Disaster Risk Reduction in Bhutan

Status Report 2020

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About this report

The disaster risk reduction (DRR) status report provides a snapshot of the state of DRR in Bhutan under the four priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030. It also highlights progress and challenges associated with ensuring coherence among the key global frameworks at the national level; and makes recommendations for strengthening overall disaster risk management (DRM) governance by government institutions and stakeholders at national and local levels.

As this report is based on information available as of the end of the year 2019, an update on the COVID-19 impact, response and recovery using a risk-informed approach by countries is provided at the beginning of this report. This report has been prepared by the Asian Disaster Preparedness Center (ADPC) on behalf of the United Nations Office for Disaster Risk Reduction (UNDRR) through country consultations and a desk review of key documents, including legal instruments and DRR policies, plans, strategies and frameworks, etc.

The report has benefited from inputs by the Department of Disaster Management (DDM) under the Ministry of Home and Cultural Affairs (MoHCA) and other government ministries/departments such as Ministry of Home and Cultural Affairs (MoHCA), Ministry of Economic Affairs (MoEA), Ministry of Works and Human Settlement (MoWHS), Ministry of Education (MoE), Ministry of Finance (MoF), Ministry of Agriculture and Forests (MoAF) and specialized agencies such as the Centre for Hydrology and Meteorology and the National Environment Commission. The international organizations including UN Agencies, Asian Development Bank, The World Bank (WB) Group, the United States Agency for International Development (USAID), and a number of non-government organizations were consulted. The list of people and agencies met is enclosed at the end of this report. UNDRR and ADPC acknowledges the government, international organizations and stakeholder representatives who contributed their valuable input and feedback on this report.

This report was made possible by a generous contribution made by the Government of Australia, Department of Foreign Affairs and Trade, as part of the Partnership Framework with UNDRR on 'Supporting Implementation of the Sendai Framework.'

This report serves as a reference document for the implementation and monitoring of the Sendai Framework. The findings, interpretations, and conclusions expressed in this document are those of the author(s) and do not necessarily represent those of the United Nations, including UNDRR, or its Member States. The presentation of the material in this report concerning the legal status of any country or territory or of its authorities or concerning the delimitations of its frontiers or boundaries, as well as the text and the tables, is intended solely for statistical or analytical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. While every effort has been made to ensure the accuracy of the information, the document remains open for any corrections in facts, figures and visuals.

UNDRR (2020). Disaster Risk Reduction in the Kingdom of Bhutan: Status Report 2020. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific

Bhutan's Response to COVID-19 and Disaster Risk Reduction

Bhutan confirmed its first case of COVID-19 on March 6, 2020. A nationwide lockdown was announced with immediate effect to contain the community spread of the virus. The RGoB put in place every measure necessary to safeguard the people of Bhutan from the pandemic and their response to the pandemic was recognized internationally.

Until July 30, 2020, active cases had flattened, with no evidence of community transmission and no deaths. However, on August 11, 2020 the RGoB announced its first nationwide lockdown, following report of a COVID-19 positive case in a traveller who had been released from quarantine. Bhutan is currently at Level 3 (Orange) stage which indicates that there is a confirmed case of COVID-19 but there is no local transmission of the virus.

A National COVID-19 Task Force (NC19TF) was constituted with the Prime Minister as the Chair. It endorsed a guideline which ensures that every zone is a self-contained unit with access to essential shops and services. During the lockdown, all schools, offices, and commercial establishments were asked to remain closed. Since the start of the pandemic, the economic impact of COVID-19 has been substantial, driven by the adverse impact it has had on the tourism industry and related services sector. Relevant agencies like Ministry of Finance (MoF), Ministry of Economic Affairs (MoEA) and Royal Monetary Authority of Bhutan (RMA) studied ways to minimize the economic impact. The Prime Minister has also designated individuals to carry out studies and provide best practical solutions.

The pandemic and its ramifications have posed some debilitating challenges. Education has been interrupted this year. The national development process, economic activity, and the everyday lives of people have been disrupted. The RGoB has taken appropriate prevention and preparedness measures with an emphasis on critical medical services and advisories. Schools and public space closures, work from home and social distancing measures have been put in place.

The Public Finance Act of 2007 in Bhutan provided the legal framework and allowed the Ministry of Finance to use public funds for emergency expenditures. The MoF notified the procedures on how activities related to the pandemic would be implemented. This is to ensure proper budgeting, timely disbursement of funds, proper accounting, and finally, audits of the COVID-19 related expenditures.

Leading the national efforts to confront this challenge, His Majesty the King has travelled extensively across the country to ensure the highest level of preparedness. Further, His Majesty commanded that utmost priority be given to prevent the loss of any life; provide good care for the patients and those quarantined in Bhutan including those living abroad; and maintain public confidence by alleviating the difficulties faced by the people and ensuring the uninterrupted supply of foods and essential commodities.

Upon the Royal Command, the government implemented numerous measures to strengthen the healthcare system by expanding public health education; implementing strict quarantine and surveillance; improving facilities for the care of patients; and expanding COVID-19 testing facilities amongst others. The government also acknowledges the critical role played by the

frontline health personnel, armed forces and Desuups or volunteers for providing exemplary service.

The Ministry of Health is responsible for the stewardship of health sector in Bhutan. The country adopted and followed all technical guidance provided by the World Health Organization (WHO) to respond to the pandemic. The Health Emergency Operation Center (HEOC) was activated at the Ministry of Health immediately. The government reprioritized and consolidated savings from non-essential activities including international travels and meetings from all sectors and are investing these in COVID-19 response and actions.

1. Introduction

The Kingdom of Bhutan is a landlocked country, located on the southern slopes of eastern Himalayas in South Asia. It borders Tibet Autonomous Region in the North, and the Indian states of Sikkim, Assam, and the Arunachal Pradesh at its south-eastern, south and western borders. The total land area covers 38,394 square kilometers, comprising diverse geography of high mountains and river valleys draining into the Indian plains. It is also considered to be among one of the ten global environmental hotspots for biodiversity; approximately 72.5 percent of the area is covered by pristine forests within 8 different ecoregions (RSPN, 2019). They support diverse spectrum of flora, fauna and various forest types forming 23 important bird areas, 10 protected areas and biological corridors housing endangered one-horned rhinoceros, pygmy hogs, Panthera tigris tigris and red pandas among other vulnerable species (Banerjee & Bandopadhyay, 2016). Due to the vastness of its forests, Bhutan is also the only carbon negative country in the world.

Administratively, the country is divided into 20 districts (dzongkhags) which are the primary subdivisions exercising powers and rights as per the Constitution of Bhutan, including regulation of commerce, operating elections and creating local-level governments. Each dzongkhag is further divided into administrative regions comprising a group of villages (Gewog) which are governed by Gewog Tshogde (village councils) operating under the dzongkhag Tshogdu as per the Local Government Act of 2009 (Government of Bhutan, 2009). A Thromde is the lowest, second-level administrative division of Bhutan, governed independently by Thromde Tshogde in sufficiently populated areas (Class A) or directly under Gewog Tshogde.

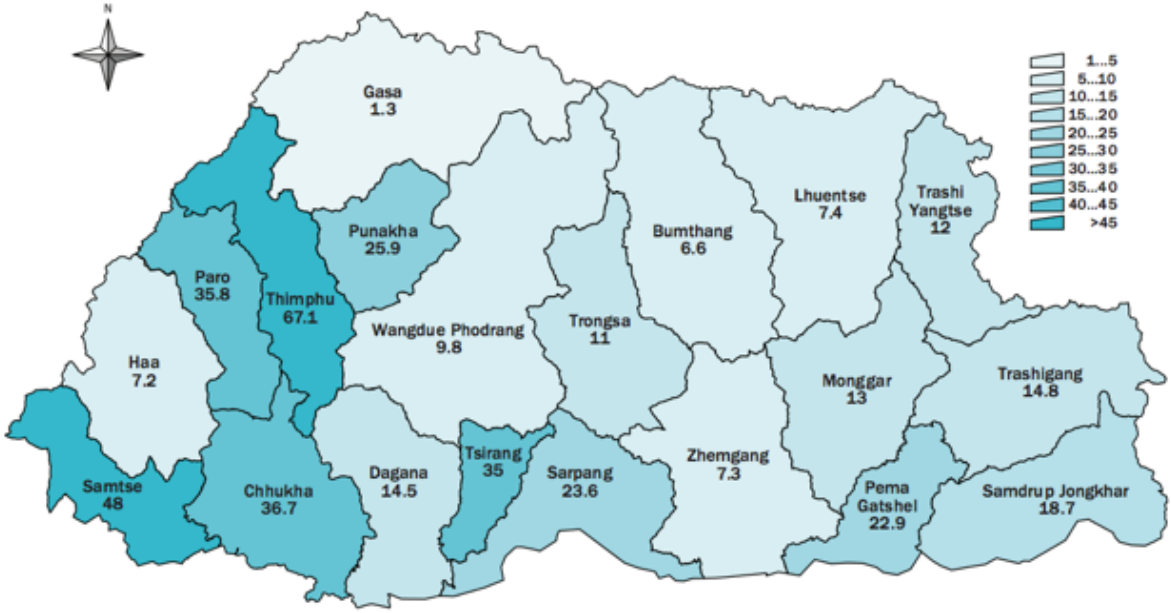
In terms of economy, Bhutan has maintained growth and macroeconomic stability over the past years, supported by hydropower construction, stable political environment alongside robust fiscal and monetary policies (World Bank, 2019). Yet, it remains among the world's smallest and least developed economies with foundations on agriculture, which represent 17.4 percent of the GDP and employs 56 percent of the population (Societe Generale, 2019), operated on land less than 3 percent of the country's total area (Parker, et al., 2017). Progress has been made in reducing extreme poverty following the shift to a democratic constitutional monarchy in 2008, and the success is maintained by strong and strategic relationships with India, among other countries. The economic growth increased from 2.1 percent to 8 percent between 2013 and 2017, and the country graduated to lower-middle income status in 2018 (BTI, 2018). Directed by not only growth-oriented philosophy, but by the Gross National Happiness as well, the future prospects are positive despite high public debts, reliance on imports and trade, as well as relatively high poverty persisting in the more rural regions. Still, extreme poverty has been mostly eradicated, measuring at 1.5 percent in 2017 (Lhaden, 2018).

