. Due to this growth, there have been numerous stressors that have been placed on surface water and groundwater resources in order to increase water supply.

South Asia as a region only has access to approximately 8% of the world's water resources, but supports 21% of the world's population. Population growth, industrial development, excessive extraction of groundwater and surface water for agriculture, urbanization, environmental pollution, poor domestic water management, increasing variability of rainfall and extreme climatic events have all increased the susceptibility of the region to natural disasters, floods and droughts (Surie, 2015). Water scarcity has increased in the region. For instance, 22 of 32 Indian cities face daily water shortages, Nepal has faced long queues for drinking water, and Pakistan is facing electricity and water shortages (Surie, 2015). The lack of regional treaties, and open and transparent data

sharing between countries has also reduced the region's ability to adapt to climate change and effectively manage water resources.

Across the seven countries, climate change can be considered as a significant additional source of stress on water resources availability and demand, with knock-on effects across economies. As shown in Figure 1, South Asia is considered as one of the most climate-vulnerable regions, with virtually all countries in this region falling within the 20 most vulnerable countries. Table 2 provides an overview of the major climate risks for each country in the region, and the sectors likely to be most affected by climate variability.

Figure 1. Climate change vulnerability index.



Source: Kreft et al. 2016

Table 2. Major climate risks and (potentially) affected sectors

	Afghanistan	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Water-related climate risks	Landslide, riverine and flash floods, droughts, groundwater depletion	Storms, cyclones, riverine and coastal floods, groundwater salinization and depletion, droughts	GLOF, flash floods, landslide, droughts, erosion, storms and cyclones	Droughts, groundwater depletion, riverine and flash floods, landslide, storms and cyclones	GLOF, flash floods, land slide, droughts, erosion	Droughts, groundwater depletion, landslide, flash and coastal floods, groundwater salinization, erosion.	Droughts, storms and cyclones, groundwater salinization and depletion, riverine and flash floods

Table 2. Major climate risks and (potentially) affected sectors							
	Afghanistan	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Affected sectors	Agriculture Water Energy Transport Health	Agriculture Water Environment Housing Transport Health	Agriculture Water Energy Forestry Health	Agriculture Water Forestry Health Energy Environment	Agriculture Water Environment Health Energy Forestry	Agriculture Water Energy Health Forestry Environment	Agriculture Water Forestry Housing Health Transport Energy
Source: Authors' compilation from various sources; Paper 1							

In relation to climate change adaptation, the role of water is multidimensional in its support to a range of sectors that power growth. These include food production (irrigated agriculture and green water), energy (hydropower) and the support of ecosystems that provide a range of services. The widespread relevance of water also means that its overabundance or absence can have far-reaching developmental consequences. These include floods, GLOF or droughts. Ensuring that the impacts of climate change on water (Paper 1) and their costs are well understood has significant implications for the shaping of adaption responses (whether planned and implemented or through other systems of, for example, consumer and market behavior), and future adaptation strategies and programs.

Ahmed and Suphachalasai (2014) projected the economic costs of climate change at a regional level in South Asia (Table 3) and estimated that, without global deviation from a fossil fuel-intensive path, the region could lose an equivalent of 1.8% of its annual GDP by 2050 due to climate change. This would progressively increase to 8.8% by 2100 under a business-as-usual (BAU) scenario. However, according to the same study, should the global mean temperature rise below or within 2 °C, the region would only lose an average of 1.3% of its GDP by 2050 and approximately 2.5% by 2100.

Table 3. Projected reductions in % GDP due to climate change			
Country	**Under the BAU scenario**		**If mean temperature rise is below 2°C**
	2050	2100	2100
Asia	1.8	8.8	2.5
Afghanistan	Not assessed	Not assessed	Not assessed
Bangladesh	2.0	9.4	2.1
Bhutan	1.4	6.6	1.7
India	1.8	8.7	1.9
Nepal	2.2	9.9	2.4
Pakistan	Not assessed	Not assessed	Not assessed
Sri Lanka	1.2	6.5	1.4

Source: Based on Ahmed and Suphachalasai (2014).

Although the analyses suggest that, by 2050, the costs of climate risks will be less than a 10% reduction in real GDP across the seven South Asian countries, specific sector impacts on food security, in particular, would have disproportionately severe impacts on human security, not least because the poorest would be hit most acutely, especially in countries that are highly dependent on agriculture. At the same time, the model employed to generate these estimates excludes the

impact of extreme climatic events, such as storms, floods and droughts, which may in fact lead to an underestimating of the cumulative impacts over time.

In terms of the required expenditure on adaptation to mitigate damage and economic losses under a BAU scenario, Ahmed and Suphachalasai (2014) estimate that, to avoid serious damage and economic losses, the region needs to provide an average adaptation expenditure of 0.48% of regional GDP per annum (USD 40 billion) by 2050 and 0.86% of GDP per annum (USD 73 billion) by 2100.

Regional adaptation costs under the Copenhagen-Cancun scenario are much lower than the BAU scenario, requiring only an average of 0.36% of GDP per annum (USD 31 billion) by 2050 and 0.48% of GDP per annum (USD 41 billion) by 2100. The authors state that the costs of specific adaptation measures and that of adaptation in individual sectors are frequently difficult to determine, and may vary widely across the region.

Afghanistan

Afghanistan contributes 57 billion cubic meters (Bm^3) to major river systems as surface water and 18 Bm^3 as groundwater. Water resources in the country are particularly susceptible to shifts in rainfall, and changes in glaciers and snowmelt. Afghanistan is still primarily an agrarian economy, and water availability or lack thereof will play a huge role in how much development takes place with regard to poverty reduction and improving livelihoods. Eighty-percent of the population in Afghanistan lives in rural environments, and are heavily dependent on the agriculture and livestock sectors for their livelihoods. In order to maintain a reliable quantity of water for the agriculture and livestock sectors, a large portion of the cultivated land is under irrigation and 98% of the volume of water in Afghanistan is used for irrigation. However, because Afghanistan is extremely drought-sensitive, and due to its associated years of conflict, water infrastructure is poor and only 27% of the population has access to improved water sources. Therefore, it is vital that the appropriate infrastructure and proper water management practices are in place to increase access to water. However, from the total annual potential usable water, only 30% is used due to the previous war, poor water management practices, lack of security and inadequate infrastructure.

Overall, the economy of Afghanistan had a marginal increase from 1.3% in 2014 to 1.5% in 2015 (Afghanistan Country Overview, 2016). The economy is expected to grow to 3.6% in 2018. The marginal increase as opposed to a significant increase is due to a combination of factors, including the departure of foreign troops in 2014, which have had impacts on businesses that catered specifically to foreign soldiers. Other factors include lack of economic diversification, poor management of resources (including water), and the disconnect between the rural communities and the central government with regard to allocation of development projects. There are three major economic sectors comprising the country's GDP; agriculture (24%), industry (22%) and services (54%). Over 60% of the population works in the agriculture sector and 39% lives below the poverty line (Afghanistan Ministry of Economy, 2013; Human Development Report, 2015). Since over half the population earn a living from the agriculture sector, and due to poor water supply delivery, farmers have turned to crops with low water requirements as a means of adjusting to the changing climate and to make ends meet. This change can also be linked to the severe flooding and drought that has wreaked havoc on Afghanistan's agriculture sector. For instance, ADB estimated that 70% of the losses as a result of GLOF and flash floods were to crops, livestock,

housing and loss of life (ADB, 2014). For further details on disaster estimates in Afghanistan, refer to Annex 2. Agriculture as a sector declined by a projected 2% in 2015, and this combined with the sluggish growth in GDP put upward pressure on the number of people below the poverty line (Afghanistan Country Overview, 2016). Indeed, the sectors most affected by climate change are the water, energy, transportation, agriculture and health sectors.

The majority of the losses from floods and drought impact nearly 80% of the population and the reconstruction costs of the irrigation infrastructure were also high (ADB, 2014). The Ministry for Energy and Water (MoEW) estimated that the reconstruction costs for large-scale irrigation projects would amount to USD 6.3 million in the Balkh, Jowzjan, and Samangan provinces (ADB, 2014), while the reconstruction costs for traditional irrigation systems after the 2014 floods in 15 provinces in the northern region were estimated to reach USD 19 million.

In conclusion, Afghanistan has a wide spectrum of issues to be concerned with outside of climate change. Even though the war is officially over, the terrorist threat still remains and the extreme centralization of the central Government has alienated the rural population. This is the segment of the population that is most affected by droughts and floods, and is going to be the majority of those that depend on either irrigated or traditional agriculture and livestock systems for their livelihoods. The costs related to drought- and flood-related disasters in Afghanistan vary depending on the source. However, it is expected that such costs will increase in the coming years, affecting the country's agrarian economy. However, with better climate management practices, such as improved water storage, resource management and farmers cultivating less water-intensive crops, Afghanistan can see a means of adapting to climate change. Infrastructure development (especially irrigation) should be a priority, as poor infrastructure will be detrimental to the country's resilience towards climate change and further hinder growth of the economy.

Bangladesh

Despite the seeming abundance of surface water in Bangladesh, groundwater is the most important water source for domestic, industrial and agriculture sectors, with 85% of irrigation sourced from groundwater (Faruque and Ali 2005). The agriculture sector is relevant not only in terms of economic growth, but also as a source of food security, nutrition and employment. In fact, nearly 54% of rice production is expected from the dry season *boro* crop (World Bank 2016b), which is mainly irrigated with groundwater. Linked to this dependence on groundwater is the vulnerability of surface water flows. As 90% of total renewable water resources is derived from the 57 international rivers flowing through Bangladesh (Faruque and Ali 2005), this highlights water uncertainties linked to natural events as well as transboundary political economies. As noted in Paper 1, one major dimension of drought and water shortage in the country is of a hydrological nature, as Bangladesh depends on upstream water use in India and other neighboring countries.

Water is clearly intricately linked with broader development in Bangladesh which, with nearly 150 million inhabitants, is among the most densely populated countries in the world. Nevertheless, despite also being one of the countries most affected by climatic stresses, Bangladesh has maintained an average annual growth rate of about 6% for more than a decade (World Bank 2016). This sustained, accelerated growth has spurred a dramatic decline in poverty incidence from 58.8%

in 1991-1992 to 24.8% in 2015 (World Bank 2015), with this rate expected to fall to 18.6% by the end of the 7th Five Year Plan (World Bank 2016b). A significant proportion of poverty reduction has occurred amongst the country's 70% rural population, and much of this achievement can be attributed to agriculture since 87% of rural people derive at least part of their income from agricultural activities according to World Bank (2016). Although the contribution from agriculture to GDP is expected to decline to 15% in 2021, it generates employment for 47.5% of the labor force, and accounts directly and indirectly for about one-fourth of total export earnings, and provides food security for the growing population (GoB 2013). In fact, World Bank (2016) identified that pro-poor agricultural growth has also stimulated the non-farm economy in Bangladesh, whereby a 10% rise in farm incomes stimulates a 6% rise in non-farm incomes.

Nevertheless, the large national population means that about 46.8 million people still live below the poverty line (GoB 2013), while many who now live above this threshold remain highly vulnerable to economic and natural shocks (World Bank 2016). While the current growth rate bodes well for the country's aspiration to be a middle-income country by 2021, it needs to raise annual GDP growth to at least 7.5% (World Bank 2016) while maintaining its resilience to multiple shocks including those linked to climate change. Many of these have water at their center. This is partly because 80% of the country is included in the floodplains of the Ganges-Brahmaputra-Meghna Basin, with very low elevation and high vulnerability to river flooding as monsoon rains are expected to intensify while sustained dry spells prior to monsoons will increase surface runoff. The risk of river flooding will further increase due to higher temperatures that will result in increased glacier melt, thereby increasing runoff from the neighboring Himalayas into the Ganges and Brahmaputra rivers. These changes, according to Huq and Ayer (2008), may also alter the timing of floods, as well as their magnitude, depth, extent and duration, with implications for the seasonality of the hydrological cycle, and potentially a dramatic change in land-use patterns. The same authors note that coastal flooding will also increase due to sea-level rise and be exacerbated by storm surges. Bangladesh is also prone to drought given significant variation in rainfall across its landmass, and variability linked to climate change. Consequently, growth in the agriculture sector (including livestock and fisheries) is characterized by annual fluctuations as a result of environmental shocks, such as floods, droughts and cyclones (Faruque and Ali 2005). Climate change will exacerbate this drought risk, both in terms of intensity and frequency linked to higher mean temperatures and potentially reduced dry season precipitation (Huq and Ayer, 2008). Thus, these challenges in water resources management have clear and multiple implications across key sectors driving development in the country, including the vulnerable populations, in particular. A third climatic risk, and one that demonstrated cumulative impacts of multiple climatic risks, is salinity. Increased salinity intrusion will reduce the availability of freshwater sources, especially during low flow conditions. In the coastal regions, this is linked to sea-level rise resulting in saline water intrusion in the estuaries and groundwater. The effects are exacerbated by greater evaporation and evapotranspiration of freshwater as temperatures increase, coupled with a greater demand for freshwater in times of water stress. An overall increase in temperature will also be marked by greater temperature extremes during the summer and winter seasons. This pervasiveness of climatic impacts on water resources is recognized by the National Adaptation Programme of Action (NAPA) which highlights water-related impacts of climate change to be amongst the most critical for Bangladesh. Overall, Huq and Ayer (2008) conclude that the

projected risks of climate change are expected to reinforce baseline biogeographical, environmental, socioeconomic and demographic stresses already faced by the country.

In an attempt to provide economic values to these risks, Ahmed and Suphachalasai (2014) estimate that, under a moderate climate change scenario, all sectors depending on water resources would suffer and real GDP would fall by 0.78% in 2030. Agriculture is one of the most sensitive sectors to climate change, given its exposure to extreme weather events, such as droughts and floods, as well as saline intrusion, and altered rainfall patterns and temperature. These cumulative impacts will overrun the positive impact on the production of natural flood regimes bringing silt and nutrients that increase soil fertility. Consequently, Ahmed and Suphachalasai (2014) estimate that, under a BAU scenario, due to the reduction in yield, paddy production would fall by 1.6% in 2050 and 5.0% in 2100, causing a negative impact on real GDP by 0.67% in 2050 and 0.93% in 2100. Further reductions to GDP occur due to impacts on land availability, leading to a fall in real GDP by 0.73% in 2030 and up to 0.93% in 2100 under the BAU scenario. The negative impacts on the economy due to land quantity shock would also manifest through an increase in the Consumer Price Index, and a decrease in overall exports and imports. These climatic impacts will also affect the fisheries sector, which contributes about 3.5% to GDP and provides 80% of daily dietary protein. Of particular relevance to the 260 species of fish in Bangladesh will be salinity, since all these species are sensitive to particular salt and freshwater conditions (Huq and Ayer, 2008). Therefore, in addition to the GDP implications of these climatic impacts, food security and an undermining of livelihood bases of the majority of Bangladesh's population represent other major consequences.

While the government has produced the National Environment Management and Action Plan (NEMAP) in 1995, Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008, National Adaptation Programme of Action (NAPA) in 2005 (updated in 2009), and the National Plan for Disaster Management (NPDM) in 2010, no clear official long-term climate change cost projections exist (GoB 2014) except for some independent estimates. For example, modifying food production in marginal areas prone to salinity is expected to cost USD 10 million initially, possibly rising threefold by 2030 (Mainuddin, K. et al. 2011). While climate change will affect all segments of the population, the poor and marginalized groups will be mostly affected because unlike the rich and middle-income groups, they lack sufficient resources to invest in climate risk reduction (GoB, 2012).

Bhutan

Bhutan is considered as a country rich in water resources, with total withdrawals in 2008 being only 0.43% of the total annual renewable volume of water. Almost every valley houses a stream, for which the source of water is glacial melt or the summer monsoon (or both). The country is highly dependent on this resource both as an engine for economic growth through hydropower production, and for livelihood sustenance through agriculture.

It is estimated that hydropower exports comprise 25% of the country's GDP, with a further addition of 25% if indirect impacts such as construction are also factored in. Around 70% of the energy produced is exported to a single buyer, India. While only 5% of Bhutan's hydropower potential is developed at present, this is expected to change, with a plan to generate 10,000 MW by 2020, mainly financed by loans and grants from India (at a ratio of 70:30). However, the agriculture

sector, accounting for only 12% of the GDP, remains the leading source of employment with 62% of the population depending on it for their livelihoods. The sector is mostly subsistence-based, with rice (both irrigated and rain-fed) being the main crop produced, although the cultivation of other cash crops is increasing. Irrigation is mainly from river water, as the mountainous nature of the country means that groundwater resources that can be developed (and have been developed) are limited. Tourism is a sector that has seen growth in recent times, with revenues making up 20% of non-hydropower exports.

Although Bhutan is sparsely populated, with a population density of 12 persons per square kilometer, it is experiencing a rapid growth in population. The country's population is overwhelmingly rural, with only 30% of the population residing in urban areas. However, efforts to modernize the economy have resulted in a high rate of rural to urban migration, with the proportion of the population employed in agriculture shrinking in number. The country's social and economic well-being is measured by the Gross National Happiness Index. Other measures of development consider Bhutan to be a least developed country (LDC), with its ranking of 132 in the Human Development Index. There has been a rapid growth in the country's GDP in the past decade, mainly driven by hydropower development.

Ahmed and Suphachalasai (2014) conclude that, under a BAU scenario, the impact of climate change could lead to an annual loss of 1.4% of GDP by 2050, which is expected to increase to 6.6% in the long term. The potential risks posed by climate change are already making Bhutan's hydropower investment less attractive (Meenawat and Sovacool, 2011), as the country's existing hydropower systems are mainly run of river and therefore highly vulnerable to fluctuations in streamflow, damage caused by flooding and increased sediment loading, which would be intensified due to GLOF. With regard to agriculture, Masutomi et al. (2009) predict an increase in the productivity of rice cultivation until 2050 (by up to 15.8% depending on the scenario) and a decline until 2080 (by 12.9%) (Gautam et al. 2013). This would worsen the current level of food insecurity. As only 8% of the land is cultivable, this not only makes Bhutan a net importer of food at present, but also highlights its vulnerability to climate change in terms of long-term food production.

Farmers who depend on subsistence agriculture, including tenants and landless, are the most vulnerable sections of the community (Chettri, 2003). As incidences of flood damage to crops and irrigation infrastructure are expected to worsen in the lowlands, farmers will have to move to higher elevations, where the land is steeper, less productive and more dangerous to cultivate. Further, owing to the difficulties involved in pumping water to the highlands, most farms and settlements are situated close to rivers, making them highly vulnerable to glacial floods (Mirza and Ahmad, 2005).

On the broader economy, the role of Bhutan's water resources in sustaining current and future socioeconomic development cannot be overstated, making the country extremely vulnerable to the impacts of a changing climate in this sector.

India

India's current water consumption is approximately 581 trillion liters out of an estimated 1,122 trillion liters of exploitable water, with irrigation accounting for as much as 89% of total

consumption (KPMG 2010). The same source notes that the demand for water is projected to overtake availability very soon, and that this is already a reality in some regions of the country. Lal (2005) expects India will reach a state of water stress before 2025, when per capita availability falls below 1,000 m^3. Demand assessments suggest a 20% increase by 2020, driven primarily by industrial requirements, which are projected to double. Urban demand will also rise rapidly, with 10 million dwellers added to the urban population each year (World Bank 2015b). Pollution of rivers restricts the supply of usable water (Lal 2005). World Bank (2015b) concludes that limited availability of water is already constraining industrial and agricultural performance, whereby the 12^{th} Five Year Plan recognizes water availability as being a key constraint to economic growth (World Bank 2015b).

India's recent growth has been significant, beginning with an agricultural revolution that has taken the country from chronic dependence on grain imports to a net exporter of agricultural produce. Irrigation is one of the key drivers in agricultural development and poverty reduction, with 25% average poverty rates in irrigated districts compared to 70% in un-irrigated districts (Grey and Sadoff 2006). As noted by Lal (2005), agricultural output is primarily governed by the availability of water, making the agrarian economy sensitive to the status of water resources and the monsoon, in particular. Surface water and groundwater resources also play a vital role in fisheries, livestock production, forestry, energy production and industrial activity. Today, growth is driven by further structural changes in the economy, with the services sector accounting for 57% of GDP in 2012-2013, thanks largely to the information technology subsector, while the industrial sector has consistently contributed around 26% of GDP. In contrast, the agriculture sector now contributes only 17% to GDP, but, as with many other South Asian countries, it provides employment and livelihoods to more than 50% of the labor force (World Bank 2015b).

Most of India's population is vulnerable to the adverse impacts of a changing climate. Despite the country's economic growth of 7.6% average annual rate during the last decade (World Bank 2015b), approximately 75% of the country's population lives below a daily income of USD 2. Moreover, many of India's newly non-poor, especially in rural areas, remain highly vulnerable to climate shocks that can push them below the poverty line (World Bank 2013). Such vulnerability is driven, for example, by the dependence of around 650 million Indians on rain-fed agriculture for their livelihoods, while around 250 million live along a 7,500 km coastline that is at high risk due to sea-level rise and extreme weather events (Garg et al. 2015).

Therefore, the impacts of climate change on the water sector, as detailed in Paper 1 and summarized in Table 2 above, occur within a context of other drivers of water stress. In addition to rapidly increasing water demand, about 10% of India's total renewable water resources that originate from snowmelt faces an uncertain future with glacier melt expected to increase under changed climate conditions (Lal 2005), with both quantitative and temporal repercussions. India is also highly affected by meteorological droughts. While groundwater dominates India's irrigation and provides almost 80% of domestic water (Lal 2005), over-extraction of the resource poses a significant challenge for the country's water resources management (Shah, 2008). Furthermore, India is ranked the highest in terms of exposed population. These natural factors are compounded by irrational and inefficient use of water resources (KPMG 2010).

Although the exact impacts of changes in water availability could not be identified, several studies confirm that climate change will drive significant economic losses for India. The preceding text on the role of water as a driver across several sectors suggests that climatic impacts on water

availability will play a central role. Chaturvedi (2015) estimated that major food crop losses could reach USD 208 billion and USD 366 billion in 2050 and 2100, respectively. Moreover, Garg et al. (2015) estimated that the direct losses associated with extreme weather events were USD 51 billion, of which floods accounted for almost 76%. As the intensity and frequency of extreme weather events are expected to increase under a changing climate, the costs associated with these events are also expected to rise significantly in the future.

A few studies have assessed the quantum of finance required for adaptation and their estimates vary widely. ADB (2014) estimates that adaptation actions will require India to invest 0.48% of GDP annually. Ministry of Finance (2013) estimated that implementing the NAPCC by 2017 would cost USD 38 billion (i.e., more than USD 7 billion per year). Another assessment (GoI 2015) suggests that India would need around USD 206 billion (at 2014-2015 prices) between 2015 and 2030 to implement adaptation actions in agriculture, forestry, fisheries infrastructure, water resources and ecosystems, whilst recognizing that additional investments will be needed for strengthening the resilience and disaster management in sectors such as transport infrastructure (roads, bridges, ports) and buildings. Further investments would be needed to meet future power generation requirements, which Chaturvedi (2015) estimates at USD 33 billion and USD 123 billion in 2050 and 2100, respectively.

Garg et al. (2015) estimated that, in real terms, the adaptation gap for India could be over USD 1 trillion from 2015 to 2030, and could increase substantially beyond 2030. There are, however, limited efforts to assess the impact of climate change on the national economy, and to prioritize climate-related investments within national and sectoral budgets, based on a detailed needs assessment. Although national plans such as the 12th Five Year Plan refer to the impacts of climate change, they do not provide a detailed analysis of the implications climate change will have on the economy, an observation that also applies to state-level and sectoral development plans (Steinbach et al. 2014).

Nepal

Nepal has 225 Bm^3 of water available annually, and only 15 Bm^3 has been utilized for economic and social purposes (Water and Energy Commission Secretariat, 2011). It is estimated that Nepal uses 0.756 Bm^3 of groundwater for irrigation and 0.297 Bm^3 for domestic purposes (Thapa and Sharma, 2004). With groundwater continuing to be used extensively, a proper water management solution is needed to prevent the problem of over-extraction of the resource, especially since irrigation water demand will increase by 185% in 2025. Since a large portion of Nepal's population derive their livelihoods from the agriculture sector, water management decisions need to be made carefully to avoid significant GDP losses from agriculture.

