

Disaster Risk Reduction: A Collective Approach from South and Southeast Asia



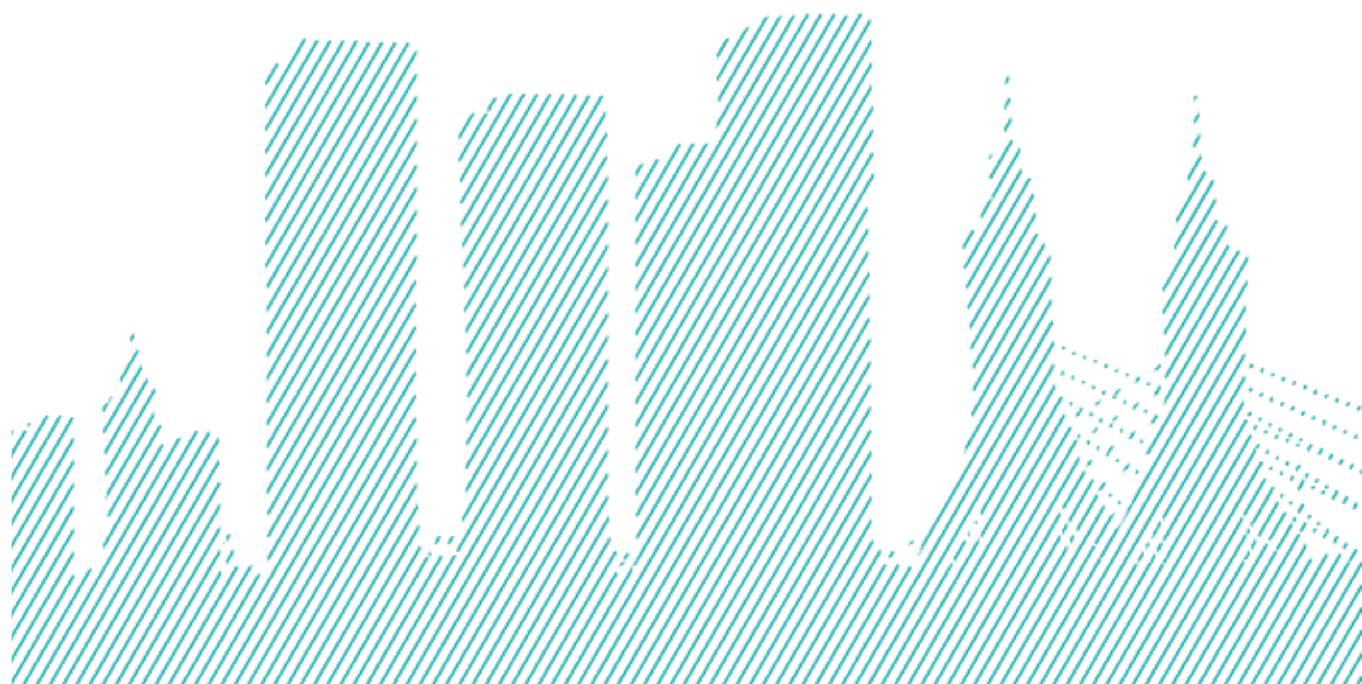
Regional Project Energy Security and
Climate Change Asia-Pacific (RECAP)

CONSORTIUM OF SOUTH ASIAN THINK TANKS

COSATT

BRIDGING POLICY RESEARCH IN SOUTH ASIA

Disaster Risk Reduction: A Collective Approach from South and Southeast Asia



Foreword

Each time a natural disaster causes significant loss of life and property, it gets onto the headline in the international media. Governments scramble to manage the calamity; security forces try to save lives; and reconstruction efforts get slowly underway. The most representative examples will be the 2010 glacial lake outburst flood in Pakistan which displaced thousands of families and cause billions of dollars of economic loss. Similar events will occur more and more often as rising global temperature causes more glaciers being melted. However, as the news recedes in the following weeks and months, people tend to overlook the causes and effects that brought such a catastrophe. Disasters caused by extreme weather — hurricane, floods, wildfires, cyclones, heat-waves, droughts, landslides and storms have not only been increasing year by year in South Asia but are also getting more severe. A significant portion of the GDP of South Asian countries have had to be allocated to manage natural disasters, re-build critical infrastructure and spent to reduce impacts on people's livelihoods.

A historic UN Inter-governmental panel on Climate Change submitted a comprehensive report in August 2021 and alleged human activities as unequivocally causing global temperatures to rise. The report provides new estimates of crossing the global warming level of 1.5 degrees Celsius or even 2 degrees Celsius is foreseeable in the next two decades without urgent reductions in greenhouse emissions. The report said that it is not just about temperature. Climate change will increase global heat. Some areas will witness intense rains and flooding while others will face severe drought. What is even more concerning is that the impact of COVID-19 pandemic has hit all sectors of the South Asian economy and society, and the region as a whole will have to grapple with managing natural disasters with lesser resources than in the past. Thus, the issue of disaster management and disaster response has become a vital part of climate adaptation strategy in South Asia.

Regional Project Energy Security and Climate Change Asia Pacific (RECAP) and the Consortium of South Asian Think-Tanks (COSATT) launched this seminal study on Disaster Risk Reduction in Asia with papers from Bangladesh, Bhutan, India, The Maldives, Nepal, Pakistan, Sri Lanka. In order to consider a collective approach in understanding the challenges faced and lessons learnt, we have a paper from Southeast Asia (Thailand) as well.

Authors have employed analytical treatment and deep scholarship to analyze various forms of disasters witnessed in their respective countries in the recent past and the approaches taken by the government(s). They have also listed structural mechanisms at the central and provincial levels created to deal with disasters which will be useful as we evaluate regional mechanisms that have proven rather ineffectual and reactive due to lack of capacity and current policies not being implemented fully. They suggested that strengthening regional collaboration will effectively enhance the much needed capacity of each country to deal with disaster events, and the region should not hesitate in receiving help from non-governmental participants and external actors. We, KAS-RECAP and COSATT, will continue to delve ourselves in the study and analysis of climate change and disaster management in South Asia, and we hope this publication serve as a signpost as to the importance of good disaster governance and how can South Asia work towards it.

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Introduction



South Asia is a geographically complex region, with the highest mountain of the Himalayas up north and the lowland around the Bay of Bengal down South. Such a profile causes the region to be threatened by all sorts of geological and hydro-meteorological hazards such as floods (including glacial lake outburst floods (GLOFs)), landslides, droughts, cyclones, earthquakes, heat waves, avalanches, and tsunamis, and the region is getting impacted by these events more often and more severely due to climate change. The major disaster events in the region, amongst the others, were: The Indian Ocean Tsunami in 2004, Kashmir Earthquake in 2005, Koshi River Flooding in 2008, the 2010 GLOF in Pakistan, as well as numerous tropical cyclones hitting the coasts of Bangladesh, India, and Thailand each year. It is a region that is highly vulnerable to natural disasters, with Bangladesh being the most vulnerable country in the region and followed by India and Pakistan. These three countries cover the vast majority of South Asia's population and lie in very high-risk zones where seismic and hydro-meteorological hazards are active.

Apart from geographical factor, human factor is another major reason causing South Asia's vulnerability to disaster. The region is home to 1.8 billion people of which 70% of them live in poverty. Such a high population density with high rate of poverty, together with exposed population from fast urbanization and lack of preparedness due to capacity and resource shortage, can be attributed to the vulnerability to disasters. Economic vulnerability analysis shows that India, Pakistan, and Bangladesh exhibit the largest losses because of large exposure to high-level hazards.

In order to adapt to the worsening hydro-meteorological disasters due to climate change, South Asian and Southeast Asian countries like Thailand have each introduced their own national disaster management policy in the past decade. In formulating the policies, they have adopted the Sendai Framework for Disaster Risk Reduction 2015-2030 endorsed by the United Nations

(UN) General Assembly in 2015, with an aim to substantially reduce the human and social impact of disasters around the globe.

Besides establishing national disaster risk reduction (DRR) policies, the South Asian Association for Regional Cooperation (SAARC) member states have signed a SAARC Action Plan on Climate Change that recommends cooperation on climate risk governance. The Action Plan addresses both natural and climate-related disasters, and the SAARC has identified several areas that require attention: climate adaptation and mitigation, transfer of technology, awareness raising and education, management of risks and impacts, and capacity building.

In spite of the attempted efforts, disaster governance in South Asia and Southeast Asia is still at its initial phase as the governments of these nations are starting to pay attention to managing the inevitably more frequent and intense hydro-meteorological disasters. As a result, although the disaster management policies and institutional structures in these regions are sound on paper, there is still much to be desired in practice. This publication analyzes the disaster governance of each South Asian country and Thailand in terms of current policies and institutional structures, as well as offering recommendations in amending the situation and further enhancing disaster resilience.

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Bangladesh

Introduction

Author: Ayreen Khan, *Researcher*

Bangladesh is one of the most vulnerable countries in the world due to climate change. On the fiftieth year of the country's independence in 2021, Bangladesh is classified among the 'Next Eleven Emerging Markets' despite having major challenges on its face like a huge population of 165 million, frequently visiting natural calamities, vulnerability to climate change and lack of big reserves of natural resources. Currently, Bangladesh is the world's seventh fastest growing economy with a GDP growth rate of 8.2 per cent in 2019.¹ Sheikh Hasina's government is determined to eliminate extreme poverty from Bangladesh by 2030 and become a "Developed" country by 2041. The government plans to achieve these goals by opening the country to industrialization. However, industrialization has a negative impact on the environment. Scientists have observed that from the 1800s, since the time of pre-industrialization till now, the world has become 1 degree Celsius warmer. The world is getting hotter at a very fast pace. It is estimated that the temperature of the globe will increase by 1.5 degree Celsius by 2030. This means that we must deal with a fast-changing warmer climate and its adverse effects on a large population.²

Frequent cases of extreme weather conditions are observed all over the world. 2020 will be marked in history not only for the Novel Corona virus attack on the human race but also for being among the three hottest years ever recorded. Australia, Siberia and California suffered record fires. The Australian bushfire that lasted for more than six months, from the beginning of September 2019 till 23 February 2020 killed more than one billion mammals, birds and reptiles, and billions of insects. This bushfire emitted 434 metric tons of carbon dioxide (CO₂). China witnessed the worst drought in Yunnan Province in the last ten years causing seven forest fires and leaving 1.5 million people with shortage of water.³

Floods in Kenya, Uganda, Germany, and China displaced thousands of people and made records of its own kind. Cyclone Amphan hitting India and Bangladesh is considered as the costliest tropical cyclone on record with losses in India of 14 billion U.S. dollars. Heavy rainfall has vastly affected China, Africa, and Bangladesh causing millions of dollars' worth of loss. These impacts are from a 1.1 degree Celsius rise of the temperature from pre-industrial times. A 2 degree Celsius or a 3 degree Celsius rise will be devastating for the world if we do not take necessary measures immediately. Bangladesh is already witnessing extreme climate conditions with frequent floods, storms, cyclones, heavy rain, sea level rise and heat waves. In 2021, Bangladesh recorded the highest temperature in seven years.

The economy of the country gets highly affected by climate change. Over the past 40 years the damage caused by the climate is 12 billion U.S. dollars which is 0.5 per cent to 1 per cent of the Gross Domestic Product (GDP). In 2007, Cyclone Sidr caused damage of 1.7 billion U.S. dollars or about 2.6 per cent of the GDP. In May 2009, cyclone Aila caused damage to assets of 270 million U.S. dollars. These cyclones have left permanent damage in the region. People lack fresh drinking water, and water for irrigation.⁴

Under such critical climatic conditions and having other social and political challenges, Bangladesh managed a positive economic growth rate even during the time of pandemic. This paper endeavors to analyze how Bangladesh is balancing between climate vulnerabilities and economic growth.

THE ECONOMY



The economy of Bangladesh is growing rapidly with a GDP of **\$348 Billion** and they are the second-largest financial hub in South Asia.



It is expected to have a GDP growth rate of **6.8%** in 2021 and **7.2%** in 2022.



The poverty rate in Bangladesh was **20.5%** in 2019, which rose to **35%** in 2020 after the outbreak of pandemic.

Economy of Bangladesh

Bangladesh has a market economy that is rapidly developing. With a Gross Domestic Products (GDP) of 348 billion U.S. dollars and Purchasing Power Parity (PPP) of 860 billion U.S. dollars in 2020 the country is the second largest financial hub in South Asia.⁵ The economy is mainly dependent on the export of ready-made garments, remittances received from migrant laborers abroad and the agricultural sector. The pandemic has affected all the three main sectors of Bangladesh's economy in a major way.

During the first and second year of the pandemic, major apparel brands canceled or delayed orders which put the livelihoods of millions of garment workers at risk. This industry contributes 16 per cent to the country's GDP. Rubana Huq, President of Bangladesh Garment Manufacturers and Exporters Association said that the exports in this sector fell 9.7 per cent in December 2020,⁶ and rose 12.59 per cent in March 2021.⁷ Bangladesh is the eleventh largest remittance economy. About ten million migrant workers together with the exports from the ready-made garment industry have helped reduce poverty in the country. Every 0.1 per cent of district population emigrating will cause poverty to fall by 1.7 per cent.