The country is also prone to plethora of different natural hazards given its geological and environmental conditions. Hazards affecting Bhutan include earthquakes, storms, forest fires, landslides, Glacial Lake Outburst Floods (GLOF), drought, diseases and urban fires (Lotay, 2015). While past disaster events have been relatively small compared to many others in the region, losses occurring as a result of frequent seasonal hazards are placing a burden on the economy, livelihoods, people and their wellbeing. Climate change and the risk of environmental degradation contribute to the anthropogenic stressors interacting with the hazards as well.

1.1 Demographic Characteristics

According to the 2017 population census, Bhutan's population had reached 735,553 persons, of which 681,720 were Bhutanese (National Statistics Bureau of Bhutan, 2018). Majority (62.2 percent) of the people reside in the rural areas, the average density remains at 19 persons per square kilometre, and the population has grown at a rate of 16 percent since 2005 (figure 1). Bhutan is South Asia's second least populous nation following Maldives. However, it should be noted that domestic migration rates remain high; Thimphu continues to attract people due to its numerous employment and education opportunities.

Figure 1. Bhutan population density (persons/km2) per dzongkhag (National Statistics Bureau of Bhutan, 2018).



Given the past investments made in education, health and the economy, Bhutan's Human Development Index (HDI) reached 0.612 in 2017, positioning the country into medium human development category at 134 out of 189 measured countries and territories (UNDP, 2018). Over the past few years, socioeconomic development has maintained positive trends, with risen school enrolment rates, improved health indicators and poverty which declined to 12 percent in 2018 (BTI, 2018). National literacy rate has reached 71 percent and the youth literacy rests at 93 percent (Lhaden, 2018). However, disparities exist between rural and urban regions, as well as between women and men; 78.1 percent of the male population were literate in 2017 as opposed to 63.9 percent of the women (National Statistics Bureau of Bhutan, 2018). Despite the challenges, equal access to schooling is increasing, majority of the population is literate, child survival rate is high (94.1 percent) and life expectancies have improved by nearly 4 years since 2005.

Moreover, advances have been made in terms of achieving gender equality as well. School enrolment for girls was 98.8 percent compared to 97 percent of boys in 2016, and 68 percent increase in women's representation in the government was seen in the 2016 elections when compared to the previous year of 2011 (Lhaden, 2018). However, challenges remain; according to the Violence Against Women and Girls Study Report, quarter of Bhutanese women interviewed had experienced physical or sexual violence, more than

40,000 women between 15-64 faced violence from a partner, and only 15 percent of the current parliament representation are women (UNDP, 2019).

Also, it should be noted that the total dependency ratio (numbers of dependents, aged less than 15 and those 65 years and above, vis-à-vis the working age population) is relatively high at 47.0 (National Statistics Bureau of Bhutan, 2018). However, Bhutan still has one of the youngest populations in the world with about 45 percent of its people below the age of 25, and the working age populations are estimated to peak at around 71 percent between 2050, which signals a significant potential for a demographic dividend which could boost economic growth (National Happiness Commission, 2010). Benefitting from this trajectory, however, requires further investments in education, health, the society and the economy to guarantee that the working age populations have an equal access to employment and opportunities. Currently, there is need to create 6,000 jobs annually to match the growing needs (Lhaden, 2018).

1.2 Economic Impacts of Disasters

Frequent hazards and disasters have the potential to cause widespread disruption to ecological and human systems, which may lead to significant damages and losses to key industries such as agriculture, transport and services in Bhutan. A disaster loss database of Bhutan in Desinventar.net with records from 2009 to 2015 (which include records on floods, windstorms, etc.) is available and the government is developing a disaster information management to strengthen disaster damage and loss information, which will support in the country's hydro met service capacity and disaster resilience (World Bank, 2016).

Despite the limitations, a few examples can illustrate the damaging potential disasters have. For example, the 2009 cyclone Aila caused flooding across 17 dzongkhags, resulting in estimated damages of US$ 17 million to properties and housing (Ministry of Home and Cultural Affairs, 2017a). During the same year, an earthquake occurred. According to Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction, the total losses of the event reached US$ 52 million, causing severe damages to housing, infrastructure, 91 schools, 25 health centres, 50 government offices and 281 monasteries (Royal Government of Bhutan, The World Bank & The United Nations, 2009). Reconstruction costs were projected to exceed US$ 41 million. Also, it was identified that due to prevailing poverty and reliance on agriculture in the affected areas, livelihood support was required for the people to support their income generation activities (Royal Government of Bhutan, The World Bank & The United Nations, 2009). Some of the needs were met by the Royal Insurance Corporation of Bhutan (administering rural housing and social insurance) which sought to release life and rural compensations in the immediate aftermath of the event. However, financing for recovery was also sought from other on-going projects related to risk management and reduction, illustrating that disasters may have the potential to divert already stretched funding from development priorities during crises.

Two years later in 2011, another severe earthquake event hit the country, affecting 7 percent of the population in all of the Dzongkhags, and causing damages of US$ 24.26 million (Ministry of Home and Cultural Affairs, 2017a). While both damage (as repair/replacement value for damaged or destroyed assets) and losses (as changes in economic flow) shall be taken into account to assess financial cost of disaster impacts, available documents use terms "damage" and "loss" interchangeably, making it difficult to assess whether or not actual losses were estimated or included. Additionally, it is important to consider the amount

of damage to cultural heritage given the importance of cultural assets. In 2011, religious and cultural buildings suffered damages of nearly US$ 7 million, and estimates of their reconstruction costs were nearly as high given the need to preserve traditional design, as well as to integrate considerations for disaster risk reduction. Total costs combined from damages to all sectors, needs for DRR integration to build back better, and for holistic recovery were estimated to exceed US$ 22 million (The Royal Government of Bhutan, United Nations & GFDRR, 2011).

Disasters also pose a threat to the development of the economy given the increasing interdependence of fragile infrastructural systems. In 2016, 27 percent of the government's revenue and 14 percent of the GDP were formed by major hydropower facilities and electricity exports to India (IHA, 2016). While domestic consumption is low, earthquakes, GLOF events, landslides and climate change contributing to lessened river flow volumes may all endanger the hydropower industry, on which Bhutan is largely reliant on. Bhutan is indeed among countries which have the greatest national-level economic consequences following glacier flood impacts (Carrivick & Tweed, 2016). Given that the water levels of rivers have already started decreasing, and now that GLOFs are becoming increasingly common, the Royal Government has recognized the need to develop alternative energy sources in consideration of the impacts of climate change (Ulmasova, 2013). Additionally, transport networks are crucial for a landlocked country. Concerns have been expressed about the vulnerability of roads and bridges, blockage of which could cut main arteries, thus impairing the economy in the longer term if reconstruction efforts span over a long period of time (Harris, et al., 2019).

1.3 Social Impacts of Disasters

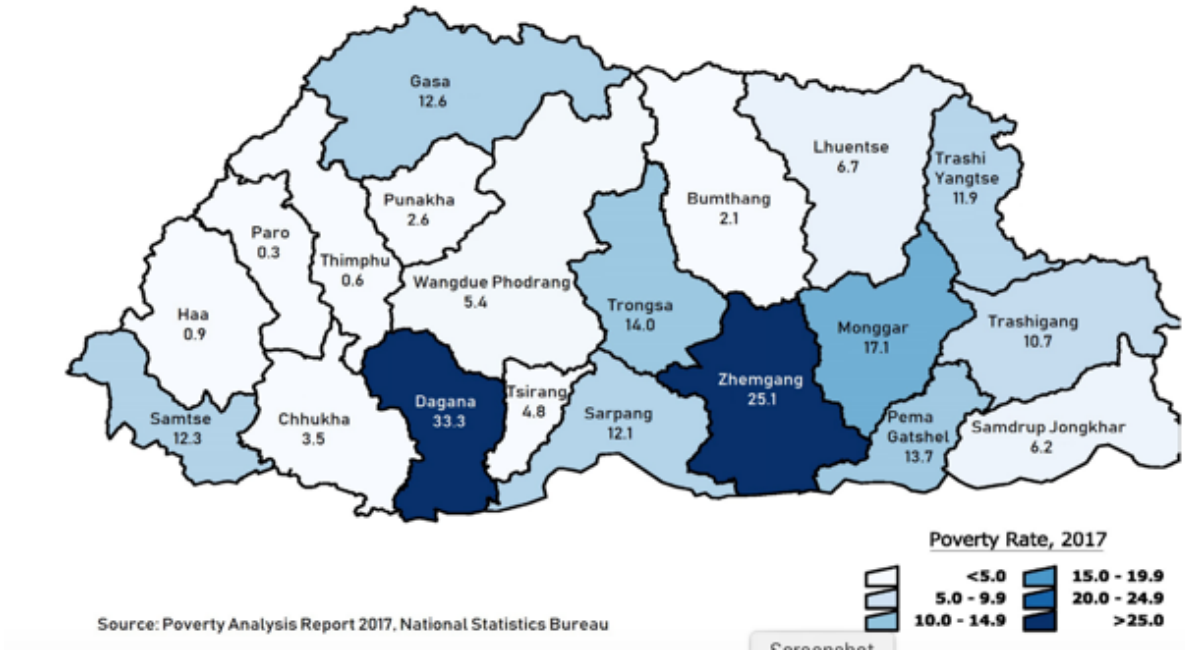
Alongside damages and losses, disaster always have social dimensions. They affect people differently depending on how they are positioned on the social strata, or on their age, gender, available human or social capitals (knowledge, social networks), public safety nets, disability or homelessness among other factors. In the aftermath of the earthquake in 2011, the psychosocial impacts were particularly visible in children affected by shock and anxiety, and many of school authorities were reported to be unprepared to deal with surmounting counselling needs (The Royal Government of Bhutan, United Nations & GFDRR, 2011). Additionally, given the number of damaged schools and required support for temporary schooling facilities, disasters have the potential to severely disrupt education – especially in the more rural regions. Loss of education has further implications to poverty as it remains as one of the most significant determinants of income poverty in the longer-term (Thapa, 2013). Yet, poverty is multidimensional, and must be accessed based on other determinants as well. Other dimensions and functions affecting poverty in Bhutan include access to electricity, geographic area, remoteness (rural/urban) as well as land ownership (Santos & Ura, 2008). Thus, levels of poverty vary widely depending on the region (figure 2).