Nepal remains one of the poorest countries in the world and continues to have setbacks, including the earthquake in 2015 which destroyed a large amount of Nepal's infrastructure. Fortunately, before the earthquake, Nepal had strong macroeconomic fundamentals, as factors such as decreasing public debt and increasing remittances assisted with reducing the debt. Most of this economic growth came from remittances which accounted for 29% of GDP in the fiscal year 2014/2015 (World Bank, 2016). The primary economic sectors of Nepal are agriculture, industry, and services, accounting for 35%, 20%, and 45%, respectively, of GDP in 2015. Most of the

population in Nepal lives in rural areas and are employed in the agriculture sector. A poverty reduction of 92% occurred in rural agrarian villages over the past few years, which means that agricultural growth is vital for the reduction of poverty.

Nepal is subjected mostly to GLOF and landslides, but also experiences droughts and floods due to climate variability. Declining snow cover and increased water demand due to population growth, economic growth and pressure on increased hydropower generation mean that there will be a water deficit which could lead to competition for water in the energy, industry and agriculture sectors (Mirza and Ahmed, 2005). An overarching water policy is needed to avoid competition between the hydropower and agriculture sectors. According to the Economic Impact Assessment (EIA) conducted by the Government of Nepal, the sectors most affected are the agriculture and hydropower sectors (IDS-Nepal, 2014). Both these sectors are affected by many risks, including increase in the periods of droughts, temperature rise, snowmelt and increased runoff. The EIA estimates climate change to have a direct cost to GDP of 1.5%-2% (USD 270-360 million/year in 2013 prices) per year, rising to a GDP cost of 5% per year in extreme years (IDS-Nepal, 2014). Net agricultural losses in the longer term (2070) were estimated to be 0.8% of GDP per year. Water-induced disasters are estimated to cost 0.6%-1.1% of GDP per year, though Nepal had spent approximately USD 580 million between 2010 and 2011.

Overall, Nepal's cost of adaptation is projected as USD 530 million in 2013 prices (IDS-Nepal, 2014). The cost of adaptation for agriculture and irrigation was the highest. Hydropower also had a significant projected adaptation cost of USD 1.1 billion (IDS-Nepal, 2014). This is due to risks such as GLOF on infrastructure, glacial melt rates on river flows, high flows and floods (IDS-Nepal, 2014), which will increase sediment transport flowing into the dam storage. The populations affected by climate change would be those that are already experiencing inequalities (women, poor and rural populations), and climate change would magnify these inequalities. In order to adapt to climate change, Nepal has invested or is investing in infrastructure projects in energy and water that would potentially assist with increasing water storage and hydropower. With water demand for agriculture and energy increasing, additional water storage will increase the resilience of Nepal and reduce the competition between hydropower and agriculture in meeting these sectors respective demands for water.

Pakistan

Pakistan has the world's fourth highest rate of water use. In 2016, the country had a total annual per capita water availability of 1,017 cubic meters (m^3), which is quite close to the scarcity threshold of 1,000 m^3 per capita. As a comparison, water availability per capita in 2009 was 1,500 m^3. It is the world's third highest water-stressed country and has the highest water intensity, which is the amount of water used (in cubic meters) per unit of GDP (Shams, 2016). As a result, Pakistan's economy is very water-intensive. As with most South Asian countries, agriculture accounts for a significant portion of Pakistan's GDP (25.3%), with services (53.1%) and industry (20.1%) making up the rest of the economy (Global Finance, 2016). Some 64% of the population of Pakistan lives in rural areas, and derive their livelihoods either directly or indirectly from agriculture-related business. The irrigated floodplains along the Indus Basin contribute 90% of the country's crops. Agriculture, which consumes most of the available water, is largely untaxed. Additionally, the majority of Pakistan's farmland is irrigated through canal systems, but is underpriced, and recovers only one quarter of annual operation and maintenance costs.

Groundwater is also being rapidly depleted as surface water is insufficient to meet demands (Shams, 2016). Climate change exacerbates the country's water scarcity issue, and climate change-induced disasters also play a factor in contaminating and reducing the available water supplies (Shams, 2016).

Pakistan is affected by both floods and droughts, which in turn affect sectors such as agriculture, transportation, communication, irrigation and livestock, and hydropower. On average, the negative impact of floods (both GLOF and rain-fed floods) on Pakistan's economy amounts to approximately USD 6 billion per year (GWP, 2011). It is difficult to estimate the exact impacts on the water sector as an average because Pakistan has not conducted specific water sector impact assessments. However, flood damage assessments have been conducted and these highlight the economic damage to each sector. Annex 2 provides details of the damage incurred by the 2010 floods. For the agriculture sector, economic costs due to water variability (due to changes in snow cover that feed the Indus and Ganges) will affect the country's irrigated crop production (Memon, 2014; Mirza and Ahmed, 2005), including its key cotton industry.

Pakistan also has a lack of storage capacity and can only hold 7% of average annual river flows. However, the water needs of the country demand a capacity equivalent to at least 40% (Sufi et. al, 2010). Integrated Water Resources Management (IWRM) principles can be applied to improve storage capacity as well as improve water management principles (see paper 2 and Annex 2 for details).

In conclusion, Pakistan is going to continue to see increased economic losses from extreme weather events, and competition between the energy and agriculture sectors to meet demand. With extreme weather events having a significant effect on the country's agrarian economy, together with the fact that the economy is heavily dependent on the water sector, Pakistan will have to do more in terms of adapting to climate change for the future. Unfortunately, with the current external and internal security threats facing the country, as well as population growth and industrialization, the economic security of Pakistan has been questionable. In fairness, Pakistan has invested significantly in energy and water storage, even though the budget has not classified it as being related to climate change. Moreover, Pakistan still has one of the stronger economies out of the seven countries analyzed in this paper. This means that it has the resources to meet increasing water demands and avoid water scarcity. In addition, Pakistan can adapt to climate change threats, and take advantage of potential benefits, such as increasing the diversity of crops grown and becoming more resilient to climate-induced disasters.

Sri Lanka

In Sri Lanka, irrigation for agriculture accounts for 92% of total water withdrawals in the country, of which rice accounts for 82%. Employing nearly 30% of the total labor force, the agriculture sector is also an important foreign exchange earner, accounting for about 30% of the total earnings. Hydropower is an important contributor to electricity generation in the country, accounting for 58% of the total generation in 2013 and 37% in 2014. The extent to which groundwater contributes to agriculture is unknown, although a significant increase in the number of wells has been observed in the past decade, particularly in the Dry Zone, which has been an important mode of poverty alleviation as well as a source of drinking water (see Annex 2).

Sri Lanka is classified as a low to middle-income country, experiencing a rapid rate of economic growth at 6.3% (2002-2013). Other human development indicators and achievement of the millennium development goals (MDGs) are considered to be high. However, 6.5% of the population of 20.48 million is estimated to be living below the poverty line. Agriculture, industry and services are the dominant sectors of the economy, accounting for 11%, 33% and 56%, respectively, of GDP in 2015.

Ahmed and Suphachalasai (2014) conclude that, under a BAU scenario, the impact of climate change would be an annual loss of 1.2% of GDP by 2050, which is expected to increase to 6.5% in the long term. Studies of the impacts of climate change on agriculture in Sri Lanka predict both increases and decreases in yield, depending on the location of production and timescale. For example, changes to net income from the country's rice production could vary from a decrease of 27% to 46%, depending on the different scenarios (Munasinghe et al. 2005). Of the different impacts of climate change, the amount and temporal distribution of precipitation is expected to have the highest impact on rice cultivation (De Silva et al. 2007; Eriyagama et al. 2010). A study by Wijeratne et al. (2007) finds that tea (the highest foreign exchange earner) yields are expected to increase at higher elevations and decrease at lower elevations with the combined impacts of climate change. Decreased precipitation in the Central Highlands is also expected to lead to a loss in the catchment for the multipurpose Mahaweli Complex, which currently accounts for 59% of the total hydropower capacity. This could also lead to challenges and potential conflicts in water allocation between the agriculture and hydropower sectors. With regard to the impact of climate change on groundwater resources in Sri Lanka, Eriyagama et al. (2010) noted that this has been the subject of only a limited number of studies (see Annex 2).

The contribution of agriculture to the country's GDP has been decreasing steadily. Further, as most feasible large hydropower projects have been developed, future provision of electricity needs will largely come from other sources. Thus, as the economy diversifies gradually and other sources of electricity generation expand, the contribution of water-related sectors to economic growth will reduce. The impact of climate change on the water sector in Sri Lanka will instead be felt more strongly by those dependent on the agriculture sector for their livelihoods and food security Geographically, Eriyagama (2010) reveals that five of the 28 districts (Nuwara Eliya, Badulla, Moneragala, Ratnapura and Anuradhapura) are at particular risk. These are areas with a historically high incidence of natural disasters, but where a dependency on primary agriculture is high, along with a low level of socioeconomic assets and infrastructure development (see Annex2).

The costs of implementing adaptation measures in each of the nine sectors defined in the NAPA for the next 10 years is estimated to be USD 72.3 million. Sectors for which water-related adaptation measures form a significant component of the estimated costs also account for high proportions of the total costs. Overall, water-related adaptation measures amount to 65% of the total cost or USD 47 million. However, it must be noted that these costs were estimated only from preliminary consultations held with the relevant stakeholders, and are therefore not complete. Therefore, it can be reasonably concluded that they represent underestimations of the actual costs involved.

The absence of comprehensive cost assessments of climate change impacts, in general, and for water resources management, in particular, is a key issue across the seven countries. Existing assessments are generally sector-focused, but with the lack of information on the water sector

specifically, this will lead to a patchy picture of cost calculation and estimation, and unclear direction on water-related adaptation strategies.

Comprehensive financial assessment of climate change impacts should disaggregate financial costs for the water sector specifically, while also linking these to broader development targets and specific population groups, with particular attention to gender, poor and marginalized groups. Moreover, the costs borne by climate change should be integrated into development planning in order to better understand who will bear these costs.

3. Financial Structures and Mechanisms in Climate Adaptation

3.1 Existing Financial Structures and Mechanisms

Afghanistan

The current financial structure in Afghanistan is heavily dependent on foreign aid. Afghanistan tracks its foreign aid through the National Budget and Aid Management System. While not divided specifically by crosscutting issues, such as climate change, it does provide breakdowns by different economic sectors. Afghanistan receives a greater percentage of grants than loans. The money is spent primarily on infrastructure development, which includes groundwater projects, well monitoring and mapping of water supply systems, and irrigation systems. Yet, the amount of aid dedicated to agriculture, rural development and water has been declining from USD 251 million and USD 120 million in 2012 to USD 193 million and USD 69 million in 2013, respectively (Donor Assistance Database, 2016). This is in line with wider global aid trends for LDCs (OECD, 2014). Since Afghanistan relies on aid to a greater extent than revenues from taxes and imports. the trends in declining global aid is a red flag in terms of maintaining current projects and programs in the long term, and the capacity to finance climate adaptation measures in the long term. For details on the climate adaptation budget as well as the primary funding organizations refer to Annex 3.

According to Afghanistan's recently approved national budget, the money allocated for canalization and water supply decreased by 13% from 2015 to 2016. The reason for this is that some projects were discontinued or had funding reduced, such as the access to drinking water project in Samangan (Afghanistan National Budget, 2016). There was an increase in funds to the Ministry of Energy and Water. These funds were divided into IWRM, irrigation, dam and power projects. This information suggests that there may have been a reprioritization of funds to the Ministry of Energy and Water, but the exact reasoning for this is not stated and is unclear at this point. The aid received by local communities for climate change or water projects is also not documented very well and is hard to track. While aid disbursement is mostly centralized (at the federal level), the Government of Afghanistan has emphasized local community input in the allocation of project funding in the NAPA. Involving local communities, however, is lacking, due to mistrust between the rural communities and the Government of Afghanistan.

Overall, most of Afghanistan's project funding has been dedicated towards development and is not necessarily linked to specific climate change projects. Since Afghanistan already has a database that tracks donor funding, it would be beneficial to add climate-related funding as a potential filter in order to better track adaptation funding. Currently, there is a large disconnect between the nationally-received funds and that received from local communities. Responding to this disconnect and, to a certain extent, the national government's lack of capacity to distribute funds at a local level, some organizations have channeled aid directly to local communities. There is also a large funding gap between climate adaptation estimates and funding received. While this

is true for most countries analyzed in this paper, Afghanistan relies heavily on aid to stimulate its economy in most cases and more than other countries. Therefore, it is necessary to ensure that aid is being allocated correctly to enable the country to become less dependent on foreign aid.

Bangladesh

Responses to climatic threats in Bangladesh pre-date the emergence of climate change as an issue (GoB 2012). In fact, the BCCSAP (2009) estimates that government investments alone in addressing climatic impacts over the last 35 years have exceeded USD 10 billion. Government spending in fact dominates identifiable climate spending, including the amount used for adaptation. Available data also indicates a growing influence of climate risks across sector fund allocations. Another trend has been a noticeable shift in the direction of both external and internal financial flows from mitigation to adaptation, given national strategies geared towards developing resilience (GoB 2014). Approximately 97% of spending in recent years attributable to climate-sensitive activities has been for adaptation, as classified under the six BCCSAP themes ranging from infrastructure to social protection (GoB 2012). The structure of external finance for adaptation has also changed, with two-thirds of foreign financing consisting of loans (GoB 2014). This marked shift away from grants has meant that loan funding increased from 58% to 82% of foreign resources between the financial years 2009/2010 and 2011/2012 (GoB 2012). Bilateral and multilateral lending (Annex 3) will be supplemented by international funds, such as the still-nascent Green Climate Fund (GCF) meant to support enhanced action on adaptation, mitigation, technology development and transfer, capacity building and the preparation of national communications by the developing countries. According to Baboyan et al. (2014), the GCF will become the main conduit of future international climate finance for Bangladesh[6] and other developing countries.[7]

There are four mechanisms delivering climate finance in Bangladesh:

1. ***Annual Development Program (ADP) of GoB*:** this is the primary source of finance for climate activities. Projects are prepared by the Planning Commission (PC) on the basis of detailed proposals and budgets from line ministries. Sectoral allocations are made by the PC after the Finance Division determines the total size of the ADP.
2. ***Non-Development Budget (N-DB) of GoB*:** this is prepared by the Finance Division. It pays mainly for the recurring costs involved in the functioning of the government, and is intended to be fully financed from domestically-generated sources. The relevance for climate change responses lies in the inclusion of elements such as infrastructure maintenance and other standard programs such as crop breeding under various ministries. It is also, importantly, a key funder of the Bangladesh Climate Change Trust Fund (below).
3. ***Bangladesh Climate Change Trust Fund (BCCTF)*:** this was established and is fully financed by GoB to support BCCSAP implementation via allocations from the N-DB. While

[6] GoB has nominated the Ministry of Finance, Economics Relations Division, as the National Designated Agency (NDA) to interface with the GCF.

[7] The fund also includes a private sector facility to finance the private sector directly or indirectly on adaptation and mitigation activities (Tashmin 2016), which may spur the entry of new actors into adaptation programming.

66% of the funds can be spent on climate change-related activities[8], the remaining 34% has to be used for emergencies. The fund is administered by the Ministry of Environment and Forests (MoEF). While annual allocations from 2009-2012 remained at BDT 700 million (approximately USD 890,000 at current exchange rates), this has dropped to BDT 100 million for the financial year 2015/2016 (BCCTF website[9]). The reasons are unclear, although it was always the expectation that GoB would provide initial allocations after which development partners would take over (GoB 2014).

4. ***Bangladesh Climate Change Resilience Fund (BCCRF)*:** this was set up in 2010 to support the implementation of the BCCSAP. Unlike the BCCTF, this is entirely donor funded.[10] Primarily targeting adaptation, there are funding windows for public sector projects, civil society[11] and research[12]. The CCU in MoEF coordinates the fund, while a technical assistance portion is executed by the World Bank. Some uncertainty is apparent regarding future donor contributions to BCCRF, since the fund has yet to achieve the desired momentum, and capacity is needed to disburse funds already committed more quickly (GoB 2014, 2012).

Although around 50% of total development expenditure is resourced by foreign aid (Tashmin 2016), according to GoB (2014), over 80% of climate-related activities are financed by domestic resources estimated at USD 1 billion a year (see Annex 3 for details).[13] This domestic finance is sourced mainly from the ADP through its financing of programs with a climate dimension. These accounted for, on average, 60% of GoB spending on climate dimension projects[14] during 2010-2014, with the remaining 40% financed from the revenue budget (GoB 2014). This suggests that climate-related responses remain mostly coupled with broader developmental objectives, constituting one of multiple developmental outcomes.

Findings in the CFF (GoB 2014) suggest a significant shift in the in-country treatment of climate-oriented funding during 2009-2014, suggesting the emergence of a greater, broad-based consciousness of the need to address climatic risks. In the financial year 2009/2010, for instance, the number of national budget codes with climate relevance increased significantly from 24 in the original budget to 115 in the revised budget, concentrated mainly in the agriculture and water resources sectors (GoB 2012). Moreover, while in the financial years 2011 and 2012 only 27% of

[8] It is not clear whether these activities cover both adaptation and mitigation measures or are limited to adaptation.
[9] http://www.bcct.gov.bd/index.php/trust-fund
[10] A total of USD 188.2 million has been contributed principally by the United Kingdom (USD 96.9 million), European Union (USD 37.6 million), Sweden (USD 19.3 million), Switzerland (USD 12.5 million), USAID (USD 13 million), AusAID (USD 7.1 million) and Denmark (USD 1.8 million).
[11] Representing 10% of the fund value.
[12] Approximately USD 3.2 million.
[13] A number of other more dispersed and difficult-to-track funding sources operate that may not be fully represented in climate finance analyses, including direct donor funding to NGOs and local organizations, as well as private household investments in local adaptation. There is currently no policy in relation to private sector involvement in climate change or any preferred mix of public and private funding or delivery modalities (GoB 2012).
[14] The CPEIR and the CFF measure two figures of climate expenditure: i) **climate dimension expenditure:** the total expenditure of any program that includes climate elements; and ii) **climate-relevant expenditure:** weighted average climate dimension expenditure, adjusted based on the level of relevance to climate change of each program. The latter recognizes that not all climate-related programs are equally relevant to climate change, and therefore uses this method to assess spending according to relevance. Relevance is classified as follows: (i) strongly relevant: 75%+, (ii) relevant: 50-74%; (iii) somewhat relevant: 25-49%; and (iv) implicitly relevant: 0-24%.

climate spending was executed under activities classified as 'strongly' or 'significantly' relevant, this percentage almost doubled over the following two years to 45%, suggesting a considerable gain in the integration of climate issues in public expenditure management and planning processes. The overlap of these developments with the revision of the BCCSAP in 2009 suggests that the latter may have had considerable influence over broader development planning, although the water resources are not within the top recipients of climate-sensitive finance (see Annex 3 for sector spending details).

The CPRIR, CFF and Baboyan at al. (2014) agree that climate dimension allocations are driven by sectoral policies rather than through direct responses to climate strategy and policies. Relevant sector ministries have climate change components and mandates, and receive funds to implement programs through the ADP and non-development budgets. The MoEF is mandated to implement projects from the BCCTF and BCCRF (GoB 2012).While this process disconnect emerges as a key gap in fund allocation, the mapping of climate content in government spending (GoB 2012, 2014) does place much of this funding within the BCCSAP's six themes, though with unequal distribution. Most funds have relevance to adaptation related themes (1-3) and capacity building (theme 6), while mitigation (theme 5) and R&D (theme 4) have received only 4% and 8% respectively, further confirming the focus on adaptation, Bangladesh being only a small global emitter of GHGs (Baboyan et al. 2014).

Despite the spread of climate finance across a broader sectoral landscape, a lack of connectivity amongst different structures central to harmonized and inclusive adaptation appears to persist. The CPEIR and CFF (GoB 2012, 2014, also Khan et al. 2013) note a distinct lack of coordination between the BCCTF and BCCRF, and that the BCCRF and PPCR circumvent the formal Public Financial Management (PFM) system. Standard project approval guidelines do not apply to projects implemented under the BCCTF, which may have originally been necessary in emergency situations. Furthermore, the CPIER found that, on average, around 45% of planned climate-sensitive expenditure was not referenced in the Ministry Budget Frameworks (MBF) of all 37 ministries involved in climate spending in the financial year 2011/2012. There is no reference to climate in ministries' key performance frameworks, which removes a significant proportion of the climate-sensitive spending from the performance management architecture and disconnects climate policy at an operational level. Although the foregoing section indicates increasing attempts to reflect climate activities in sector activities, this appears to occur in an ad hoc manner, and contrary to the principles of harmonization and alignment that seek to link climate policy and priorities with diverse sector policies and planning processes.

Therefore, CPEIR and CFF recommend bringing these activities within the ADP, thereby ensuring that they fall within the regular monitoring framework of the Implementation Monitoring and Evaluation Division (IMED), and strengthen the Medium Term Budget Framework (MTBF), being the policy implementation framework used by GoB. This brings the policy planning and budgeting processes together by matching financial resources with intended policy outcomes in a performance, accountability and governance framework that includes performance indicators. The benefits for climate adaptation would include: i) more predictable funding to enable ministries as implementers to plan over 3 years; ii) improved transparency in the allocation and use of resources; iii) explicit ministry ownership of climate programs and achievement of their objectives; and iv) increased emphasis on service delivery by linking budget inputs to desired outcomes in the performance management framework. An important element recommended by the CFF is to introduce a 'climate marker' in the MTBF, as done for gender and poverty, to specifically track

ministry plans and budgets in terms of explicit objectives, activities and allocations, and reporting against these.

The CFF further recommends inclusion of a brief description of the BCCASP's six thematic areas and 44 projects/programs in the Budget Call Circular 1 guidelines (Government of Bangladesh 2014[15]). By facilitating coordination between MoF's Finance Division and the Planning Commission in funding the ADP, and between the Finance Division and MoEF with respect to the BCCTF and BCCRF, the MTBF would also ensure climate activities are reflected in the budget frameworks of relevant ministries and divisions, are subject to government accountability and outcome frameworks, and support a single system for financing climate actions. It would also help link climate fund management with allocations for operationalizing the National Strategy for Accelerated Poverty Reduction (NSAPR).

The disconnect between planning, allocation and oversight between the center and local government is another key area that needs attention. While there are no climate-change specific funds available to Union Parishads[16] (UP), they receive climate-relevant funds from: 1) central government, 2) donors, 3) local government's locally-generated revenue, 4) household spending, and 5) private funds. In fact, local governments receive the second highest climate allocations compared to other ministries, reaching over USD 3 billion between 2011 and 2014 (Baboyan et al. 2014). This issue also includes the fact that, while some donor funds use the national system to channel funds to UPs, most channel funds directly to NGOs bypassing government systems. Most often, while central government funds are usually allocated to *Zilas* (districts) and *Upazilas*[17] for further allocation to UPs, both government and donor funding mechanisms are characterized by the limited involvement of, or autonomy for, UPs in the planning and budgeting of these funds. Consequently, local planning and budgeting is a linear operational process whereby UPs implement the directives of the central government. This, together with the fact that NGOs operate outside the Joint Country Strategy (JCS) framework, leaves scope for potential overlap and duplication with government development programs, and presents a challenge in tracking climate expenditure and aligning efforts to address climate change in a more integrated manner (GoB 2012).

The CFF recommends establishing a Climate Fiscal Cell in the Finance Division to strengthen climate finance coordination and management. The CFF also recommends a set of climate codes designed to (i) track climate change expenditure for policy analysis and reporting, and (ii) estimate long-term climate finance needs by identifying potential climate-related public expenditure across government ministries. According to Baboyan et al. (2014), GoB has committed to implementing the CFF recommendations, with support from several development partners, including UNDP, UNEP, GIZ and DFID, through the Inclusive Budgeting and Financing for Climate Resilience (IBFCR) project.