⁸

Bangladesh is the only economy in the Indian sub-continent to see its GDP grow by 5.2 per cent during the pandemic. It is expected to have a GDP growth rate of 6.8 per cent in 2021 and 7.2 per cent in 2022.⁹ However, many small businesses could not survive in the pandemic. The unemployment rate increased from 4.1 per cent in 2019 to 13 per cent in 2020.¹⁰ The diaspora population is coming back to the country. Poverty rate in Bangladesh was 20.5 per cent in 2019 which rose to 35 per cent in 2020 after the outbreak of the pandemic.¹¹

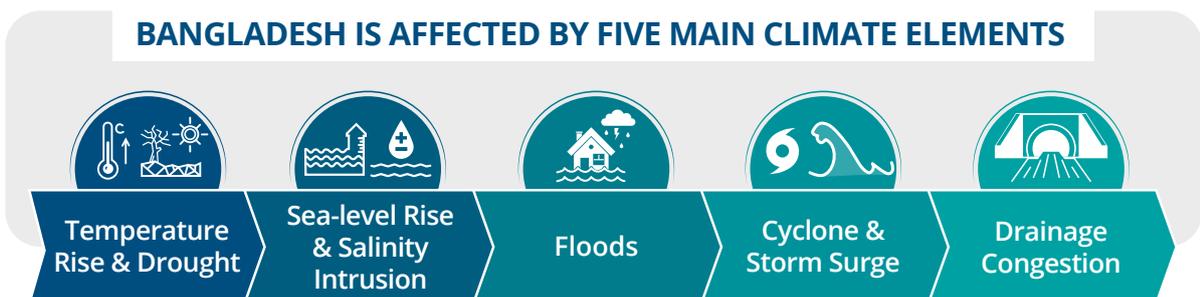
Environmental Condition of Bangladesh

Bangladesh is the world's largest delta, at the junction of three important rivers of South Asia, the Ganges, the Brahmaputra, and the Meghna. The country is crisscrossed by hundreds of rivers, their banks and tributaries. Two out of three people, 110 million, live around the water bodies and are dependent on them for their lives and livelihood.¹² This in itself exposes us to a diverse range of vulnerabilities and natural hazards.

But on a positive note, all the rivers coming from the Himalayan ranges carry silt and make the land of Bangladesh fertile. This small land mass of 147,570 square kilometres houses 160 million people and feeds them with a variety of crops, proteins, vegetables, fruits and herbs. These rivers end at the Bay of Bengal. Bangladesh has the biggest portion of the largest mangrove forest of the world on its southwest side. This forest is a sanctuary of a variety of wildlife and rare species of plants. This forest works as a frontline defender against tidal surges and cyclones. The northwestern part is the food granary that produces various kinds of crops and vegetables for the country. This part of the country is prone to drought during dry seasons and river erosion during monsoons. The northeastern part of the country produces tea for local and global use.

Rivers are the lifelines of Bangladesh. Thus, rivers are the most essential part in any climate discussion. Rivers are important not only for the livelihood of the people but are also essential in maintaining the ecosystem and coexistence with nature. Bangladesh has 54 trans-boundary rivers with India. These rivers carrying freshwater push back the saltwater of the sea from the land. Because of global warming, sea levels are rising. When the rivers get dry or they lack proper flow of water, seawater enters in the mainland.

Two-thirds of Bangladesh is 5 meters above sea level.¹³ This makes the country one of the most vulnerable countries of the world due to climate change. About 19 million people live around the coastal areas. Water in the rivers of Bangladesh comes from melting icecaps in the Himalayas and rain. On one side, there is a higher flow of water in the rivers during monsoons and to the south the sea level is rising. Upper riparian countries are building more dams on international rivers. China has built over 4,800 dams and over 80,000 reservoirs.¹⁴ India has built many dams to divert water from the trans-boundary rivers. When the river is blocked in the upper riparian region the flow is hampered in the lower regions. Thus rivers easily dry out during the dry seasons.



Correlation between Climate Change and Economic Growth in Bangladesh

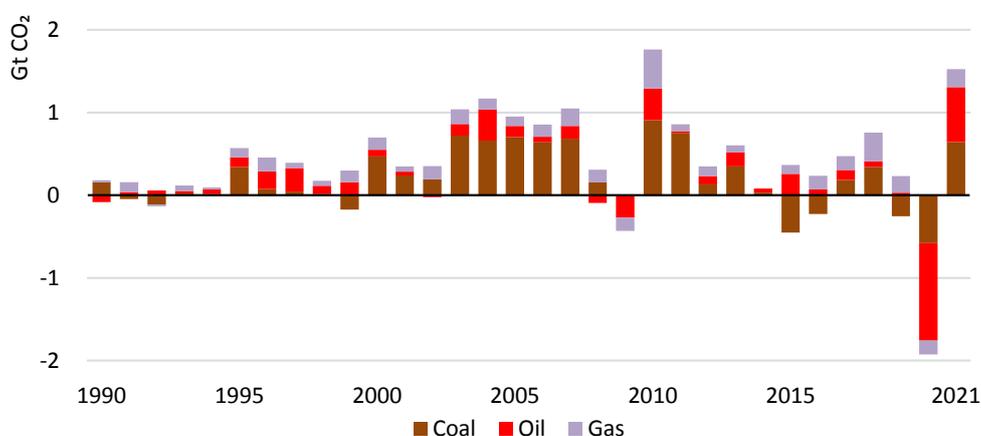
Climate change is considered as the most perilous crisis of our time. Millions of people worldwide have been protesting against governments’ market policies and demanding real action to slow the process of climate change. It is difficult to measure the impact of climate change because it changes over a period of time. But when the changes are visible in the climate, it is already too late to undo anything. We are witnessing this phenomenon worldwide and it is high time that the government becomes serious about this issue.

The world started breaking the records of its own carbon emissions at the time of the industrial revolution. Human choices are the main cause of the increase of CO₂ in the atmosphere. Carbon emissions are largely caused by the burning of fossil fuels like coal and oil to power our homes, factories, and motor vehicles. The population of the world has tripled in the last 70 years from two billion to 6.1 billion. Every year, 77 million people are added to the planet.¹⁵ Governments make policies to support businesses, which lead to more consumption of power and burning of

fossil fuels. A small drop in CO₂ emissions during the pandemic for a year did not have a significant impact. However, a report by the International Energy Agency (IEA) says that the emissions will rise about 5 per cent in 2021 because governments have subsidized the fuel industries and they offer affordable packages to overcome their losses.

One third of the population of Bangladesh is at risk of climate-induced displacement because of rising sea levels. The Global Climate Risk Index lists Bangladesh as seventh among the top ten countries of the world most affected by extreme weather conditions during 2000-2019. Due to the rising sea levels and frequent cyclones, soil and water in the coastal areas are becoming salty. Humans should only consume five grams of salt per day.¹⁶ Excessive consumption of salt may cause cardio-vascular diseases, such as heart diseases, strokes, and high blood pressure. Excessive salt intake can cause hypertension and preeclampsia, which is one of the top causes of maternal death. Drinking water in coastal regions has become so saline that people in these regions get an average of 50-100 per cent of their daily salt intake just from drinking water.¹⁷

Figure 2.1: Change in CO₂ Emissions by Fuel from 1990-2021



IEA. All rights reserved.

Source: IEA (2021)¹⁸

CLIMATE CHANGE AND THE ECONOMY



One-third of the population of Bangladesh is at risk for climate-induced displacement because of the rising sea level.



In the last **35** years, salinity increased in the country by **26%**.



Statistics of affected land area for increasing salinity in Bangladesh:

- o **83.3 million** hectares in 1973
- o **102 million** hectares in 2000
- o **105 million** hectares in 2009



For the last year, the flow of Foreign Direct Investment (FDI) dropped by **11%** with the US being the single highest investor with **20%** of the total FDI inflow in Bangladesh.

A leading English newspaper of Bangladesh, the 'Daily Star,' gives comparative data on affected land area regarding the increasing salinity in Bangladesh which increased from 83.3 million hectares in 1973 to 102 million hectares in 2000 and 105 million hectares in 2009. In the last 35 years, salinity increased in the country by 26 per cent. The same report highlights research findings from the International Centre for Diarrheal Disease Research Bangladesh (ICDDRDB) that has observed an unexpectedly high rate of miscarriage in a small village of Chakaria, near Cox's Bazaar, on the east coast of Bangladesh. A World Bank study says that by 2050 climate change will cause significant changes in river water with salinity in the southwest coastal region during the dry season and increase salinity to 26 per cent. This will not only cause scarcity of drinking water, irrigation water, and health hazards but also will change the courses of aquatic ecosystems. Due to the rise of salinity, about 15,000 to 30,000 people will be internally displaced per year from Chittagong and Khulna districts.¹⁹ These 'climate migrants' will head towards the capital of the country, Dhaka and end up working in the industry and labor-intensive sectors for lower wages and live in the unhealthy and filthy urban slums.

On one side, the remittance earners are returning; ready-made garment industry is recording losses. The lives and livelihood of people have become more difficult. Because of the sea level rise, heavy rain, and river erosion agricultural lands are being damaged and people who are dependent on nature for their livelihood are becoming displaced. The government has worked ahead in mapping the plausible threats facing the economy. To overcome these current challenges, the government is seeking Foreign Direct Investments (FDI). For the last year, the flow of FDI dropped by eleven per cent. However, as Bangladesh manages the pandemic situation well, the economic condition will improve by creating a stable place for investment.

The US is the single highest investor with 20 per cent of the total FDI inflow in Bangladesh. China, Japan, the United Kingdom, Saudi Arabia, and a few other countries are among the top ten investors. The major FDI recipient sectors in Bangladesh are energy and power, textiles, food, banking, leather, services, telecommunications, information and communication technology, trading, engineering, and a few others. Till today, energy and power are the highest recipient among all.²⁰

Conflict between Environmental Justice and Growth

In this interdependent world where on one side Bangladesh is highly vulnerable to climate change, caused by the rich countries, the country is again dependent on the same rich countries for its economic growth. This puts Bangladesh in a difficult position to seek environmental justice against polluting nations. Global leaders are more interested in making economies thrive. China is one of the major financial investors in Bangladesh. As part of China's Belt and Road Initiative (BRI) China will invest 21 billion U.S. dollars in upgrading infrastructure especially in transport, power and the IT sector. Bangladesh's government is currently implementing nine development projects with Chinese loans of 7.1 billion U.S. dollars.²¹

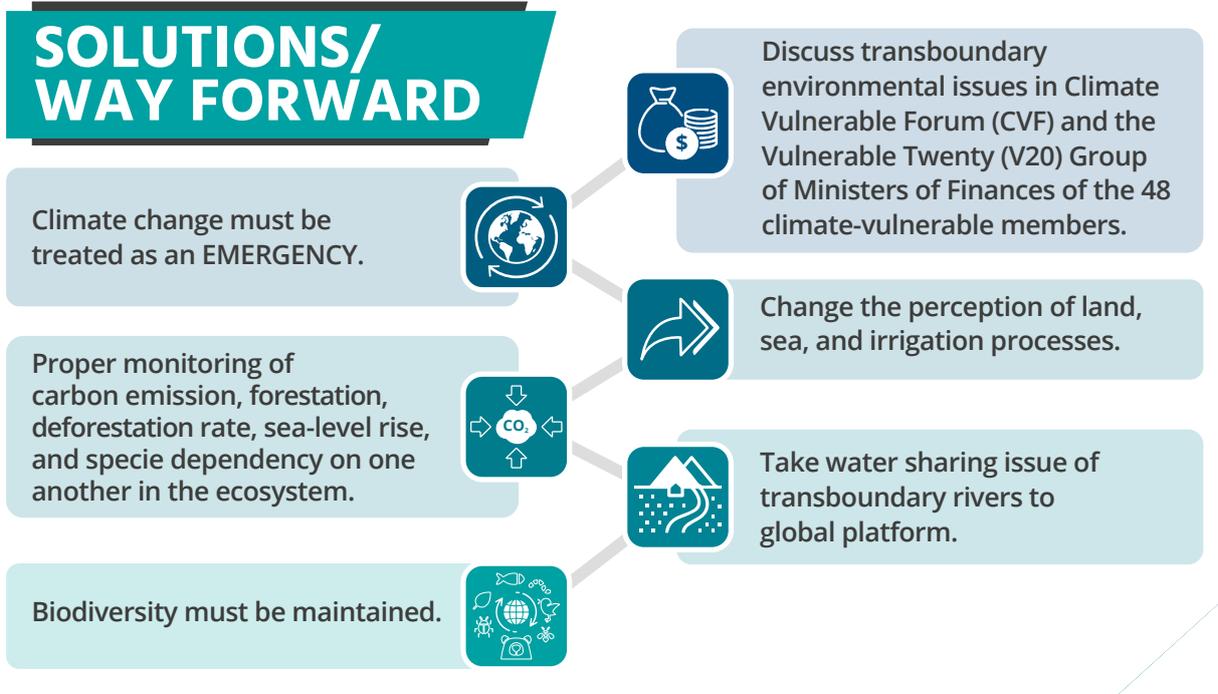
U.S. companies are the largest foreign investors in Bangladesh, with 3.4 billion U.S. dollars in investments as of 2018, which accounts for 20 per cent of total FDI stock. The vast majority of these investments are in the oil and gas, banking and insurance, and power generation sectors. At present Bangladesh receives 3.11 billion U.S. dollars in investment from India which is likely to be nine billion U.S. dollars in the near future.²²

nations. Bangladesh can impose conditions to make the polluter countries compensate. But that will jeopardize the trading deals. Bangladesh can also take climate and water issues to the global platform, but that might hamper political relations. Under such circumstances, what choice does Bangladesh have?