Poverty and associated negative effects, then, also correlate with disasters and affect people in myriad of ways. For example, many in Bhutan still rely on subsistence agriculture and rice imports from India. If transportation networks are compromised, peoples' access to markets may be lost (loss of income), and imports may temporarily decrease, thus increasing the number of people losing their entitlements to food. Similarly, people's ability to sustain themselves and their families may be compromised in the event of a livelihood loss. These processes could further contribute to poverty and potential food insecurity for some, especially given that the Food Corporation of Bhutan (FCB) only maintain 3-4 days' worth of emergency food rations in a series of depots across the country (Harris, et al., 2019).

Disasters also impose stress on wellbeing, health and the contingency of healthcare provision. Currently, there are three large hospitals in the country, supported by 185 Basic Health Units with trained primary healthcare staff and supporting personnel (Harris, et al., 2019). While the structural integrity and exposure renders many healthcare facilities vulnerable, they also have limited capacity to administer counselling and psychological support (Harris, et al., 2019), thus suggesting that large-disasters continue to endanger the physical and mental wellbeing of Bhutanese people.

In terms of gender and equity, women may be more vulnerable to disasters given social and gendered structures of power and hierarchies which may create inequities in the distribution of rights, assets, resources and power among men and women, often leaving women and girls less educated, poorer or lacking access to information (ICIMOD, 2016). In Bhutan, women may often have less agency in management of households and assets and are often tied to responsibilities of care and protection which may limit movement, their ability to help themselves and their access to support, thus rendering women more vulnerable to disasters in the country (ICIMOD, 2016).

Figure 2. Poverty rates by dzongkhags in 2017 NBS, cited in Gross National Happiness Commission (2018)



2. Disaster Risk Profile

2.1 Hazards and Climate Change

Bhutan is exposed and vulnerable to a spectrum of natural and anthropogenic hazards, ranging from earthquakes, landslides and GLOFs to flash flooding, storms, forest fires, urban conflagration and epidemics (Ministry of Home and Cultural Affairs, 2017a). Among these hazards, earthquakes have had severe sudden impacts due to Bhutan's location on one of the world's most seismically active zones, nested between Indian and the Eurasian tectonic plates. However, the current tectonics are poorly understood. While it is widely assumed that the on-going orogeny of the Himalayan region contributes to high seismic risks, Bhutan still seems to exhibit relative seismic quiescence (UKRI, 2019). Also, in association with earthquakes or high precipitation, landslides tend to occur frequently given the mountainous topography, soil conditions and land-use patterns. They are often triggered in areas characterized by road-cutting during the rainy months, and may also endanger the hydropower production in steep and narrow valley-rivers which may become blocked (Kuenza, et al., 2010). However, slope failures depend on many factors, including lithology, rock-mass strength, soil vegetation cover, on-going development and rainfall.

Flooding is among the more frequent events, contributing to high risks and economic damages given its seasonal occurrence across the country. Several flood disasters have impacted the country in the past, sometimes in association with cyclones (such as Aila), or due to heavy rainfall. For example, in 2010 flash floods and landslides affected nearly 4,800 households, and in 2012, flooding in Gasa caused damages of over US$ 5 million to infrastructure and housing (ICIMOD, 2016). Bhutan is indeed a zone of high rainfall; the monsoon brings in 70 percent of the country's annual precipitation between June and September, during which usual flooding occurs. GLOFs can also cause significant damages and disturbance. Most recently, one was triggered by the collapse of a vertical wall of a supraglacial pond near the Lemthang Tsho lake following heavy rainfall, leading to the drainage of numerous other interconnected ponds and the outburst of the lake in 2015 (Gurung, et al., 2017). Luckily, the impact was minimal and confined within a 30 kilometer-stretch of the river downstream. Still, the potential for emerging GLOFs is increasingly alarming given the number of glacial lakes, and the current rate of glacial melting.

Urban conflagration and wildfires are also a concern. In October 2010, a fire occurred in the town of Chamkhar, Bumthang, wherein 59 shops were destroyed, and 267 people rendered homeless (Chan, et al., 2016). Due to the heavy reliance on wood for housebuilding, heating and fuel, fire risks are higher especially in the rural regions. Wildfires on the other hand, tend to occur during the dry months from November to March, most of which are usually caused by accidental spread following intentional culling of grass and forests to promote new growth (which has now been penalized) (Chan, et al., 2016). Between 2017 and 2018, the gewog of Paro (with the highest recorded rate of fire incidents) lost more than 8,000 acres to forest fires (Chezom, 2019).

Finally, due to the high incidence of hydrometeorological hazards, climate change is a significant concern for Bhutan given its intensifying effects on hazard impact and frequency, and because of the fact that arising temperatures, adverse weather and melting glaciers may constitute to environmental degradation, biodiversity loss and permanent offset of the fragile ecological cycles in the country. Also, the economy continues to be reliant on highly

sensitive sectors such as agriculture, hydropower and forestry, and the increasing rate of the glacier retreat contributes to GLOF and flooding risks (UNDP, 2019). This change also threatens majority of the country's population and infrastructure which are concentrated into large river valleys prone to flooding (UNDP, 2019), not to mention agricultural output of which most of the population is reliant on. Given that all the farming activities occur on less than 3 percent of the country's land area, sustainable agricultural management and appropriate adaptation strategies are elemental for responding to the challenges posed by climate change (Parker, et al., 2017). Water security is another dimension of the problem, potentially created by adverse rainfall patterns and future volume loss of glaciers which feed most of the country's river systems. While the medium-term impacts could contribute to more flooding, major loss of ice may result to significantly decreased river volumes and shortages of water during summer periods, which would also hinder the output of hydropower facilities (UNDP, 2018).

2.2 Exposure

Due to the diverse ecological systems, variable terrain and regional climate, disasters affect Bhutan and its people to a varying degree. However, limited data hinders the estimation of exposure and vulnerabilities. In the case of earthquakes, lack of official historical records tracking earthquakes and damages, alongside limited seismic assessments have contributed to poor understanding of earthquakes in the country. Recently, a seismic risk assessment was conducted (focusing on Thimphu) with the support of World Bank, preliminary results of which estimated that that the most severe activity tends to occur from the border of the Himalayan range towards the Indian border on any given return period (World Bank, 2014). However, the geometry of faults and sources for deeper earthquakes remain largely unidentified, alongside site-specific conditions such as potential for liquefaction (World Bank, 2014).

Most of the country is also exposed to flooding. Over 70 percent of all settlements, most of infrastructure and agricultural lands are located along the main river basins, which heightens exposure to flooding (GFDRR, 2019). Narrow river gorges are also prone to flooding which may be enhanced by landslides resulting in the formation of artificial lakes. For example, one formed following a rock slide on the Tsaticchu (tributary of Kurichu River) in 2003, posing a severe threat to the Kurichu hydropower plant as the newly-formed lake rapidly gained a volume of 33 million cubic meters (De-Suung, 2011). Given the growing numbers of damns, hydropower facilities and transport infrastructure, bursts of such lakes (as well as GLOF events) are increasingly threatening infrastructure, especially in a context characterized by steep mountain valleys and sloping terrain (UNCDP, 2018). Impacts on critical infrastructure and loss of functionality within interdependent supply chains have the potential to impair the economy and compromise development in the event of large-scale damages.

It should also be noted that the increasing rate of urbanization and growing populations contribute to high exposure to urban risks such as fires, but also to earthquakes and flooding, impacts of which may be heightened in places where density of infrastructure and population is high (Lotay, 2015). Similarly, added pressure on land following the spread of cultivations and hill cutting contributes to the increased risk of landslides and flash flooding, especially in areas where poverty drives people towards expanding to unsafe lands (UNCDP, 2018). Also, as most of the country is covered by forests, wildfires pose a significant threat to people and infrastructure during the dry season between November and April.

Exposure to diseases and epidemics is also a persisting issue in the rural regions. Due to lack of sanitation, diseases are more likely to spread in conditions where access to safe water is low and where infrastructure cannot support sanitation. As of 2016, only 63 percent the population had access to basic sanitation services – majority of them living in rural communities –, which is likely to contribute to higher incidence of skin infections and diarrheal diseases (UNICEF Bhutan, 2016). Furthermore, such diseases become more common in the aftermath of heavy precipitation when floodwaters are likely to bring human in contact with waste, or during droughts when water availability is lessened.

2.3 Socio-Economic Vulnerability

Exposure often correlates with socio-economic functions such as poverty and marginalization. For example, people rarely choose to inhabit dangerous locations – rather, they are forced to marginal land while seeking new income opportunities to escape poverty, which may also contribute to further environmental degradation (and thus, increased risks), as was mentioned in the chapter above. While poverty rate has fallen significantly and unemployment remains low, income and asset stratification exist between the ends of the rural-urban continuum (Tenzin & Natsuda, 2016). Understanding these complexities of local needs is important given the fragile setting. For example, while forests are managed through state management systems to support conservation and protection, natural resources such as timber and land clearing for agriculture and pastures remain an important source of livelihoods. Farmers may not always be aware of the negative impacts of land clearing and deforestation, and the total amount of timber being harvested remains poorly documented (Suberi, et al., 2018). Thus – and unless managed – threat of poverty and degrading natural systems are closely interlinked in Bhutan.