The fact that Bangladesh's engagement in addressing climatic risks, be it a focus on extreme weather events such as floods and cyclones, came well before climate change became a global agenda affords it a somewhat unique position, and goes a long way to explain the considerable progress made both in terms of financing climate adaptation and the significant steps taken to institutionalize its climate response within the formal planning and budgeting mechanism. The

[15] See Appendix 5 for the recommended Circular.
[16] Subunits of districts, and the lowest tier of regional administration in Bangladesh.
[17] Subunits of districts, and the second lowest tier of regional administration in Bangladesh, above Union Parishads.

recent shift in financing from mitigation to adaptation further suggests a conscious expansion in the scope of Bangladesh's climate response to include the systemic shifts that will occur under climate change, such as rainfall variation and salinity intrusion. The fact that the agriculture sector is the largest recipient of climate finance is thus no surprise, and the plant breeding programs to address salinity intrusion, drought and inundation are examples of investments with direct relationships to water resources. An important point of weakness, however, is the sector-oriented allocation that seemingly does not facilitate the cross-sector coordination that may be needed to address the multi-dimensional drivers of specific risks. In the water sector, this would also entail highlighting the need for integrated management approaches. Nevertheless, initiatives such as the CPEIR and CFF do illustrate the significant in-country motivation and capacity for cycles of review and improvement within the overall financing system. The recent decline in government budgetary allocations for the BCCTF is a concern, especially since national funds have been the mainstay of adaptation efforts thus far, and the expected flow of funds from development partners to the BCCRF has not yet materialized. Why exactly allocations to BCCTF have fallen so significantly is also not clear, but it appears to create a danger of underfunding climate-explicit activities in the future.

Bhutan

In line with the NAPA II sector priorities, Bhutan's priority adaptation projects are estimated to cost approximately USD 7.5 million, which is equivalent to 7.5% of the total ODA flow into the country, thus giving the financial feasibility of these projects a high rating (Saito, 2013). All of these projects have an association with the water sector, with six focusing on disaster mitigation and management, and three dealing with variations in water availability in various sectors (agriculture, forestry and water supply), indicating the significant connections between the water sector and adaptation planning.

Projects that explicitly promote climate adaptation in the water sector have been mainly funded by multilateral sources, and this was mainly (86%) in the form of grants (see Annex 3). Following the trend seen in the NAPA II, disaster prevention and management is the leading objective, followed by increasing food security and mainstreaming adaptation. While direct government spending that explicitly mentions climate change is small in proportion, there are many avenues of spending, especially in the renewable natural resources, energy and urban development, housing and amenities sectors, that indirectly contribute to adaptation in the water sector. Around 26% of the spending on major activities in the National Budget 2015-2016 in the renewable natural resources sector (a large proportion from the development of irrigation systems), 32% of the spending in the housing sector (a large proportion on the flood protection structures) and 5% on the energy sector (early warning systems) can be considered as contributing to adaptation in the water sector.

The Bhutan Trust Fund for Environment Conservation is an initiative to channel funding from multilateral and bilateral sources towards environmental conservation projects (including climate adaptation) by Bhutanese locals and organizations. It is an endowment fund, where the principal capital is kept intact and its investment income is used as the source of funds (see Annex 3).

Efforts to mainstream climate change considerations into financial planning include both governmental and nongovernmental initiatives. A Mainstreaming Reference Group has been set up by the Royal Government of Bhutan with the objective of mainstreaming the incorporation of

climate change considerations into governmental planning cycles. The Performance Based Climate Change Adaptation Grants program by the UN Capital Development Fund aims to mainstream adaptation considerations into the development cycle of local governments, by providing the additional financing needed for projects to include account adaptation considerations. (see Annex 3). Rinzin and Linddal (2011) examined environmental spending of the national budget and found that one-third of the spending occurred at the local level, indicating significant fiscal decentralization of environmental spending in Bhutan (Bird et al. 2012).

Up to now, measures to build adaptive capacity by governmental and nongovernmental sources have placed greater focus on natural disaster mitigation and management, followed by food security, with other sectors such as energy also receiving a certain level of attention. These align strongly with the adaptation needs identified in the NAPA. Taking into account the vulnerability of the country to natural disasters related to GLOF, it is not surprising that natural disaster mitigation and management has received the highest focus. However, both hydropower and agriculture, two sectors that are important contributors to economic development and livelihood security, are also those that are extremely vulnerable to the impacts of climate change. It is not clear if present and future development of these sectors, and the financing of this development, will take into account the need to build adaptive capacity against the projected impacts of climate change.

India

India's climate actions have so far been largely financed from domestic resources (GoI 2015a), driven by consistent commitments through the annual Union Budgets towards public spending on climate adaptation. According to Garg et al. (2015), international financing constitutes only about 3.4% of national resource commitments towards climate change, amounting to INR 306 billion (USD 4.7 billion) received under current internationally-funded projects[18]. While the overall national budget outlay quadrupled from 2003-2004 to 2014-2015, development- and adaptation-related spending increased by a factor of five, suggesting a steady increase in the percentage of domestic spending on climate action.

In value terms, public spending on adaptation in 2013-2014 was INR 2,130 billion (USD 32.75 billion), i.e., 12% of the budget or about 2% of GDP (Garg et al. 2015), which is significantly higher than the 1.45% in 2000-2001 and 1.7% in 2006-2007 (Ganguly and Panda, 2009). State governments contribute a further INR 3,100 billion (USD 47.6 billion) through their state budgets for similar activities in 2013-2014 (Garg et al. 2015). Further spending on adaptation in the same year took the form of 21 Central Government Schemes directly related to adaptation, amounting to INR 740 billion (USD 11.37 billion) or 0.7% of GDP. Therefore, total spending on adaptation in 2013-2014 was INR 5,970 billion (around USD 91.8 billion).

Garg et al. (2015) identified 30 key ministries to which GoI is consistently committing resources through the annual Union Budgets towards public spending on adaptation, although about 50% of these funds are consumed by the ministries of rural development, agriculture and consumer affairs, food and public distribution, with only 7% going to water and sanitation.

[18] The highest number of projects is supported by the Asian Development Bank (66%) followed by the World Bank (33%) and the Global Environment Facility (1%) (Garg et al. 2015).

Current GoI spending on adaptation appears to be significantly lower compared to the cumulative direct and indirect adaptation spending in past years. GoI's budget provision of INR 350 crores (USD 52.8 million) for the years 2015-2016 and 2016-2017 is an order of magnitude lower, and in the face of an estimated requirement of INR 181.5 crores for the financial year 2017-2018 (GoI 2015c), current allocations only represent a fraction of the financing that is in fact necessary for addressing climatic risks. Similarly, while INR 100 crore (USD 16 million) was originally allocated for a National Adaptation Fund (NAF) in the 2014-2015 budget, this has been revised to INR 10 crores (USD 1.6 million) in the 2015-2016 budget[19] (Sharma et al. 2015).

One reason for this reduction in central allocations may be because the State Action Plans on Climate Change (SAPCC) are developed by each State to capture state-specific needs in NAPCC implementation. With 70-75% of activities related to adaptation and the remainder for mitigation, SAPCC's focus on sustainable development for the state and protection of the most vulnerable populations in the face of a changing climate represent a significant step to bringing financial allocation decisions closer to the most vulnerable geographies and people. Their total finance requirement until 2030 is estimated at INR 10,950 billion (USD 168 billion); about three times the current expenditure and will clearly require additional financial resources (Garg et al. 2015). In terms of adaptation, agriculture accounts for about 83% of the estimated costs, followed by forests (9.6%) and the water the sector trailing with just 4.6%. Given the centrality of water resources in supporting many productive sectors, and its own vulnerabilities to climate change, this figure is surprisingly low.

Overall, existing climate finance volumes are insufficient to meet the USD 38 billion funding necessary to implement the NAPCC, let alone the far greater amount needed for the SAPCCs. While there is no comprehensive plan for bridging this gap, GoI has established two dedicated funds at the national level for mobilizing financing: (ii) National Clean Environment Fund (NCEF) in 2010, which is used for financing clean energy within the mitigation domain[20] (GoI 2015a); and (ii) National Adaptation Fund in 2015 to support scaling-up adaptation interventions in SAPCCs in accordance with the NAPCC, especially in sectors such as agriculture, water and forestry. This will be in addition to sectoral spending by the respective ministries (GoI 2015a). GoI has also allocated funds to several National Missions under the NAPCC. Here, too, the allocation to water is notable for being one of the lowest amongst the Missions (Annex 3), and contrasts with the USD 129 billion overall investment required to maintain the support of the water sector to economic development (KPMG 2010). Allocations to the water sector are higher when considering only external adaptation finance, where water-related actions represent 20% of all such finance, according to Krishnaswamy et al. (2013), covering a topical and geographical range (Annex 3).

The funding challenge is exacerbated by a highly fragmented but crowded landscape of international climate finance (Steinbach et al. 2014) that contributes to the difficulty faced by countries such as India in developing an efficient, targeted climate financing plan that can help meet national climate response goals. Delays in disbursement and project implementation are other related barriers to accessing international climate finance. This has contributed to the fact that, while India has attracted significant international funding (see Annex 3 for details) compared to many other developing countries, these volumes are relatively small compared to the country's future adaptation and mitigation needs. One underlying factor may be the transaction costs and

[19] The Fund has been turned into a Mission, to be managed by the MoEFCC instead of the Ministry of Agriculture.
[20] Includes a carbon tax, worth USD 2.7 billion in 2014-2015.

levels of coordination within India's bureaucracy needed to respond to the requirements of each funding source.

Also, with respect to in-country financing, current structural arrangements are described as being "dispersed and fragmentary" by Sharma et al. (2015), allowing for neither efficiency nor accountability. This is despite the ostensible existence of several institutional mechanisms, which have been established specifically for climate action coordination (described in Section 4). The same authors believe that this stems from a top-down and inflexible approach to planning with centrally-sponsored schemes and tied funding. This top-down approach is said to characterize the central government's role as a 'donor' in the manner in which it delivers funds to the States and to local governments through pre-determined adaptation goals and targets, leaving little room for devolved decision making and local ownership around adaptation priorities and approaches. It is further claimed that the SADCCs were also prepared without inputs from local governments or communities,[21] and are therefore likely to be tied to achieving pre-determined adaptation goals and targets without flexibility to adapt them to local circumstances. This suggests that climate governance, including adaptation planning and implementation in India, bypasses the process of devolution[22] that has been central to development efforts in the past two decades (Sharma et al. 2015). Consequently, climate finance appears not to be systematically mainstreamed into national and State budgets, as most development policies/programs view climate outcomes as co-benefits rather than as explicit objectives (Steinbach et al. 2014).

Therefore, from a climate finance readiness standpoint, this brings into focus the importance of planning and financial management arrangements as key components of readiness (Steinbach et al. 2014), and GoI recognizes that efforts to bridge the funding gap must be based on an approach that combines public, private and international sources of finance and ensures their efficient utilization (Sharma et a. 2015). Yet, as will be discussed below, GoI currently has no unified strategy to raise the necessary funds from these various sources, and coordinate the delivery of NAPCC and SAPCC priorities.

Creation of the Climate Finance Unit (CFU) at MoF is a step towards addressing this core weakness, although it will need to be strengthened for it to be able to support key national nodal agencies in mainstreaming domestic and international action on climate change – particularly on issues related to financing (Steinbach et al. 2014). Linking MoEFCC, CFU, line ministries and states will be critical, if domestic budget allocations and foreign aid are to be systematically and explicitly allocated and tracked within NAPCC and SAPCC priorities. This 'blending' of national and international sources is already a primary goal for climate governance mechanisms set up in other developing countries such as Bangladesh's Climate Change Trust Fund (Sharma et al. 2015).

Another dimension in meeting future climate finance challenges will be increasing the hitherto limited engagement with the private sector, with respect to climate change decision making and coordinating a national financing strategy that encourages private sector investment in climate-related activities (Steinbach et al. 2014). Current challenges go beyond limited engagement, given the limited capacity of Development Finance Institutions (DFIs) to implement climate-related projects beyond a narrow range of themes, sectors and geographies in India, which inhibits a

[21] The process was coordinated by MoEFCC and the state environment departments (Sharma et al. 2015).

[22] The Indian Constitution was amended in 1993 to devolve powers of local governance to Panchayat Raj Institutions (PRIs) in rural areas and Urban Local Bodies in urban areas. Given that climate impacts are likely to be very localized and need localized responses, local governance and devolved decision making will be critical.

pipeline of bankable projects that could increase climate-related investment linked to the NAPCC and SAPCCs. Were they to be better linked and able to generate bankable projects, Indian DFIs would need to increase their capacity in meeting international fiduciary standards[23], and social and environmental safeguards (Steinbach et al. 2014; Varma et al. 2014).

In summary, despite the existence of climate adaptation plans at national and state level, a significant adaptation gap remains for India to tackle. The NAPCC is not backed by a coherent national climate finance strategy and, consequently, it is difficult for GoI to assess exactly how much funding is available. Nor is it clear who is meant to benefit from national and international financial allocations, or whose needs are being prioritized (Sharma et al. 2015; Steinbach 2014). A focus on domestic governance and capacity building arrangements for accessing climate finance, and to ensure more effective, efficient and accountable spending thus emerges as a priority for India, since it is unlikely that, under current arrangements, the poorest and most vulnerable will either be able to access climate finance or be allowed sufficient flexibility to tailor locally-relevant solutions (Sharma et a. 2015). Therefore, an Indian National Climate Fund (INCF) is proposed (Sharma et al. 2015) to pool climate finance from national and international sources, and coordinate its disbursement to line agencies, and the state and local levels, through a single mechanism with representation from all relevant sectors and levels (states, districts, *Panchayats*), communities and nongovernmental experts.

Nepal

As of 2011, Nepal's expenditure favored adaptation over mitigation, with 76% of budget allocation going towards adaptation (UNDP et al, 2011). While the government is one of the primary funders of climate adaptation programs (amounting to 44% of total climate funds), current trends also show an increase in donor contributions and a reduction in government support (see Annex 3 for details) (Sharma, 2014). In general, adaptation projects are supported by multilateral organizations and donors, whereas bilateral donors handle both adaptation and mitigation projects. For details on funding amounts and organizations, and details on the budget refer to the section on finances in Annex 3. In 2014, 91% of donor funding for Nepal's climate adaptation came from grants (Sharma, 2014). This is in contrast to global trends to support climate adaptation through loans. It is unclear if this was a direct policy decision linked to civil societies and media objection to the loans as a violation of the UNFCCC agreements (Regmi et. al, 2012). Under the UNFCCC agreements, developed countries agreed to assist with funding for climate change programs, as it was agreed that these countries were primarily responsible for climate change due to consumption patterns. While loans constitute financial assistance, it is still money that needs to paid back and there has been significant opposition to this concept.

In 2012, the government introduced budget codes for climate-related projects into the budget planning system, which would enable the relevant ministries to prioritize, allocate and track investments that would reduce the negative impacts of climate change (Sharma, 2014). The codes categorized climate change initiatives as highly relevant, relevant or neutral, by looking at the percentage of how much funding and other factors (risks) were allocated to climate-related activities per project. For details on government ministries and their allocation of climate adaptation funds, refer to Annex 3. Nepal's poor water management practices and lack of

[23] Sound financial management, transparency, independence and professional standards.

transparency with funding allocations at the federal level has led to a level of distrust among some international funders. Therefore, at the federal level, there needs to be an institutional change by the ministries to ensure greater transparency with allocation of funds and better water management practices.

In practice, however, financial planning and allocation for adaptation appears to suffer from a disconnect between a NAPA-driven top-down approach on the one hand, and a more bottom-up process envisaged by the Local Adaptation Program for Action plans (LAPAs) and Development Plans. From the 124 projects planned at the local level, only 12 have been implemented (Karanjit et. al, 2014). One of the reasons for poor implementation could be because only 11.4% of the total climate budget was in fact allocated to local governments as of the financial year 2013/2014 (Karanjit et. al, 2014). This is despite the 80% target set for local-level climate financing. Other reasons for the discrepancy between locally implemented and planned projects could be that the formal and actual distribution of funds differed significantly due to transparency issues (Regmi et al. 2014). The lack of transparency in funding allocations by the Government of Nepal has hindered the ability to track financing. For example, it is unclear whether the remaining 88.6% of total climate budget is used at national level and for what type of activities. The currently centralized finance governing structure has resulted in a large disconnect between the local communities and the government. For instance, while local governments included gender equity and social inclusion next to sanitation, disaster risk reduction and climate change considerations, only 1% of the allocated annual budget of local bodies is directed towards gender equity and social inclusion (Karanjit et al, 2014).

The disconnect between the national and local governments regarding priorities of climate change budget allocation is one of the largest hindrances to effective climate change financing in Nepal. For example, while agricultural and irrigation development are considered as top priorities by local government, both activities are poorly funded (Oxfam, 2014), resulting in increased vulnerability to climate change. Similar to other South Asian countries, the gap between climate adaptation and funding received is also large. Moreover, despite the NAPA explicitly stating energy, water and public health as a priority for climate adaptation, Nepal lacks any funding related directly to climate adaptation for the respective sectors.

Pakistan

At the federal level, expenditure on mitigation-related climate spending is higher than adaptation spending, and adaptation is seen as a higher expenditure at the provincial level. The reason for the higher expenditure on mitigation at the federal level is because Pakistan spends a great deal on energy-related projects (55%), whereas funding is more diverse at the local level (CPEIR, 2015). Converting climate change projects into budget prioritization agendas remains a challenge, despite the fact that the NCCP and implementation framework are in place. In practice, budget allocations for climate adaptation focus on large-scale investment projects such as hydropower (CPEIR, 2015), with very little focus on other aspects of climate adaptation. Sectoral ministries generally pay little attention to the NCCP and are driven primarily by their own key sector policies, which limits the central positioning of climate adaptation in the MTBF budget ceiling (CPEIR, 2015). This also compromises any local-level climate adaptation funding, because funding prioritizes national over local-level needs (see Annex 3 for details). For the most part, water-related projects

are not categorized as climate change-related projects and fall under the development umbrella, and are specifically related to either energy, water or DRR.

Pakistan is heavily dependent on dams and canal linings as the primary defense against climate change events. The Pakistani government argues that more water storage is needed in order to combat climate change. The dam also increased power output and irrigation capacity (GWP, 2011). Reservoir construction is an integral part of IWRM in Pakistan. Construction of dams enables water management in terms of supply, floodwaters and wastewater.

Groundwater is also being used extensively in farming practices to improve crop yields and reduce the amount of withdrawals from surface water sources. However, the private financing of more than 20,000 tube wells in the region has affected the natural ecosystem, by the desertification of lands and drying up of high-value fruit orchards (Qureshi et al, 2009). There is no explicit mention of climate change and no quantifiable amount of climate-related funding towards groundwater projects. This means that there are projects related to climate adaptation being implemented that are not categorized as groundwater or surface water projects as such, and are seen as primarily development projects and not under the climate change umbrella. For further information on water-related investment in Pakistan, refer to Annex 3.

There is a need to link both national- and provincial-level governments to establish common financial protocols and improve communication mechanisms. Integrating climate adaptation into the budgetary and planning process is also a potential entry point. These linkages and integration are crucial to ensure that climate adaptation expenditure aligns with the priorities of local governments and key stakeholders. IWRM is required at all levels, including improving canal water management, adopting high-efficiency irrigation systems, improving drought forecasting, increasing water shortage and improving regulations. Unfortunately, the costs of these implementations have not been estimated in their entirety. While WAPDA is conducting assessments on additional water storage, monetary values are currently difficult to ascertain.

Sri Lanka

Existing financial structures for climate adaptation in Sri Lanka take the form of government investments, and bilateral and multilateral grants and loans. Government expenditure directly targeting adaptation in the water sector is low and private sector involvement is notably absent for direct adaptation activities. The projects that target direct adaptation are financed mainly by international funding and focus on many different areas. Among the projects studied from 2009 onwards, around USD 88 million (27%) has been disbursed through grants and USD 238 million (73%) through loans. Projects financed by grants can be considered as contributing to 'soft' adaptation measures, while the projects for which a greater proportion of the funding is through loans, a large segment of the finance is apportioned for infrastructure development (see Annex 3).

A major proportion of governmental expenditure that contributes to water-related adaptation (as identified from the main projects in the National Budget allocations for the year 2016) can be classified as contributing to indirect adaptation through allocations for rehabilitation of irrigation schemes, groundwater monitoring, and disaster mitigation and management. A significant fund of USD 434 million was allocated for the development of water storage and distribution systems for the purpose of water supply for agriculture, hydropower, and domestic and industrial use (see

Annex 3). As described earlier, agricultural communities that depend on precipitation or irrigation from minor tanks are at particular risk from climate change. The large allocations to develop water storage and distribution facilities could assist in alleviating part of this problem. However, it must be noted that these structures are not necessarily built taking into consideration the predicted future impacts of climate change, and hence may not be responsive to this.

Following the trend seen in the NAPA, adaptive capacities in the food security, water resources, coastal and marine sectors, human health and infrastructure, ecosystems and biodiversity crosscutting needs are developed through direct adaptation measures. Indirect measures contribute to the human health and infrastructure sector, and significantly to the water sector. While the focus on the latter sector also has concurrent benefits for the food security and energy, technology and industry (ETI) sectors, adaptive capacities that are not related to this sector (e.g., enhancing the resilience of agricultural systems or ETI systems to extreme weather events, disasters) do not appear to attract high levels of funding. Further, the proportions of the adaptive costs attributed to the NAPA priority sectors (described previously) are not reflected in the actual financing received by these sectors.

The current pattern of financial allocation for climate adaptation does not correspond to the costs estimated in the NAPA. While adaptation projects initiated by international donors target a variety of sectors, the proportion of government spending that can be considered as contributing to climate adaptation is largely on developing and improving water storage and distribution infrastructure, with disaster prevention and management being the next priority. While this is not surprising, considering current contributions made by the agriculture and hydropower sectors to the country's economic performance, long-term adaptation measures, including sustainable groundwater harnessing (Karunaratne and Pathmarajah, 2002), would require knowledge development and generation across sectors and scales.

The Climate Change Secretariat, under the Ministry of Mahaweli Development and Environment, is the main governmental body coordinating the flow of funding from multilateral and bilateral sources to the relevant governmental entities. The process of monitoring has not yet been systemized, although NAPA suggests the formation of climate change cells in the relevant ministries and implementing entities for this purpose (see Annex 3). One of the main challenges involved in sourcing financing from the many international climate adaptation funds is a lack of knowledge and experience on how these can be tapped into. The need for institutional and technical capacity to meet the standards required in procedures for requesting finance (e.g., proposal writing) is considered a challenge faced by the Secretariat in procuring funding.

3.2 Key Findings on Climate Finance

3.2.1 All countries are challenged with a significant adaptation gap, with no clear bridging mechanisms

Despite patchy assessments of financial impacts of climate change and adaptation costs, existing information on current external funding flows and in-country spending makes it clear that a significant financing effort is required if the adaptation plans and priorities are to be fully and effectively implemented. While all the countries depend, to some extent, on external funding, they also exhibit a high dependency, with the exception of Bangladesh and India. While this is not surprising given the much smaller economies of these countries, it implies that adaptation costs will increase given that external funding has shifted from grants to loans. This is especially the

case for countries such as Afghanistan and Nepal, where grants currently make up a significant portion of external climate-related financing in both adaptation and mitigation. Even in Bangladesh and India, where adaptation financing has been strongly driven by government spending, significant reductions in government allocations for adaptation in current budgets suggest that this trend may be changing. Addressing this is likely to require further capacity within in-country mechanisms to effectively navigate bilateral, multilateral and private funding, and to compete for scarce global funding on climate adaptation.

3.2.2 There is no indication that improved water resources management is a priority area for adaptation finance, despite the clear impacts of climate change on water resources and their diverse developmental consequences

Although water-specific financing data was hard to locate, the little information available suggests that the water sector is generally not a priority in the context of climate adaptation. In a majority of the countries, water fails to feature in the top funded sectors, and lists were generally dominated by agriculture. However, a distinction needs to be made between investments from adaptation funds and overall sector spending, given the deep hydrological histories, even cultures, of many South Asian countries and the dominant role water plays in their economies. Low allocations of adaptation finance to water, therefore, may not necessarily mean that better water resources management will not contribute to adaptation. In fact, major investments in water infrastructure and associated institutions, many of which predate climate change consciousness, may be nevertheless considered to represent forms of continuous adaptation.