THE CONFLICT BETWEEN ENVIRONMENTAL JUSTICE & GROWTH

The actions of Major investing countries are making Bangladesh vulnerable to climate change.

The global market is highly competitive. There are limited bargaining options and opportunities for the smaller countries. Many other nations are offering what Bangladesh can offer, like human resources with certain skills required to run factories. The graduation from a least developed nation to a Middle Income Economy will eventually take away some benefits. On the other hand, the country is extremely vulnerable to climate change due to the actions of its major investing



Way Forward

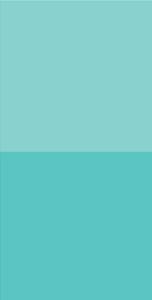
Climate change needs to be treated as an emergency the same way that the pandemic is treated. Governments of all countries should provide citizens with real data. Carbon emission, forestation, deforestation rate, sea level rise, and the dependency of all species on one another in the ecosystem should be monitored, measured and shared openly with everyone. Environmental issues should be kept separate from local and global politics and treated with utmost sincerity and emergency.

President Biden hosted the Leaders’ Summit on Climate within 100 days of taking office to show his commitment to tackling the climate crisis. This Summit that took place in April 2021 was the largest virtual gathering of world leaders, which brought together the world’s 17 biggest economies, greenhouse gas polluters as well as leaders from most climate vulnerable countries. The United Kingdom will host the 26th UN Climate Change Conference (COP26) in Glasgow on 31 October to

12 November 2021. This is a significant gathering of world leaders that is aiming to strictly control the temperature by cutting carbon emissions. To keep the global temperature rise within 1.5 degree Celsius, it is important to maintain the cycle of dependency in nature, to maintain biodiversity. To do this, we need to change the way we look after our lands and seas and irrigation processes. We need to change our theories of progress and prosperity.

Bangladesh is currently chairing the Climate Vulnerable Forum (CVF) and the Vulnerable Twenty (V20) Group of Ministers of Finance of the 48 climate vulnerable states. This is a good time to take the issue of water sharing of the trans-boundary rivers to a global platform. International organizations should be more representative of the vulnerable states in dealing with climate crisis.

Considering the current state of the environment, in terms of climate and species, it is important to help communities connect with each other and share their knowledge and best practices. Indigenous



communities have traditional knowledge of living with nature. Such knowledge should be preserved and used to protect and conserve nature.

To make electricity available for all by 2021, the government of Bangladesh has formulated many short, medium and long-term power generation plans using gas, coal, dual fuel, nuclear and renewable energy resources. To meet the internal energy requirements, the government has initiated many power plant projects in the southwestern part of the country which houses the largest mangrove forest, a UNESCO World Heritage Site and an area massively vulnerable to sea level rise and other environmental attacks. On 16 June 2021, UNESCO declared Sunderbans as a “World Heritage in Danger.” Sunderbans, a forest that has outstanding global value, is threatened by large development projects like a coal-based power plant in Rampal, Taltali and Kalapara power plants and other industrial projects. These projects are expected to damage the forest and will have an adverse impact on the ecosystem of the area. When the whole world is talking about limiting carbon emissions and prioritizing the environment, Bangladesh being one of the most vulnerable countries, is building a coal-based power plant near a significant and the only living forest. This puts us in a critical position both globally and at home when the major economies are declaring to close their coal-based power plants by 2040.

Even by emitting only 0.35 per cent of global greenhouse gas, we are facing a huge impact due to climate change. The country has achieved outstanding success in adaptation especially in the agricultural sector. Bangladesh now grows seeds that can survive under water for three months. Other hybrid seeds have also been developed to maximize food production. However, due to the extreme weather conditions caused by global warming the country is coming under attack by nature more frequently and in various forms. The country has declared its first ever techno-economic mega project, Bangladesh Delta Plan 2100 to better manage its water, environment and economy. This project aims to eliminate extreme poverty and unemployment, and sustain GDP growth above 8 per cent until 2041. This project also plans to reduce

urban migration by 60 per cent, displacement of coastal people due to climate change by 50 per cent, and displacement around river areas by 50 per cent.

At the same time, the government needs to promote green financing, foster green banking and establish dedicated funds. But no country can tackle climate change alone. The whole world, neighboring countries, rich economies and international organizations should provide monetary, political, business and technological support to help Bangladesh make peace with nature.



Bhutan



Introduction

Author: Sonam Choden Wangdi, *Economist, Thimpu*

The Kingdom of Bhutan, nestled in the Eastern Himalayas, spans 14,824 square meters. The northern parts of the country arise from the Himalayas, whereas the country's southern parts end in the subtropical plains. Bhutan's highest peak, the Gangkhar Puensum, has an elevation of 7,570 meters. Bhutan's development is based on the four pillars of Gross National Happiness, namely (i) cultural preservation, (ii) environmental conservation, (iii) good governance, and (iv) sustainable socio-economic development.²³ Article 5.3 of the Constitution of Bhutan mentions that the country maintains a forest cover of 60 per cent. In 2016, national forest coverage was recorded at 71 per cent.²⁴ Bhutan maintains its status as the world's only carbon negative country in the world, with forest sequestration at 9.38 million gigatons of CO₂e.²⁵ The country has 20 districts, locally known as dzongkhags, which are further divided into sub-districts known as gewogs.

A CARBON NEGATIVE STORY

NATURAL DISASTER AND CLIMATE CHANGE



Climate models have predicted that by the end of the century, Bhutan will experience higher average temperatures ranging from **0.8 °C to 3.2 °C**.



Bhutan's geographic disposition makes it vulnerable to hydro-meteorological disasters.



Disasters include

- Landslides
- Flash-floods
- Glacial lake outburst floods (GLOF)
- Windstorms



Bhutan maintains its status as the world only carbon negative country in the world, with forest sequestration at **9.38 million** gigatons of CO₂.

Natural Disasters that Arise from Climate Change

Bhutan is already facing the impacts of climate change through increasing incidences of declining water availability and decreasing snow cover.²⁶ Climate models have predicted that by the end of the century, Bhutan will experience higher average temperatures ranging from 0.8°C to 3.2°C, which will be more prevalent in the spring and winter seasons.²⁷

Bhutan's geographic disposition makes it vulnerable to natural disasters that arise due to climate change. These disasters include

- i) landslides,
- ii) flash floods,
- iii) glacial lake outburst floods (GLOFs), and
- iv) windstorms (most recent)

that are predominant in March and April. As these are the most predominant natural disasters that occur due to climate change, these four disasters are analyzed in this study.

Landslides

A landslide is defined as the “natural phenomenon of mountain slope deformation.”²⁸ The Department of Disaster Management (DDM) reports in 2015 and 2016 identified earthquakes and heavy rainfalls as triggers for landslides.²⁹ In 2018, the Department of Geology and Mines identified areas prone to landslides, after which mitigation measures based on the type and magnitude of landslide were implemented. Mitigation measures included the construction of physical defenses such as drains, piles, retaining basins, and walls. Adaptation measures recommended in the Third National Communication were the use of bioengineering, such as planting suitable trees and plants in landslide-prone zones.³⁰

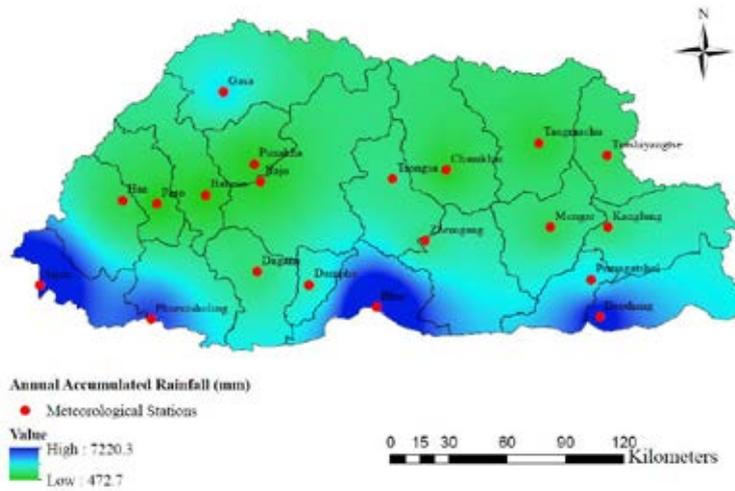
Flash Floods

Flash floods are a consequence of higher rainfall.³¹ In 2020, Bhutan’s annual rainfall (average area) was 2,076.7 mm, which was normal to slightly above average rainfall relative to historical trends.³² In Figure 3.1, it can be noted that the southern parts of the country experience the highest rainfall relative to other parts of the country. This means that these areas were more vulnerable to flash floods.

Glacier Lakes Outburst Floods

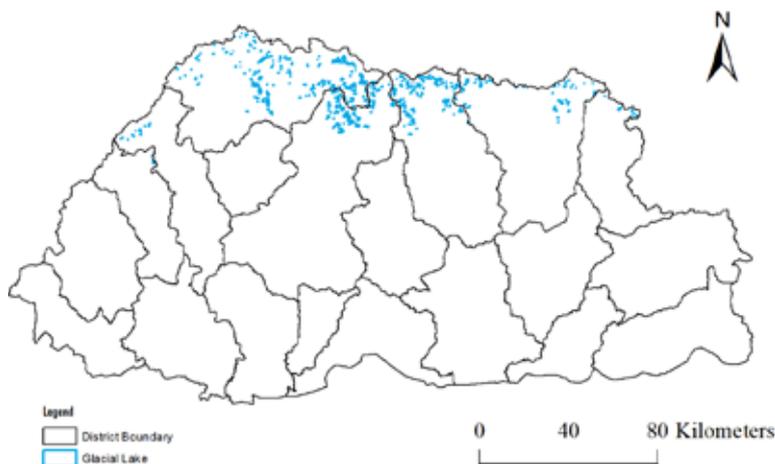
Based on the Bhutan Glacial Lake Inventory 2021, 567 glacial lakes were recorded in four river basins in Bhutan.³³ Glacial lakes accounted for 19.03 per cent of total water bodies and account for 0.14 per cent of total land area.³⁴ The first study³⁵ of potentially dangerous glacier lakes that was conducted in 2001 identified 25 glacier lakes³⁶ as potentially dangerous. A re-assessment of potentially dangerous glacial lakes was conducted in 2019, and 17 glacier lakes were deemed potentially dangerous.³⁷ However, a limitation of this study was that not all lakes considered in the 2001 study were studied due to the lakes being remotely located.

Figure 3.1: Spatial Distribution of Rainfall in 2020



Source: WCD NCHM, Royal Government of Bhutan(2021)³²

Figure 3.2: GLOFs in Bhutan



Source: Cryosphere Services Division, NCHM (2021)³³

Windstorms

Windstorms have also been a common phenomenon in the kingdom and are most prevalent in March and April. While windstorms have damaged crops, property, and infrastructure, the most notable impact of windstorms is the damage to roofs of houses in rural areas. The National Center for Hydrology and Meteorology (NCHM) investigated whether the cause of the damage to roofing in rural areas was due to higher wind speeds in rural areas relative to urban areas. The results of their investigation indicated that wind-speeds were the same in both rural and urban areas, making poor roofing techniques in rural areas the cause of roofs being damaged during windstorms.

Past National Disasters that Occurred Due to Climate Change

To date, Bhutan has categorized GLOF events into two timeframes. The first timeframe is GLOF events that occurred before 1994. There were ten recorded GLOF events before 1994.

Table 3.1 outlines the recent GLOF events from 1994 to date, during which the country experienced four GLOFs.

Table 3.2 outlines the occurrence of the four natural disasters that have taken place in the last 14 years (2006–2019). These disasters affected 3,185 people and 6,212 houses, and resulted in 26 deaths. Windstorms have had the most significant impact on the total damage count, followed by flash floods, landslides, and GLOF.

Table 3.3 outlines the aggregate economic loss caused by natural disasters from 2006–2019. Based on Table 3.3, flash floods have resulted in the most significant aggregate economic loss caused, relative to the other three disasters. The total economic loss from flash floods amounted to Nu. 607.97 million, followed by landslides which accounted for economic damage worth Nu. 127.75, windstorms accounted for losses worth Nu. 34.25 million, and economic losses from GLOFs accounted for Nu. 0.68 million.

Table 3.1: Recent GLOF Occurrences in Bhutan from 1994 to Date

Sl. No.	Events	Date of occurrence
1	Luggye GLOF	7 October 1994
2	Tshojo GLOF from Tshojo Glacier in the Phochhu Sub-basin.	29 April 2009
3	Lemthang Tsho GLOF, Headwater of Mo Chhu, Laya	28 June 2015
4	Thorthormi Subsidiary-II GLOF.	20 June 2019

Source: Cryosphere Services Division, National Center for Hydrology and Meteorology. Royal Government of Bhutan.