Numerous transhumant pastoral communities still reside in Bhutan, often focusing on Yak rearing which is practiced throughout the northern belt of the country from Haa to Trashigang (Chettri, 2008). However, such traditional lifestyles are facing immense threats given the pressures of contemporary times, including climate change, degrading natural spaces, adverse changes in seasonality and industrialization. Between 1990 and 2010, numbers of those practicing transhumant pastoralism was reduced by 31 percent, and it is likely that this decline will continue further (Namgay, et al., 2014). If natural spaces and suitable climate supporting subsistence agriculture and traditional livelihoods in Bhutan continue to erode, more and more people could be threatened by poverty, food insecurity and face the inevitability of having to migrate towards urbanizing areas. Lack of self-sufficiency and risk transfers (such as cattle that can be sold, or savings) contribute to mounting vulnerabilities of those residing in the rural, remote regions. However, numerous community-level cooperatives may bridge this cap and provide social capital which reinforces community resilience. Groups focusing on forestry management, water use, seeds, savings and other jointly managed assets have started gaining attention since 1990, after which the government has started promoting these cooperatives to enhance self-reliance, sustainable development and mutual collaboration (Tenzin & Natsuda, 2016). Given that vulnerability highly correlates with the access to safety nets, social capital, networks, assets and other factors, these semi-informal organizations are important in safeguarding vulnerable livelihoods, supporting community members and sustaining networks among different groups of people, thus providing bridging ties feeding into increased collaboration and pro-poor poverty reduction.

Alongside those relying on subsistence agriculture, the National Vulnerability Assessment of 2016 also highlighted the vulnerabilities correlating with age and unemployment, disability, gender, single parenthood, and with substance addictions or partaking in sex work (GNHCS & UNDP, 2016). For example, those who are homeless and beg for living lack safe, secure and healthy habitats, suffer from social exclusion and thus may be more prone to socially deviant behaviour, all contributing to their pariah status and high vulnerability. Elderly people may also be more vulnerable due to lack of stable income or due to not having social support networks (GNHCS & UNDP, 2016). Gender is also an important determinant of vulnerability due to social hierarchies of power and control which may limit women's access to resources, opportunities and education (which then correlate with poverty and vulnerability). Gender-based violence, antipathies against women working in entertainment-sector (Drayangs), or single-parenthood (mothers who face stigma, become isolated and economically vulnerable) all contribute to higher women's' and girls' vulnerabilities to disasters in Bhutan (GNHCS & UNDP, 2016).

In times of disasters, these underlying factors aggravate the situation of those with lesser means and social networks to support themselves, leading to stratified impacts following socio-economic and cultural boundaries of a society. Furthermore, hazards affecting those vulnerable may create permanent conditions. Children who remain out of school due to the need to support their families losing livelihoods to disasters, or because their education is discontinued, may end up in cycles of poverty (GNHCS & UNDP, 2016). Similarly, unemployed youth are also more vulnerable to disasters due to lack of economic capitals, inability to integrate into the society and to participate political, social and cultural life, which are also a pressing concern given the growing numbers of working-age people in need of employment.

To mitigate the situation, the Royal Government has significantly invested in programs and initiatives targeting health outcomes and equity in service-delivery alongside drafting risk-informed policymaking such as Bhutan 2020: A Vision for Peace, Prosperity and Happiness, and the 12th Five Year Plan 2018-2023. However, many dimensions of vulnerability in the country still remain unexplored (Tandlich, et al., 2018), and more needs to be done to understand the nexus of multi-dimensionality of vulnerability and disasters in Bhutan.

2.4 Physical Vulnerability

Urban dwellers also tend to be more prone and vulnerable to natural and man-made hazards given the fact that unplanned development, absence of legal entitlements and poor-quality housing all contribute to high risks in cities (GNHCS & UNDP, 2016). Greatest concern (in terms of earthquake risk) is the high potential for mass-scale building collapses given that many of the existing structures predate the seismic design regulations implemented in 1997 (Harris, et al., 2019). Currently, 66 percent of the buildings in Bhutan are built by utilizing traditional construction methods such as rammed earth and stone masonry – however, the seismic resistance of many critical facilities such as hospitals have been consistently improved (Harris, et al., 2019). Increasing amount of infrastructure is also exposed and vulnerable to a myriad of natural and man-made hazards. For example, in the aftermath of Cyclone Aila, damage was witnessed across national highways, roads, bridges, alongside irrigation systems and hydropower facilities following flooding and severe landslides (Bhutan Department of Disaster Management & ADPC, 2014). Given the mountainous topography, the resiliency of roads and bridges is of paramount importance, which could be supported by comprehensive integration of DRR considerations into infrastructure development.

Climate change is likely to contribute to the challenges which threaten infrastructure development. The country is currently undergoing a warming at an unprecedented rate, and the numbers of potentially dangerous glacial lakes have increased to 22 following melting (Mahagaonkar, et al., 2017). Many of high-profile hydropower facilities are located in narrow river valleys and in the vicinity of glacier lakes, burst of which may contribute to massive-scale damages not only to the electricity industry, but also to communities and towns located in the downstream. The livelihoods of those dependent on the environment in the Himalayan region are also endangered by climate change, which also correlates with physical vulnerability given that those poor and marginalized tend to expand their farming and income-generation to potentially high-risk or degraded areas following loss of other income generation options, or they result to migration (Dilshad, et al., 2019).

Direct pressures to the environment, including infrastructure development, urbanisation, forest fires, overgrazing, unsustainable agriculture, alongside indirect factors (climate change, population growth and poverty) all contribute to the pace of environmental degradation which contributes to physical vulnerabilities (Bhutan National Environment Commission, 2016). These processes form complex, interrelated feedback mechanisms which tend to reinforce each other in the absence of a comprehensive system-wide intervention focusing on addressing maladaptation, poor construction practices, or encroachment of natural space due to urban and/or agricultural expansion.

2.5 Future Disaster and Climate Risks

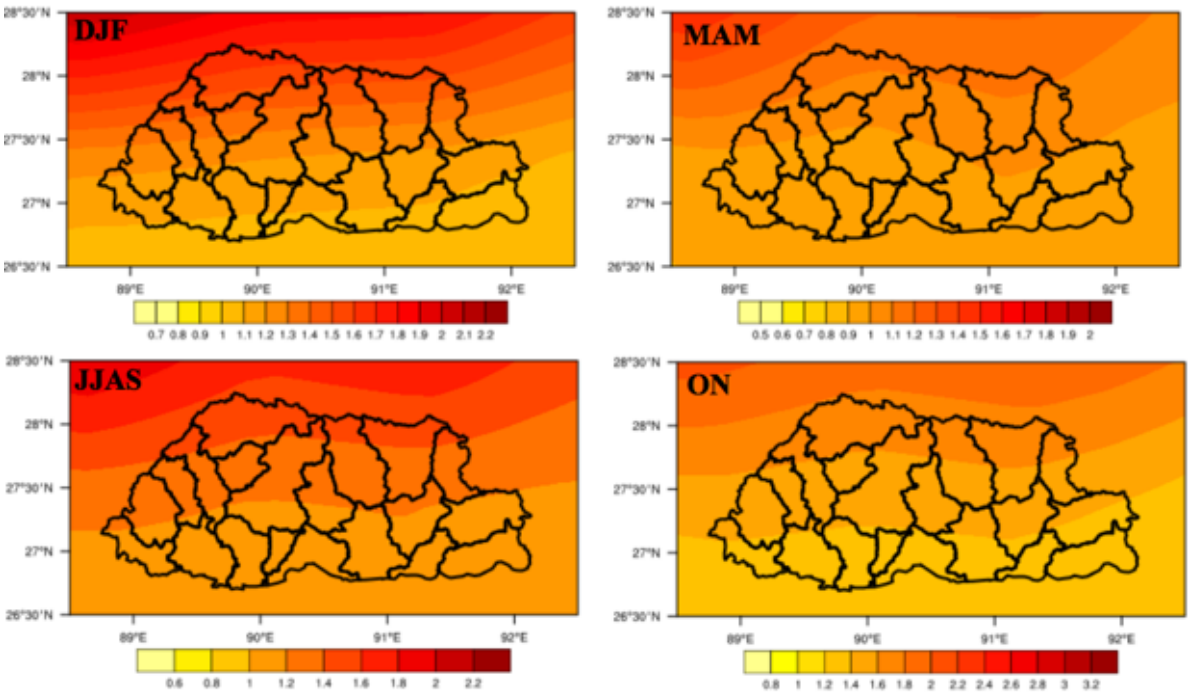
Despite the current status of a carbon negative country with an estimated forest sequestration of 6.3 million tons of carbon annually (Bhutan Ministry of Agriculture & Forests, 2016), Bhutan still remains a victim to the global conditions which render the country vulnerable to rapid and adverse impacts of changes in the regional climate. Average temperatures, precipitation patterns and the incidence of hydro-meteorological hazards have already increased over the past decades (including windstorms, flooding, GLOFs, wildfires and landslides), which have had severe implications to the agricultural sector. Current future projections estimate a temperature increase of 0.8° to 1.6° C during 2021-2050 (figure 3), and the precipitation could increase by 500 – 600 mm annually during the same period (Bhutan Ministry of Agriculture & Forests, 2016; National Center for Hydrology and Meteorology, 2019). However, these impacts have high spatial variability. Air temperatures are more likely to increase more in the western regions and in the inner valleys, while overall increase of the precipitation affecting the country could fluctuate seasonally (Bhutan Ministry of Agriculture & Forests, 2016). The winter precipitation could be reduced by up to 30 percent by 2050 from the current levels, while overall increase in annual precipitation is still expected (Bhutan Ministry of Agriculture & Forests, 2016).

Given the scale of potential impacts, climate change may derail current development and heavily affect agricultural output. Currently, crops cultivated in Bhutan include rice, maize, wheat, barley, buckwheat and millet alongside fruit crops. However, given the increasing adverse and unpredictable weather, sustaining or increasing the rate of agricultural production in Bhutan is severely endangered (Choggyel & Kumar, 2018). Droughts in the region have become longer and more severe during the past two decades, thus decreasing availability of water which has a compounding effect on the vulnerability to poverty and food security (Tandlich, et al., 2018). Now, there is a need to identify which crops may become unsuitable to farm under current climate projections, and conversely, which crops could provide new opportunities for farmers.