3.2.3 Disjointed funding mechanisms and underdeveloped structures struggle to match funds to priority adaptation actions

The institutional architecture for incorporating climate finance into climate adaptation planning is almost nonexistent in majority of the countries, with the exception of Bangladesh, Nepal and India. While some funds are multi-sectoral, others are sector-specific. Adaptation measures are driven mainly through indirect funding where climate change responses are co-benefits or windfalls of broader sectoral and multi-sectoral development investments. This is illustrated by the significant investments made by Bangladesh in establishing an estimated 165,000 deep tube wells since 2000 (Winston et al. 2013) to increase food security and meet the growing demand for supplementary irrigation attributed to climate change. Disaggregating these large bundles of spending often to meet policy targets outside of the water sector (e.g., food security) is crucial to linking the country's climate spending with major climate risks and adaptation needs.

There is, however, some progress in attempting to identify climate financing and efforts needed in better linking finance with planning in different countries. The clearest examples are the two major evaluations of structural weaknesses in climate finance spending in Bangladesh, commissioned by the Ministry of Finance, which provides detailed means of addressing key weaknesses. Other examples include the Climate Expenditure Report commissioned in Pakistan in 2015 to identify adaptation and mitigation spending as well as the relevant governmental ministries responsible for financing, though there is as yet little movement with respect to institutional adjustments to achieve better finance-planning linkage, and the Mainstreaming Reference Group's aims in Bhutan to more systematically incorporate climate change considerations into national- and local-level planning. Overall, however, the majority of funds generating adaptation capacity in each country cannot be clearly identified, making any assessment of spending on climate finance, including in the water

sector, only approximate. It also means that most adaptation results arise out of multipurpose investments not directly related to adaptation.

While risks are expressed in terms of specific climate change impacts, current assessments of climate finance focus on sectors, which challenges attempts to understand the extent to which funding is being directed to address specific risks. The water sector is a good example as it plays a central role in a range of risks, including flooding, drought and changes to groundwater. Improvements in finance tracking mechanisms, therefore, may also need to consider a risk-based approach as opposed to a sectoral approach. In addition, in view of the large gaps between available finance and estimated investments required for effective adaptation, utilizing all available funding sources, especially through engaging the private sector, is essential.

3.2.4 The disconnect between national and local levels in adaptation planning undermines finance targeting and accountability

A majority of climate finance flows and attempts to improve adaptation planning have occurred at a national level, and appear to represent, for the most part, highly centralized and top-down processes, though Nepal and India have introduced subnational planning. A major gap in these approaches is the limited engagement between central government and local government with respect to decision making on adaptation planning and financial flows. This center-local disconnect is a key issue given that it is the poorer and otherwise marginalized segments of country populations that will be worst affected, due to their greater exposure to climate change and shortage of assets to undertake their own adaptation measures. Bringing both local government as well as other representatives of local communities into planning processes, backed by legislation and capacity building, is therefore a priority action, recognizing that several functions constitutionally assigned to local government bodies are directly or indirectly related to building adaptive capacity.

Additionally, the attempts by some of the countries (India and Nepal) to introduce basin-level planning and management does not only bring to light how water sector planning and management could contribute to climate adaptation, but also highlights the need to develop adaptation measures specifically for the water sector.

4. Climate Adaptation: An Institutional Perspective

4.1 Sectoral Fragmentation and its Implications for Climate Adaptation: Country-level Analysis

At a country level, and for the water sector specifically, climate adaptation highlights the need for IWRM, as holistic adaptation measures would require integrated water resources planning and management across the different sectors. In this subsection, we discuss the current institutional frameworks in water resources management in each of the seven countries in South Asia selected for this study, how this corresponds to IWRM both theoretically and in its actual implementation, and the implications this has for approaches to climate adaptation.

Afghanistan

The Water Sector Policy established in 2004 created the Supreme Council for Water Affairs Management. The Council is chaired by the first Vice President and the respective heads of the line ministries are its members (Mahmoodi, 2008). While the Supreme Council can in theory be regarded as a formal inter-ministerial coordination body in water resources management, there is no clear guideline as to how the Council will promote IWRM principles in relation to the defined plans and programs of the different sector ministries. Formally, the Ministry of Energy and Water (MoEW) is in charge of IWRM implementation through the formation of river basin and sub-river basin agencies, and reports to the Supreme Council for Water Affairs (Mahmoodi, 2008), though the relationship between MoEW and other sector ministries is not clearly defined (additional details in Annex 4).

While water resources management is 'incorporated' into the formal mandates, responsibilities and development plans of different sector ministries, the question remains as to how water resources planning and management are conducted both formally and in practice. For instance, while it is obvious that MoEW will lead the planning process in conjunction with energy, it is unclear as to how the process will include the roles and development plans of other ministries in different aspects of water resources management, including domestic use, health and industry.

In practice, while River Basin Organizations (RBO) are envisaged to promote the application of IWRM, such application took place only on a project basis (such as in the Amu Darya River Basin). Little effective implementation of IWRM principles has taken place in practice. This is shown by Afghanistan's mismanagement of groundwater resources (Habib, 2014). The contamination of groundwater resources by industry has caused severe health risks, which is due, in part, to poor wastewater management. Although Afghanistan has the Groundwater Development Policy, it is poorly implemented and the lack of enforcement by institutions responsible, primarily the MEW, has caused severe groundwater depletion in some parts of the country (Habib, 2014). In addition, while Water Users Associations (WUAs) have been formed and established in various irrigation systems in the country, it is unclear how WUAs' envisaged role in irrigation systems management

is linked to the wider context of water resources management, not to mention that many of these WUAs become inactive after their formation.

Institutionally, Afghanistan prioritizes climate risks mainly in relation to the agriculture sector and desertification, and thus not directly linked to the need towards IWRM. This is evidenced from the positioning of the Ministry of Agriculture, Irrigation and Livestock (MAIL) as the country's national focal point for climate adaptation, under both the UNCCD (United Nations Convention to Combat Desertification) and UNCBD (United Nations Convention on Biological Diversity). While water resources management is partly included as a priority area, mainly in the context of irrigation, this is derived largely from its positioning as one of the supporting factors in agricultural production, and not necessarily linked to water resources management in a broader sense (e.g., incorporating flood protection measures as well as issues of groundwater depletion). While the central positioning of the agriculture sector in climate adaptation corresponds with drought, landslides and groundwater depletion as major climate risks identified in Paper 1, it is unclear as to whether the Government of Afghanistan also links these risks with the wider context of water resources management, especially in relation to how it might reduce or exacerbate specific climate risks and vice versa.

Institutional frameworks for climate adaptation also relied on the existing institutional set up for disaster management, embodied in the National Disaster Management Commission (NDMC) as the apex body, chaired by the Second Vice President with the participation of all the relevant ministries, UN representatives and other relevant stakeholders. ANDMA, as the principal executing body and nodal agency at national level acting as the Secretariat for the NDMC, is mandated to coordinate all aspects related to disaster mitigation, preparedness and response. At provincial level, the Disaster Management Committee/Commission (PDMCs) act as the extended arm of the NDMC. The PDMCs are the vital link between the NDMC, provinces, districts and local levels. Both at the central and provincial levels, ANDMA lacks the capacity (both material and human) to lead prevention, response and operationalization of post-disaster recovery activities. ANDMA has provincial directorates in all 34 provinces of Afghanistan. Yet, the capacity of directorates differs from province to province depending on availability of staff, level of operational resources, security and geographic terrain. This weak institutional capacity suggests major challenges in tackling flash and riverine floods, a widespread natural hazard in Afghanistan.

Lacking a formal inter-ministerial coordination body, cross-sectoral collaboration takes place mainly on ad hoc basis, through development programs such as the Comprehensive Agriculture and Rural Development Facility (CARDF), which involves both MAIL and MoRRD. While IWRM is essential, water resources management continues to be directed through sectoral approaches both formally and on an ad hoc basis, thus not specifically targeted to address the problem of lack of cross-sectoral coordination. Referring to Afghanistan's major climate risks (landslides, riverine and flash floods, droughts, groundwater depletion), linking water, agricultural, energy and land agencies is pertinent to increase the government's overall capacity to develop more holistic adaptation measures to deal with systemic implications from climate change. In the context of climate adaptation, ANDMA can serve as a potential entry point to harvest more structural and robust inter-ministerial coordination for adaptation formulation and implementation, though this will inevitably require stronger capacity building efforts and significant fine-tuning with MoEW's role with regard to water-specific adaptation measures.

Bangladesh

The National Water Resources Council (NWRC) was established in 1983 as an inter-ministerial coordination body chaired by the Prime Minister and comprising 47 members. These members include relevant government ministries, water management authorities, academics, as well as representatives from development agencies. The NWRC's main task is to facilitate the coordination of water-related policies. Most decisions on national water management are taken by the executive committee of the NWRC, chaired by the minister of water resources, as the lead government agency for IWRM formulation and implementation. While this institutional set up highlights the important leadership of the Ministry of Water Resources (MoWR) in shaping the cross-sectoral coordination between different sector ministries across scales, the relationship between MoWR and these sector ministries remains very broadly defined. For example, while NWRC is to facilitate the coordination of water-related policies, it is unclear how it could ensure such facilitation, especially when MoWR's role in the formulation of such policies is not clearly defined. The Water Resources Planning Organization or WARPO, under MoWR, is responsible for planning for both groundwater and surface water development, while the Bangladesh Water Development Board (BWDB) and the Ministry of Local Government and Rural Development are responsible for operationalizing this development. However, it is felt that the mandate of the BWDB does not still have a concrete definition, therefore encumbering its functions.

Water Management Organizations (WMO) in Bangladesh at present can be largely organized into two main groups — those following the Comilla Model, and those following other models. The first category consists of the large majority of WMOs, largely due to governmental push to increase irrigation cover. The Comilla Model provides access to credit and other agricultural inputs as well as training to organized two-tier cooperative systems. The Bangladesh Agriculture Development Cooperation and BWDB were responsible for the development of the Comilla Model for groundwater and surface water irrigation (de Silva, 2012). Such participatory management in Bangladesh has, however, been criticized for not succeeding in promoting more inclusive participation in management, and moreover for resulting in the replication of existing institutional structures.

While IWRM has been adopted in the national policies for more than a decade, in practice, sectoral decision making prevails in water resources management. As stated by Rouillard et al. (2014: 520), "Responsibilities and powers for the construction and management of different types of water infrastructure remain fragmented between several ministries and agencies, and achieving policy integration remains challenging because the decisions of coordinating bodies are loosely binding." The NWRC's current lack of power to direct the development plan and activities of sector ministries is rooted in the fact that, while NWRC is assigned with the coordinating role, sectoral development budgets are channeled directly to sector ministries and not through the NWRC. Thus, while hydrological boundaries were considered under the IWRM approach through catchment planning, planning responsibilities are maintained in NWRC and WARPO often with little connection with the development plans and activities of sector ministries. Internationally, a Joint Rivers Commission (JRC) was established in 1972, which provided the institutional arena for maintaining a dialogue between Bangladesh and India on Ganges River management. In practice, however, JRC's decisions are non-binding recommendations to be considered for ratification by

both governments (Das Gupta et al. 2005). Hence, in times of water scarcity, disputes can continue with respect to water sharing, because JRC could not direct and oblige relevant sector ministries to follow its recommendations (Chowdhury, 2010; Rahaman, 2009).

For climate adaptation, the government took a broader institutional approach by incorporating the water sector as an integral part of the country's adaptation strategies, but without sufficiently emphasizing the need for IWRM or trying to address the current challenges for its implementation. Institutionally, the government established a Climate Change Cell (CCC) in 2004 to build capacity and promote climate-resilient development without referring specifically to the water sector, and how the established CCC will be linked to other institutions involved in water resources management. As part of the shift in disaster management practices towards preparedness and risk reduction rather than relief efforts (Tanner et al. 2007), CCC received support from DFID through the Comprehensive Disaster Management Program (CDMP). For its day-to-day functioning, CCC is hosted by the Department of Environment (DoE), which acts as the national focal point on climate adaptation, under the Ministry of Environment and Forests (MoEF).

CCC's formal mandate includes preparation of technical papers for MoEF to support international negotiations, identification of sectors vulnerable to climate change in Bangladesh, and formulating climate adaptation guidelines and training modules for relevant sector ministries. A Climate Change Knowledge Network (CCKN) was established, which is active in the dissemination of research findings of the Cell and other line agencies on climate change issues. Based on the recently completed community-based adaptation project titled 'Reducing vulnerability to climate change', CCC is developing a series of guidelines for the emerging community risk assessment processes created under CDMP (CDMP, 2006). During the early years of its formation, CCC focused its role on facilitating cross-sectoral coordination among sector ministries through the establishment of climate focal points in each relevant ministry. For this, it initiated a process to identify institutional focal points in each ministry and provide them with a basic training on climate issues.

Established by the government after Bangladesh signed and ratified the UNFCCC, MoEF (through its technical arms - the Climate Change Cell and the Department of Environment) is the lead institution for work on climate change. Institutionally, this reflects the government's approach to tackling climate adaptation from a broader development perspective by linking it with environmental aspects and not necessarily focusing specifically on water resources management. While this is very much in line with the high risks associated with riverine and coastal flooding, and storm/cyclone impacts the country frequently faces as identified in Paper 1, one could also argue that these risks are strongly linked with water resources management. Nevertheless, the current institutional set up for climate adaptation does not focus on adaptation measures for the water sector specifically. While this might be linked to the NWRC's inability to effectively implement IWRM, it also poses a risk for furthering the current problem of groundwater salinization and extraction.

In line with the major climate risks identified in Paper 1, especially those pertaining to storm/cyclone and coastal floods, Bangladesh combined an environmental emphasis with disaster management in its adaptation strategies. For example, while MoEF acts as the national focal point for climate adaptation, the Ministry of Food and Disaster Management (MoFDM) also plays an important role in positioning disaster risk reduction as a bottom-up strategy for climate adaptation. As stated in the report prepared by the CCC (2008: 8), "The mission of the Ministry of Food and

Disaster Management is to bring a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of the communities to hazards".

Under CDMP, an existing institutional framework was adapted towards the positioning of climate adaptation as a cross-sectoral issue, which requires inter-ministerial coordination. CDMP demonstrates a process through which a country such as Bangladesh can integrate and address climate-related risks and disasters within a comprehensive management framework. CDMP framework is built from an assessment of risks at community level through sector and cross-sectoral analysis. Bangladesh is also equipped with quite a number of national think tank and research institutes, which include the Bangladesh Centre for Advanced Studies (BCAS), Centre for Environmental and Geographical Information System (CEGIS), and the Bangladesh Institute of Development Studies (BIDS).

While Bangladesh approaches climate adaptation from a cross-sectoral perspective, it is unclear as to whether this will enable it to tackle groundwater salinization and depletion more effectively. With almost 80% of the total cultivated area being irrigated with groundwater (Qureshi et al. 2014) and partially due to ineffective IWRM, Bangladesh faces problems of groundwater over-extraction and water quality issues. The Groundwater Management Ordinance (1985) operationalized by the Ministry of Local Government and Rural Development, and the Bangladesh Water Act (2013) attempt to use licensing to regulate the installation of new wells. However, difficulties in enforcement and accountability in rural areas, together with the fact that such legislation usually operates at *Upazila* (subdistrict) level, ignoring aquifer management beyond such boundaries has meant that efforts up to now to regulate groundwater usage have not borne fruit.

Crucial in the positioning of climate adaptation as a cross-sectoral issue (despite the lack of clear and concrete adaptation strategies for the water sector) is the incorporation of climate issues in the country's national planning strategy. The General Economic Division (GED) of the Planning Commission, under the Ministry of Planning (MoPl), has initiated a process to enhance its institutional capacity to facilitate the incorporation of climate issues in the planning processes. As the Planning Commission is in charge of preparing short- and long-term national plans for the economic and social development of the country, as well as the annual development program (ADP), the incorporation of climate adaptation into these plans provides a strategic entry point to link climate adaptation with relevant sectoral development plans and activities.

Over the past years, through donor-assisted projects such as the Poverty, Environment and Climate Change Mainstreaming (PECM) project, funded by UNDP and UNEP, climate adaptation has increasingly become significant in terms of national planning. All macro and perspective plans, including the 'Perspective Plan' and the 'National Sustainable Development Plan', acknowledge BCCSAP and include its climate change strategy. The recent long-term (50 to 100 years) holistic plan called 'Delta Plan 2100' includes adaptation as a critical component in the planning process. The government will complete formulation of the 'Delta Plan 2100' by 2016. All macro and perspective planning, including BCCSAP, will be subsequently incorporated into the 7th Five-year Plan (2016-2020).

Referring to the existing institutional frameworks and arrangements, Bangladesh is one of the most advanced countries in climate adaptation in South Asia. In the government's strategy to mainstream climate adaptation as an integral part of its development planning and activities, a key element is how it tackles the problem of sectoral fragmentation through centralized funding

mechanisms to address climate issues. While CCC provides an entry point for cross-sectoral approaches in climate adaptation, it was the incorporation of climate issues into the national development planning strategy and budget that enabled Bangladesh to implement its climate adaptation strategies without too great a reliance on donor support. Thus, Bangladesh's 'successful' attempt to mainstream climate adaptation is not about forming a new inter-ministerial coordination body, but merely through the formation of CCC, assigning MoEF as the lead government ministry in climate adaptation, and the central positioning of GED in providing centralized funding mechanisms to support climate adaptation plans and activities. From the perspective of water resources management, Bangladesh's ability to reduce climate risks would be defined by the incorporation of water-related climate adaptation activities into the overall strategy, through further fine-tuning of development plans and programs of MoEF and NWRC. For example, increased climate risks in relation to the steady decline in groundwater recharge will need immediate action to identify effective measures to stop groundwater over-exploitation, which in turn will reduce the country's ability to increase food security and reduce poverty, if left unaddressed. Institutionally, this highlights the need to develop incentives for different government agencies working on water-related issues to coordinate their efforts.

Bhutan

Provisionally, the National Environmental Commission (NEC) has the mandate to coordinate water-related issues among relevant sectoral ministries and other government agencies. In line with this coordination role, NEC proposed to establish the Bhutan Water Authority to implement IWRM. Ideally, the Authority would be assigned with the task of formulating a series of guidelines for sustainable water use among the different stakeholders, including private sector actors. Yet, while the government envisioned the adoption and application of IWRM, this and the proposed plan to form and establish BWA have yet to be materialized. The delay is most probably linked to the fact that the establishment of BWA would consequently confuse the role of NEC as the formal coordinating body in water resources management. Moreover, it is unclear as to which government agency/sector ministry would be responsible for BWA formation, since Bhutan does not have a separate ministry focusing on water resources management (apart from water management for agricultural purposes).

In practice, water resources development continues to be directed through sectoral decision-making structures and processes, often overlapping or in parallel with each other. While this lack of cross-sectoral coordination does not seem to matter in terms of the water availability issue, such coordination is eminent in relation to the government's plan to develop hydropower dams and how it might affect the country's vulnerability in relation to GLOF.

At local level, WUAs were formed and established in line with the National Irrigation Policy in the 1980s, which required rural households to maintain the sections of the irrigation canal they used, and raise funds for this purpose. In practice, however, WUAs organizational development has mixed results, with many becoming inactive after its formation. In some cases, WUAs become inactive because the government focuses their organizational development mainly on collecting irrigation service fees from farmers and conducting canal maintenance, without linking this with improved water service provision to farmers' fields. In other cases, WUAs stop functioning because farmers do not see how they can benefit from it, especially if they do not experience a water scarcity issue.

Apart from its provisional mandate to coordinate water-related issues, NEC is the highest decision-making body for environmental management, established under the National Environment Protection Act (NEPA). It is an inter-ministerial body, chaired by the Prime Minister, with four to five high officials representing relevant sectoral ministries (e.g., minister level or equivalent) nominated by the Chair and three representatives from civil society. Internationally, NEC is also the national climate focal point for UNFCCC and the Designated National Authority (DNA) for the Clean Development Mechanism (CDM) of the UNFCCC's Kyoto Protocol.

Following the Earth Summit in Rio de Janeiro, Brazil, in 1992, Bhutan ratified UNFCCC in 1995. The National Environment Commission Secretariat (NECS) became the national focal point for climate change activities in the country. As a technical arm of the NEC, the Secretariat is responsible for policies, regulations and directives formulated by the NEC and for administering the provisions of the NEPA. In 2011, NEC established a Climate Change Unit and created a high-level national climate change committee called the Multi-Sectoral Technical Committee on Climate Change (MSTCCC) to serve as a forum to coordinate all climate change-related activities in the country. MSTCCC members are selected from relevant government ministries.

NEC today has the status of an autonomous, high-level, inter-ministerial body representing the highest decision making on all matters related to the protection, conservation and improvement of the natural environment. As the National Focal Agency, NEC is mandated with the responsibility for policies, plans and guidelines for environmental protection, sustainable development and proper utilization of natural resources, including recommendations on ratification of bilateral and multilateral instruments and regulation of emission limits. While NEC could in theory act as the umbrella institution for IWRM, in practice, the positioning of water resources management in NEC's mandate is far from central and hardly underpinned.

Apart from NEC, other ministries also have water-related climate adaptation mandates. These ministries include: Ministry of Agriculture and Forest, hydropower and meteorology in the Ministry of Economic Affairs (MoEcA), and the Division of Disaster Response and Preparedness within the Ministry of Home and Cultural Affairs (MoHCA). Theoretically, this will enable the government to tackle specific climate risks such as drought and groundwater depletion (see Paper 1) from a sectoral perspective, especially when related to agricultural development. With regards to climate adaptation for the water sector, this will partially fill the current gap in water-specific adaptation measures as well as the current ineffective application of IWRM. While these formal mandates is a good starting point, for climate adaptation measures to be effective, they also need to be accompanied by stronger cross-sectoral coordination between the relevant ministries involved.

Similar to Bangladesh, the Bhutan case study clearly illustrates how the government links climate adaptation with environmental management, through the appointment of NEC as the national focal point to direct and coordinate climate-related issues. The difference is that unlike Bangladesh, in Bhutan, NEC is in charge of both climate adaptation and water resources management. Institutionally, NEC provides an organizational umbrella to link climate adaptation and water resources management in a more integrated way. This is in line with the central positioning of GLOF, flash floods and landslides as major climate risks the country is facing (see Paper 1). Moreover, while the government has positioned NEC as an inter-ministerial coordination body, it has also linked this with project management units for implementation of climate adaptation as part of the development plans, activities and sector ministries. While the linkage has enabled NEC

to gain decision-making authority in directing and coordinating climate adaptation responses in the country, it is important to note here that NEC's role is also closely linked with the availability of donor funds for climate adaptation (Bisht, 2013).

India

India adopted basic principles and approaches for IWRM in 1995 through the creation of the Integrated Watershed Management Program (IWMP). The National Water Resources Council, chaired by the Prime Minister, is formally responsible for inter-ministerial coordination. In practice, however, inter-ministerial coordination is hampered by the Council's lack of decision-making power to direct the development plans and activities of sectoral ministries, as sectoral development budgets are channeled directly to each sectoral ministry and not through the Council.

While an IWRM approach is implied in India's water resources management policies and guidelines, in practice, sectoral ministries direct sectoral development activities often without much collaboration. For example, while the Ministry of Agriculture and Farmers Welfare (MoAFW) is in charge of agricultural development, their plan and activities to promote agricultural development is not always linked with the issue of groundwater over-extraction. Sectoral fragmentation persists in water resources management, but this does not mean that the government does not see the need for cross-sectoral coordination as evidenced in the 2012 Water Policy. The question remains as to how to create incentives that motivate sectoral ministries towards such coordination in relation to the potential costs and benefits of water resources management and adaptation.

The Ministry of Water Resources (MoWR) plays an important role in shaping water resources management in the country. Three crucial departments, Department of Land Resources (DoLR), Department of Agriculture and Cooperation (DoA&C), and MoWR have been engaged in implementing various schemes and programs for the holistic development of land, drought proofing, irrigation and flood control at a central level. The MoWR has also focused on the management and regulation of groundwater sources through its groundwater management and regulation scheme. It carries out groundwater management studies as well as groundwater exploration through geophysical studies.