Table 3.2: Consolidated Destruction Caused by Natural Disaster in Numbers (2006–2019)

Disaster	Result of Disaster	Total Number Affected by Disaster
Flash Floods	Houses Affected	823
	People Affected	586
	People Missing	4
	Deaths	4
	Health Facilities Damaged	5
	Educational Facilities Damaged	8
	Other Critical Infrastructure Damaged (Airports, bridges, government buildings, fire stations)	78
Windstorms	Houses Affected	5,018
	People Affected	2,157
	People Missing	1
	Deaths	7
	Health Facilities Damaged	20
	Educational Facilities Damaged	54
	Other Critical Infrastructure Damaged (Airports, bridges, government buildings, fire stations)	59
Landslides	Houses Affected	366
	People Affected	437
	People Missing	2
	Deaths	15
	Health Facilities Damaged	4
	Educational Facilities Damaged	9
	Other Critical Infrastructure Damaged (Airports, bridges, government buildings, fire stations)	50
GLOF	Houses Affected	5
	People Affected	35
	Other Critical Infrastructure Damaged (Airports, bridges, government buildings, fire stations)	6

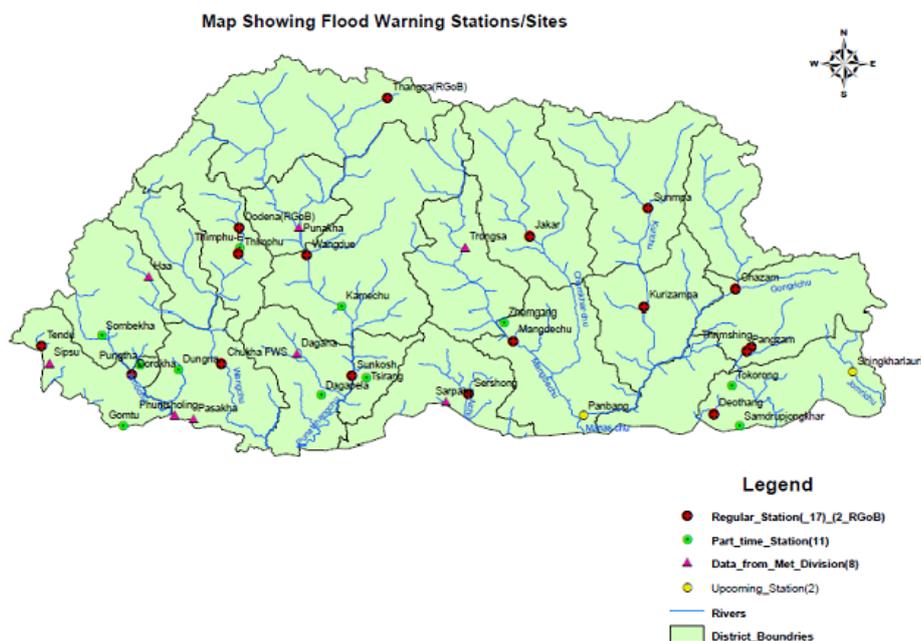
Source: Department of Disaster Management, Ministry of Home and Cultural Affairs, Royal Government of Bhutan.

Table 3.3: Aggregate Economic Loss Caused by Disaster (2006–2019)

Disaster	Economic Loss Caused by Disaster	Monetary Loss (in millions of Nu.)
Flash Floods	Agricultural Loss	11.87
	Economic Loss due to Damaged/Destroyed Productive Assets (Hotels, hostels, warehouses, offices, etc.)	294.28
	Economic Loss due to Damaged/Destroyed Critical Infrastructures (Health, schools, airports, etc.)	301.82
Windstorms	Agricultural Loss	12.35
	Economic Loss due to Damaged/Destroyed Productive Assets (Hotels, hostels, warehouses, offices, etc.)	11.15
	Economic Loss due to Damaged/Destroyed Critical Infrastructures (Health, schools, airports, etc.)	4.23
	Economic Loss due to Damaged/Destroyed Cultural Heritage	6.51
Landslides	Agricultural Loss	3.07
	Economic Loss due to Damaged/Destroyed Productive Assets (Hotels, hostels, warehouses, offices, etc.)	2.64
	Economic Loss due to Damaged/Destroyed Critical Infrastructures (Health, schools, airports, etc.)	120.07
	Economic Loss due to Damaged/Destroyed Cultural Heritage	1.97
GLOF	Agricultural Loss	0.68

Source: Department of Disaster Management, Ministry of Home and Cultural Affairs, Royal Government of Bhutan.

Figure 3.3: EWSs for Flood Warning Stations in Bhutan

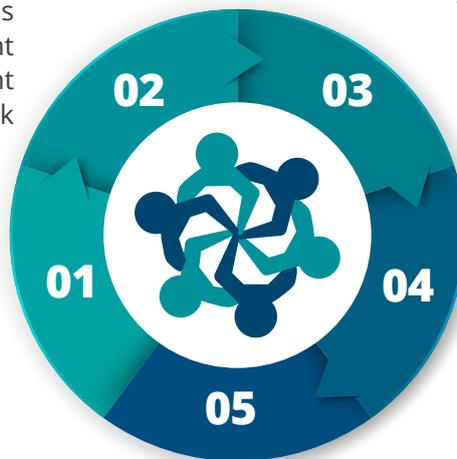


Source: National Center for Hydrology and Meteorology. Royal Government of Bhutan.

DISASTER MANAGEMENT AND CLIMATE CHANGE REGULATIONS

The Rules and Regulations for Disaster Management 2014 - disaster management governance framework

The **Disaster Management Act of Bhutan 2013** (DMA) establishes and strengthens institutional capacity for disaster management



The Local Government Rules and Regulations 2012 (LGRR) - Local operational disaster management

The **Climate Change Policy of the Kingdom of Bhutan 2020** (CCP) - climate mitigation and adaptation policy

The **National Disaster Risk Management Framework 2006** outlines the situational analysis of disaster management, the disaster management framework, and the implementing agencies

Relevant Regulations on Disaster Management and Climate Change

The Disaster Management Act of Bhutan 2013 (DMA) establishes and strengthens institutional capacity for disaster management. It outlines the National Disaster Management Authority, the Dzongkhag-level committees, the inter-ministerial task force, the secretariat of national disaster management authorities, overall disaster management and contingency plan, financial arrangements, classification of disasters, relief assistance and compensation, and offenses and penalties, among other topics.

The Rules and Regulations for Disaster Management 2014 encompasses the disaster management institutions, governance, critical disaster management facilities, emergency operation centers, early warning systems, and search and rescue team, among others.

The National Disaster Risk Management Framework 2006 outlines the situational analysis of disaster management, the disaster management framework, and the implementing agencies.

The Local Government Rules and Regulations 2012 (LGRR) outlines rules for budgeting, finances, tax, revenue, land management, obligations, policies, and procedures, among others that the Local Government Act 2009 outlines. Section 449 of the LGRR gives dzongkhags the authority to take action in accordance with the laws of Bhutan at times of natural disasters and emergencies.³⁸

The Climate Change Policy of the Kingdom of Bhutan 2020 (CCP) outlines actions required to mitigate emissions, ensure adaptation to climate change impacts, ensure adequate support measures, and promote engagement among stakeholders.³⁹ The CCP has prioritized responding to climate-induced disasters and taking local actions on climate change.

Frameworks and Agencies Managing Natural Disasters and Climate Change

National Centre for Hydrology and Meteorology

The NCHM's mandate is to provide scientific and technical services relating to "the cryosphere, climatology, hydrology, meteorology and water resources to ensure the safety, socio-economic wellbeing of society and to support national and international needs."⁴⁰ Functions of the NCHM relevant to this study include: study of glacier lakes, assessment of water resources, hydrological data management, forecasting, disseminating hydrological data and information, issuing early warning services related to floods and GLOFs, provision of severe weather warnings, meteorological data management, and climate change information services.⁴¹

The Early Warning System (EWS) is used for tracking floods and GLOFs. Three out of five river basins in Bhutan have early warning systems. The three river basins with a fully functional EWS installed and in use are

- i) Punatsangchhu,
- ii) Maangdechhu, and
- iii) Chamkharchhu.

Punatsangchhu is the only basin with sensors in its glacier lakes, allowing the monitoring team to differentiate between a GLOF and a flash flood. The other two basins do not have sensors in the lake, which results in a lack of ability for the monitoring team to differentiate a GLOF from a flash flood and vice-versa. Punatsangchhu was prioritized as it has the most significant number of glacier lakes relative to Maangdechhu and Chamkharchhu basins.

The United Nations Office for Disaster Risk Reduction defines an EWS as "An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enable individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events."⁴²

An EWS has four main components:

- i) Hazards, whereby disaster risk knowledge is based on the systematic collection of data such as water levels at different points of the river, flood hazard assessments, and various other disaster risk assessments.
- ii) Monitoring instruments which include detecting, monitoring, and forecasting disasters and potential consequences.
- iii) Communication houses that disseminate data through official sources containing accurate, actionable, authoritative, and timely warnings on the likelihood of disaster occurrence and impact.
- iv) Search and rescue, which is overall preparedness to respond to the warnings received.

The Amochhu basin has an interim EWS which only consists of communication houses upstream that notify downstream settlements in the event of a flood. The shortcoming of this interim EWS is that it is labor intensive as it requires 24-hour surveillance for it to be fully effective. There are plans to install an EWS in the Amochhu and the Wangchhu basins by the end of the 12th Five-Year-Plan (FYP), 2023.

Windstorms are monitored by the NCHM based on wind speed and through the global wind system that tracks the location of monsoons and can make predictions up to 72 hours ahead. It should be noted that the accuracy of predicting windstorms is only about 30–40 per cent.

The DDM drafts disaster contingency plans based on dzongkhag levels. All dzongkhags have response teams equipped with essential equipment and have been trained in instant response to disasters.

Disaster Management

Bhutan uses a decentralized approach to managing disaster management. The Dzongdas⁴³ of the 20 dzongkhags are responsible for managing their disaster risk management for their respective dzongkhag. This includes building protective structures such as mitigatory flood structures, advising local populations living close to rivers banks on evacuation procedures and processes, and rebuilding and repairing structures damaged in a disaster. Individual dzongkhags are also required to send their budgets for disaster management to the Ministry of Finance to receive funding.

The DMA is the legislative act governing disaster management in Bhutan. Article 77 of the DMA mandates every dzongkhag in coordination with the Dzongkhag Disaster Management Committee and other relevant agencies to develop Dzongkhag Disaster Management Plans (DDMP) tailored to every individual dzongkhag's needs. The DDMP must have linkages to the National Key Result Area (NKRA) outlined in the 12th FYP. NKRA 6 of the 12th FYP refers to carbon-neutral developmental pathways and building capacity to respond, mitigate and adapt to climate change, and build resilience to disaster impacts.⁴⁴

The DDMP is mandated to seek professional inputs from relevant agencies for risk assessment procedures. For instance, if the DDMP includes building flood mitigation measures for a river prone to flooding in the monsoon season, the Flood Engineering and Management Division (FEMD)

from the Ministry of Works and Human Settlement is contacted. The FEMD visits the site and assesses potential structures and accounts for whether the measure is a short-term or long-term measure. The design, drawing, estimation, and preparation of the project details are drafted and delivered to the dzongkhag that made the request.⁴⁵ The dzongkhag is then responsible for finding contractors to build the mitigation flood structure and also has to monitor the structure after the construction.

As Bhutan uses Community-based Disaster Risk Management, dzongkhags are also responsible for carrying out: (i) hazard, (ii) vulnerability, and (iii) capacity assessments in their overall risk assessments at dzongkhag level.⁴⁶ The hazard assessment must include a Hazard Map with the areas highly susceptible to hazards based on historical data, prioritization of hazards based on past occurrence, and the overall impact. The vulnerability assessment accounts for the conditions that increase vulnerabilities, such as environmental and organizational conditions. Lastly, capacity assessment is based on the findings of the hazard and vulnerability assessments whereby the disaster mitigation and overall preparedness of every dzongkhag are assessed in terms of (a) making an inventory of all resources available for disaster prevention, preparedness, and mitigatory measures, (b) documenting indigenous techniques that have been useful in reducing hazard-prone populations and infrastructure, and (c) documenting key challenges relating to awareness creation, training, and capacity building for all stakeholders within the community.

DISASTER MANAGEMENT



Bhutan uses a decentralized approach to managing disaster management.



The Dzongdas of the 20 dzongkhags are responsible for managing their disaster risk management.



Bhutan also uses Community Based Disaster Risk Management to manage its disaster risk.



Disaster risk management includes:

Building protective structures.



Educating local populations living close to river banks on evacuation.



Rebuilding and repairing structures damaged in a disaster.

Climate Change

The National Environment Commission (NEC) is the central agency responsible for all environmental matters, including policies related to climate change and water management, among other matters. The NEC is responsible for the formulation and regulation of policies relating to climate change. This includes formulating the National Adaptation Plans and the National Adaptation Programme of Action (NAPA), among other programs to combat the adverse effects such as increasing incidences of floods, GLOFs, and landslides as well as mitigation measures to transition to low-carbon development strategies.