Climate change is also threatening small-scale and traditional farming and animal rearing activities throughout the country. At the local level, it has already been witnessed how adverse climatic conditions have increased the prevalence of invasive species, hampered the growth of vegetables, and reduced the amounts of fodder leading to livestock losses and pastoral output (Suberi, et al., 2018). Given that more than 69 percent of the population rely on crop farming, horticulture, livestock and forest products, understanding this interaction and interdependence of climatic conditions, the environment and livelihoods in Bhutan is necessary to mitigate potential impacts on livelihoods and wellbeing (Suberi, et al., 2018). However, to avoid succumbing to the numeric valuation of lives in terms of available monetary resources alone, it is also necessary to consider the potential of losing cultural heritage, ecological systems, traditional ways of living and, at worst, loss of national identity. These socio-cultural dimensions often arise in the context of island nations threatened by complete submersion. Still, diverse and unique communities nested in the Himalayan region are similarly facing a potential extinction given the rate of rapid change, glacier melt, degradation, adverse seasonality, pollution and development.

Furthermore, climate change will also affect human health and wellbeing in Bhutan. Alongside extreme temperature-related mortalities, loss of human productivity and increased heat/cold-stress, as well as plethora of diseases have also been associated with changes in the regional weather patterns. Diarrheal mortality-rates, prevalence of malnutrition and the incidence of dengue and malaria are expected to increase due to lack of safe water, and because of more favourable conditions for vectors transmitting diseases (Tandlich, et al., 2018; WHO, 2015). In domestic animals, incidence of piroplasmosis and helminthes infections are becoming more common given rising numbers of ticks and helminths (Bhutan Ministry of Agriculture & Forests, 2016).

Figure 3. Seasonal mean temperature projections for Bhutan between 2021-2050 under a 4.5 Representative Concentration Pathway scenario (National Center for Hydrology and Meteorology, 2019).



3. Disaster Risk and Climate Action Interventions

As evidenced above, disaster and climate risk management in Bhutan is a colossal task requiring not only support from development partners, but also risk-informed, holistic risk reduction and adaptation planning and investments vis-à-vis the current vulnerability context. This section intends to evaluate the country's current success and challenges in integrating disaster risk reduction (DRR), climate change adaptation (CCA) and sustainable development to planning, projects and policy as mandated by the Sendai Framework for Disaster Risk Reduction, 2030 sustainable development agenda and the Paris Climate Agreement.

Priority 1. Understanding Disaster Risk Analysing, collecting and managing disaster and climate risk-related data is essential for achieving a comprehensive understanding of disasters. It supports conducting risk and vulnerability assessments, prioritizing investments, as well as sustainable and resilient development planning in all the sectors of society. It should also be categorized as well as appropriately disaggregated to facilitate disaster trend projections and identification of impacts to different demographics, and all the information should be accessible to the public and authorities at all levels, stored within well-managed disaster information management systems.

In Bhutan, national and local level multi-hazard risk assessments are indeed mandatory for any projects carried out, and the Gross National Happiness Commission is working to further integrate DRR into sectoral planning (Ministry of Home and Cultural Affairs, 2017a). To support this process, risk information is collected on an ad-hoc basis by various sectoral institutions and government agencies, but no formal mechanism for developing, analysing and updating risk information in a coherent manner exists. Information is only shared between stakeholders when needed (Ministry of Home and Cultural Affairs, 2017a). Also, the scope of such efforts is naturally limited to the accuracy of currently available disaster and climate data. No overarching, harmonized and cross-platform compatible system exists for systematic monitoring, archiving and analyzing information. Hazards are consistently monitored across localities, but reports are rarely generated to inform public planning, finance and sectoral development (Ministry of Home & Cultural Affairs, 2013). Section 60 of the Disaster Management Act requires the establishment of a comprehensive Disaster Information Management System (DIMS), but the one hosted by Department of Disaster Management (DDM) office in Thimphu is not updated and remains underutilized (Royal Audit Authority, 2016). DMIS was intended to be implemented in all of the Dzonkhags, but as of 2016, no local authorities had user rights to the system, nor had they any knowledge about its operations by 2016 (Royal Audit Authority, 2016). However, the Dzongkhag authorities have received a training to utilize the Bhutan Disaster Assessment (BDA) tool, which is used for compiling information about damages during, and in the aftermath of disasters to support post-disaster needs assessments (Ministry of Home and Cultural Affairs, 2017a).

Absence of hazard zonation maps and vulnerability reports due to lack of adequate baseline disaster data was also highlighted among one of the key concerns in the 2016 Performance Audit, and while some initiatives have been implemented, their efficacy has been poor (Royal Audit Authority, 2016). Common framework based on accurate risk-information is necessary for conducting hazard and vulnerability assessments, achieving of which would require strategic focus among various agencies involved in risk management

in Bhutan at all levels of government (Royal Audit Authority, 2016). However, current status of disaster data in Bhutan limits even the most basic assessments across the country, thus contributing to challenges when developing policy or implementing sectoral development projects. Estimation of hazard impacts, exposure and vulnerabilities also remain difficult due to lack of capacities and resources, especially at the local level. For example, there exists no rainfall thresholds for projecting the occurrence of rainfall-induced landslides anywhere in Bhutan, apart from a proposed mechanism introduced under the BRACE project in 2019 (Gariano, et al., 2019).

However, some agencies excel in hazard monitoring and projection, and their experience would be elemental for supporting the integration of improvements to future data management initiatives. For example, the National Center for Hydrology and Meteorology is the focal agency responsible of monitoring, collecting and analysing data covering hydrometeorological hazards to generate a better understanding of the current climatic and weather conditions, the cryosphere alongside water resources and flooding (National Center for Hydrology and Meteorology, 2019).

Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk In recognition of the need to manage disaster risks and respond to climate change from a holistic perspective, the government has established a robust mechanism for disaster risk management, supported by a comprehensive policy framework. According to the Disaster Management Act of 2013, the National Disaster Management Authority[1] (NDMA) has been assigned with the highest powers in terms of decision-making and coordination of all disaster-related activities. Its operations are supported by numerous governmental agencies and stakeholders at the national and local levels (figure 4). Its responsibilities include approving national DM strategies, policies, vulnerability maps and hazard zonation, implementation of mitigation measures, standards, guidelines and procedures related to DRM in Bhutan. The NDMA also allocates and monitors DM related resources and provides guidance in integrating DRR and CCA into sectoral development. The Department of Disaster Management (DDM) serves as the NDMAs operational arm. It should be noted that all of DRM activities in the country are supported by numerous other sectoral legislative documents which integrate provisions for disaster management, alongside policies and plans such as the Disaster Management Rules and Regulations, National Action Plans for Earthquake Safety (school and health facilities) (Lotay, 2015), and the Disaster Risk Management Strategy of 2017. The latter is especially important, given that it outlines the strategic priorities and policy-aspirations related to achieving the full implementation of Sendai Priorities, tangible climate change adaptation and sustainable development during the upcoming decade.

The DM Act of 2013 also mandates the formation of the Inter-Ministerial Task Force (IMTF), which comprises technical experts from various agencies and institutions (including those which are members of the NDMA), and the IMTF is chaired by the Head of the DDM. They focus on reviewing the technical aspects of planned interventions, maps and zonation, alongside structural and non-structural measures vis-à-vis the national standards, guidelines and operating procedures (Lotay, 2015). However, there are some issues in the implementation of the IMTF. Given that its operations are largely ad-hoc, the members may struggle to find a suitable time for all its stakeholders to meet given the spectrum of agencies involved (Ministry of Home and Cultural Affairs, 2017a).

1 The NDMA comprises the Prime Minister (Chairperson), Minister for Home & Cultural Affairs (vice Chairperson), Finance Minister, Secretaries of all Ministries, Gyalpoi Zimpon (Royal Secretariat), Head of the National Environment Commission, President of the Chamber of Commerce and Industry, Head of the DDM alongside other members which may be co-opted in accordance of the DM Act mandates.

For climate change-related concerns, the Royal Government has devised the National Adaptation Programme of Action (NAPA) already in 2006. It highlights the importance of managing the adaptation action to respond to the vulnerabilities present in the kingdom, characterised by fragile mountain ecosystems and high dependency on stable weather conditions (National Environment Commission, 2006). The NAPA also highlights risks of climatic hazards to hydropower resources, infrastructure and human health, and outlines adaptation priorities in the country in areas that are facing highest risks. Sector-wise, it proposes adaptation activities to protect human health, water resources, agriculture, forests and biodiversity, alongside infrastructure (National Environment Commission, 2006).

Figure 4. Disaster Risk Management Institutions in Bhutan (Ministry of Home and Cultural Affairs, 2017a).

Additionally, given the need to decentralize DRM to achieve effective, timely and contextualized interventions at the local level, the Royal Government has sought to increase the capacities and involvement of sub-national level authorities to support the implementation of strategic objectives as per the national level policy. At the local level, the Dzongkhag administrations must form Dzongkhag Disaster Management Committees as per the instruction of the NDMA, comprising of various officers, Police Superintendents, Thromphons, Welfare Officers alongside other authorities. The main function of the DDMC is to prepare and implement Dzongkhag DM and contingency plans, to monitor and evaluate implemented measures seeking to improve prevention, mitigation, preparedness and response, to oversee enforcement of risk zonation and risk mapping, to ensure promotion of DRR awareness at the local level among other responsibilities (Lotay, 2015). However, given the wide range of technical requirements, need for resources and human capital, as well as the sheer magnitude of required interventions to achieve integration of DRR and CCA into local development, achieving strategic goals at the local level is challenging.