With regard to river basin management in India, the large majority of the rivers are inter-state in nature. States are given authority through the Constitution to develop water resources within state boundaries, while the central Government has the authority to develop inter-state rivers. Current river basin management in India centers largely around infrastructure development and conflict resolution, and has yet to evolve to include more basin-wide integrated approaches to management. At present, River Basin Organizations are largely top-down in nature with limited stakeholder participation.

Through the River Boards Act, parliament has the authority to develop inter-state river basin boards/authorities, though this initiative has to be collectively requested by the states involved. Until now, no such request has been made and it is felt that the states perceive such an initiative as a potential loss of power, hence their reluctance. The establishment of entities by the Central Government to deal with inter-state river issues up until now has, therefore, been independent of this Act. However, most inter-state water resources have already been tapped into, and most future

projects in India will be largely inter-state in nature, thereby increasing the necessity for such inter-state river basin boards in the future. Internationally, India played a prominent role in the formulation and signing of the Indus Water Treaty in 1960.

In common with Bangladesh and Sri Lanka, participatory irrigation management (PIM) models in India have had a top-down origin. The Ministry of Water Resources started fostering farmer participation in 1985 through a centrally-sponsored Command Area Development Program. Since then, the Ministry has promoted PIM through a legal model which the states have then used to design PIM Acts of their own, a practice adopted by 17 states up to now. As in other countries, the PIM model faces its own set of challenges, including a lack of resources and support, and an unclear legal and policy environment.

For climate adaptation, the national response around climate change emerged through the Prime Minister's Office (PMO), manifested in the creation of the Prime Minister's Council on Climate Change (PMCCC) in 2007 to coordinate national action for assessment, adaptation and mitigation of climate change, but without specific emphasis on how such coordination can address current challenges in IWRM application. PMCCC was to provide overall guidance on climate change-related actions taken by nodal ministries and other agencies, as well as review the progress and implementation of the each of the eight 'Missions' in the National Action Plan on Climate Change (NAPCC). Further, under the direction of NAPCC, each of the nodal ministries was required to submit comprehensive mission documents detailing objectives, implementation strategies, timelines, and monitoring and evaluation criteria to PMCCC.

In practice, however, PMCCC's actual role as the main coordinating entity overseeing all climate policy in India at a central level remained unclear. In practice, the Council is challenged with overseeing the implementation of adaptation plans within and across the different states. For example, at state level, there is very little evidence with regard to how the defined adaptation plans have actually commenced. Despite the central government's continuous efforts to convene nodal states to provide updates on their plans, there are very few examples of coordinated and concerted efforts to implement the plan in any state. While some of the adaptation actions listed in the plans are possibly being implemented, this is likely to be more as a 'side effect' of other pre-planned initiatives, such as the modification of an existing irrigation program to increase its coverage.

Nevertheless, reconstitution of the Council by the government in 2014 indicates a renewed focus on its functions and the need to revive its coordinating role around issues of climate change. Following the reconstitution, the Council was assigned to: 1) coordinate national action plans for assessment, adaptation and mitigation of climate change; 2) advise the government on proactive measures that can be taken to deal with climate change challenges; and 3) facilitate inter-ministerial coordination and guide policy formulation in relevant areas. While the Ministry of Environment, Forests and Climate Change (MoEFCC) would assist the PMO in facilitating the work, the Council could also obtain assistance as required from any relevant government ministry. Prior to the PMCCC reconstitution, MoEFCC acted as the main coordinating entity under the NAPCC, and nodal ministry is required to liaise and coordinate its proposed and ongoing activities with MoEFCC. Internationally, the Council would act as a high-level, decision-making body to provide guidance on climate negotiations. In theory, relevant sectoral ministries would submit their development plans related to climate adaptation to the Council. The Council would also review and report on these development plans on a regular basis.

At present, MoEFCC houses both the climate change unit as well as the National Mission for a Green India. The unit comprises of members from relevant sectoral ministries, including the Ministry of Finance (MoF), Ministry of New and Renewable Energy (MoNRE), Ministry of Power (MoP), Ministry of Science and Technology (MoST), Ministry of Water Resources (MoWR), Ministry of Urban Development (MoUD), Ministry of Agriculture (MoA) and the Ministry of External Affairs (MoEA) (Dubash and Joseph, 2016). Interesting to note here is that, while the relevant sector ministries are well represented in the climate change unit, the envisioned inter-ministerial coordination platform is placed under MoEFCC. While this implies the MoEFCC's institutional ability to direct and coordinate climate adaptation across sectors through its access to the climate change unit, MoEFCC's ability to control the unit will be influenced by its ability to ensure sector ministries' involvement and commitment, and enable its effective functioning.

India's National Bank for Agriculture and Rural Development (NABARD) has been accredited as a National Implementing Entity (NIE) for the Adaptation Fund created under the United Nations Framework Convention on Climate Change (UNFCCC). In its capacity as NIE, NABARD has generated several feasible projects on climate change adaptation in diverse agro-climatic regions and livelihood sectors, five of which have been submitted as proposals to the Adaptation Fund. Additionally, NABARD is implementing several developmental projects to promote sustainable livelihoods through natural resource management, such as watershed development and sustainable livelihoods for tribal communities, which are helping to build climate change resilience and the adaptive capacities of rural communities.

In 2009, the government also formed the Indian Network for Climate Change Assessment (INCCA) to enhance knowledge about the impacts of climate change at national and subnational levels. INCCA comprises 127 institutions and has been conceptualized as a network-based scientific program designed to: 1) assess the drivers and implications of climate change through scientific research; 2) prepare climate change assessments once every 2 years; 3) develop decision support systems; and 4) build capacity towards the management of climate change-related risks and opportunities. Recently, the government has also set up the National Institute for Climate Change Studies and Actions (NICCSA) under its Climate Change Action Program (CCAP) of the MoEF. The Institute will conduct analytical studies on scientific, environmental, economic development and technological issues related to climate change, though direct influence of these studies remain to be seen in the coming years.

Existing institutional frameworks for climate adaptation in India incorporate both institutional arrangements to ensure cross-sectoral coordination and financial mechanisms for climate adaptation policy implementation. While the central government has been quite successful in dealing with sectoral fragmentation in their climate adaptation responses, through centralized budget allocation under NABARD as well as the establishment of an inter-ministerial platform to facilitate coordination (under MoEFCC), the question remains as to how this financial and institutional platform can be translated at state level, and how cross-sectoral mechanisms for climate adaptation can help address sectoral fragmentation in the water sector so that water resources management forms an integral part of the country's adaptation strategies. The latter is of high importance not only because droughts and groundwater depletion are identified as major climate risks facing the country (see Paper 1), but also because irrigation and flood control are key to the government's development strategies to increase agricultural productivity and promote national economic growth.

Nepal

Partially driven by the global agenda on IWRM, the National Water Plan (2005) states the importance of IWRM principles and the notion of river basin management to ensure that water resources development is undertaken in an effective and sustainable manner. Initially, the Ministry of Water Resources (MoWR) and Water Energy Commission Secretariat (WECS) were identified as the main government institutions responsible for promoting IWRM implementation. In 2009, however, MoWR was split into two ministries: the Ministry of Irrigation (MoI) and the Ministry of Energy (MoE). For this reason, WECS was located under MoWR and later under MoE.

WECS, formed in 1981, is the permanent secretariat of the Water and Energy Commission (WEC), which was established by the government in 1975 with the objective of "developing the water and energy resources in an integrated and accelerated manner" (ADB, 2004, p. 4). The establishment of WECS was largely driven by the government's objective to be well-equipped in negotiating transboundary water and energy issues with India, notably through the creation of "an integrated and centralized environmental database system for information related to water resources development and management" (WECS, 2010). In its early days, WECS's role was envisioned as providing other government ministries with review and technical reports in relation to the development plans of sectoral ministries, and provision of design guidelines. Following the development of the National Water Plan (NWP), WECS's role was oriented more and more towards the formulation of policies and legal frameworks to promote IWRM, and towards cross-sectoral coordination.

There is considerable confusion, however, over what WECS's role and mandate are, as well as marked disagreement on what they should be. International donor representatives believe that WECS's role lies in coordination of water planning, but some sectoral ministries perceive that WECS should solely provide technical expertise to them, while civil society organizations perceive WECS as a government body in charge of IWRM implementation – without actually defining what IWRM implementation entails (Suhardiman et al. 2015). Following the NWP's formulation in 2005, WECS developed a draft Act that outlined the institutional frameworks that need to be developed towards the realization of IWRM. However, the Act was never approved, because of MoE's objection. The Act was drafted notably to give legal backup to WECS to review and approve development plans and activities of sector ministries. MoE resisted the Act because it would result in a new control mechanism (in terms of technical audit), which would stand above the sectoral ministries' decision-making authority, and might threaten their power and budget allocation.

Following this major setback, WECS has been unable to fulfill its role in promoting cross-sector coordination, as outlined in the NWP. Lacking the legal backup to ensure sector ministries' compliance with the principles of IWRM (e.g., sharing its development plan and activities with WECS and other sectoral ministries), WECS continues to struggle to find an institutional niche where it can add value for sector ministries.

On water-related projects, WUAs have been formed in accordance with the national irrigation policy. The water users were, however, not involved in preparing the national irrigation policy

and, therefore, may feel excluded. Nevertheless, there is still support from the water users for participation in water management, as they realize it will be beneficial to them in the long run (Howarth et. al 2004).

In 2008, the government was in charge of taking stock of all groundwater resources, and for making the necessary policy and institutional arrangements for the sustainable use of groundwater. As of 2011, however, groundwater is still a relatively unregulated resource and, therefore, in need of proper management and utilization (Kansakar, 2011). If IWRM principles were to be implemented, WUAs would be the organizations at the local level that would be responsible for proper management of water resources in river basins. The Government of Nepal is still the primary manager of water at a national level, and so should be included in any discussions on large-scale IWRM projects taking place.

In the context of climate adaptation, Nepal's Climate Change Council is a high-level, inter-ministerial coordination body chaired by the Prime Minister, with MoSTE functioning as the Council Secretariat. Formed in 2009, prior to COP 15, the Council's task is to provide high-level policy and strategic oversight, coordinate financial and technical support to climate-related programs and projects, as well as ensuring that Nepal benefits from climate-related international negotiations and decisions. It comprises of 25 members, including 11 ministers and eight technical experts nominated by the government.

MoSTE is the designated focal point and lead ministry for implementing the provisions of the UNFCCC, and coordinating the implementation of climate adaptation activities across sectors and donor agencies. Institutionally, this reveals how the Nepal government positions climate adaptation as a broader issue pertaining to environmental challenges, beyond water resources management alone. Nevertheless, it is unclear as to how the established institutional set up would be able to tackle the problem of sectoral fragmentation, which had and continuously impeded IWRM application.

While the current institutional structure shows Nepal's comprehensive approach to climate adaptation, in practice, MoSTE has little presence outside its administrative headquarters in Kathmandu, and has been working on how to increase its organizational capacity so that it can coordinate and implement climate adaptation at a subnational level. The Division of Hydrology and Meteorology under MoSTE collects and disseminates hydrological and meteorological information for water resources, agriculture, energy and other development activities. Yet, it is unclear how this information is conveyed or is being used as a starting point for policy discussion.

In terms of overall coordination, MoSTE is equipped with a Joint Secretary and Climate Change Program Steering Committee (CCPSC), with the latter chaired by the Minister, and the National Planning Commission (NPC). MoSTE reports directly to the Multi-stakeholder Climate Change Initiatives Coordination Committee (MCCICC) and CCPSC, which then reports to the Climate Change Council. In practice, however, though MoSTE is supposed to coordinate climate adaptation activities in the country through its Climate Change Management division, different implementing agencies (e.g., relevant ministries, NGOs) work mainly with the respective donors.

Formed in 2009, the MCCICC comprises of representatives from government agencies, NGOs, private sector actors, academics and international donors. The NAPA thematic working group coordinators are also on this Committee. Functioning as the MCCICC Secretariat is the Climate Change Management Division under MoSTE. The MCCICC's task is to coordinate climate change

activities, by providing a venue where needs are identified and taken into account in the formulation of financing strategies by the government and international donors, as well as in implementing collaborative programs across sectors. In practice, however, MCCICC has not been effective in fulfilling this role as evidenced by its infrequent stakeholder meetings.

The National Climate Change and Knowledge Management Centre (NCCKMC) was formed through close collaboration between the Nepal Academy of Science and Technology (NAST) and MoSTE in 2010. NCCKMC is part of institutional arrangements falling under NAPA supported by DANIDA, DFID, GEF and UNDP. Based in NAST, the NCCKMC's mission is to generate and manage climate-related knowledge in Nepal, and provide an institutional platform to coordinate and facilitate knowledge exchange and capacity building to a wide range of stakeholders. In practice, NCCKMC faces funding challenges to fulfill its tasks, especially because MoSTE was unable to maintain its initial investment in the Centre's development as envisaged under NAPA. Next to NCCKMC, various organizations, including national and international NGOs, formed Climate Change Network Nepal. It is a forum that aims to raise awareness on climate change, coordinate and advocate effective action for mitigation and adaptation measures, and establish an information-sharing platform on climate adaptation through community-based networks.

The Nepal case study illustrates the government's main strategy to form a (new) inter-ministerial coordination platform as an institutional means to address the problem of sectoral fragmentation, both with regard to water resources management and climate adaptation. This institutional framing corresponds very well to the major climate risks facing the country (such as GLOF, flash floods, landslides and droughts). Although these suggest the need for an integrated approach to climate adaptation, in practice, however, current institutional arrangements and linkages for both water resources management and climate adaptation remain scattered due to powerful sectoral ministerial resistance to accepting the role of WECS as a regulating body, as well as a lack of sufficient funding and organizational capacity to implement climate adaptation programs through MoSTE. While Nepal has established the required institutional set up for a holistic and integrated approach to water resources management and climate adaptation, the question remains as to how to make such structures work in strengthening the country's adaptation capacity, in general, and with regard to the water sector, in particular. Central in ensuring effective functioning of IWRM is the role of incentives for various sector ministries to get involved in the proposed coordination efforts.

Pakistan

The Ministry of Water and Power (MoWP) plays a lead role in water resources management in Pakistan. It is responsible for the national distribution of water and management of multipurpose reservoirs on the Indus and its tributaries. At present, Pakistan does not have a water resources policy, though one is currently being developed. Internationally, like India, Pakistan has signed the Indus Water Treaty in 1960, which stipulates basic rules in water distribution and sharing between the two countries.

At local level, the government has formed and established WUAs to increase farmers' involvement in irrigation system management. In practice, however, WUA organizational development has mixed results, with some WUAs becoming inactive after its formation, and others functioning

merely on an ad hoc basis, when they have to resolve water conflicts between farmers during periods of water scarcity.

The Cabinet Committee on Climate Change was formulated in 1995 to provide a policy coordination forum for climate change. This was later changed to the Prime Minister's Council on Climate Change (PMCCC) in 2004, which also aimed to establish a high-level, inter-ministerial linkage and proved to be extremely effective in initiating the country's entry into the global carbon market, but less on water-related climate adaptation. PMCCC is chaired by the Prime Minister, with several ministers as its members, including the Minister for Environment and the Deputy Chairman of Planning Commission. An important direction given by PMCCC in the wake of major climate change concerns is the need to focus on water and food security issues, though the institutional set up and mechanisms to do this were never clearly outlined. In recent years, however, PMCCC has been inactive due to unreliable funding for the implementation of climate adaptation programs and lack of staffing capacity. There is considerable merit in reactivating and utilizing it to provide a forum for integrating climate change into mainstream policy making.

In 2011, when the Ministry of Environment was devolved to the provincial authorities, responsibility for climate change was handed over to the Ministry of Planning. In October 2011, four new ministries were set up to absorb the departments that were leftover from the devolution, including the Ministry of National Disaster Management (MoNDM). This was renamed the Ministry of Climate Change (MoCC) in April 2012, elevating the issue to cabinet level. MoCC had the mandate to coordinate climate change issues with relevant agencies and institutions. The National Climate Change Plan (NCCP) Committee was established to ensure effective implementation of the climate policy and oversee progress in this regard.

MoCC was downgraded to a Climate Change Division (CCD) in 2013 working under the Prime Minister's Office. CCD is the main federal institution responsible for planning activities and formulating policies associated with environmental protection, pollution and resource conservation. It is responsible for implementing the Pakistan Environmental Protection Act, coordinating the activities of other federal ministries, and acting as the secretariat for the Pakistan Environmental Protection Council (PEPC). It also deals with agreements reached with other countries and international organizations in the field of environment. In addition, the Pakistan Environmental Protection Agency also comes under its administrative control. CCD, under the Prime Minister's Office, leads federal climate change actions and hosts the Clean Development Mechanism cell. It also leads efforts to address climate challenges in coordination with relevant federal ministries, such as Water and Power, National Food Security and Research, Science and Technology, and Planning and Development. CCD also works with agencies such as the Water and Power Development Authority (WAPDA), Pakistan Agricultural Research Council and National Institute of Oceanography. In 2015, CCD regained its status as a Ministry.

Current institutional frameworks for climate adaptation in Pakistan show how the government aims to tackle the problem of sector fragmentation through the positioning of its climate change institutional platform at cabinet level, under the Prime Minister's office, but without further reference to how earlier attempts to establish such platforms for IWRM have not been effective in terms of its application. While such positioning could theoretically ensure cross-sectoral coordination for climate adaptation programs, in practice, implementation of such programs is often directed by relevant sector ministries and depends largely on how donors channel climate adaptation funds. While the organizational transformation of MoNDM into MoCC reveals the

close linkage between climate adaptation and disaster management in the institutional framing of Pakistan's climate adaptation, the question remains as to how water resources management can be positioned as an integral part of the country's adaptation strategies. As drought, and groundwater depletion and salinization are among key climate risks facing the country (see Paper 1), institutional strengthening should be focused on developing measures for water allocation and prioritization across the different sectors, as well as linking surface water and groundwater planning and management.

Sri Lanka

Water governance in Sri Lanka is still largely based on management systems put in place during British colonial rule, and determined by administrative/land-based boundaries. At present, there are nearly 51 Acts and over 40 agencies involved in governing and managing the water resources of the country, many of which are restricted to certain functions or subsectors. As a result, there is heavy duplication, fragmentation and overlap in the institutional setup of the water sector in Sri Lanka.

Lacking an inter-ministerial coordination body and institutional arrangements to facilitate cross-sectoral collaboration, water resources development decisions are taken by each sectoral ministry, often without any connection with each other. Up to now, attempts to put in place an overarching water policy or Act have not met with any success, in part, due to a lack of political backing. Besides, while Sri Lanka is equipped with a government ministry in charge of water resources management (MoIWRM), the ministry's strong focus on irrigation tends to narrow the scope and boundary of water resources management into water planning and development predominantly for the agriculture sector, in addition to water supply for domestic use. A continued emphasis on developing irrigation systems means that irrigation institutions enjoy a position of privilege in the current system.

The Water Resources Board was established with the objective of advising the Minister of Irrigation and Water Resources Management on different aspects of management of water resources in the country, including the design of integrated management plans, prioritization of objectives in the case of river basin and trans-river basin projects, and the coordination of different government entities working in the sector. However, recently the focus of the Board appears to have shifted from encompassing the entire water sector to mainly that related to groundwater research, monitoring and development. Despite its role in groundwater management, however, the Board does not seem to be involved in working on groundwater/surface water linkages.

Currently, the State is in charge of interprovincial rivers and irrigation schemes, while the management of the same within the nine provinces have been devolved to the Provincial Councils. Other aspects of the water sector that come under the purview of the provincial councils include health, water supply and sanitation, and environmental protection. In practice, however, the devolution of these functions has not been fully realized, with both the Central Government and the provincial councils being involved in the provision of these services. For example, the Department of Agrarian Development under the Ministry of Agriculture still plays an important role in the management of minor irrigation systems.

In Sri Lanka, the operation and maintenance (O&M) of irrigation schemes is jointly undertaken with Farmer Organizations (FOs), under the program 'Participatory Irrigation System Management'. FOs that are registered with the Department of Agrarian Development are considered legal entities. A study by Samad and Vermillion (1999) found that, in cases where both the management was transferred to FOs, and where these irrigation structures were rehabilitated by the government, significant increases in yield were observed.

Within the context of climate adaptation, Sri Lanka has a Climate Change Secretariat (CCS), established in 2008 under the Ministry of Mahaweli Development and Environment. The Secretariat is supposed to provide a platform to address climate change issues at the national level, both in terms of information sharing and facilitating policy actions, and to serve as an overarching institutional mechanism on climate change responses. Internationally, it liaises with the UNFCCC Secretariat.

In line with the National Climate Change Adaptation Plan of Sri Lanka, CCS was positioned as the responsible government agency to undertake overall coordination on climate adaptation in the country. This is a huge task, given the fact that for the water-related sector alone, cross-sectoral coordination is severely lacking. Ideally, a National Working Group (NWG) would be set up to support CCS in the implementation of climate adaptation programs across the different sectors. As envisioned in the National Climate Change Adaptation Plan, NWG would function as a consortium of national government ministries, research institutes (such as Department of Meteorology, Disaster Management Centre, National Science Foundation) and NGO representatives coordinated by CCS staff members. In practice, however, NWG was not established until now.

Under existing institutional frameworks, the Mahaweli Authority of Sri Lanka (MASL) under MoMDE, the Central Environmental Authority (CEA) and the Coast Conservation Department (CCD) play an important role in climate adaptation in the water sector. MASL is a river basin organization (RBO) responsible for the Mahaweli Development Scheme, which seeks to develop the Mahaweli River Basin to meet the needs of irrigation and hydropower of the country. The area covered by the scheme includes 39% of the country and 60% of the total irrigable area. In addition, the Ministry of Irrigation and Water Resources Management (MoIWRM) is responsible for the management of all water resources in the country, with the main focus on the development and management of large- and medium-scale irrigation systems, in which the Irrigation Management Division is in charge of overall systems management. Here, climate adaptation programs and activities are strongly rooted in the construction and rehabilitation of irrigation physical infrastructure to improve storage capacity.

While the Sri Lankan government has attempted to facilitate cross-sectoral coordination and collaboration for climate adaptation through the formation of CCS, current institutional frameworks and arrangements on climate adaptation remain on the periphery as sectoral decision-making structures and mechanisms prevail. CCS's lack of capacity, in terms of budget and staffing, is also an issue. The formation of CCS does not automatically result in the establishment of an inter-ministerial coordination platform for climate adaptation. In contrast, sectoral ministries continue to operate almost in parallel to each other, because they often do not see how they would benefit from cross-sectoral coordination, not to mention potential implications of such coordination in terms of sector ministries' budget allocation. While some ministries play some role in climate adaptation, this happened mainly through donor-funded project activities, with little cross-sectoral inter-linkages and connection. From the perspective of climate adaptation in the

water sector, the government approaches this mainly through irrigation infrastructure development and rehabilitation to increase water storage capacity as means of ensuring food security. As droughts, and groundwater salinization and depletion are listed as major climate risks for the country, this requires a more central positioning of the water sector in overall climate adaptation strategies. Institutionally, efforts to strengthen cross-sectoral coordination can be started through the promotion of direct collaboration (e.g., through joint programs/projects) between the relevant sector ministries. At a country level, and for the water sector specifically, climate adaptation highlights the need for Integrated Water Resources Management, as holistic adaptation measures would require integrated water resources planning and management across the different sectors. In this subsection, we discuss the current institutional frameworks in water resources management in each of the seven countries selected in South Asia, how this corresponds to IWRM both theoretically and in its actual implementation, and the implications this has for approaches to climate adaptation.