The Way Forward

Based on this assessment, the country has made commendable progress in implementing EWSs and overall readiness in terms of disasters. Bhutan has been successful in rebuilding and recovering from disasters under the leadership and benevolence of His Majesty the King. Bhutan had prioritized disaster management under NAPA II project to improve the weather forecasting system, landslide management, and flood prevention through pilot schemes in critical areas, installing EWSs, and GLOF hazard zoning.⁴⁷

Recommendations to further improve resilience to natural disasters arising from climate change:

- i) Develop a Blueprint for Surface and Underground Water Availability:** While Bhutan has a good inventory of river water availability, no study has been conducted on mid-surface and underground water availability. Water inventory assessments for surface and underground water availability should be conducted. Additionally, assessments on the drying of water sources such as springs should also be conducted.
- ii) Install EWSs in All River Basins:** While Bhutan has installed EWSs in three river basins, EWS installation in the other two river basins should be prioritized to safeguard against GLOFs and flash floods. Additionally, all basins should move from manual systems to fully automated systems. As automated EWSs utilize satellite imagery, the government should continue funding these systems even after the funding for these projects ends. External sources currently fund these projects.
- iii) Formulate a Hydro Meteorology Policy:** As the NCHM is a young organization established in 2016, there is a need to formulate a hydrometeorology policy to clarify the current workings and responsibilities of the NCHM.

- iv) **Further Study All Hlacier Lakes in Bhutan:** As the NCHM stated that their updated inventory of potentially dangerous lakes in 2019 did not include all glacier lakes in Bhutan due to some of the lakes being remotely located, the NCHM should continue assessments of all glacier lakes to safeguard against GLOFs.
- v) **Improve Government Outreach Programs:** The government should employ a nationwide initiative to strengthen the roofing of rural households as a preventative measure against windstorms. Local governments should improve their outreach and awareness protocols regarding response, evacuation, and other disaster response protocols for their local communities. Local governments should ensure that the local communities are aware of the sirens of the EWS signal at times of floods and GLOFs and should be aware of the evacuation routes and locations. Based on past experiences, adequate budgets should be kept aside for recovery and rebuilding after disasters.

Conclusion

With its development philosophy of GNH, Bhutan has been one of the most successful countries in South Asia to mainstream climate change and disaster management, among others, in its development planning process. The outcome is reflected as the country has the lowest casualties and damage from natural disasters in the region. These efforts have ensured that the country has prioritized the health, safety, and well-being of its people.

RECOMMENDATIONS



Develop a blueprint for surface & underground water availability.



Installation of Early Warning System (EWS) in all river basins.



Formulation of hydro-meteorological disaster management policies



Improvement of government outreach programs.



More studies on glacial lakes in Bhutan.

Abbreviations	
CCP	Climate Change Policy of the Kingdom of Bhutan 2020
DDM	Department of Disaster Management
DDMP	Dzongkhag Disaster Management Plans
DMA	Disaster Management Act of 2013
EWS	Early Warning System
FEMD	Flood Engineering and Management Division
FYP	Five-Year-Plan
GLOF/ GLOFs	Glacial Lake Outburst Floods
GNH	Gross National Happiness
LGGR	Local Government Rules and Regulations 2012
NAPA	National Adaptation Programme of Action
NCHM	National Center for Hydrology and Meteorology
NEC	National Environment Commission
NKRA	National Key Result Area
Nu.	Bhutanese Ngultrum



India



Introduction

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Given the complex geomorphic profile, India experiences a wide range of natural disasters, from hydro-meteorological threats such as flooding, cyclones, droughts, heat-waves, landslides, to other hazards like wildfires, earthquakes, and epidemics. Furthermore, some disasters originate from anthropogenic sources. As per the Ministry of Home Affairs, Government of India data:

About 58.6 per cent of the landmass of India is prone to earthquakes of moderate to very high intensity. An area over 40 million hectare (twelve per cent of land) is prone to floods. Out of the 7,516 kilometers long coastline, close to 5,700 kilometers is prone to cyclone and tsunamis. About 68 per cent of cultivable land is vulnerable to drought. About 15 per cent of our country covering over 0.49 million square kilometres is prone to landslides. The Himalayan and Trans Himalayan mountains are susceptible to avalanches.⁴⁸



Heatwaves



Cyclones



Flooding

Due to complex geomorphic profile, India experiences a wide range of natural disasters, especially hydro-meteorological threats.

Climate change increases the frequency of these hydro-meteorological threats.

Besides, around 19 states and union territories have mountainous regions with 65,000 villages that are prone to landslides.⁴⁹ Above all, India is vulnerable to challenges emanating from epidemics, pollution, and industrial accidents. Therefore, it witnesses an average of ten to twenty major disasters⁵⁰ each year. It is the fourth amongst the ten most-affected countries from the human impact point of

view with 483 deaths. India also stands fifth on the list of people (4.3 million) affected by disasters.⁵¹

These disasters have economic, social, and health impacts. Since the country has a population of 1.3 billion and limited social and economic infrastructure, reducing the risks of disasters has remained challenging. Disaster risks are further compounded by increasing vulnerabilities related to a changing demography due to migration and socio-economic conditions, unplanned urbanization, and development within high-risk zones, environmental degradation, and climate change.⁵²

Climate change impacts have doubled the risks, especially with an increase in the frequency of hydro-meteorological hazards. Several research studies have found that these natural disasters might worsen in the future. The Global Climate Risk Index (CRI) has placed India as 14th amongst the 15 most-affected countries by climate change, which is largely as a result of the country's high reliance on environmentally sensitive industries, exposure to hydro-meteorological hazards, high prevalence of poverty, and lack of local adaptive capacities.⁵³

In addition, some of these disasters have trans-border implications. For example, flash floods, glacier outbursts, and landslides in Nepal inundate a large portion of the UP and Bihar states of India. Tsunamis in the Indian Ocean affect equally the sea coasts of Sri Lanka, the Maldives, and India. The landfall of a tropical cyclone in Bangladesh brings devastating destruction in the eastern part of India. Locusts breeding in Pakistan destroy crops and plants in north-western India. While the magnitude of these disasters is similar in the affected regions, their preparedness, management, and responses do not follow similar lines in all regions. Therefore, no single country can mitigate these challenges alone. In that case, sharing data, disaster management experience, and framing a common policy will help to reduce disaster risks in South Asia in general and individual countries in particular.

Disaster Governance in India

The devastating consequences of three natural disasters — the 1999 Odisha super cyclone, 2001 Kutch earthquake in Gujarat, and 2004 Tsunami in Tamil Nadu — forced India to “shift from the relief-centric approach of the past to a proactive, holistic and integrated approach for disaster risk reduction (DRR) by way of strengthening disaster preparedness, mitigation and emergency response.”⁵⁴

Under the Indian federal structure, the law and order issues and public security come under the State list. Therefore, the primary responsibility for disaster management including preparedness, mitigation, and emergency responses, rests with the provincial government.⁵⁵ The Central/Union government assists the provincial governments in providing logistic and financial support in the event of a natural disaster.

In order to strengthen the existing disaster management system, the Union government enacted the Disaster Management (DM) Act, 2005. The Act established three tiers of institutions: the National Disaster Management Authority (NDMA) at the Union level with the Prime Minister as Chairperson, the State Disaster Management Authority (SDMA) with the Chief Minister as Chairperson, and the District Disaster Management Authority (DDMA) with the District Magistrate as

Chairperson. The NDMA acts as the nodal agency in terms of coordination with the SDMA. The Union Government also established the National Institute of Disaster Management (NIDM) which is mandated to offer training programs, conduct courses and research, and issue publications.

Given the increase in frequency of disasters due to climate change and to keep up with India’s regional and global commitments to reduce climate change, the union government expanded the scope of the Disaster Management Act 2005 by introducing the 2009 National Policy on Disaster Management (NPDM). Under the NPDM, various programs and projects are being implemented both for preventive and resilience purposes.

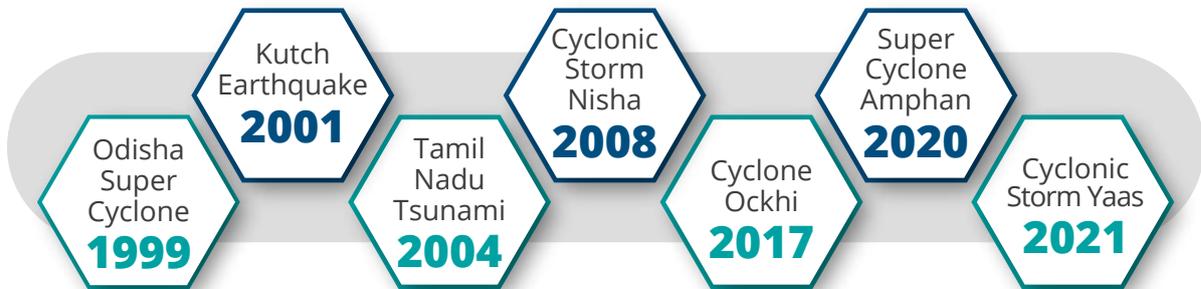
Disaster Management

India inherited the British Administration model of relief commissioner both at the union and provincial level for emergencies. The role of these commissioners was limited to distributing relief material and compensation in the affected areas. The policy was mostly reactive and post-incident oriented. In the early 1990s, India institutionalized the disaster relief program by setting up a disaster management cell under the Ministry of Agriculture at the Union level as per the UN declaration of 1990 as International Decade for Natural Disaster Reduction (IDNDR).⁵⁶

- The primary responsibility for disaster management including preparedness, mitigation, and emergency responses, rests with the provincial government with support from the Central/Union government.
- The Disaster Management Act established three -tier institutions:
 - » National Disaster Management Authority
 - » State Disaster Management Authority
 - » District Disaster Management Authority



MAJOR NATURAL DISASTERS IN RECENT TIMES



Perhaps the new structure was not sufficient to mitigate the increasing severity and frequency of natural disasters. Three major natural disasters — the 1999 Odisha super cyclone, 2001 Gujarat earthquake, and 2004 Tsunami — compelled Indian authorities to change from being reactive to pro-active. In this regard, to prevent further damage in natural disasters, the Union government enacted a Disaster Management Act in 2005.

As mentioned earlier, the act provides a three-tier robust institutional mechanism to address all types of disasters by having an early warning system, forecasting, and monitoring. The act also authorizes the Union government to station the National Disaster Response Force (NDRF), which consists of eight standard battalions (two more battalions are proposed) of Central Paramilitary Forces in different parts of the country to extend support to the affected States. These stations are identified as per the vulnerability of each region. The NDRF personnel are trained in various types of natural, manmade, and non-natural disasters. Their major task is to extend manpower and technical support to the local administration through the provincial administration in pre-disaster evacuation activities and rescue and rehabilitation work in the post-disaster period.⁵⁷

Given the institutional framework, application of modern technology, special disaster mitigation/resilience infrastructures in highly vulnerable areas, and special funds, the number of casualties has gone down in some of the recent natural disasters. At the same time, rehabilitation and reconstruction works in the post-disaster period

have been faster. Earlier, hundreds of thousands people were killed like in the 1737 Calcutta Cyclone, 1839 Coringa Cyclone, and 1943 Bengal famine. The Indian Space Research Organisation (ISRO) has also contributed significantly to India's cyclone management system. "Space-based systems have become the primary tools for collecting data on cyclones and cloud bursts. India Meteorological Department (IMD) jointly with ISRO has developed software for tracking a cyclone and making a forecast in its further movement, identifying the possible location of land impact."⁵⁸

However, despite having a strong disaster risk reduction framework since 2005, some of the natural dissipaters like the 2005 and 2007 Koshi floods, 2013 Uttarakhand floods, Kashmir floods in 2014, Chennai floods in 2015, Chamoli landslides in Uttarakhand in 2021 (around 72 people died), have witnessed more than 500 human casualties. In all these disasters, either the early warning system did not work or the magnitude of the disaster was massive due to anthropogenic encroachment in nature's space. Most importantly, as per private research data, between January and July this year, the Himalayan region witnessed at least 26 cloudbursts.⁵⁹

Therefore, in an effort to reduce further disaster risks in the Himalayan region, in August 2021, the Uttarakhand government launched the "earthquake early warning" mobile app.⁶⁰ This was a first in India. In addition to this, the Uttarakhand government decided to develop 37 "model crew stations" in remote disaster-prone areas which the rescue forces can access quickly. One state

government official observed that “The idea is to let all departments: police, disaster management, fire-fighting units as well as panchayati raj [community development] work under the same roof, in synergy, to save maximum lives and natural resources in case of any mishap.”⁶¹

In addition, India has established a high-altitude research station in the Himalayas called HIMANSH (literally meaning, a slice of ice), situated above 13,500 ft. in a remote region in Spiti, Himachal Pradesh, to better study and quantify the Himalayan glacier responses towards climate change.⁶²

India also has a long coastline. In order to reduce the risks from tropical cyclones in the coastal districts, the respective state governments have constructed multi-hazard resistance cyclone shelters. The guidelines for designing the shelters are given by the Ministry of Home Affairs, with consultation of specialized agencies.⁶³

Similarly, for the management of floods, especially in Koshi and Brahmaputra basins, and also for the entire country, the Union government has been

providing financial assistance to the provinces and union territories through a scheme called Flood Management Programme (FMP) since the XI Plan (2007–2012). The Program undertakes works related to river management, flood control, anti-erosion, drainage development, flood-proofing, restoration of damaged flood management works, and anti-sea erosion.⁶⁴

Epidemic or biological disaster preparedness has been an integral part of the disaster management program. As the number of cases increased further despite restrictions imposed at the airports and the land border points, and lockdown imposed by some provincial governments under the Epidemic Disease Act, 1897, the Prime Minister’s Office (PMO) reviewed the situation and made constructive interventions under the Disaster Management Act 2005. In India’s disaster management history, this was the first time that a nationwide lockdown was imposed for managing and reducing disaster risks. The devastating consequences of COVID-19 once again proved that India’s disaster risk reduction preparation was inept and insufficient when disaster strikes at the pan-India level.