Table 1. Bhutan legislative plans and policies intended to improve disaster risk reduction and climate resilience

IMPLEMENTATION	PLAN/POLICY	SCOPE	PURPOSE
NATIONAL DISASTER MANAGEMENT AUTHORITY	Disaster Management Act of 2013	National, Dzongkhag, Gewogs and Thromde	Establishing and strengthening institutional capacity, coordination and communication for disaster management in Bhutan. Also includes the mandate for mainstreaming disaster risk reduction.
NATIONAL DISASTER MANAGEMENT AUTHORITY	Disaster Management Rules and Regulation (2014)	National, Dzongkhag, Gewogs and Thromde	Operative guideline for the implementation of the 2013 Disaster Management Act. Covers aspects from response and preparedness to early warnings, financing and so on.
DZONGKHAG DISASTER MANAGEMENT COMMITTEES	Contingency Planning Guidelines for Bhutan (2014)	Dzongkhags, private sector, other relevant stakeholders	Supports contingency planning at local (dzongkhag) levels, alongside within the private sector, in autonomous organisations and other stakeholders who may benefit from the use of the guidelines.
NATIONAL DISASTER MANAGEMENT AUTHORITY, ALL RELEVANT STAKEHOLDERS	Bhutan Disaster Risk Management Strategy (2017)	Whole-of-Society	Articulates all policies and principles required to efficiently allocate available resources to achieve the priorities outlined in the Disaster Management Act of 2013. Aligned with the Sendai Framework, and highlights the importance of climate change adaptation.
THE ROYAL GOVERNMENT, ALL RELEVANT STAKEHOLDERS	Bhutan National Adaptation Programme of Action (2006)	Whole-of-Society	National adaptation plan, highlighting most urgent (and strategic) adaptation priorities in consideration of the Bhutan Vision 2020 and wider sustainable development.

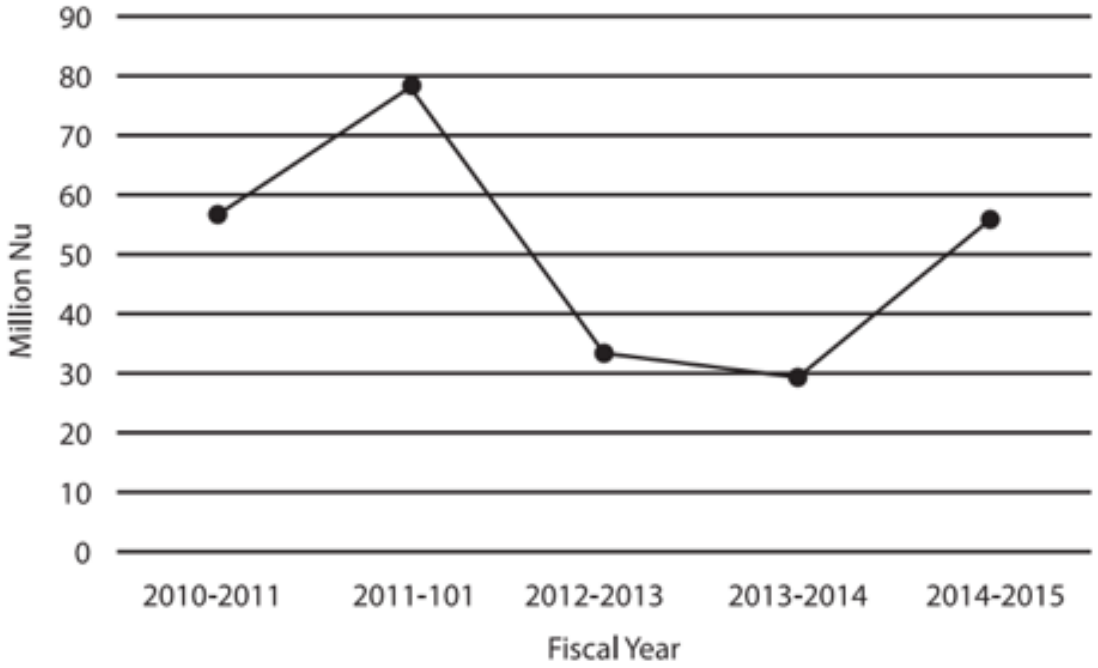
Priority 3. Investing in Disaster Risk Reduction for Resilience Robust funding mechanisms for all disaster and climate risk reduction activities is elemental for facilitating development pathway as envisaged in any given policy, and they must also support the sub-national level governments to guarantee that the local level resources are on par with the requirements for implementing national level strategies.

In Bhutan, there is high national level commitment to improve disaster finances in the country, and legislative framework exists for implementing funding mechanisms. According to the DM Act of 2013, there are four different finance mechanisms focused on DRM in Bhutan, including Response and Relief Expenditure, Budget for National DM Activities, Budget for the DDM as well as funding provisions for Recovery and Reconstruction. While these provisions are somewhat self-explanatory, it should be noted that the separate budget for DDM is utilized to support capacity building, to maintain critical DRM services and to enhance strategic focus on improving DRR for resilience. This funding has increased over the years in recognition of the fact DRR is a cornerstone of sustainable and resilient development (figure 5). However, implementation of these provisions remains largely ad-hoc and reactive, fragmented across different levels of government and sectors with no mechanisms for monitoring and controlling the budget performance vis-à-vis performance indicators (Ministry of Home and Cultural Affairs, 2017b). Furthermore, "disaster risk management" remains too narrowly defined, due to which bulk of current provisions are targeted to preparedness, response and recovery which leaves little room to improve sectoral performance (Ministry of Home and Cultural Affairs, 2017b). The 2016 Performance Audit also revealed that there seems to be persisting confusion in terms of operating existing financial mechanisms. Current practices in terms of funding Dzongkhag DRM initiatives are often requested directly from the Department of National Budget which deviates from the provisions of the DM Act of 2013, and these requests often arise on the basis of needs as opposed to strategic planning (Royal Audit Authority, 2016).

Disaster risk reduction financing also should include provisions for risk-transfer mechanisms. In Bhutan, the Royal Government shares a Memorandum of Understanding with the Royal Insurance Corporation on a unique scheme which extends insurance coverage to even rural housing to reduce the financial burdens households face in post-disaster phases (Ministry of Home and Cultural Affairs, 2017a). Cash compensations have also been given in the occasions of crop or livestock loss – however, difficulties in verifying claims and sustaining the insurance coverage contribute to current challenges. The Rural Housing Insurance Scheme remains unsustainable in the longer-term, and other risk-transfer mechanisms are needed (Ministry of Home and Cultural Affairs, 2017b).

However, the Royal Government has committed to improving the resiliency of infrastructure from medium to long-term by comprehensive integration of DRR and CCA considerations. For example, in 2013-2014 the National Budget allocated a total amount of US$ 56.7 million to construction of highways, construction of bridges and resurfacing, 5 percent of which was allocated to "improvement" (Bhutan Department of Disaster Management & ADPC, 2014).

Figure 5. Budget of the Department of Disaster Management between 2010 and 2015 (Ministry of Home and Cultural Affairs, 2017a).



When considering sectoral DRR, progress has been made on seismic resilience in education, health, cultural heritage. Efforts have been focused on risk assessment of critical facilities, seismic resilient design and retrofitting, and capacity building on resilient infrastructures, under project-based funding supported by development partners. This includes a project on Improving Resilience to Seismic Risk project funded by the Japan Policy and Human Resources Development (PHRD) Technical Assistance Program (2013 -2017), worth US$ 1.29 million (Tshering & Sekhsaria, 2019), which was jointly implemented by the Department of Engineering Services, Department of Geology & Mines, and Department of Disaster Management, among others.

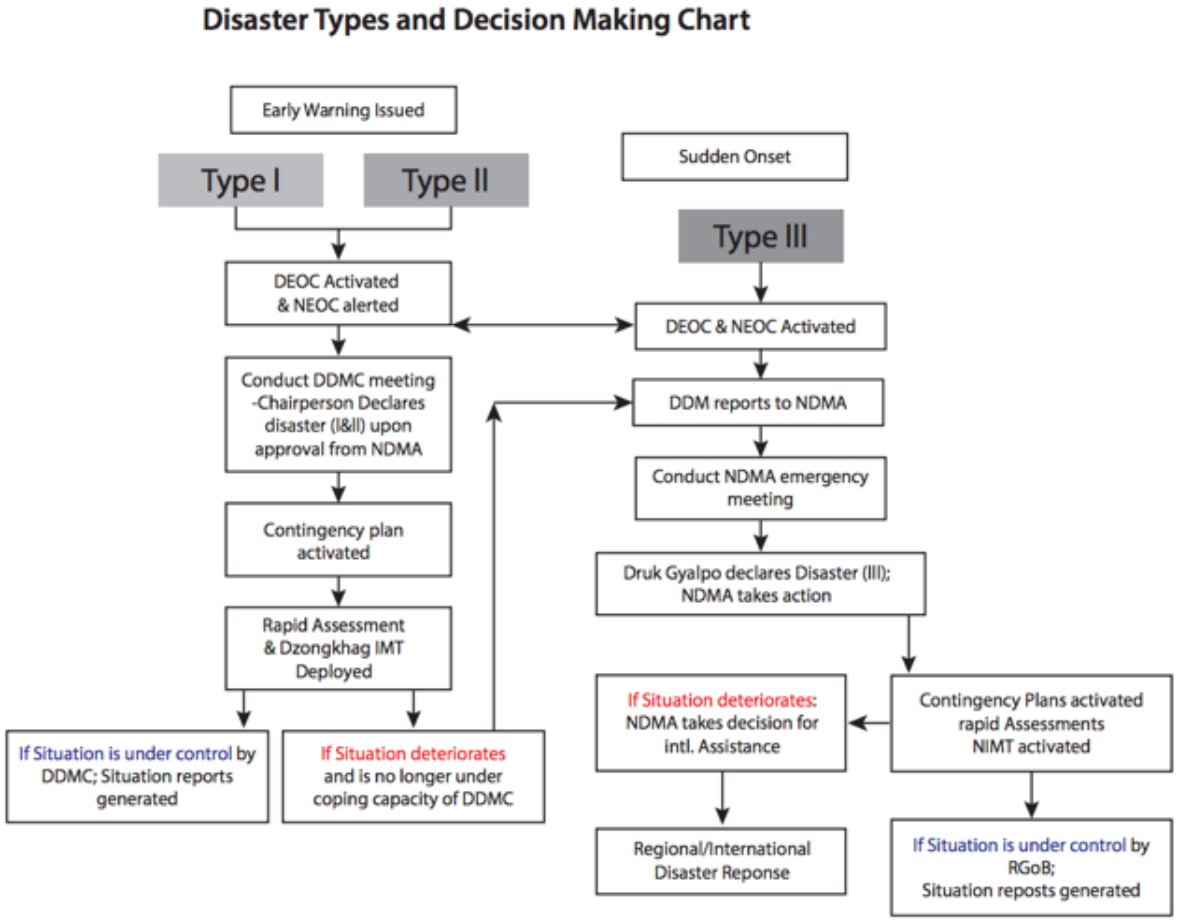
Sector specific DRR integrated plans, such as the National Action Plan for School Earthquake Safety 2013 call for committed resources to realize tangible outcomes. Similarly, a review of the Road Sector Master Plan (2007-2027) reiterated the importance of establishing a Road Development Fund to ensure sustainable funding for construction, upgrading and strengthening road networks with climate-resilient design, slope stability, erosion control, flood protecting embankments, as well as disaster preparedness to protect road infrastructure and maintain road connectivity in times of disaster (Ministry of Works & Human Settlement, 2017).