4.2 Current Trends of Existing Institutional Frameworks

4.2.1. Centralized approach does not automatically lead to holistic climate adaptation

Across the seven countries, institutional frameworks for climate adaptation follow a centralized approach, with one or more government agencies charged with leading, preparing and formulating climate adaptation programs at the national level. This is most evident in India, where the national response around climate change emerged through the Prime Minister's Office, with the creation of the Prime Minister's Council on Climate Change (PMCCC) in 2007. Similarly, the Government of Nepal (GoN) formed the Climate Change Council in 2009 as the national coordinating body to ensure effective implementation of climate adaptation policies. Though Nepal has also formulated its Local Action Plans for Adaptation (LAPA), which involves a bottom-up approach to climate adaptation planning, in practice, adaptation planning through NAPA continues to dominate LAPA (Nagoda, 2015). In Bhutan, the National Environmental Commission (NEC), an inter-ministerial body chaired by the Prime Minister, is in charge of formulating climate adaptation programs. In Bangladesh, the Ministry of Environment and Forests (MoEF) is leading the country's climate adaptation program, collaborating with other ministries and international financial institutions, through its Climate Change Cell (CCC). The same can be said with regard to Sri Lanka and Afghanistan through their positioning of the Climate Change Secretariat (CCS) under the Ministry of Mahaweli Development and Environment (MoMDE), and the National Environmental Protection Agency (NEPA) under the Ministry of Environment (MoE), respectively, as lead government agencies. Last but not least, the Government of Pakistan (GoP) has renamed the former Ministry of National Disaster Management (MNDM) to the Ministry of Climate Change (MCC), and made the latter the leading government agency in climate adaptation.

Driven by global climate policy discussions, national governments have appointed relevant sectoral ministries (e.g., MoSTE in Nepal, MoEF in Bangladesh) or formed new inter-ministerial bodies to lead program implementation, as an 'ad hoc' response (Dubash and Joseph, 2016) to institutionalization. In practice, while the institutional structures for climate adaptation are in place, more needs to be done to improve the overall performance and institutional effectiveness of these bodies, both at ministerial and inter-ministerial levels. While most of the countries have established their respective institutional set up for climate adaptation (e.g., either through an inter-ministerial decision-making platform or sector ministry leadership, or a combination of both), how such set

ups would address the existing challenges of cross-sectoral integration and collaboration (e.g., overlapping roles and areas of responsibility between the different sector ministries and the established inter-ministerial bodies) remains unclear. Similarly, while the establishment of this institutional set up is a good start to tackle climate adaptation, in many countries, it remains unclear as to how such a set up could ensure effective implementation of climate adaptation programs on the ground. For example, in Sri Lanka, Bhutan, Pakistan and Afghanistan, the leading government agencies on climate adaptation have hardly any capacity (in terms of staffing and budget) to monitor program implementation on the ground. In India, State governments directed the formulation of their State Action Plans on Climate Change (SAPCC) almost entirely towards the National Action Plans on Climate Change (NAPCC), leaving little space for discussion on how these plans could be best implemented within the current institutional structure, not to mention that formulation and implementation of climate adaptation programs continue to be directed by centralized funding mechanisms (both from donors and the government's budget). This brings to light not only the need to increase the overall capacity and performance of government agencies across sectors and scales, and those especially linked to climate adaptation (e.g., monitoring and evaluation), but also, to a certain extent, the need for budgetary reform in how funding for climate adaptation can be channeled most effectively.

Institutionally, a centralized approach to climate adaptation does not automatically result in strong institutional rooting or accommodate the inclusion of local coping strategies and/or immediate entry points to scale up these strategies as an integral part of the country's climate adaptation programs. In Nepal, the government established a Multi-stakeholder Climate Change Initiatives Coordination Committee (MCCICC) in 2009, followed by the formation of the National Climate Change and Knowledge Management Centre (NCCKMC) under the Nepal Academy of Science and Technology (NAST) in 2010. While MCCICC's membership includes international NGOs, academics, private sector actors and international financial institutions, next to representatives from relevant government ministries, it remains a nationally-centered institution, with very little connection to local communities. Similarly, while NCCKMC works towards a knowledge platform, which can be very useful for climate adaptation across scales, it is unclear how local communities, especially those who would be most affected by climate variability, such as women and the poorest, could access such a platform (Nagoda, 2015). Refer to Paper 2 on the importance of local action to support climate change adaptation. Overall, this highlights the need to strengthen the role of local communities, NGOs and research organizations as an integral part of the institutional landscape in climate adaptation. Across the seven countries, Water Users Associations can be used as a starting point for better understanding of institutional arrangements of farmers' adaptation strategies. For instance, when WUAs and farmers decide to change the overall water delivery schedule to deal with climate variability, understanding this change/strategy is pertinent to incorporate local adaptation measures as an integral part of the design and development of climate adaptation programs. In addition, the establishment of BCAS, CEGIS and BIDS in Bangladesh could potentially contribute to the provision of scientific information on climate adaptation.

Furthermore, while water resources management is implied in the overall institutional frameworks for climate adaptation, institutional measures for adaptations are not always directly linked with the need for IWRM. For example, while Pakistan positions MoCC as the leading agency for climate adaptation, it is unclear whether this institutional measure will integrate water resources management sufficiently in the country's climate adaptation. Similarly, while Bangladesh and

Bhutan have taken a more integrated institutional approach towards climate adaptation, driven by a strong emphasis on environmental aspects of climate change, the question remains as to whether such integration will also adequately incorporate water bodies (e.g., NWRC) in climate adaptation.

4.2.2. Institutional challenges of and opportunities for mainstreaming climate adaptation into national development programs

All seven countries mainstream climate adaptation into their respective national development programs (see also Paper 2 on policy mainstreaming in climate adaptation). In Bangladesh, Nepal, Sri Lanka, Bhutan, India and Pakistan, climate adaptation programs form an integral part of development objectives to enhance food security and reduce poverty, involving the relevant sectors (water, agriculture, forest, health, transport). Climate adaptation programs are also closely linked with risk prevention and disaster management in Pakistan, Bangladesh, Sri Lanka and Bhutan, as well as with environmental issues (problems of desertification, in particular) in Afghanistan.

Strategies to mainstream climate adaptation are partly rooted in the dependency of governments to external funding agencies for support in financing climate adaptation programs (OECD, 2009; Sharma, 2011). Lacking any financial resources to implement these programs as an overarching program, five of the seven countries' governments (with the exception of Bangladesh and India, which have put significant internal revenues into climate adaptation) 'incorporated' climate adaptation as part of their national development strategies in poverty reduction through activities such as improved health systems, water and sanitation, agricultural development, housing and infrastructure, among others.

While mainstreaming climate adaptation into national development programs can be viewed as a first step in seriously tackling climate issues (Ayers et al. 2014; Agrawala, 2004), it could also sideline climate adaptation efforts especially when such mainstreaming is not accompanied with 'climate-oriented' capacity building efforts, both institutionally and programmatically, as discussed in the previous section. For example, in Sri Lanka, Bhutan, Pakistan and Afghanistan, the absence of a strong climate adaptation program is not only due to the lack of funding, but also related to very low institutional capacity to implement such programs across scales, with most government staff involved having little knowledge on climate adaptation issues and approaches. In the long run, one might question the actual significance of such mainstreaming, which will be defined by whether or not it is accompanied by a clear plan towards institutional strengthening for the specific sectors playing a crucial role in climate adaptation (e.g., agriculture, water, energy), not to mention the specific climate risks being overridden by development priorities (e.g., groundwater depletion and salinization).

5. The Need for Regional Cooperation

The importance of regional cooperation and coordination is reflected in the transboundary nature of many water resources that will be impacted by climate change. The predicted glacial retreat in the Himalayas would affect water availability for agriculture, domestic use, hydropower and industry, on which some 400 million people across the Indo-Gangetic and Brahmaputra basins in Nepal, India and Bangladesh depend (Mirza and Ahmad, 2005). Also refer to the ICIMOD Atlas in Paper 1.

Along with other climatic impacts that undermine water availability, this could intensify existing tensions and create new conflicts over sharing of transboundary rivers, both within a country (as in the case of the Sindh and Punjab provinces in Pakistan over the Indus; as well as between states in India) and between countries. The fact that 97% of Bangladesh's freshwater flows come through India is indicative of the limits posed by transboundary factors on the adaptive space available to individual countries. Bangladesh and India have 54 transnational rivers, but agreements only exist for a few specific rivers, e.g., a 30-year old treaty over the Ganges. Even in situations where water sharing agreements do exist, as in the case of the Indus Waters Treaty, potential future reductions in water flow could lead to the need for renegotiated terms of allocations (Mirza and Ahmad, 2005). Five treaties currently exist between the South Asian nations: Indus Waters Treaty between India and Pakistan (1960), the treaties between India and Nepal on the Kosi (1954), Gandaki (1959) and the Mahakali (1996) rivers, and the Ganges Water Sharing treaty between India and Bangladesh (1996) (Prasai and Surie, 2015).

While regional cooperation is critical for climate adaptation, efforts to promote regional adaptation will have to take into account the existing asymmetries in economic and political power, geography and country priorities. Central to these dynamics is India, which will play a key role in future regional cooperation for climate adaptation, especially with regard to the water and energy sectors. In addition to its economic and political influence, India's geographical positioning – a midstream state in many ways – provides it with a central role with respect to lower and upper riparian countries. With several major rivers flowing through its territory, how India controls flows in response to increasing national demands for energy and food for its growing population and economic ambitions will have major consequences for other states (Bhaduri and Barbier, 2008). To date, India has taken a bilateral approach to developing formal cooperation, a feature in its treaties with Pakistan (Indus Waters Treaty, 1960), Bangladesh (India Bangladesh Water Sharing Treaty, 1996) and Nepal (Mahakali River Treaty, 1996) (Ranjan, 2015).

Within this context, the South Asian Association for Regional Cooperation (SAARC) has initiated many regional cooperation agreements, some directly on climate change and others on related topics such as the environment and disaster management. Of these, the Dhaka Declaration and SAARC Action Plan on Climate Change (2008) and the Thimphu Statement on Climate Change (2010) are considered to be two important milestones in the Association's response to climate change. The Thimphu Statement recognizes that South Asia is expected to be heavily impacted by climate change, thus necessitating a regional response. It also provides a more concrete direction for a response to climate change, including calls for an Inter-governmental Expert Group on

Climate Change to provide policy guidance and monitor progress for regional cooperation (SAARC, 2016).

However, while there is agreement on the need to respond to climate change at regional scale, there is as yet no settlement on how these agreements are to be financed. Considering the financing gap faced by all the countries in implementing their own national plans of action, funding from other sources would be required for these initiatives to be successfully implemented. Consequently, while there are other region-wide initiatives that contribute to adaptation, including the South Asia Water Initiative (SAWI) by the World Bank and Mangroves for the Future (MFF) by UNDP and IUCN, formal government-driven arrangements remain at a nascent stage, with no clear pathway for scaling existing bilateral approaches to a truly regional platform.

6. Key Findings

The findings in this section bring out a common theme highlighting the mainly structural nature of existing challenges faced by financial mechanisms and institutional frameworks in promoting integrated responses to climatic risks that demand the opposite to current sectoral institutional structures and culture. The concept of IWRM has, for some time, more integrated approaches within the water sector, quite independently of climate adaptation thinking. The persisting gap between policies that adopt IWRM (see Paper 2) and institutional disconnects that impede it in practice as illustrated above, demonstrate the difficulties in building integrated and deliberative responses to developmental challenges in practice. This and other related issues are elaborated on below. Table 5 in Annex 5 also attempts to represent numerically, the main findings of this report through an author-developed scoring system (detailed in Table 6).

6.1 Water resources are a fundamental driver of economic development and other aspects of well-being across the region. Their high vulnerability to climate change creates a strong argument for improved and more integrated water resources management as an explicit adaptation response.

As demonstrated in Section 2 (as well as Table 1), water is amongst several common themes characterizing the development context across the region. Its impact as an enabling resource across several key sectors such as agriculture, energy production and industry more broadly is clear, with a variation in this mix from one country to another. In Nepal and Bhutan, for instance, hydropower generation is the primary economic driver, and it is the sector that has also powered development in Sri Lanka until recent diversification of energy sources. Despite differing contributions in economic terms, agriculture remains fundamental in terms of food security, nutrition and employment, given the majority of rural populations in all the countries. Here, too, water is key, with surface water or groundwater being prominent in different countries. In many countries, such as Sri Lanka, Bangladesh and India, groundwater is an important driver of rural poverty reduction and food security. Pakistan's position as the largest cotton exporter in the world means that this element of agriculture alone plays a significant role in the rural as well as national economy.

This central role played by water can also become a major risk, given the many climate change impacts that are expressed in terms of quantitative or temporal dimensions of water availability: several types of flooding, drought, salinity and storm surges, with direct and indirect impacts on surface water and groundwater. These, in turn, stand to undermine major economic and other key developmental systems. However, the extent to which water is prioritized in funding allocations is unclear. As discussed further below, identifiable fund allocations for water in many countries have been small, although the crosscutting nature of the resources most likely means significant investments remain hidden in other sectoral investments, such as agriculture in Bangladesh, and irrigation and hydropower infrastructure in Bhutan, Nepal, India and Sri Lanka.

6.2 Understanding the potential costs of climate risks in the context of specific geographies and populations is important to identify adaptation priorities, key stakeholders and financing needs. Financing responses involves competing for scarce international funding to bridge significant gaps in national budgets, as well as ensuring hard won financial flows

effectively link with technical planning processes for effective adaptation. Current knowledge of financial implications of climate risks, and institutional structures and capacities appear to be insufficient for meeting these challenges.

As seen from Section 2, current calculations of climate change-induced costs appear to exist for some sectors but not others in each country. This suggests the absence of a concerted effort to produce a comprehensive assessment of costs associated with the full range of climatic risks. Many existing cost estimates are expressed as a percentage of GDP, and do not automatically disaggregate the unequal distribution of these costs between specific population groups and geographies. This macro-economic orientation suggests that such analyses are not underpinned by a more integrated framework that also places value on where in the landscape and populations these costs are likely to arise. This includes disaggregating costs for the water sector amongst wider estimates of costs due to climate change impacts. This is partly the result of the specific nature of the water sector, intersecting as it does with all forms of human activity. It is also because typical projects on climate change adaptation cut across multiple sectors, making it difficult to isolate components related specifically to water (and related financing). Some countries such as Pakistan and Nepal have conducted flood-related cost assessments in terms of risk, though there are many other factors which are not assessed, such as groundwater depletion and salinization, which also emerge as important water-related risks (see Paper 1 Risk table).

The overarching reason appears to be the disjointed and scattered financial mechanisms across the different economic sectors and administrative levels, which results in incomplete cost estimates of specific and cumulative climate risks and associated adaptation costs. This also causes uncoordinated fund channeling for climate adaptation across the different sectors and levels, and an inability to track allocations and spending, and to hold funding recipients accountable for specific adaptation goals they are associated with. Innovations in Bangladesh, such as the proposed climate change marker, may offer a road map for other countries in terms of mainstreaming climate funds. It is the closest to making the important transition to climate finance becoming an integral and explicit part of budgetary processes. If the most recent recommendations for structural reforms to existing mechanisms are implemented, these will put in place a comprehensive oversight mechanism that will enable the government to track the impacts of climate finance spending, thereby creating an environment of greater accountability on climate expenditure and providing support to stronger learning on what future adaptation priorities should be. The possibility that further reforms may involve the use of a climate adaptation marker – an existing innovation for tracking and accounting for spending on poverty reduction and gender – is of particular interest in terms of potential replication in other countries included in this study.

6.3. Despite coordinating institutions for adaptation being in place, the lack of connective tissue critical for effective cross-sectoral coordination remains an important practical gap for gearing planning processes towards more sectorally integrated adaptation responses.

Climate adaptation, in general, and those related to water resources management, in particular, requires complex and widespread institutional action and coordinated efforts at different scales. As such, inter-ministerial coordination and cross-sectoral collaboration are essential for the formulation of holistic adaptation programs and their effective implementation (Adger et al. 2005; Thomas and Twyman, 2005; Urwin and Jordan, 2007). This speaks to the greater levels of responsiveness needed in the face of multiple and cumulative climate risks, and to recognize

differentiated needs across geographies and human communities in a manner that supports better bottom-up information flows on needs, results and impact. Bringing countries' response capabilities up to such a level is important, given that adaptation involves iterative learning over time which depends on feedback loops. The current status, however, seems to be characterized by a 'business as usual' approach that plays into embedded political economies and sectoral egoism (Goldstein, 1993). The challenge of bureaucratic competition as institutional traps in climate adaptation and their implications for adaptation programs across scales is well documented (Lebel et al. 2011; Koch et al. 2006; de Oliveira, 2009).

There is little evidence that existing climate institutions can overcome entrenched sectoral approaches to development planning.

Across the seven countries, institutional frameworks for climate adaptation have been designed through either the formation of inter-ministerial bodies or sectoral leadership or a combination of both. While there is no silver bullet on the type of institutional frameworks for climate adaptation, existing institutional frameworks are set based on two interrelated assumptions: 1) cross-sectoral collaboration will take place in climate adaptation efforts, despite challenges of IWRM application in the water sector; and 2) existing institutional frameworks have the capacity (in terms of budget, staffing and knowledge) to implement holistic climate adaptation programs on the ground, and thus support cross-sectoral collaboration. In practice, however, the application of climate adaptation is hindered by various factors, ranging from overlapping tasks and responsibilities to sectoral competition in terms of mandates and budget allocation. At the heart of these issues lies the practical disparities in influence between agencies vested with climate response coordination and other sectors that are expected to cooperate. In India, this is most apparent in how the PMCCC's role remains unclear with regard to inter-ministerial coordination, while the authority of MoEFCC to effect the necessary cooperation has been questioned by Sharma et al. (2015). In Nepal, both the Ministry of Energy (MoE) and the Ministry of Irrigation (MoI) could proceed with their plans to build hydropower and irrigation dams, respectively, without any consultation with the Climate Change Secretariat located under MoSTE, because they do not need any approval from the Secretariat to proceed with the plans. In Sri Lanka, the formation of the Climate Change Secretariat does not automatically result in the establishment of an inter-ministerial coordination platform, as the CCS operates on the periphery and sectoral ministries continue to drive sector development. In Afghanistan, Pakistan and Bhutan, lack of inter-ministerial coordination is often exacerbated by the lack of government capacity to implement adaptation programs on the ground.

Most climate coordinating agencies, therefore, appear to be principally conduits for securing external funding.

While funding mechanisms for climate adaptation (both internally through central government revenues and through external donor funds) could act as initial and/or temporary institutional 'glue' to facilitate inter-ministerial coordination, there is a need to go beyond simply a financing approach. In Bhutan, the National Economic Commission's (NEC's) functioning is limited to developing climate adaptation program activities and allocating donor funds for climate adaptation across relevant sectoral ministries. While doing this, it lacks an institutional mechanism to ensure effective inter-ministerial relationships and joint efforts in the development and implementation of projects. Similarly, in Bangladesh, MoEF, together with the Ministry of Finance, is in charge of the allocation of climate adaptation funds to other relevant sectoral ministries. At the same time, they have very little influence to ensure inter-ministerial coordination through the different

projects. In India, centralized fund disbursement from the center to different states does not seem to encourage cross-sectoral collaboration, given the predominantly sectoral approach in the NAPCC and SAPCC formulation processes.

Another key challenge in developing appropriate climate adaptation measures is the gap between knowledge generation and knowledge adoption in policy decisions. For example, while there is an extensive network of systems for agro-meteorological and hydro-meteorological data collection involving three governmental departments in Sri Lanka, access to the data collected and dissemination of this information is non-institutionalized (Aheeyar, 2012). Additionally, this data is not always linked to each other.

Table 4 provides an overview of the typology of institutional approaches in climate adaptation, and their strengths and weaknesses.

Table 4. Typology of institutional approaches in climate adaptation (*Source:* Authors' compilation).

Type of institutional framework	Strengths	Weaknesses	Study countries
Cross-sectoral collaboration through the establishment of an inter-ministerial coordinating body	• Theoretically, it provides the institutional set up for holistic program development, planning and implementation • In theory, it can address climate adaptation more effectively (e.g., less overlapping between various government agencies)	• Often unable to overcome the problem of sectoral fragmentation • Malfunctioning due to lack of a decision-making authority to direct and enforce sectoral ministries' conduct	Afghanistan, Bhutan
Combined inter-ministerial coordinating body with sectoral leadership	• Facilitate the formation of networks for cross-sectoral collaborations • Facilitate the development of adaptive institutional frameworks, based on how relevant bodies perceive and negotiate their roles and interface	• Requires a lot of fine-tuning (across scales) to form solid, strategic alliances between relevant bodies • Requires clear division of tasks and responsibilities	• Bangladesh, India, Nepal, Pakistan
Sectoral leadership	• Direct access to decision-making authority to plan, direct and implement climate adaptation	• Sectoral approach to climate adaptation may not be sufficient to address widespread, cross-sectoral implications of climate change	• Sri Lanka
Government revenue and project fund as main financial source	• Continuous channeling of funds could increase the program's sustainability • Unclear prioritization of climate adaptation measures, since they are often implied in the government's national development programs	• Requires more time and effort for fine-tuning in terms of financial mechanisms selected, division of tasks, activities selected, etc. • Requires strong commitment from both the government and international donors	• Bangladesh, India

Type of institutional framework	Strengths	Weaknesses	Study countries
Project fund as main financial source	• Direct implementation of climate adaptation activities through various government agencies and NGOs • Effective implementation of climate adaptation through the project management unit	• Aid dependency often results in the program's unsustainability (ends after funds are fully allocated) • Parallel projects may not be effective to address cross-sectoral implications of climate change	• Afghanistan, Bhutan, Nepal, Sri Lanka

While one approach to address the politics of sectoral coordination is discussed below, a less complex and thus more attainable future objective should be investments in developing the human capacities necessary, if national climate coordinating bodies are to be transformed from administrative to strategic entities capable of pushing through a coherent and integrated vision for adaptation. This report and other analyses can provide the basis for developing performance criteria against which to conduct a comprehensive needs assessment that will provide a structure to training and other capacity development investments.

Establishing cooperation networks by leveraging climate funding can help overcome sectoral political economies.

The crucial role of networks in shaping alliance formation in climate adaptation has been noted more widely (Thynne, 2008; Ostrom 2010). Bangladesh again stands out as somewhat of a role model in this respect. Despite the absence of any formal inter-ministerial decision-making body to coordinate climate adaptation, GoB has developed quite an extensive adaptation program with significant involvement from relevant sector ministries and other government agencies. The ability of Bangladesh to continue to improve its adaptation strategies and programs is linked to several factors. First, and most critically, the way GoB positioned climate adaptation as a national development priority, while focusing on establishing policy networks with international donors, helps overcome the lack of formal coordination mechanisms, mainly through the provision of funds as key incentives for sector ministries to be involved in climate adaptation programs. Second, the way the Department of Environment under MoEF, as the lead agency for climate adaptation, has formed strategic alliances (partly through funding agreements) with other government agencies and other actors as a means of facilitating cross-sectoral collaboration helps tackle the problem of bureaucratic competition. Here, as cross-sectoral collaboration is harnessed at departmental level, instead of ministerial level, it presents much less threats at the institutional level. Third, GoB's ability to advance its climate adaptation programs cannot be viewed in isolation of how the government ensured sufficient funds from its central budget to fund climate adaptation programs while also combining this with support from donor funding. Unlike other project-oriented programs with external donor funds, the Ministry of Finance also supported the BCCSAP through its non-development budget to cover regular expenses, such as salary, wages and training for programs delivering climate-responsive activities. Similarly, the Planning Commission of Bangladesh financed plans related to infrastructure development for climate adaptation purposes (Alam et al. 2011a).

With the exception of Bangladesh, 'collective' action from various government agencies to institutionally strengthen climate adaptation approaches across sectors appears to be relatively

weak. Although Sri Lanka, Nepal, Bhutan and Pakistan have coordination bodies, they seem to lack the 'right' networks and strategic alliances as well as access to significant funds for climate adaptation. These newly formed bodies sometimes cease to function and may simply exist mainly on paper, or provide mainly administrative rather than strategic functions, such as the National Climate Change Plan Committee in Pakistan, which meets biannually to report to the Prime Minister's Council on Climate Change (PMCCC).

6.4 Current institutional frameworks do not promote deliberative decision making capable of achieving informed, inclusive and accountable climate adaptation.