Table 4.1: Major natural disasters in India since 2005

Year	Disaster Type	Human Casualties
2008	Cyclonic Storm Nisha	200
2012	Cyclone Nilam	75
2013	Cyclone Phailin	45
2014	Cyclone Hudhud	124
2017	Cyclone Ockhi	245
2020	Super cyclone Amphan	NIL
2021	Cyclone Tauktae	24
2021	Cyclonic Storm Yaas	NIL
2010–2018 ⁶⁵	Droughts (around 270 districts)	NIL

Sources: Telangana Today (2021) ⁶⁶

Synchronizing with Global Commitments

In 2015, the government adopted three international agreements having a bearing on disaster management:

- 🏠 Sendai Framework for Disaster Risk Reduction (SFDRR) in March 2015 (UNISDR 2015a);
- 🏠 Sustainable Development Goals (SDGs) (2015) in September 2015; and
- 🏠 Paris Agreement on Climate Change in December 2015 (UNFCC 2015).

Given these international commitments, the Government in 2016 adopted the National Disaster Management Plan (NDMP) with the objectives of keeping up with the global best practices.

Vulnerable South Asia

In an era of globalization and climate change, incidents occurring in a particular state or region have trans-national and trans-regional ramifications. India's Minister of State for External Affairs, V. Muraleedharan, observed, "We live in a world where natural disasters do not respect national borders."⁶⁷ This applies in the case of South Asia too. During the SAARC video conference in March 2020, SAARC member countries agreed that no single country can fight against COVID-19 alone.

As per the Global Climate Risk Index 2019 released at the Katowice Summit, the South Asian region is among the most vulnerable globally to the impacts of climate change. Sri Lanka was ranked in second place after Puerto Rico. Nepal was ranked the fourth most vulnerable, while Bangladesh was ranked ninth. India was ranked fourteenth. Similarly, Bhutan, Pakistan, Afghanistan, and the Maldives are vulnerable to hydro-meteorological activities.⁶⁸



The Global Climate Risk Index (CRI) has placed India as **14th** amongst the 15 most-affected countries by climate change

This high index is a result of:

- High reliance on environmentally sensitive industries
- Exposure to hydro-meteorological hazards
- High prevalence of poverty
- Lack of local adaptive capacities

SAARC Disaster Governance

Since 1990, the SAARC region has witnessed more than 1,625 major disasters causing the loss of more than twelve million lives, affecting 2.8 billion with damage worth more than 100 trillion U.S. dollars. Nearly 23 per cent of the world's population lives here. The region is exposed to a plethora of natural hazards.⁶⁹ Since it is rated as highly vulnerable, the 3rd SAARC Summit commissioned a comprehensive Regional Study on the Causes and Consequences of Natural Disasters.

Concerned by the increasing frequency and scale of consequences of natural disaster in the region, and learning from ASEAN in responding to natural disasters, the member countries adopted a SAARC Rapid Response to Natural Disaster (SARRND) mechanism in 2011. The objective of the mechanism is to reduce substantial disaster-related losses by jointly responding to disaster emergencies.⁷⁰

Despite having a comprehensive framework on disaster management like the SDMC and the SARRND, the affected countries in the region receive more relief and rehabilitation assistance at the bilateral level than under the SAARC framework. For example, Nepal did not receive any assistance during the 2015 earthquake under SAARC.⁷¹ The same happened in the case of Sri Lanka during the 2017 floods.

It is important to note that given these countries' vulnerability to various kinds of disasters, SAARC countries' preparedness to DRR appears insufficient. Although most of the SAARC member countries have set up disaster management institutional mechanisms and policy frameworks, they still lack the application of modern technology and a dedicated and trained disaster response force.

Most importantly, in 2015, India could send its relief and rehabilitation within six hours of the earthquake in Nepal. India sent the first air force flight that landed in Kathmandu with National Disaster Response Force (NDRF) rescue teams and relief materials. Similarly, the Indian Navy and its medical team played a crucial role in rescue and

rehabilitation operations in the 2017 Sri Lanka flood. More than 600 Indian navy personnel assisted in the relief with divers searching the brackish waters and medical teams seeing patients in makeshift tents set up at shelters.⁷²

In December 2014, the Indian Navy and the Air Force carried nearly 1,000 tons of fresh water to Male' as India mounted a major effort to help the Island country that faced an acute shortage of drinking water after its lone desalination plant caught fire.

India's prompt response to the 2004 Tsunami and 2015 Nepal earthquake reflected its preparedness for any disaster hitting South Asia anytime and its commitment to extend support to its neighbors. Apart from the bilateral HADR program, India extends its support to keep the South Asian region free from environmental disasters. For example, the firefighting operations on the container ship, the MV X-Press Pearl, off Colombo, in May 2021 would have been difficult for Sri Lanka to deal with alone without prompt support from the Indian Coast Guard (ICG) ships. Similarly, the ICG played a crucial role in dousing a fire on the oil tanker, the MT New Diamond, in September 2020. The tanker caught fire after a major explosion in its engine room when it was transiting a Sri Lankan exclusive economic zone (near Trincomalee).

While extending such support, Indian response teams have also learnt lessons from other countries. The NDRF shared its experiences by stating that "the prevalent Geo-climatic conditions as well as increased frequency of natural calamities in the South Asian Countries Region, calls for enhanced/strengthened levels of preparedness and risk resilience as well as collaborative action amongst member countries so as to individually and jointly deal with such disaster situations and ensure minimal loss of lives and assets."⁷³

SAARC COVID-19 Cooperation

Unlike the hydro-meteorological and other anthropogenic-induced disasters, COVID-19 has been a different kind of experience for South Asia. Despite India's initiative to hold the SAARC leadership level conference on COVID-19 in March 2020 and formation of a SAARC COVID-19 fund, a coordinated effort was still missing. Although other SAARC member countries contributed to the SAARC COVID-19 fund as per their capacity, India vouched for 10 million U.S. dollars. Roughly 20 to 30 per cent of that fund was utilized last year.⁷⁴

India's initiatives

Given its geo-cultural proximity and interdependence in economic and security issues, India realized that the pandemic required support and cooperation from all SAARC countries. India has an open border with Nepal and Bhutan and regular border trade and document-based human movement with other SAARC countries. On 15 March 2020, Prime Minister, Narendra Modi interacted with leaders of SAARC countries through a video conference to chart out a common strategy in order to combat COVID-19.

From March 2020 onwards, India supplied medicines such as hydroxychloroquine, paracetamol, and Remdesivir, medical logistics, and testing kits to Nepal, Bhutan, the Maldives, and Bangladesh as part of its emergency medical assistance. This assistance was provided under the SAARC COVID-19 Emergency Fund. In January 2021, India sent millions of vaccines under grant assistance.



Challenges

Despite having robust institutional mechanisms, policies, and rich experiences, India's disaster management, rehabilitation, and resilience programs are not free from challenges. These challenges are political, social, technical, constitutional, economic, and trans-boundary in nature.

The first and foremost challenge has been non-cooperation in implementing disaster management policies due to ideological differences between some provincial governments and the centre and vice versa. For example, West Bengal Chief Minister, Mamata Banerjee, skipped a meeting chaired by PM Modi in Bengal after the Yaas cyclone and handed over a letter to the PM Modi seeking 20 billion Indian rupee in aid.⁷⁵ Another example was the blame game between the Union and some provincial governments over limited supply of oxygen to the hospitals during the second wave of COVID-19 between April and June 2021.

Moreover, during the COVID-19 period, some legal experts and officials from Maharashtra raised issues of interference by the Union government in state matters like healthcare and law and order.⁷⁶

Other than Maharashtra, some states like Odisha, Punjab, West Bengal, Karnataka, Uttar Pradesh, and Kerala had imposed lockdowns much ahead of the national lockdown under the Epidemic Disease Act. Kerala, in fact, adopted a controversial Kerala Epidemic Diseases Ordinance, 2020, which was seen as bypassing some of the powers of the Central Government. Later, Kerala promulgated another ordinance on 4 July 2020 omitting controversial sections from the previous ordinance.⁷⁷ The COVID-19 situation has highlighted some major gaps in India's federal structure related to disaster management.

Second, there has been non-distribution of relief materials and delay in sending rescue and rehabilitation teams to the states ruled by the opposition parties. There have also been reports about negligence and discrimination towards certain caste groups by the state agencies during the disaster period. In fact, a study found that certain caste groups have been systematically excluded from relief and rehabilitation efforts during a series of disaster situations.⁷⁸

Third, it has also been observed that there was a concentration of rescue, relief, and rehabilitation operations at the epicenter of the disaster and a neglect of peripheral regions, which were equally affected by the disaster. For example, during the

1999 super cyclone in Odisha, rescue, relief, and rehabilitation teams from centre, state, and civil society groups had concentrated in the Erasama region, which was of course the area worst affected by the cyclone. But the state and civil society teams did not extend any support to the regions located just 30 kilometers away from Erasama.

Fourth, there are media and civil society reports about mismanagement of disaster funds and assistance at the local administrative level.

Fifth, there is a trust deficit between certain communities and the State. For example, some Indian minority groups did not follow the COVID-19 restriction guidelines because they felt that the restrictions could be a conspiracy against their community. For example, various religious groups contributed to the spreading of coronavirus to unaffected regions of India.

Sixth, illiteracy, poverty, population density, lack of public awareness about disaster preventive measures, or insensitivity towards the consequences of public gatherings remain a major

challenge at the community level. For example, during the pre-disaster evacuation process, local people did not cooperate with the local administration.

Lastly, the asymmetry between India and other SAARC countries in terms of resources and territorial size continue to be a major hurdle for regional cooperation. Moreover, historical baggage and contemporary bilateral issues will further impede disaster prevention and management initiatives with neighboring countries. On several occasions, friendly and unilateral humanitarian assistance from India during a crisis period has been widely interpreted as interference in internal matters due to the presence of foreign relief and rehabilitation teams. These issues, for instance, came up repeatedly when India's humanitarian assistance operation was on-going in Nepal during the 2015 earthquake.

Therefore, India has to draw a fine line between "proactive role" and "cooperation" while extending humanitarian assistance and DRR programs to other countries.

MAJOR RECOMMENDATION



India has to draw a fine line between 'proactive role' and 'cooperation' while extending humanitarian assistance and DRR programmes to other countries.

A tropical resort scene featuring a swimming pool, palm trees, and a building. The image is overlaid with a semi-transparent blue filter. A large, stylized number '5' is visible in the upper left quadrant. The word 'Maldives' is written in white, bold, sans-serif font, underlined with a yellow line, in the center of the image.

Maldives

Introduction

Author: Dr. Rasheeda M. Didi, *independent lecturer/researcher*



The Maldives has been identified as one of the most vulnerable to threats posed by climate change.



The most significant factor associated with vulnerability is the low elevation, with an average of **1.5 meters** above sea-level.



The Maldives a significant part of the land would be severely inundated by **2100**.

Disasters regularly destroy lives around the world. It was estimated that between 2000 and 2012, over 700,000 people lost their lives, and more than 1.5 billion people were affected by one or other type of disaster. During this period, the total economic loss was estimated to have been 1.3 trillion U.S. dollars.⁷⁹ Hence, disaster management is an absolute and immediate necessity, particularly in vulnerable, small countries.

Though a small island nation, Maldives has had its share of disasters. With a registered population of 374,775⁸⁰ in 2018, Maldives is a vulnerable, low-lying nation in the Indian Ocean, where the most disturbing hazards are induced by climate change, one of which is global warming that is a result of sea level rise. Because of this, Maldives continues to experience warming trends, with increases of 0.8°C between 1978 and 2018.⁸¹ In fact, the country has been identified as one of the most vulnerable to threats posed by climate change.

The most significant factor associated with vulnerability is the low elevation, with an average of 1.5 meters above sea level, the highest point being approximately three meters which strengthens the impacts of the hazards. Moreover, the geological structure of the country that creates vulnerability results in a lack of disaster resilience and environmental sustainability which are perceived as threats to development.⁸²

Emphasizing the vulnerability and delicateness of Maldives in connection with climate change, Former President Mohamed Nasheed said, “the Maldivian people will be among the world’s first climate refugees due to sea level rise if global warming is not averted.”⁸³ This notion comes from scientists’ belief that if sea levels continue to rise, Maldives would be completely submerged. According to their calculation, a significant part of land will be severely inundated by 2100. In this process, 15 per cent of Malé, the capital, will be submerged by 2025, with 50 per cent of it having been submerged earlier, by 2021.⁸⁴

Because of this troubling prediction, taking disaster risk reduction steps is crucial to the country’s survival. As a step towards achieving this objective, the Disaster Management Act (the Act) was passed by the Parliament in 2015.⁸⁵ This Act paved the way for the creation of the Disaster Management Authority (DMA) which, then, created the Disaster Management Council, the main body responsible for dealing with disasters.