As urban expansion has emerged as a development trend, investment in disaster-resilient options to minimize negative consequences of the disaster-development interface is deemed increasingly necessary. Projects have started in collaboration with development agencies including the Strategic Environmental Assessment (SEA) of the Thimphu Structure Plan 2002-2027 to assess the interconnectedness of urban systems, functions and facilities viz-a-viz different challenges, including disaster risk, to inform revision, implementation and monitoring of the plan in the changing context, supported and funded by LDCF-GEF Third National Adaptation Program of Action (NAPA 3), UNDP-UNEP Poverty Environment Initiative

(PEI) and the Global Environment Facility (GEF) (Ministry of Works and Human Settlement, 2018); and Phuentsholing Township Development Project, a US$ 24.2 million funded project supported by Asian Development Fund on flood-protection and early warning to safeguard Phuentsholing Township and its residences from flood risk and enhance climate-resilient urban development (ADB, 2019).

Priority 4. Enhancing Disaster Preparedness for Effective Response to "Build Back Better" in Recovery, Rehabiltation and Reconstruction The Royal Government has made significant progress in improving the preparedness for effective response by establishing preparedness and contingency policies, plans, relief funds and by targeting to improve capacity of local level authorities, informed by the decentralization agenda. Contingency planning exists within each sector, response plans have been mandated to be established by the DDMCs, and capacity building has been carried out to local Search and Rescue Teams alongside the Fire service (Ministry of Home and Cultural Affairs, 2017a). However, there is need to finalize contingency plans and the national response mechanism in a manner which would include clear roles and responsibilities of stakeholders during the stages of response and outlines communication flow and procedures (Ministry of Home and Cultural Affairs, 2017b). National Emergency Operation Centre (EOC) should be established, with the support of a network of Dzongkhag EOCs, and the sub-national level capacities should be rapidly improved in terms of skills, manpower and equipment to manage emergency response at the local level. The current envisaged flowchart for disaster response decision-making is outlined in figure 6.

Figure 6. Disaster Types and Response Decision Making Chart in Bhutan (Ministry of Home and Cultural Affairs, 2017a).



In terms of early warning systems in Bhutan, significant progress has been made to improve the dissemination of information of imminent hazard threats to the population. EWS for flooding have been implemented across the country, including Punatshang Chhu river (supported by JICA), under the direction of the Department of Hydrometeorological Services (DHMS) within the Ministry of Economic Affairs in cooperation with the Central Water Commission of India (NCHM, 2013). As of now, there are 15 stations transmitting real-time data to the DHMS, alongside three automatic weather monitoring stations in Semtokha, Chamkhar and Kanglung (ICIMOD, 2016). Furthermore, the current coverage of hazard-monitoring infrastructure is intended to be improved by at least 70 new AWS, 25 AWLS and 8 landslide monitoring devices which contribute to 35 new sets of integrated EWS (ICIMOD, 2016). In 2019, WhatsApp was also explored as a potential option for disseminating early warnings to communities in Assam, routed through the Bhutan-India Friendship Association to NGOs who pass information to their networks (Oxfam India, 2019). Other improvements have also been established to further improve EWS covering GLOF events. In 2015, 2,674 glacial lakes were reassessed, and numerous new EWS were implemented based on this information (Lamsang, 2015), and the support of ICIMOD has been elemental in mainstreaming gender into existing EWS to increase inclusion and to guarantee that the warning mechanisms do not exclude those marginalized.

For Building Back Better (BBB), National Recovery and Reconstruction Plans have been devised in the aftermath of major disasters, in recognition of the fact that there is a need to improve infrastructure and housing by integrating considerations for DRR and CCA to improve resilience against disaster and climate-related hazards. However, due to lack of strategic overview, lack of local technical capacities and inadequacies in funding for recovery, the implementation of BBB considerations is challenging in Bhutan. Absence of key disaster and climate-related information is among the key challenges to be solved before risk-informed development may occur.

4. Coherence with Sustainable Development Goals and the Paris Climate Agreement

Disaster management, climate change adaptation and sustainable development share similar characteristics, overlapping strategic objectives and synergies which should be harmonized across various policies to guarantee maximum efficacy. Separate legislative provisions and institutional arrangements, strategies, frameworks and plans targeting DRR, CCA and sustainable development constitutes to overlapping, redundancies, repeated efforts and thus, wasted resources. Existing DRM frameworks should be revised in accordance to the post-2015 development agenda to identify how countries could best prioritize and synchronize their domestic efforts vis-à-vis on-going projects, available funding, risks and vulnerabilities to utilize the highest potential for holistic disaster risk management.

To support the mainstreaming of the SDGs into national level planning, the government has established a National Planning Framework within the 12th Five-year Plan, which is supported by a SDG Working Committee operating under the Gross National Happiness Commission (Royal Government of Bhutan, 2018). Guided by the development philosophy of Gross National Happiness, the Royal Government is well on-track in its efforts to implement SDGs by reducing poverty, income inequality, gender disparities, and by ensuring that no one is left behind (Royal Government of Bhutan, 2018). Environmental conservation and sustainable use of available national resources have also been consistently highlighted within national development planning documents, most recently in the Bhutan Vision for 2020.

Synergies between DRR and CCA have also been identified in many of national level frameworks and policy interventions, (Mall, et al., 2019). The National Adaptation Program of Action was developed in 2009 as the first deliberate strategy to address climate related concerns in Bhutan, aligned with other development strategies and existing legislative framework (National Environment Commission, 2006). However, the tangible harmonization of DRR and CCA remains to be achieved – policy linkages between the two agendas exist only in references. Adaptation efforts should be increasingly reflected as a part of DRR strategies, tied together by a comprehensive implementation framework which can be easily translated to development planning at the local level. Even if such framework existed, aimed to maximise synergies to reduce overlaps and wasted budgets, efforts will remain limited in the absence of comprehensive disaster and climate risk-related data which would facilitate prioritization and inform sectoral intervention needs. Also, persisting limited understanding about the interlinkages and dependencies between DRR, CCA and sustainable development contribute to issues which limit the tangible integration of these dimensions into existing policies and strategies (Ministry of Home and Cultural Affairs, 2017b). Currently, the first step towards fully synchronized DRR and CCA have been outlined in the 2017 Disaster Risk Management Strategy, which is intended to guide the development of further medium-term risk management plan in consideration of the Five-Year Plans and wider development efforts. However, it remains a guiding document, intended to strengthen the tangible implementation of Sendai Priorities and climate adaptation aspirations in policy for years to come (Ministry of Home and Cultural Affairs, 2017b).

Table 2. Some of the synergies between international agreements and different policies and commitments of Bhutan in various sectors.

Sectoral Aim	Policies/programs with potential links to Sendai Framework for Disaster Risk Reduction	Policies/programs with potential links to Sustainable Development Goals	Policies/programs with potential links to the Paris Climate Agreement or Environment
National Development	National Disaster Risk Management Strategy (2017) 12th five-year plan (2019)	12th five-year plan (2019) National Disaster Risk Management Strategy (2017)	Bhutan National Adaptation Programme of Action (2006) 12th five-year plan (2019)
Agriculture & Resource Management	Water Act of Bhutan (2011)	12th five-year plan (2019) National Environment Protection Act (2007)	Forest and Nature Conservation Act of 1995 Renewable Energy Policy
Disaster and Climate Risk Reduction	National Disaster Risk Management Strategy (2017) Contingency Planning Guidelines for Bhutan (2014) Bhutan 2020: A Vision for Peace, Prosperity and Happiness	12th five-year plan (2019)	12th five-year plan (2019) Bhutan National Adaptation Programme of Action (2006)
Vulnerability Reduction	Local Government Act (2009) Waste Prevention and Management Act (2009)	Bhutan 2020: A Vision for Peace, Prosperity and Happiness National Health Promotion Strategic Plan (2015-2023) 12th five-year plan (2019) Cottage and Small Industry Policy (2019)	National Environment Protection Act (2007
Urban Development	National Disaster Risk Management Strategy (2017) Bhutan 2020: A Vision for Peace, Prosperity and Happiness	12th five-year plan (2019) National Urbanization Strategy (2008)	-

5. Issues in the Implementation of Disaster Risk Reduction and Climate Policy

There are numerous issues hindering the implementation of the DRM policy-provisions in Bhutan as identified in the Disaster Risk Management Strategy of 2016 (Ministry of Home and Cultural Affairs, 2017b). They include the absence of policy framework which has led to a compartmentalized administration of DRM issues on ad-hoc basis, wherein lack of clarity over roles and responsibilities further estrange local level interventions from those as envisaged by the national government. Multi-sector coordination and lack of strategic overview further contributes to the issues in putting in place mandated procedures, policies, guidelines and standards as identified in the DM Act of 2013. Furthermore, the lack of technical skills, tools, knowledge, and allocated funds dedicated specifically to disaster risk reduction all contribute to issues which render many of the policy-provisions ineffective in the longer term (Ministry of Home and Cultural Affairs, 2017b). This leads to disconnect between central and district level plans, which hinders planning activities (Department of Local Governance, 2015).