Deliberative decision making in relation to climate adaptation (Ayers, 2011; Huq and Khan, 2006) and to IWRM implementation, in particular, can strengthen current approaches by including a greater set of voices in the building of consensus around what actions to take, including the voices of the poorest and most marginalized groups who are frequently the most vulnerable to climate impacts. At a broad scale, this includes the majority of the country populations who still depend on agriculture for employment and food security. At a finer scale, examples include small-scale farmers across the region, especially in countries such as Bhutan, with limited arable land due to its biogeography, and Bangladesh due to its population density. Other groups include those in coastal areas vulnerable to storm surges and salinity intrusion that impacts food production and drinking water availability. Many of these groups are those who are already experiencing inequalities, and therefore possess the least adaptive capacities. Currently, ongoing policy discussions on climate adaptation, in general, and integrated water resources management, in particular, fail significantly to put local communities and marginalized groups into the overall shaping of adaptation strategies. Central to the challenge of adaptation – and the ability of societies to adapt – is the notion of collective action (Adger, 2003: 387).

Though the role of local communities and informal institutional arrangements in transforming coping strategies to sustainable adaptive capacity has been raised in recent discussions on climate adaptation (Berman et al. 2012) across the seven countries, local communities continue to be positioned as recipients of (nationally-defined) adaptation programs rather than as actors capable of articulating context-specific needs and shaping their own adaption measures. Examples of local communities across the seven countries using local strategies to cope with climate variability are numerous (Birkenholtz, 2013; Chhetri and Easterling, 2010; Chhetri et al. 2012; Rotberg, 2012), and demonstrate the significant human capital that currently remains mostly untapped by adaptation decision making and planning.

There is, therefore, a need to link government agencies' development strategies in climate adaptation, what this means for the formulation and implementation of adaptation measures in the water sector specifically, both institutionally and financially, with local communities' strategies to cope with climate change. Climate-smart villages, in which researchers documented local villagers' adaptation strategies in agricultural development and water use, can be considered as a starting point to build this linkage (CCAFS, 2015). To be effective, current institutional frameworks need to be oriented towards adaptive institution building, enabling existing institutions to react and respond more rapidly and flexibly to emerging climate trends and development demands. While the inclusion of the respective ministries in charge of local government in central decision-making bodies is noted, what is lacking is an explicit mechanism to reflect adaptation needs from the ground upwards. This would enable planning, allocation and tracking of climate funding to support priority needs more effectively and efficiently, and to ensure accountability in

the conversion of funds into results. These center-local linkages are key not only for identifying context-specific adaptation strategies, but also for highlighting the centrality of water resources management in climate adaptation.

6.5 Given the strong transboundary nature of climatic risks, serious efforts are needed to promote greater regional cooperation

Section 5 makes clear that the biogeography of South Asia makes effective regional cooperation an inescapable necessity. This is especially important because minimizing transboundary impacts can have a major impact of the efficacy of country-level adaptation investments, with the exception of Sri Lanka, given its island nation status. Water assumes a central position in defining a number of the key transboundary elements in climate risks, in light of the major significance of transboundary rivers in the region, and their origins in glaciers located in several focal countries. What is apparent is a distribution in the points of leverage across most countries depending on where transboundary rivers originate and flow through. In this geographical perspective, it could be argued that Bangladesh is particularly disadvantaged, given its riparian status, and extremely high dependence on transboundary flows for surface water supplies. Another critical source of differentiation arises from the diverse economic and political influence of each country in the region. India can be seen as the dominant economic and political actor, shaping current transboundary cooperation mechanisms especially with respect to the sharing of water in transboundary rivers. One option for transcending a distinctly bilateral flavor to existing transboundary treaties could be to focus on the GLOF issue, which may bring a larger number of countries into the dialogue. Such broader threats would also be more appropriate issues to highlight within well-established broader cooperation frameworks such as SAARC.

Conclusions

Across the seven countries, respective governments have created institutions to deal with climate change issues, either through the formation of inter-ministerial coordinating bodies or by assigning the responsibility to tackle climate-related issues to specific sector ministries, but without strong emphasis on developing adaptation measures for the water sector specifically. These mechanisms, with the exception of Bangladesh, also appear to operate at a somewhat superficial scale, and struggle to overcome perennial weaknesses of a sectionalized bureaucracy in transforming from administrative to strategic entities. Several factors influence this impasse, including the choice of lead agency and its positioning within the political economy shaping inter-agency collaboration, and the human capacities with which these agencies are endowed. Bangladesh, a country with a long pedigree of responding to environmental and climatic stresses, offers one avenue for mediating political economies, although investments in human capacities will also be necessary. The need for ensuring sector planning and investments to optimize contributions to the national adaptation effort, singly and through cooperation, is highlighted by the significant gap between incomplete assessments of adaptation costs and levels of mobilized finances from international, government and private sources. While this report has focused on climatic risks, it is necessary to note here that another advantage of better coordination in planning could be the ability to take advantage of any opportunities presented by climatic changes.

Such a view meshes well with the logic of IWRM, which (as argued in Paper 2), if effectively implemented, offers significant contributions to a country's overall adaptive response, given its centrality across multiple development sectors. Discernible financial data, however, suggests that this point has not been internalized in all the countries, given the small financial flows to the water sector compared to others such as agriculture. It must, however, be borne in mind that, given its enabling role across other sectors (e.g., agriculture, energy), available data may be missing other allocations embedded in other sectors. More broadly, this analysis argues that placing adaptation as a central element of development rather than an add on is a critical need, and a feature of the Bangladeshi approach of broad sensitization and network development.

With no clear bridging mechanism to address the funding gap in the short term at least, making the most of scarce resources becomes critical. This then means ensuring that scarce funding is well targeted to key adaptation needs, which in turn needs to be defined not just in terms of macroeconomic impacts, but in terms of broader human needs amongst highly heterogeneous populations. This brings into play a number of other findings on the structural dimensions underpinning planning processes. Some of these relate to the gaps that disrupt the continuum from accessing climate finance to its allocation to meet specific adaptation objectives, perhaps also in specific locations, to accountability against these objectives. Given that more attention is generally placed on the acquisition of climate finance mainly from external sources, this analysis has strived to highlight the importance of structural continuity that sees funding acquisition as only the beginning of this continuum. In addition to these lateral institutional disconnects, each country appears to be characterized by vertical gaps in information flows and decision-making pathways that effectively deprive both local government and their constituents of agency in defining adaptation priority and modalities, despite well-developed devolution processes in a number of countries. As such, adaptation seems to remain centrally driven and quite technocratic.

Finally, while much attention and effort has been placed on generating international finance for adaptation, and the articulation of risks and response strategies such as NAPA and similar documents and coordinating bodies at country level, this report makes clear the need to look more deeply into the actual mechanisms that need to bring together finance and technical planning as well as central government agencies and local stakeholders, if the efforts to raise funds in support of adaptation are to be fruitful.

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Annex 1. Details on Study Methodology and Information Sources

Current trends in financial flows and structures and institutional frameworks are key building blocks in identifying how to increase a country's capacity to cope with climate risks. Information on international funding was obtained from the online database http://www.climatefundsupdate.org/, maintained by the Heinrich Böll Stiftung and the Overseas Development Institute (ODI), as well as from other sources. The regional study by Ahmed and Suphachalasai (2014) on the costs of climate change and estimated costs of adaptation as well as a range of other recent studies either fill gaps or illustrate variation between different cases. It is however also understood that this and other sources cited in this paper are based partly or wholly on figures provided by governments may not always be wholly representative.

Ahmed and Suphachalasai (2014) has been an important source of information on the projected economic impacts of climate change in the countries studied. The study is based on a modelling process that involves regional climate modeling physical impact assessment, and economic assessment (using the integrated assessment model and the computable general equilibrium model). The emission scenarios considered were those emerging from the Fourth Assessment Report of the IPCC and other developments arising from UNFCCC negotiations. For the section on economic impacts, a limitation of the study is that regional estimates are predominately based on the results for India. Further, the model does not take into consideration extreme events as well certain other impacts that could arise as a result of climate change. Therefore the estimates are expected to be on the conservative side (Ahmed and Suphachalasai, 2014)

The challenge of cross-country comparisons is important to note. Different methodologies underlie the various estimates and calculations and these are rarely based on similar groupings of risks or adaptation priorities. Where existing studies on the economic costs of climate change, (estimated) costs of adaptation and international and governmental financing were not available, reference was made to primary data sources (e.g. governmental budgets, governmental databases that track donor funding and national adaptation plans). In the case of some governmental budgets, only the spending on major activities were looked at, As a result, these may not be entirely reflective of the actual costs and levels of spending.

Deriving mainly from a broad literature review, the paper has not been able to incorporate local-level financial mechanisms and institutional arrangements for climate adaptation, as these are rarely documented in the literature. Other key constraints stems from the fact that in each country, investments in water resources development and management can be embedded across sectors, which makes it difficult to separate out data and values specific to water. For instance, while water resource management in Afghanistan falls under the Infrastructure and Natural Resources Pillar, this does not limit spending on water-related projects in other sectors such as Agriculture and Rural Development. This is also the case in Sri Lanka and Bhutan, where water resources management is spread across several Ministries and sectors to which finances are allocated, each with varying levels of involvement with the water sector.

How country classifies the 'water resources sector' is also important. Pakistan has a separate classification for Water and Sanitation, but still has projects such as solar pumping that assist farmers with improved energy capacity to pump water from groundwater wells. Additionally, Nepal has water components related to agriculture without classifying the funding as water related, though it also classifies some hydropower projects as water-sector related. Afghanistan classifies water-related irrigation under the infrastructure sector. Therefore tracking funding specific to the water sector is challenging as water spans energy, agriculture, infrastructure, and DRR sectors. The approach has been to reflect water-specific data when available, but to base much of the analysis on wider data on climate adaptation.

Annex 2. Supplementary Details for Section 2: Development, Water Resources and the Economic Implications of Climate Change in South Asia

Afghanistan

Estimates of Losses from Disasters for Afghanistan

The onset of disasters has been severely detrimental to the ability of Afghanistan's economy. The current droughts in Afghanistan as well as flash floods have increased damages and loss of life. The Afghanistan Disaster Knowledge Network (ADKN) estimates the costs of flood- and drought-related disasters as approximately USD 396 million (ADKN, accessed 4/7/16). However, the Ministry of Finance (MoF) reported the losses from floods as around USD 800 million, while the ADB estimated flood losses amounting to USD 240 million in four provinces. The financial estimates of loss were high by any estimate, and continue to have an impact on the livelihood of the majority of the Afghanistan population who live in rural settings. The ADB also estimated that 70% of the losses were from crops, livestock, housing, and loss of life. The difference between the MOF and the ADKN is unknown as the methodology for the estimates is not stated.

Pakistan

Estimates of Losses from Floods for Pakistan

The estimate of Pakistan's losses in the 2010 floods were approximately USD 10 billion, with agriculture, livestock and fisheries suffered the worst damage totaling USD 5 billion. Total reconstruction costs after the 2010 flood was estimated at approximately USD 8.9 billion, with agriculture, livestock and fisheries, irrigation and flood management, and water supply and sanitation amounting to USD 2.1 billion (ADB, 2010).

Further details on Groundwater Irrigation, WUA's and IWRM in Pakistan

There are a number of groundwater and agricultural management projects in Pakistan. For instance, ICARDA is leading the "Watershed Rehabilitation and Irrigation Improvement in Pakistan" which consists of a multi-year project dedicated to assisting farmers with best practices, and technologies in order to maximize yields and minimize environmental damages (ICARDA, 2016).

For instance, a cubic meter of groundwater irrigation adds 2.5 times more to Pakistan's GDP than canal irrigation (GWP, 2011). Pakistan as of 2011, had 1.2 million groundwater structures, two thirds of which were in the province of Punjab. Crop yields in Punjab have increased 150-200%, as well as increasing cropping intensity by 70-150% (GWP, 2011). Groundwater irrigation provides approximately 40% of irrigation water, and has emerged as a primary source of drinking

water as of 2011 (GWP, 2011). Groundwater is another area where IWRM practices apply. Pakistan conducts artificial recharge of its aquifers called Aquifer Storage and Recovery (ASR) which enable them to use aquifers as a mode of water storage. Since floods are one of the major causes of disaster, IWRM principles have been adopted to minimize flood losses by construction of percolation tanks, and collection of run off.

The reasoning behind this can be shown by the example of the Tarbela dam which reduced flood damages from USD 43 billion to USD 10 billion. The Dam also increased power output and irrigation capacity (GWP, 2011). The Water and Power Development Authority (WAPDA) supports IWRM practices by means of constructing multi-purpose projects such as reservoir construction. Additionally, this also helps Pakistan with water storage, which is in drastically short supply (Sufi et. al, 2010).

Originally groundwater was meant to be a supplementary source of water for irrigation when surface water sources ran dry during the growing seasons. With the increase in productivity from groundwater irrigation over canal irrigation as well as the accessibility of the groundwater, it has become a popular primary mode of irrigation.

Even though the average cost of irrigating with groundwater is 30 times higher than that of surface water irrigation (Qureshi et. al, 2009), farmers that have access to both ground and surface water have shown earnings which are five times higher than farmers who depend on surface water only (Qureshi et. al, 2009). While these figures are old, it reinforces the fact that access to water for farmers is critical during dry seasons and groundwater will supplement the lack of surface water during dry spells. However, with groundwater withdrawals increasing groundwater depletion can be seen as a potential problem. Some farmers have already looked to constructing deep tube wells which are USD 5,000 as compared to USD 1,000 for the shallow tube wells (Qureshi et. al, 2009). The average cost of pumping will also increase as pumping groundwater from a shallow tube well is USD 4.2 per 1,000 m^3, as opposed to USD 12 per 1,000 m^3 for deep tube well (Qureshi et. al, 2009). In Balochistan only the rich and large farmers are able to afford deep tube wells. The increase in deep tube wells has resulted in degradation in waterways. Groundwater therefore, should be used as a mechanism for combating climate change with caution, as excessive withdrawal will cause more harm than good.

Certain parts of Pakistan have witnessed a slow transfer of the management of irrigation networks form the government to water users' associations (WUA). The farmers on a watercourse that belong to these WUAs at the watercourse level have the mandate to coordinate irrigation water withdrawals by ensuring timely delivery of water by reducing theft of water and maintenance of the water course (Mekonnen et. al, 2014). In turn the chairpersons of the WUA creates the farmers' organization (FO) to coordinate water usage and distribution from the canal to the water course (Mekonnen et. al, 2014). A research study conducted by Mekennon et. al (2014) suggest that there is not enough literature to determine if this transition from government to WUAs is beneficial to the farmer and if it does increase water productivity. However, through analysis the study found that watercourses that belonged to a WUA earned 27% more value per acre compared to farmers without WUAs. The effect was heightened during the rainy season (Kharif) than in the winter season (Rabi) (Mekonnen et. al, 2014). At the same time, a third of farmers reported WUAs as being unsuccessful at water management due to the WUA being inactive or failing to serve all farmers equally.

WUAs and FOs are considered components of IWRM for Pakistan. However, without proper uniform implementation of policies and enforcement when necessary water management will be difficult especially with groundwater and surface water being used conjunctively. Moreover, as mentioned earlier the exact dynamics of WUAs is unknown, and further research should be conducted regarding specific factors relating to water management practices with a focus on equitable service delivery (Mekonnen et. al, 2014).

Sri Lanka

Groundwater utilization and impact climate change on groundwater resources

Groundwater is also an important contributor to rural and peri-urban water supply, accounting for nearly 80% of the rural drinking water supply. The greater proportion of the groundwater extracted is used for producing vegetables and other high value crops, and not in paddy cultivation. Most available sites for surface water storage are exploited, and previously under-developed groundwater resources may become increasingly important going into the future. An example of this would be the deep confined aquifers long the northwestern coast which have till now been too capital intensive for development. (IWMI, 2005; Panabokke and Perera, 2005). Paper 1 identifies groundwater salinization as a high level risk faced by Sri Lanka. However, Eriyagama et al. (2010) note that the impact that climate change could have on groundwater resources of Sri Lanka have been the subject of only a limited number of studies.

Impact of climate change on food production

On the impact of climate change on food production, almost 72% of paddy production is from dry areas in the Maha (wet seasons), where water shortages are already experienced. Due to the combined impact of reduced precipitation, increased potential evapotranspiration and rainfall seasons that end earlier, irrigation water requirements in this area are expected to increase by up to 23% (De Silva et al. 2007; Eriyagama et al. 2010). A study by Wijeratne et al (2007) finds that tea (the highest foreign exchange earner) yields are expected to increase at higher elevations and decrease at lower elevations with the combined impacts of climate change and that a reduction in the monthly rainfall by 100 mm could lead to a loss of 30-80 Kg/hectare of 'made' tea.

Impact of climate change on smallholder farmers

In Sri Lanka, 71% of agriculture land holdings are less than one hectare, where surplus production is not common. Smallholder farmers with land that is rain-fed or irrigated from minor tanks are considered to be particularly vulnerable to the impacts of climate change.

Annex 3. Supplementary Details for Section 3: Financial Structures and Mechanisms in Climate Adaptation

Afghanistan

Details on Afghanistan's climate and development budget structure

The climate adaptation budget is primarily provided through the financial aid structure, which comprises the majority of aid being delivered outside of the government budget. For instance, in 2010/11 approximately 88% (USD 13.8 billion) in aid was received outside of the government budget known as the 'external budget' whereas, only 12% was received by the core government budget (USD 1.9 billion) (World Bank, 2012). The external budget is financed through bilateral donors as well as military contractors. The core budget is broken down into the operating and development budgets. A large portion of the development budget is comprised of donor-financed programs and projects implemented by the government. Direct climate-related investments usually fall under the purview of the Ministry for Agriculture Irrigation and Livestock (MAIL) and the Ministry of Energy and Water (MEW). For example, the agriculture and rural development sector received funds amounting to approximately USD 1.4 billion in grants in 2012, compared to approximately USD 12 million in loans. Similarly, the water sector received approximately USD 363 million in grants (Donor Assistance Database, 2016) compared to USD 28 million in loans.

Climate funding sources and projects for Afghanistan

The primary funding organizations that focus on climate change and more specifically water and agriculture are the World Bank, Least Developed Countries Fund, and the MDG fund. Other organizations include the UNDP, UNEP, FAO, and the WFP (Climate Funds Update, 2016). The primary implementing organizations in terms of climate change in Afghanistan are MAIL and MEW. Direct funding related to sectors focused on water, agriculture, energy, disaster preparedness and transportation and is primarily the focus of Afghanistan's NAPA. Indirect funding focuses on building up strategic grain reserves, and disaster preparedness in terms of climate-related components. For instance, the WFP funded a strategic grain reserve that would preserve food stores for communities in the cities and towns of Kandahar, Mazar-e-Sharif, Herat and Baghlan (Climate Funds Update, 2016). Unfortunately, due to the nature of the many projects being implemented in Afghanistan, cross-cutting issues such as climate change are difficult to track due to the components that are integrated in nearly every project relating to agriculture and water (Donor Assistance Database, 2016).

The IWRM project is funded primarily by the ADB, the Government of Afghanistan and the Islamic Development Bank. The project constitutes approximately 0.7% of the National Budget (Afghanistan National Budget, 2016). While there are several projects related to IWRM such as irrigation and flood control projects, they are not categorized as such under budgetary codes. Therefore, the actual percentage of IWRM projects conducted in Afghanistan is higher than what is stated here. Unfortunately, assessing the entirety of financing for the indirectly related IWRM

projects is difficult as each project would have to be looked at individually in order to assess the relevancy towards IWRM.

Bangladesh

Bangladesh Climate Change Trust Fund (BCCTF)

Disbursements are possible to both Government and non-governmental organizations (NGOs), with a maximum allocation of USD 3.57 million for government projects, and USD 714,000 per project to NGOs. Projects related to climate change are submitted to the Climate Change Unit (CCU) which scrutinizes and prioritizes those that are: a) consistent with one or more of the BCCSAP's six thematic areas, and b) within the funding limits for government and NGOs (GoB 2012).

Factors shaping donor funding

With respect to foreign aid, Khan et al. (2013) see four distinct pathways of donor engagement with Bangladesh on climate adaptation:

i) Evolutionary processes leading on from ongoing foci on poverty reduction, food security and DRR (e.g. DANIDA);
ii) Responses to country drivers such as increased GoB attention to climate change especially with production of the BCCSAP and commitment to aid effectiveness and the increasing momentum around the Local Coordinating Group on Environment and Climate Change;
iii) Funding resulting from donor country politics e.g. wishing to be seen to be at the forefront on climate change, and
iv) Strategic re-positioning within especially multilateral donors, where climate change is more centrally linked to international developments.[24]

Amounts and trends in in-country adaptation finance

According to the Ministry of Finance's (MoF) Bangladesh Climate Public Expenditure and Institutional Review or CPEIR (GoB 2012), GoB commitments for adaptation increased by 18% between FY2009/10 and 2011/12, while foreign aid increased by 11%. The Bangladesh Climate Fiscal Framework (CFF), also a MoF study (2014), found that between FY2011/14 the average allocation for non-development climate programs comprised 12.65% of the total non-development budget. For the same period, climate development projects constituted 47.63% of the ADP.

Sectors with the largest climate sensitive fund allocations

The CPEIR (GoB 2012) found the highest spending Ministries in respect of climate sensitive activity to be the Local Government Division (LGD) at 22.1%, the Ministry of Agriculture (MoA) at 19.7% and Ministry of Disaster Management (MoDM) at 17.5%, while the CFF (GoB 2014)

[24] In 2010, Bangladesh established the Strategic Program for Climate Resilience (SPCR) under the World Bank's Climate Investment Fund (CIF). Endowed with USD 110 million,24 it focuses mainly on integrating climate-resilient interventions into specific sectors: agriculture, food security, water and sanitation, and climate-proofing coastal infrastructure.

found the MoA spent the most by 2014 at 24.80%; LGD 18.58% and MoDM 14.07%, which seemingly supports a shift from mitigation to adaptation in recent years. The water agencies are notably not amongst the top receivers of such finance.

Bhutan

Projects directly targeting adaptation

Projects that explicitly promote climate adaptation in the water sector have been mainly funded by multilateral sources. The funding is largely through grants (86% with a total of USD 36.4 million), with 14% from a loan by IFAD. The Least Developed Countries Fund by GEF is a large source of funding, with other sources being IFAD and GCCA.

The Bhutan Trust Fund for Environment Conservation

The Bhutan Trust Fund for Environment Conservation is an initiative to channel funding from multilateral and bilateral sources towards environmental conservation projects by Bhutanese locals and organisations. This also includes projects that target climate adaptation and water resources management projects and takes the form of grants. It is an endowment fund, where the principal capital is kept intact, and its investment income is used as the source of funds. By 2011, total assets amounted to USD 42.3 million, with the funding coming from international and bilateral sources.

Mainstreaming Adaptation Consideration

A Mainstreaming Reference Group has been set up by the Royal Government of Bhutan with the objective of mainstreaming the incorporation of climate change considerations into the governmental planning cycles. The objective of this group is to more systematically incorporate gender, environment, climate change, disaster risk reduction and poverty considerations into the policy, planning and budgeting processes by identifying opportunities to incorporate these considerations at both the national and local levels of governments. However, this initiative is still in its infancy, having been established only in 2013. A further attempt to mainstream adaptation considerations into the development cycle of local governments has been made through the Performance Based Climate Change Adaptation Grants program, as part of the LoCAL program by the UN Capital development Fund. Local governments are allocated funding by the central government through a resource allocation formula. The Performance Based Grants System further aims to supplement this, by providing financing to develop adaptation projects or to increase the climate resilience of projects that otherwise do not take it into account, and which local governments have the mandate to implement.

Challenges involved in building adaptive capacity

Some of the challenges for climate adaptation are the need to develop better institutional capacity so that those working in the field can better implement their functions and overcome the perception that resource allocation for adaptation conflicts with that for developmental and energy security needs (Meenawat and Sovacool, 2011).

India

National Missions under the NAPCC

Solar energy (USD 1.4 billion); Enhanced Energy Efficiency (USD 30 million); Sustainable Habitat (USD 151 million); Water[25] (USD 31 million); Sustaining the Himalayan Ecosystem (USD 76 million); Green India (USD 2 billion); Sustainable Agriculture[26] (USD 2 billion) and Strategic Knowledge on Climate Change (USD 397 million).