To participate effectively in the disaster risk reduction process, the government of Maldives became a signatory to the Sendai Framework for Disaster Risk Reduction (SFDRR),⁸⁶ an ambitious agreement that sets out the overall objective of substantially reducing disaster risk and, hence, loss of lives and livelihoods.

The Climate Situation

Climate change is the biggest environmental challenge for Maldives. It affects almost every aspect of the country, including its economy, livelihoods, habitats, and water and food security. The seriousness of its effects is summarized in a statement by Foreign Minister Abdulla Shahid, addressing the impacts of climate-related disasters on international peace and security, at the Security Council open debate in June 2019. He said, “Climate change is destroying our tiny island country for years. It’s eroding our beaches. Killing the coral reefs protecting our islands. Contaminating our fresh water with sea water, and we are losing our fish stock. But most importantly, climate change is going to take our home away from us entirely.”⁸⁷

Although it is difficult to pinpoint accurately and attach every climate phenomenon to climate change, it is commonly believed that, most definitely, there are differences in the timing of the seasons, rainfall patterns, and increasing beach erosion and sea level rise. Such differences create flash floods caused by sudden downpours of heavy rain, changing patterns of dry and wet seasons, and the level of the sea due to the melting ice caps.

The change is demonstrated by events in 2020 when several islands such as Thinadhoo (Gaafu Dhaalu Atoll), and Dhiffushi (Kaafu Atoll) reported incidences of severe flooding. This is supported by the island councilor’s observation, according to which, the storm surges were of “unprecedented” severity compared to previous monsoonal patterns in which the tide in some islands had risen to three feet above sea level.⁸⁸

This scenario is already modifying the frequency and intensity of many weather-related hazards as they are steadily increasing the vulnerability of the country and eroding the resilience of exposed population, which depends on a stable mean sea level for fishing and transport purposes. The ground water on which the outer island communities depend for hygiene and drinking purposes are unsuitable due to rising sea levels and temperatures leading to ocean acidification that contaminate it.

As climate change affects many aspects of Maldivian life, its impact on biodiversity and ecosystem services, which has been increasing over the years, is of utmost importance. It affects coral reefs, the top attraction for tourists who keep the country’s economy going. Evidence indicates that coral bleaching and coral mortality are caused by warming of the ocean surface⁸⁹ as manifested by the events in 1977, 1983, 1987, 1991, 1995, and 1997 and in 1988, 1998, 2010, 2016, and 2020 due to El Niño (warming of the sea surface), which steadily increases seawater temperature. One of the most serious of these was the 1998 El Niño, which devastated the coral reefs and fishing industry.

To emphasize the speed at which biodiversity is affecting marine life, Minister of Environment stated that “in less than ten years from now, as much as 70–90 per cent of our coral reefs will be destroyed.”⁹⁰ To mitigate the process and implement disaster risk reduction (DRR) mechanisms, the government has designated 15 National Coral Reef Sites for protection,⁹¹ the monitoring and status of which are published regularly.



Sea Swells

Figure 5.1: Shaushath (2017)⁹²

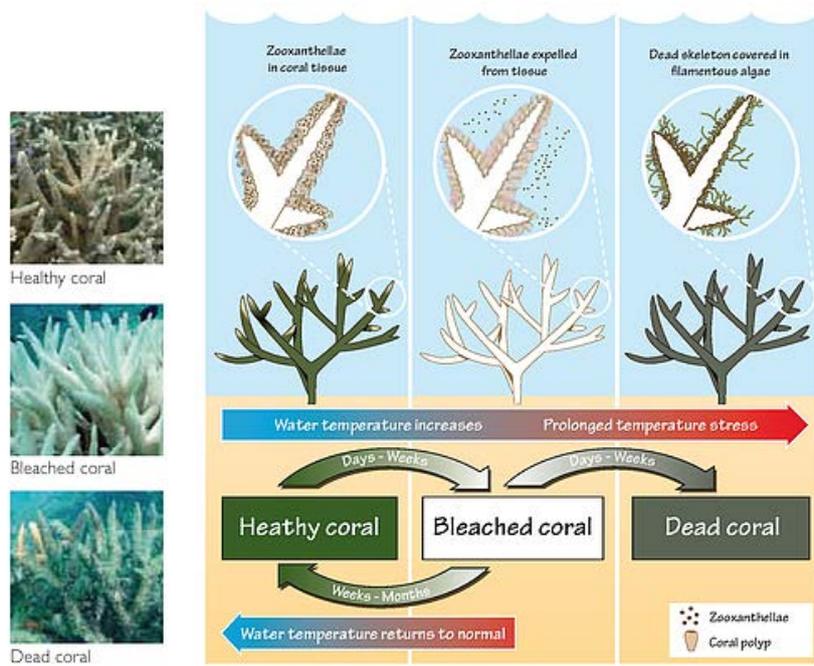


Beach Erosion

Figure 5.2: Abdul (2020)⁹³

The following diagrams show the coral bleaching process in which “bleaching occurs when warmer water stresses the coral and disrupts the symbiotic relationship with a micro-alga called Zooxanthellae, causing the coral to expel the food source and turn white.”⁹⁴ Finally, the coral dies and disintegrates becoming sand, creating a major disaster to the marine environment as dead corals cannot hinder sea swells which produce flooding and erosion.

Figure 5.3: The Coral Bleaching Process



Source: Maldives: Republic of Maldives – About Ecosystem (2013)⁹⁵

Figure 5.4: Coral Bleaching (2 to 3 weeks)



Source: Sendi, Maldives

Figure 5.5: Coral Bleaching (3 to 4 weeks)



Source: Sendi, Maldives

Of the major disasters of recent years, the Indian Ocean Tsunami of 2004 had the biggest impact on Maldives. However, the frequent occurrences of El Niño,⁹⁶ and small-scale recurrent hazards such as increased rainfall, cyclonic winds, storm surges, salt-water intrusion and coastal floods, flash floods, and sea swells have been causing more damage. These damaged properties include farms, buildings, and sea transport vehicles, this is counteracted by the decreasing frequency in

disaster events. Due to lack of proper assessments, the exact loss from any given hazard is unknown.⁹⁷ Table 5.1 gives a summary of hazards reported from 2012 to 2015. As can be seen, they are extreme rainfalls, tidal waves, and strong winds, damaging crops, infrastructure, and forms of livelihood. By world standards, these are minor incidents, but one must note that this information is derived from reported cases only.

Table 5.1: Reported Cases — Damage by Climate Events 2012 to 2015

Year	Hazard	No of isles affected	Season	Extent of Damage
2015	Extreme rainfall with strong winds	13	May/June	12 islands — infrastructure and crop damage 1 island — severe damage to a school
2014	Tidal Waves	20	May/June	16 islands — crop damage 1 island — minor crop damage 3 islands — no damage
2014	Extreme rainfall with strong winds	21	May/June	All 21 islands — mainly agricultural and minor to moderate infrastructural damage
2013	Extreme rainfall due to Cyclone Nilam <i>Damage due to strong wind</i>	20	Oct/Nov	8 islands — severe livelihood, agricultural and infrastructural damage 9 islands — severe livelihood, agricultural and mild to moderate infrastructure damage 3 islands — livelihood, agricultural, infrastructural damage
2012	Extreme rainfall due to Cyclone Nilam <i>Damage due to strong wind</i>	20	Oct/Nov	8 islands — severe livelihood, agricultural and infrastructure damage 9 islands — severe livelihood, agricultural and mild-moderate infrastructure damage 3 islands — livelihood, agriculture, infrastructure damage

Source: Composed from information in National Disaster Management Centre's Cases Reported from 2012 to 2015⁹⁸

However vulnerable and delicate the country is, it is important to note that it is not inevitable that climate change leads to increasing disaster risk. What is important is to differentiate between climate change and disaster risks associated with climate change. Experts advise that because climate change is intricately linked to various other risk drivers, it may be addressed in combination with reducing these risk drivers because if they are not addressed, disaster risk will continue to increase even if climate change is successfully mitigated.

A case in point is Huvarafushi Island (Ha Alifu Atoll) where the airport was built, in a hurry, on the northern side facing the deep ocean, which is the side where sea swells occur. As a result, there have been floods which damaged various parts of

the airport as experienced in May 2021. Although the airport was built after an environmental impact assessment (EIA), certain necessary conditions have not been addressed.⁹⁹

Another case is Kulhuduffushi Island (Haa Dhaalu Atoll) where 70 per cent of the island's mangroves were destroyed to make way for the airport. This resulted in more frequently occurring floods than pre-airport times. Consequently, after a torrential downpour, the island can be flooded within hours which requires setting up bolster embankments with sandbags and digging channels to clear waterlogging.¹⁰⁰ As the drainage system is not functioning efficiently, the problem of flooding is unmanageable.

Figure 5.6: Tsunami 2004



Source: Haikuformythoughts (2014)¹⁰¹

DISASTER RISK REDUCTION (DRR)



As the Maldives is believed to be submerging by **2100**, taking disaster risk reduction steps is crucial to the country's survival.

The **National Disaster Management Council** is the main organ in the government responsible for disaster risk reduction (DRR) Under Article 9 of the Disaster Management Act.



The council consist of the:

President

**Minister of
Defense**

**Other Ministers
connected to Disaster**

To decrease the possibility of a hazard returning to disaster status, the State is mandated to **form communities**, which must include organizations in **economic and social sectors**.



Disaster Risk Reduction (DRR)

As Maldives is believed to be submerged by 2100, taking disaster risk reduction steps is crucial to the country's existence. Initially, it was the Indian Ocean Tsunami of 2004 that brought disaster management to the forefront. With the intention of working for continued survival, the Disaster Management Act (the Act) was passed by Parliament on 6 September 2015 and under this, on 30 December 2018,¹⁰² the National Disaster Management Authority (DMA), the main coordinating body for disaster activities at the national level, was promulgated.

Furthermore, under Article 9 of the Act, on 14 June 2019, the National Disaster Management Council (the Council), the main organ in the government responsible for disaster risk reduction (DRR)¹⁰³ was formed with the objectives of mitigating the effects of disaster and responding to policy decisions on the recurrence of disasters. The importance given to the Council is demonstrated by its high-powered composition, which includes the President, Minister of Defence and other leading ministers connected with disaster.

The Act (No. 28/2015) outlines the responsibility of the State to protect citizens in their natural and built-up environment "from natural and man-made disasters and hazards." The multi-faceted objectives of the Act concentrate on protecting the people from natural disasters, mitigating such disasters, implementing preparedness, managing pre- and post-disaster events, and researching and making citizens aware. Additionally, emphasis is placed on incorporating DRR into sustainable development plans as well.¹⁰⁴ To decrease the possibility of a hazard returning to disaster status, the State is mandated to form communities which must include organizations in economic and social sectors as well as civil society.

Apart from the State's responsibilities, the Act contains Citizens' Responsibilities and Rights (Chapter 2, Article 5), the core of which are preparedness and mitigation. Citizens also must obey the instructions of the State, participate, report and assist everyone suffering by fulfilling their needs.¹⁰⁵ It is important to note that this highlights the inclusion of citizens, making DRR

more relevant to and meaningful for everyone.

To deal with DRR effectively, information management in emergencies is a very crucial part to help save lives and reduce the suffering of people because an effective information management system helps in timely humanitarian assistance. In such situations, the data collected and analyzed are used as a foundation for situation reporting and for crafting public information messages. The following weather warnings from the Meteorological Department demonstrate such information that is recorded and used for forewarning the people.

Maldives Meteorological Services (MMS) forecasts "torrential rain with heavy thunderstorms between Laamu to Gaafu Dhaalu Atolls from 15/0900–15/1200 hrs. The islands of Laamu and Gaafu Dhaalu Atolls should immediately take preparedness actions to minimize losses caused by a possible flooding event."¹⁰⁶

And

MMS forecasts that "tidal waves during high tide may cause flooding across the central and southern atolls of Maldives in the next two days."¹⁰⁷ People are advised to take precautions to avoid flood water into the house and travel by sea is not advisable."¹⁰⁸

Another factor that can speed up the DRR process is education. In Maldives, education is used more for creating responsibility for disasters rather than for academic purposes. For example, the NDMA teaches Maldives National Defence Force, career-course modules on disaster risk reduction, Maldives Police Service Junior Officer Command Course, and first Line Management courses which deal with reacting to disasters. It also teaches the Emergency Management Module in the Faculty of Health Science at Maldives National University (MNU). Moreover, it formulated the MNU's Emergency Response Plan.¹⁰⁹ This would be immensely beneficial for campuses outside of the capital — Hithadhoo Island (Addu City), Thinadhoo

Island (Gaafu Dhaalu Atoll), Kulhuduffushi Island (Haa Dhaalu Atoll), and Gan Island (Laamu Atoll), as they are more prone to climate hazards such as wave surges, floods, and sea swells.