Lack of funding for the Dzongkhags, alongside their limited capacity, technical skills and available resources limit the extent to which DRR and CCA can be mainstreamed to the local levels. Projects and initiatives undertaken by the sub-national level governments are only as effective as their capacity to integrate such considerations to development. Coordinating DRM activities across sectors is also challenging, and a more structured approach for engagement between the DDM and sectors is required (Ministry of Home and Cultural Affairs, 2017a). Similarly, lack of comprehensive monitoring and evaluation of initiatives (apart from the Audit process) limits the national capacity to accurately evaluate the impact of past interventions to improve resilience.

Top-down planning approach also limits the effective implementation of initiatives which require local participation and contextualisation. Development priorities are often decided at the national level, which then leads to sectoral allocations of responsibilities, but such approaches negate the holistic and integrated planning progress which must reflect local priorities, problems and needs (Department of Local Governance, 2015).

6. Stakeholder Analysis

At the national level, the DM Act of 2013 mandates every agency – including the private sector– to institute a disaster management unit into its organizational structure if requested by the NDMA. Notified stakeholders are required then to establish contingency plans, hazard zonation and vulnerability mapping, and adhering to structural and non-structural mitigation regulations. They are also required to support DDMCs as and when so required (Ministry of Home and Cultural Affairs, 2017b). Department of Hydrometeorological Services, Department of Engineering, Department of Human Settlement, Department of Roads, Department of Local Governance, Department of Agriculture, Department of Medical Services and Royal Bhutan Police provide important support to the DRM activities in Bhutan, among other institutions and agencies.

International partners and donors have also had a very important role in supporting the Royal Government in its efforts to achieve resilient and sustainable development goals over the years. For example, United Nations and its agencies, Funds and Programs are crucial in disaster and climate risk management in Bhutan. Other multi-lateral donors, including the World Bank, Asian Development Bank and the SAARC have also provided financial support to various projects and initiatives seeking to further reinforce DRR and CCA across sectors. Bilateral donors, including the governments of India, Japan, Denmark, and Austria have also been major supporters contributing to the Governments efforts.

Given the cross-cutting nature of disaster risk management activities, harmonized implementation approach has been adopted in Bhutan to facilitate ownership and responsibility over DRM issues across a range of ministries and departments (Ministry of Home and Cultural Affairs, 2017b). All stakeholders have agreed on establishing a supervisory mechanism, monitoring and evaluating the efficacy of DRM interventions – thus, a Joint Steering Committee (JSC) has been composed among the key resident development partners consisting of UNDP, UNICEF, WBGFDRR, ADB and JICA (Ministry of Home and Cultural Affairs, 2017b).

Given geographical remoteness and limited accessibility, building community resilience to disaster and climate risk is crucial to complement the government DRR efforts through their contextual understanding on the impending hazards in their locality. Community-based Disaster Risk Management (CBDRM), mandated to Dzongkhag Disaster Management Committee with support from the DDM, focuses on community awareness raising, early warning systems (Flood and GLOF), disaster preparedness and structural mitigation measures. Community DRR activities are also implemented by UNDP Bhutan in critical landslide and flash flood prone area, Save the Children on school-based multi-hazard plan (ICIMOD, 2016), and Bhutan Red Cross Society (IFRC, 2019). Volunteer support is also essential to support in the case that there are gaps in manpower resources during emergencies; the De-suung, a voluntary organization initiative by His Majesty the King and its fleet of volunteers, supports the DDM and Royal Bhutan Army in emergency operations and provide response and relief assistance to the communities, society and the country at large in times of disasters (De-Suung, 2011).

The role of state-owned enterprise and private sector will be increasingly important as they are a major driving force for economic growth and investment, in which resilient building is key to protect development gains and sustain growth. As such, more collaboration in DRR shall be pursued, for example, the Druk Green Power Cooperation responsible for

the hydropower generation, in which flood risk reduction is the main concern. Under this initiative, the Bhutan Chamber of Commerce and Industry which has been involved in dissemination and communication of early warning and information on impending floods to its business members (ICIMOD, 2016). The participation of land development and construction companies will also be compulsory for risk-informed urban facility development, enforcement of building codes and land use planning, among others.

7. Future Priorities

7.1 Challenges

As evidenced in this report, numerous challenges constitute to the problems in integrating holistic DRR, CCA and sustainable development into policy and sectoral planning in Bhutan. This section intends to provide a brief and concise overview of the most pressing challenges vis-à-vis recommended priority actions, in recognition of the fact that issues addressed here do contain a level of subjectivity and may change from sector to sector.

To that end, more remains to be done to understand and to respond to the mounting vulnerabilities in Bhutan. Currently, lack of comprehensive, cross-compatible, accessible disaster information management systems contributes to severe challenges in conducting risk or vulnerability assessments, hazard zonation, trend projection or estimating future (sectoral) climate change impacts. To facilitate risk informed DRR and CCA, data gaps and its availability must be rapidly addressed to improve the current understanding of disaster and climate risks in Bhutan. Additionally, local level capacities in terms of technical skills (to collect and analyze data) should be brought up to par with the national level.

Also, significant issues in funding domestic initiatives are also likely to persist. In 2015-2016, domestic revenue was only able to finance 23 percent of capital expenditure of the country, and income tax and dividends attributed to hydropower generation continue to generate the highest tax revenues in the country (Wangchuk, 2017). Thus, sustaining the increasing investment needs are unlikely to be achieved without the contribution of stakeholders and development partners in the short to medium-term future. Yet, given the rapid rate of regional climate change, environmental degradation and increasing impacts of hydrometeorological hazards, the investment needs for risk mitigation, reduction and monitoring are constantly increasing. Needs for physical protection measures, alongside increased requirements for social protection measures are likely to grow following livelihood losses, not to mention the need to generate employment for the growing population.

Growth and development are also likely to form a problem to sustainability in the long-term. Given that urbanization is a relatively new phenomenon in Bhutan, there is now a need to start identifying sustainable and resilient urban development strategies from the national to local level, wherein development and interventions would be locally-led to guarantee participation of residents with the support of local authorities (Ministry of Works and Human Settlement, 2016).

7.2 Priority Issues

First and foremost priority for the Royal Government should begin exploring options for maximizing the efficacy of existing disaster information platforms and the agencies which contribute to disaster data collection, management and analysis. Landslide risks, seismic hazards, adverse impacts of climate change and the threats of environmental degradation should all be closely monitored and understood in the context of present vulnerabilities to adequately estimate where needs are greatest now, and in the future. Additionally, more comprehensive vulnerability-related data must be gathered and analyzed to explore the contextual, multidimensional issues of structural and social origin, which could then

inform the legislative framework review progresses to facilitate change by integrating considerations of the ever-increasing social complexities and needs.

Development of multi-hazard early warning systems is also required nationwide. While significant progress has been made in terms of flood monitoring (GLOFs, precipitation and riverine flooding), more remains to be done. For example, setting precipitation thresholds matched with understanding of geomorphology for generating landslide warnings would be immensely beneficial for a mountainous country, and establishing a comprehensive network of seismic instruments to provide earthquake warnings would reduce the sudden destructive potential that seismic activity has. To that end, improving existing infrastructure against seismic risks is important in a country where numerous buildings across the country pre-date the seismic building codes. While preservation of cultural heritage is paramount, it must be done in consideration of disaster risks without a trade-off between safety and conservation.

Also, supporting policy coherence for the purposes of harmonizing of DRR, CCA and sustainable development is necessary. Currently, lack of understanding of the tangible synergies these development priorities share is hindering the process of achieving tangible results, especially at the sub-national level. While progress has been made, and numerous legislative frameworks exist with cross-referencing elements, no overarching framework has been established which could be utilized to guide planning processes in Bhutan. Those involved in DRR and CCA must rely on various plans, strategies and policy-pieces which as a whole do inform development, but also leave gaps in between.

Among the recommended priorities, strengthening institutional capacity (civil service, sub-national level government bodies and civil society organizations) is required, alongside supporting community cooperatives focusing on joint-resource management and support (GNHCS & UNDP, 2016). To achieve the localization of DRR and CCA agenda, and to guarantee that national level policy will be translated to action, these capacities to translate policy-provisions to action must be reinforced. Also, to improve preparedness for response under priority 4, Emergency Operation Centers should be established at the National level and within Dzongkhags as envisaged within the DM act of 2013. They could support the coordination and management of information during disaster response situations, and thus they are fundamental cornerstones for effective disaster management (Royal Audit Authority, 2016). Furthermore, current Dzongkhag response teams may be hindered by irregularities in the provisions of trainings and equipment, and the storage of available gear was found to be inconsistent in 2016 leading to equipment in poor condition (Royal Audit Authority, 2016).

Finally, given Bhutan's unique status as the only carbon negative country in the world, sustaining the economic development without endangering the fragile ecological systems is a mounting challenge in an ever-globalizing world which is built on growth-orientated, extractive industries. The Vision 2020 recognizes the magnitude of these forces seeking to influence the social and economic transformation in Bhutan, and highlights the potential adverse impacts that the country's integration to a globalizing world system may bring, as they may seek to offset the bascule between development and conservation to a direction which may endanger the Bhutanese national identity as protectors and care-takers of their unique setting (Planning Commission, 1999). Development, growth and its associated side-effects (such as urbanization and environmental degradation) must be continuously managed sustainably to avoid succumbing to the pervasive global issues (including pollution, deforestation and massive-scale biodiversity loss). Nature and its treasures are a cornerstone of Bhutanese identity and must be preserved as such alongside development which seeks modern, equitable, and most importantly, happy society for all its citizens.

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