Examples of externally funded adaptation initiatives

A number of assessments of the impact of Himalayan glaciers retreat; an integrated assessment of the hydroclimatology, crops, and water and energy systems in several vulnerable states; policy and institutional development to harmonize watershed development projects and policies in Himachal State, and farm level implementation of specific water and energy saving methods.

Details of international climate financing accessed by India

Of the 28 international climate funds (Steinbach et al. 2014), India is eligible to access 10 of them, including the recently established Global Climate Fund (GCF). Since 2003, India has accessed USD 554 million from multilateral climate funds, with the CTF and GEF being the two most important sources. While most of this funding has been for mitigation (Sharma et al. 2015), the GoI (2015b) also confirms that there has to be more focus on adaptation. While the Adaptation Fund supports three projects amounting to USD 5.0 million (NABARD website[27]), Sharma et al. (2015) note that the Fund itself is facing a funding crisis given it depends mainly on a 2% levy on transactions on the Clean Development Fund (CDF), whose future is currently uncertain. Steinbach et al.'s (2014) analysis of bilateral contributions from donors using the OECD/DAC Rio Markers shows that India received USD 927.74 million in 2012, of which 75.6% came from Germany. This does not include the USD 3.36 billion in mitigation and adaptation support from Japan received in 2012.

In addition to multilateral and bilateral donor funds, around USD 9 billion has been invested by Indian national and private banks and other local private finance institutions, to mobilize private climate finance, predominantly in renewable energy, energy efficiency and transport (Varma et al. (2015).

Nepal

Funding Sources for Climate Change in Nepal

Multilateral funding primarily comes from the Pilot Program for Climate Resilience (PPCR), and the Least Developed Countries Fund (LDCF). Major bilateral donors include the United Kingdom, European Union, which are primarily funding through the National Climate Change Support

[25] Focuses on rainwater harvesting, groundwater charging, and increasing water use efficiency at least by 20% by 2012. The Mission has been criticized for emphasizing energy- and resource-intensive infrastructure projects, and ignoring water use in agriculture and demand-side water management

[26] To make Indian agriculture more resilient to climate change by developing new varieties of climate-stress resistant crops, new credit and insurance mechanisms, and improving productivity of rain-fed agriculture.

[27] http://www.krishaksarathi.com/nabard-nie-adaptation-fund.html

Program (NCCSP). Other countries financing Nepal's climate related projects include the United States, Finland, South Korea, Switzerland, Germany and Cyprus (Sharma, 2014). Government support from 2007/2008 to 2011/2012 dropped by approximately 10%, while donor support increased by approximately 20% during the same period increasing their contribution to 40% in FY 2011/2012. Between 2009 and 2012 Nepal received USD 236 million from international sources to fund climate adaptation related initiatives (Sharma, 2014).The Special Program on Climate Resilience for instance, allocated USD 36 million of its total USD 86 million as loans (Regmi et al. 2012).

Dedicated climate funds including the Climate Investment Fund (CIF), and LDCF/GEF constitute 36.7% of adaptation funding (USD 90.5 million). Multilateral adaptation funding amounts to 8.99% of total adaptation funding (approximately USD 22 million), though this percentage may be underestimating multilateral funding sources because some dedicated climate funds are also from multilateral sources (Baral et. al, 2014). Between 2009 and 2012, total adaptation funding amounted to USD 538.24 million. bilateral donors, with total bilateral funds for climate adaptation amounted to USD 133 million (Baral et. al, 2014).

Details on Climate Adaptation Funds and Finance Structure in Nepal

Over three years FY 2011/2012- FY 2013/2014, climate adaptation funds as a percentage of the total budget rose by 3.5% (Karanjit et. al, 2014: 9). Most of the increases in funding went to the Ministry of Finance (Karanjit et al., 2014: 9). The highest share of climate financing went to the Ministry of Urban Development (21%) followed closely by the Ministry of Agriculture (20%). Ascertaining which projects are directly related to which ministry and specifically linked to climate change, however, is difficult due to data accessibility. Regmi et al. (2012) estimate a total of USD 350 million to complete the most immediate parts of these programs. As of fiscal year (FY) 2013/2014 Nepal had 11 ministries that were related to climate budget allocations. Nepal's budget planning system attempts to unite both the local and national level budget priorities (sectors) together. The local governments inform the line ministries of their budget priorities, and the line ministries are in turn responsible for creating sectoral level budgets for climate adaptation, channeled through the Ministry of Finance. The recipient funding theoretically is then split according to project and under the relevant 11 ministries related to climate change. The funding is then meant to be diverted to the District Development Committees (DDC), and Village Development Councils (VDC) to implement specific Development Plans (DP).

Pakistan

Climate Change Related Expenses and Funding Sources

As of FY 2013-2014 climate change related expenses amounted to 6% of the total national budget (USD1.8 billion) (CPEIR, 2015). This is an increase of approximately USD 500 million from FY 2012-2013. Adaptation expenditure focused 30% on water resources, 19% on disaster and risk preparedness, 14% on transportation, and 35% on health and social services.

In FY 2012-2013 approximately 85% of Pakistan's foreign funding for projects came from loans. While the amount of loans decreased from FY 2011-2012 Pakistan is expected to get a majority of its funding through loans. Major multilateral funding organizations include the Adaptation

Fund, World Bank (IDA), UNDP, UNIDO, and the Special Climate Change Fund (SCCF) (Climate Funds Update, 2016). The Adaptation Fund generally funded projects related to GLOF and disaster risk reduction (USD 3.9 million). The SCCF funded a project under the water and sanitation sector (USD 3.4 million). The IDA projects also funded water sanitation and flood protection (USD 125 million) as well as irrigation and flood management (USD 242 million), with the latter partly funded by the Government of Pakistan (Climate Funds Update, 2016)). Most of the projects targeted the Punjab and Sindh provinces.

The highest number of CC-related projects was under the MCC, the Water and Power Division, and Kashmir Affairs and Gilgit-Baltistan Division. Climate related projects tend to have high budget variance because the actual expenditure was less than 50% of the allocated budget for 7 of the 13 ministries (CPEIR, 2015). Over four years (2010/11 – 2013/14) external resources varied between 43 and 110%.

Climate Financing Governance and Budgetary Structure (Additional Information)

The structure and mechanisms of Pakistan's climate financing are determined by the Ministry of Finance (MOF), Ministry of Climate Change (MCC), and the Ministry of Planning Development and Reforms (MDPR). The MDPR is responsible for the Public Sector Development Program (PSDP), the MOF is responsible for budget allocations, and the MCC is in charge of climate change policy. It is important to note that the Economic Affairs Division and the Ministry of Foreign Affairs also have indirect roles to play in climate financing. The roles include coordination of multilateral agreements including the UNFCC, and external financing of development projects that include climate change (CPEIR, 2015).

Since 2003 the Government of Pakistan implemented a rolling three-year Medium Term Budgetary Framework (MTBF) at the Federal and provincial level. There are two mutually reinforcing processes that start the budgetary process at the Federal level:

- "The 'top-down' approach establishes medium-term ceilings for each line ministry at the start of the annual budget preparation process;
- The 'bottom-up' approach sets in motion the budget-making process within line ministries, directed by senior management." (CPEIR, 2015).

Sri Lanka

Projects directly targeting adaptation

Funding that directly targets adaptation in the water sector is largely from multilateral sources in the form of grants (with a large proportion from the Adaptation Fund, Global Environment Facility, and loans from ADB and the World Bank, or a mix of both). Projects financed by grants contribute to enhanced food security and livelihoods, early warning systems, post war reconstruction and rehabilitation that is climate resilient as well as coastal zone and natural resources management. Projects for which a greater proportion of the funding is through loans, a large segment of the finance is apportioned for infrastructure development (e.g. dam-associated water distribution structures and in urban water systems that are more climate resilient).

Government expenditure that contributes to indirect adaptation measures

A major proportion of governmental expenditure that contributes to water-related adaptation (as identified from the main projects in the National Budget allocations for the year 2016) can be classified as contributing to indirect adaptation. Associated with the NAPA priority sector of water resources, USD 11 million has been allocated for rehabilitation of irrigation schemes and the establishment of groundwater monitoring, while USD 10 million is apportioned for disaster mitigation and management. A significant fund of USD 434 million was allocated for the development of water storage and distribution systems. The water storage systems also include the two multipurpose reservoirs (Lower Uma Oya and Moragahakanda-Kaluganaga), for which the objective of construction is to supply water for agriculture, hydropower and domestic and industrial use.

Governmental agencies and non-governmental organizations involved in funding

The governmental agencies involved in the implementation (and distribution of finances) of the projects are the Ministries (along with associated Departments) of Mahaweli Development and Environment, Irrigation and Water Resources Management, and Disaster Management, while ADB, the World Bank, IFAD, UNDP and WFP are key donors involved. The Department of National Budget under the Ministry of Finance is responsible for preparing the annual national budgets for the Ministries, Departments and Statuary Boards in the Government.

Climate Change Secretariat

The Climate Change Secretariat, under the Ministry of Mahaweli Development and Environment is the main governmental body, coordinating the flow of funding from multilateral and bilateral sources to the relevant governmental entities. Proposals for funding are usually designed based on the sectoral vulnerability assessments as part of the NAPA and the technology needs assessments with funds emphasized for cross-sectoral projects. With regard to implementing of adaptation funding, the NAPA suggests the formation of climate change cells in the relevant ministries and implementing entities for this purpose. This is to be started at a pilot level (for a mitigation-related initiative) later in 2016, and the Secretariat hopes to expand it further into the future.

Annex 4. Section 4: Climate Adaptation: An Institutional Perspective

Afghanistan

In Afghanistan, the Ministry of Energy and Water (MoEW) is in charge of managing both water and energy resources at national level. Other government agencies involved in water resources management include: Ministry of Agriculture Irrigation and Livestock (MAIL) responsible for managing agricultural land, forests, and protected areas; Ministry of Public Health (MoPH); Ministry of Public Works (MPW); Ministry of Rural Rehabilitation and Development (MoRRD) responsible for supporting the poor and most vulnerable groups, Ministry of Mines and Industry (MoMI); Ministry of Urban Development and Housing (MoUDH); Ministry of Commerce and Small Industry (MoCSI); and Afghanistan National Disaster Management Authority (ANDMA).

Within the UNCCD, MAIL is supported by an Advisory Committee on Desertification and Sustainable Land Management. This Committee was assisted by UNDP/GEF and was established to provide strategic guidance to the national action planning process.

Bangladesh

The executive committee has 15 members from different ministries and government bodies and is supported by the Water Resources Planning Organization (WaRPO), the lead government agency responsible for developing national water policies (Rouillard et al. 2014). In 1996, however, WaRPO and the Flood Plan Coordination Organization (FPCO) were merged to form a new national water resources planning organization.

Government ministries involved in water resources management include the Ministry of Environment and Forest (MoEF), Ministry of Health (MoH), Ministry of Food and Disaster Management (MoFDM), Ministry of Agriculture (MoA), and the Ministry of Local Government Rural Development and Cooperatives (MoLGRDC) responsible for advising people to keep the foundation of their residence above the flood level amongst other responsibilities. Several government agencies are also responsible for implementing water-related projects and programs. For example, the Bangladesh Water Development Board is responsible for water projects throughout the country, such as irrigation, inland and coastal flood control (Das Gupta et al. 2005). The Local Government Engineering Department is responsible for the development and management of small-scale (less than 1,000 ha) projects in flood control, drainage, irrigation, water supply and sanitation. In addition, the Bangladesh Agricultural Development Corporation an autonomous corporate body under the MoA is involved in irrigation works.

Major on-going studies undertaken by the CCC include: study on sea level rise impact in the coastal zone of Bangladesh; sectoral vulnerability and financial needs assessment in the fisheries and livestock sector and in biodiversity and marine ecosystem. Development of an updated and web-enabled Climate Change Database is in process.

MoEF directs all climate change related policy issues and represents the country at international negotiations under the UNFCCC, a number of UNFCCC committees, and at conferences on multinational environmental agreements. Nationally, MoEF leads the implementation of climate change programs under the Bangladesh Climate Change Strategy and Action Plan (BCCSAP). It

generally responds to queries on Bangladesh's preparation and response to climate change in the national parliament. The MoEF also chairs the Local Consultative Group (LCG) on Climate Change and Environment, which is an apex coordination mechanism between the government and development partners on environment and climate change programs. Moreover, with the advent of international financing modalities on climate change and the availability of seed financing for three consecutive years from the government, MoEF has become active in mobilizing funds and instituting mechanisms for managing climate change funds. In 2010-2011, MoEF formed the Climate Change Unit (CCU) to provide support to the Bangladesh Climate Change Trust Fund (BCCTF).

The BCCSAP envisions climate change programming to function within a multi-institutional architecture. National institutions, which predominantly represent the interests of public sector institutions and their allied agencies (such as trustee agencies formed under a certain ministry), are mandated to implement the BCCSAP 44-point agenda. However, institutional linkages between various ministries, their allied departments, and national and local government institutions are not clearly articulated in the BCCSAP. Nonetheless, cross-sectoral linkages between different sectoral ministries have taken place through specific project development activities.

Relevant ministries involved in climate adaptation plan and activities include Flood Forecasting and Warning Centre of Bangladesh Water Development Board under the Ministry of Water Resources; Bangladesh Rice Research Institute under the Ministry of Agriculture; and the Ministry of Local Government, Rural Development and Cooperatives.

Bhutan

Government ministries involved in water resources management include: Ministry of Agriculture and Forests (MoAF), Ministry of Health (MoH), and Ministry of Works and Human Settlement (MoWHS). Water resources management in Bhutan appears to be mainly related to that of surface water, as the mountainous terrain of the country means that groundwater resources are less abundant, and most often drained by surface water.

The head of NECS is also a member of Gross National Happiness Commission (GNHC), another high-level institution, which mainstreams environmental policies in particular and in relation to climate adaptation in general (Down to Earth, 2011).

In the past NEC had facilitated the launching of the NAPAs and has continued to facilitate coordination between sectoral ministries towards integrating climate adaptation projects, though the relevant sectoral ministries implement the NAPA projects as part of their planned development activities in consultation with the Department of Aid and Debt Management under the Ministry of Finance. Having said this, NEC would monitor climate adaptation components within each of these projects, to ensure that key NAPA objectives are taken into account, though in practice NEC has also been struggling with lack of staffing to do the actual monitoring.

India

Other government ministries involved in water resources management include: Ministry of Environment Forest and Climate Change (MoEFCC), Ministry of Agriculture and Farmers' Welfare (MoAFW), Ministry of Health (MoH), and Ministry of Science and Technology (MoST).

At both central and state level, irrigation and flood control are important components not only for sustainable land development processes but also for increasing agricultural productivity and national economic growth. While DoA&C implements the program of micro irrigation and soil conservation in catchments of river valley projects in the flood prone areas, the MoWR implements many flood control programs as part of its Central Sector Scheme development. For the small and medium irrigation facilities, MoWR implements the Command Area Development (CAD) Program and Accelerated Irrigation Benefit Program (AIBP) to meet the gap between the potential created and its effective utilization, and to complete ongoing major/medium projects and extension, renovation and modernization of projects to benefit drought-prone areas.

The PMCCC comprises of: 1) the Prime Minister (chair); 2) relevant ministries including Ministry of External Affairs (MoEA), Ministry of Finance (MoF), MoEF, Ministry of Agriculture (MoA), Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR), Ministry of Urban Development (MoUD), Ministry of Science and Technology (MoST) among others; 3) the Cabinet and Foreign Secretary; and 4) representatives from The Energy and Resources Institute (TERI) and civil society organizations.

Nepal

Other ministries involved in water resources management include the Ministry of Urban Development (MoUD) responsible for drinking water supply and water and sanitation provision, Ministry of Agriculture and Cooperatives (MoAC) responsible for agricultural crop production, Ministry of Forest and Soil Conservation (MoFSC), Ministry of Science Technology and Environment (MoSTE), Ministry of Physical Infrastructure and Transport (MoPIT), and the Ministry of Federal Affairs and Local Development (MoFALD) in charge of local infrastructure development in rural areas, including small-scale irrigation schemes.

Supported by various international donors, WECS has conducted some pilot-testing studies for IWRM implementation in the Indrawati and Dudh Koshi sub-basins. Lessons learned from this piloting of IWRM have not been applied elsewhere, however, due to lack of budget and the absence of a strong coordinating agency at the national level, to whom the newly formed river basin organizations would need to report.

Groundwater conservation is mentioned in the National Water Policy, however, the document also states that there is not much in terms of conservation due to insufficient legal provisions (Government of Nepal, 2002). While this water plan is old, there is no clear indication of IWRM being applied to manage groundwater resources. Nepal did implement the Water Resources Act in 1992, which is meant to regulate all forms of water resources. The State claims of ownership of all water resources and the right is non-transferable (including groundwater). The roles of the local government authorities are to manage water infrastructure, to prevent pollution and protect the environment (Kansakar, 2011).

Administratively, MoSTE comprises of four divisions: 1) Climate Change Management; 2) Science and Technology Promotion; 3) Planning and Evaluation; and 4) Administration. In total, there are 12 sub-divisions within the ministry, three of which are within the Climate Change Management division. These include: 1) Climate change; 2) Sustainable Development and Adaptation; and 3) Clean Development Mechanism.

Pakistan

Other government ministries involved in water resources management include the Ministry of Planning Development and Reform (MoPDR) responsible for the formulation of the country's overall planning and development programs; the Ministry of National Food Security and Research (MoNFSR) responsible for policy formulation, economic coordination and planning in respect of agriculture food production; and the Ministry of Climate Change (MoCC).

A Core Advisory Group under PMCCC and composed of representatives from government and civil society meets more frequently and provides input on Pakistan's positions in the international climate negotiations and technical inputs on domestic policy and programs.

The autonomous Global Change Impact Studies Centre (GCISC) was established to act as the secretariat of the PMCCC and is now the primary scientific research body that is engaged in conducting research on impacts and adaptation to climate change in the country and also at regional level. The Planning Commission (PC) also plays an important role in planning, monitoring and evaluating the implementation of major development projects related to climate change. In late 2008, the PC established a Task Force on Climate Change (TFCC). TFCC is assigned with the task to facilitate the formulation of climate change policy, with specific emphasis on ensuring water, food and energy security. It comprises 17 members from federal secretaries of key ministries, representatives of relevant public sector organizations, international NGOs and academics.

Sri Lanka

Key government ministries involved in water resources management include the Ministry of Irrigation and Water Resources Management (MoIWRM), Ministry of City Planning and Water Supply (MoWSD), Ministry of Land, Ministry of Fisheries and Aquatic Resources Development (MoFARD), Ministry of Mahaweli Development and Environment, (MoMDE) and the Ministry of Disaster Management (MoDM).

Annex 5. Overall Country Performance Table and Scoring System

Table 5. Overall country performance on adaptation from financing and institutional perspectives.									
Dimension	**Indicators[1]**	**Scoring Scale (low – high)[28]**	**Afghanistan**	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Understanding costs of climate change and adaptation responses	Importance of water resources to GDP	1-5	2	1	4[29]	1	3	2	1[18]
	Importance of water resources for rural food security and livelihoods[30]	1-5	4	3	4	4	4	4	2
	Magnitude of economic and other implications of climate impacts on water resources	1-5	1[31]	5[32]	4[21]	4	4	2	4[21]
	Are costs of CC linked to water resources known?	0-1 (No/Yes)	0	1	1	1	1	1	1
	o Was government involved in these studies? [33]	0-1	N/A	1	1	1	1	1	1
	Have countries estimated adaptation costs?	0-1	Data not available	1	0	1	1	1	1
	o Was government involved?[22]	0-1	N/A		N/A	1	1	1	1
Finance mobilization and allocation	Dependence on external funding	1-5	Data not available	1	5	1	5	5	5
	Dependence on national sources	1-5	1	5	1	5	1	1	1
	Climate specific funds or similar mechanisms established	0-1	1	1	1	1	1	0	0
	Proportion of Adaptation needs covered by current finance	1-5	Data not available	2	Data not available	1	1	1	Not clear[34]

[28] For an explanation of the scale used for each indicator, please refer to the table in Annex 1.
[29] Only agriculture and hydropower considered
[30] Given that a large proportion of smallholder farmers employed in the agriculture sector in these countries, percentage of total employment in the sector is used as a proxy
[31] Afghanistan has not done a comprehensive economic impact assessment of climate change costs. If it did, this rating is likely to be much higher.
[32] Applies to all sectors including water
[33] A proxy for level of interest.
[34] Refer country-relevant section in Section 2

Table 5. Overall country performance on adaptation from financing and institutional perspectives.									
Dimension	**Indicators[1]**	**Scoring Scale (low – high)[28]**	**Afghanistan**	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
	Explicit targeting of adaptation in allocation national government	0-1	0	1	1	1	1	1	1
	o Sector-specific?	0-2	0	1	1	1	1	1	1
	o Influence of NAPA or similar plans	0-2	0	1	2	2	1	1	0[35]
	o Gender targeting	0-1	1	1	1	1	1	0	1
	o Poor and marginalized groups targeted?	0-1	1	1	1	1	1	1	1
	Is indirect funding important	1-5	5	4	1[36]	4	5	5	3[25]
	Mechanisms for mainstreaming adaptation in institutional planning	0-2	1	1	1	1	2	1	0
	o Level of centralization in decision making	1-2	1	1	1	1	1	1	1
Financial tracking and accountability	System for tracking climate financing entering the country	0-3	0	1	0	0	1	0	0
	System for accountability for sectoral climate spending	0-3	0	2	0	0	0	0	1
Institutional adaptiveness	Is the national level institutions assigned for climate adaptation represented at local level?	1-4	1	2	1	2	3	1	1
	Can the assigned agency responsible for climate adaptation fulfill its envisioned roles?	1-4	1	3	2	3	2	2	1-2
	Has the assigned agency widespread connection with others engaged in climate adaptation?	1-4	1	4	2	3	2	2	2

[35] The NAP was published only in 2015, leaving little time to observe its influence.
[36] Information about indirect funding obtained from those classified as 'major projects' only, and so would not be fully indicative of the actual situation.

Table 5. Overall country performance on adaptation from financing and institutional perspectives.									
Dimension	**Indicators[1]**	**Scoring Scale (low – high)[28]**	**Afghanistan**	**Bangladesh**	**Bhutan**	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
	Is it financially equipped to implement climate adaptation measures?	1-4	1	4	2	4	2	2	2

Table 6. Elaboration of scale used for rating in Table 5.

Indicators	**Scale**
Importance of water resources to economic development	Percentage contribution to GDP 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Importance of water resources for rural food security and livelihoods	Percentage employed in the agricultural sector 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Magnitude of economic impact on water resources	Costs as a percentage of GDP 0-2% =1; 2.1-4=2; 4.1-6=3; 6.1-8=4; 8.1-10=5
Are costs of CC linked to water resources known?	Yes=1; No=0
o Was government involved?	Yes=1; No=0
Have countries estimated adaptation costs?	Yes=1; No=0
o Was government involved?	Yes=1; No=0
Dependence on external funding	External funding as a percentage of total 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Dependence on national sources	Government funding as a percentage of total 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Climate specific funds or similar mechanisms established	Yes=1; No=0
Proportion of Adaptation needs covered by current finance	Proportion covered 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Explicit targeting of adaptation in allocation national government	Yes=1; No=0
o Sector-specific?	No=0; Some sectors=1; All water-related sectors
o Influence of NAPA or similar plans (Projects selected from 'Climate Funds Update'	*Derived from NAPA=2; Mention of NAPA priorities=1; No mention of NAPA=0*
o Gender targeting	Yes=1; No=0
o Poor and marginalized groups targeted?	Yes=1; No=0
Is indirect funding important	Proportion of total funding 0-20=1; 21-40=2; 41-60=3; 61-80=4; 81-100=5
Mechanisms for mainstreaming adaptation in institutional planning	No=0; Present, but not developed=1; Developed institutional structure=2
o Level of centralization in decision making	Centralized with provision for local participation, but low influence=1; Centralized with provision for local participation and high influence=2

Indicators	Scale
System for tracking climate financing entering the country	Actions being developed for mechanisms=1; Mechanism in place but not fully functional=2; Mechanisms in place and functional=3
System for accountability for sectoral climate spending	Actions being developed for mechanisms=1; Mechanism in place but not fully functional=2; Mechanisms in place and functional=3

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