In educating the public at the island level, NDMA conducts awareness-creating sessions and planning workshops. In the latter, workshops were held in three regions — northern (Haa Alifu atoll, Baarah Island), central (Lhaviyani Atoll, Naifaru Island), and southern (Gaafu Alifu Atoll, Kon'dé) in 2019.¹¹⁰

Apart from this, the government has taken steps

to educate and train the staff of the NDMC itself by way of scholarships, workshops, fellowships, and training which include important areas of DRR such as DRR strategy, emergency operations, and leadership in disaster management, among others. Table 5.2, giving a summary of these, contains only one year of activities as the NDMA was created in 2018, and in the following year the COVID-19 pandemic hit the world. Hence, there is only a short period during which the NDMA has been able to educate its staff as well as the community.

Table 5.2: Scholarships/Fellowships/Workshops/Training Programmes 2019

Name of Programme	Organizer	Title of Trainee	Dates	Country/ Location
Disaster Resilience Infrastructure	Indian Embassy	Senior Admin Officer	19–20 March 2019	Gujurat, India
8th Intn'l Course on Food Mitigation and Storm Water Management 2019	MTCP	Assistant Project Officer	9–20 September 2019	Malaysia
Training Workshop Towards DRR Strategy among SAARC members	SAARC	Administrative Officer	9–11 July 2019	Gujurat, India
Emergency Operation Center Workshop	World Bank	Deputy Exec Chief and Director Gen.	22–24 July 2019	Bangkok, Thailand
Leadership Program in Disaster Management	Govt	Director General	29 July – 2 August 2019	Singapore
Disaster Risk Reduction	Govt	Senior Programme Officer	3–6 September 2019	Singapore
IORA Workshop: Tsunami EWS-Lessons learned from 2018 Tsunami	IORA	Assistant Programme Coordinator	26–28 September 2019	Jakarta, Indonesia
U-Inspire Workshop	IDMR	Assistant	6–8 December 2019	Chengdu, China

Source: Composed from National Disaster Management Authority's Annual Report 2019, pp: 16–17

In training community preparedness, emergency response teams were organized and awareness raising was planned. Community-based Disaster Risk Reduction (CBDRR) had been conducted in 45 of the 200 inhabited islands by the Red Crescent and UNDP-Maldives.¹¹¹ Added to this, to make the cities resilient to disaster, “Make Cities Resilient Campaign” was initiated and, together with Malé City Council, the NDMA formulated the Male City Emergency Programme, and collaborated on the risk management of the project with Red Crescent, Maldives.

Other noteworthy activities include the flood mitigation project, funded by the government of Maldives, and implemented by UNICEF on twelve islands, of which the government funded seven and UNICEF four.¹¹²

As a DRR mechanism, some resorts have started coral regeneration using various techniques such as coral line, coral pops and 3D printed coral reef, the award-winning technique used in the Summer Island Resort, Maldives. However, because it is not mandatory, only a few resorts are involved in coral regeneration.

Figure 5.7: Coral Regeneration — 3D Printed Coral Reef, Summer Island, Maldives



Source: Boissonneault (2018)¹¹³

Sendai Framework

The Sendai Framework for Disaster Risk Reduction (SFDRR), adopted at the World Conference on DRR (WCDRR) in 2015, covering the period 2015 to 2030, is an instrument that was designed to reduce human and economic loss directly resulting from disasters. It emphasizes that “disaster risk reduction must be reinforced with the provision of sufficient resources through different financing mechanisms,”¹¹⁴ which should include stable and predictable contributions to the special fund allocated for this by the United Nations.

In adopting this Framework, effort was made to align the three landmark UN agreements through the convergence of three global policy frameworks: The Sendai Framework (2015–2030), Sustainable Development Goals (September 2015; SDGs) and the Climate Change Adaptation (December 2015; COP21).¹¹⁵ By stipulating in the Act, the Government has taken this factor into consideration.

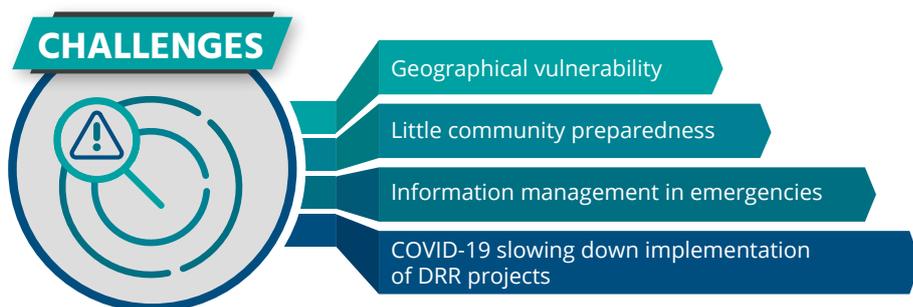
As a signatory to the Sendai Framework, the Maldivian government recognizes the importance of Sendai and other related international bodies and frameworks established to work on disaster risk reduction. This recognition is demonstrated by the Minister of Defence and National Security,¹¹⁶ Honourable Adam Shareef Umar’s statement at the Asian Ministerial Conference on Disaster Risk Reduction, New Delhi, India, 2–5 November 2016: “The Sendai Framework and the Sustainable Development Goals, along with the Paris Agreement on climate Change are vital for the survival of Maldives in the face of climate change and extreme disasters.”¹¹⁷

Challenges to DRR

There are many challenges to disaster risk management. The biggest is the geography of the country which is composed of islands scattered in the Indian Ocean. As a result, in times of disaster, travel is difficult as the ocean can be rough with sea swells and other disturbing phenomena that hinder inter-island travel for the purposes of risk management.¹¹⁸ To make it worse, the country has added challenges by having to face the COVID-19 pandemic,¹¹⁹ which has slowed down the activities and projects considerably.

Since investment in education creates more resilient societies,¹²⁰ investment in education for DRR is invaluable. In an island nation like Maldives, everyone should be aware of the type of possible hazards that could occur and become disasters. So, awareness and preparedness programs must be speeded up because disasters arrive unexpectedly. But since all activities are tied to the COVID-19 pandemic, such programs cannot be conducted at the present time. This is a major challenge as one cannot foresee the end of the COVID-19 pandemic.

Although community preparedness is a priority for the government, and it has tried to establish the necessary bodies, it desires a lot more. For example, there is no Community Emergency Response Team on every island because the Maldivian National Defence Force (MNDF),¹²¹ which is mandated by the Act to assist with first response, is not deployed on every island. Hence, programs must be customized to suit each island and the island community itself must learn to deal with disasters without the military’s assistance. But this



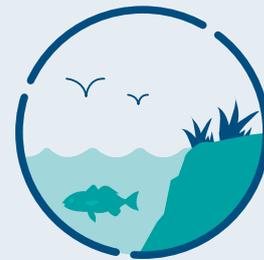
may not always be successful. Similarly, the Resort Resilience Programmes for dealing with disasters are not established in every resort.

Despite the Marine Research Center’s advice to the Government to suspend projects that affect the health of reef ecosystems, the speed at which the projects have been implemented, continue on a large scale, damaging the environment.¹²² Other activities such as coral mining, reef-entrance blasting, solid waste dumping, dredging, land reclamation and beach nourishment projects, and sewage disposal

which affect the health, integrity, and productivity of reefs¹²³ need to be monitored much more strictly, and the violators reprimanded heavily. The government’s effort at retaining the natural ecosystems and protecting the full range of biodiversity has been highly inadequate, as indicated by the Environmental Performance Index (EPI) placing Maldives last by giving it 180 for environment preservation ranking. This strongly points to the fact that the most immediate concern for the nation is to address biodiversity and habitat preservation.¹²⁴

RECOMMENDATIONS

- Investing in education creates more resilient societies;
- The most immediate concern is to address biodiversity and habitat preservation.
- As the Maldives is believed to be submerging by **2100**, taking disaster risk reduction steps is crucial to the country’s survival.



Abbreviations

MTCP	Malaysian Technical Corporation Program
IORA	Indian Ocean Rims Association
IDMR	Institute of Disaster Management and Reconstruction
EWS	Emergency Warning System



6

Nepal

Introduction

Author: Veera Lamichhane, *Researcher, CSAS, Kathmandu*

NEPAL IS DISASTER-PRONE DUE TO VARIOUS FACTORS:



Nepal remains a disaster-prone country as it has had to suffer major disasters in recent years. The major earthquake of 2015 with its epicenter in Gorkha district certainly put the spotlight on, and acted as a catalyst for the country to be better prepared for disasters. Building resilience and building back better have become key themes. Major disaster risks remain, including the recurrence of fires, floods, landslides, droughts, GLOFs as well as earthquakes¹²⁵. Nepal is prone to disaster due to various factors, such as difficult geological terrain, unplanned settlement, poor construction practices, cultivation of unsuitable land, and so on. Conversely, this vulnerability has been further aggravated by the Earth's constantly rising temperature¹²⁶, leading to record-breaking statistics with each passing year.

Several approaches have been made in regard to Disaster Risk Reduction Management (DRRM) by local institutions such as the National Strategy for Disaster Risk Management (2009) and Nepal Risk Reduction Consortium while international help from INGOs, such as UN agencies have been instrumental. Yet the sturdiest step forward so far has been the endorsement of the Sendai Framework.

Nepal, as a member state, follows the Sendai Framework, which was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction. The Framework advocates "the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries" (UNDRR, 2020).¹²⁷

To understand and explore opportunities for regional cooperation in relation to disaster risk management, it is first important to a) understand the National Strategic Plan of Action and b) clarify the responsibility of each sector of the government in response to DRRM. The reiteration of the roles of these bodies helps build adaptive capacities at multiple levels, as "sectoral fragmentation and bureaucratic competition may pose serious challenges for the integration across scales."¹²⁸ Clarification of the frameworks also allows each subsection of disaster risk reduction management to be allocated to the responsible authority.

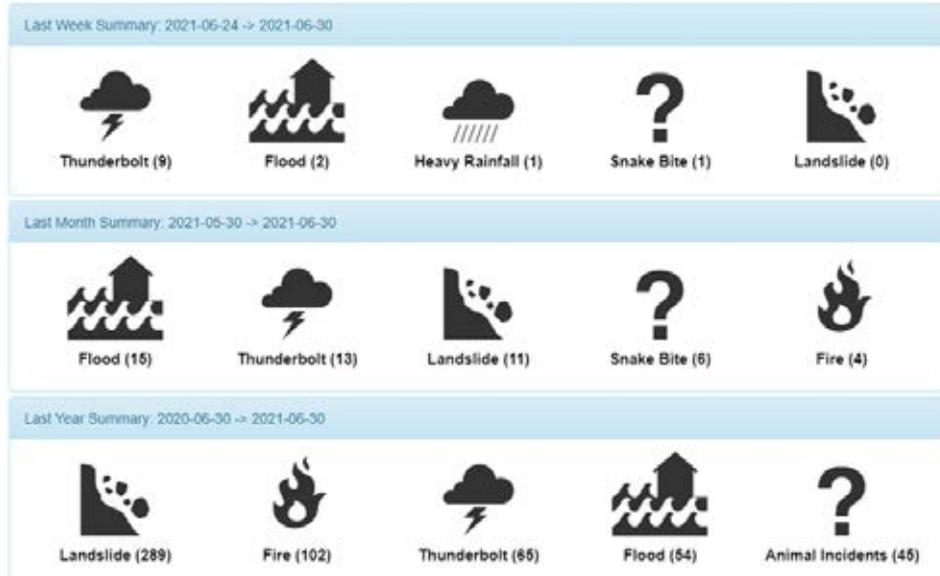


The major **Earthquake of 2015** with epicenter in **Gorkha district** was an eye-opener for the country



Disasters such as glacial lake outburst floods, landslides, floods, and droughts are common in the basin

Figure 6.1: Summary of DRR portal (Death)



Source: Nepal Disaster Risk Reduction Portal (2021)¹²⁹

THE SENDAI FRAMEWORK

SUBSTANTIAL REDUCTIONS

- Reduce global disaster mortality.
- Reduce the number of affected people globally.
- Reduce direct economic loss in relation to GDP.
- Reduce disaster damage to critical infrastructure.

SUBSTANTIAL INCREASES

- Increase the number of countries with DRR strategies.
- Substantially enhance international cooperation.
- Increase the access to multi-hazard Early Warning Systems.

Source: UNDRR (2021)¹³⁰

Functional Frameworks

The Disaster Risk Reduction National Strategic Plan of Action is as follows: The Strategic Action Plan has adopted a holistic approach to support sustainable development by mainstreaming disaster risk reduction in the development process of the country. Taking the Sendai Framework for

Disaster Risk Reduction as the main guidance, this action plan has identified four priority areas and 18 priority actions. Under each Priority Action, the following Strategic Activities are proposed for 2018 to 2020 as short-term measures, 2018 to 2025 as medium-term measures, 2018 to 2030 as long-term measures and continuous for those which are to be implemented regularly.

Table 6.1: The Disaster Risk Reduction National Strategic Plan of Action

Priority Area 1: Understanding disaster risk		Priority Area 2: Strengthening disaster risk governance at federal, provincial, and local level	
Priority Action 1	Hazard-wise assessment of risk	Priority Action 5	Establishing and strengthening organizational structures
Priority Action 2	Inter-agency coordination for multi-hazard risk assessment	Priority Action 6	Developing legal and regulatory frameworks
Priority Action 3	Development of an effective disaster management information system and information dissemination	Priority Action 7	Capacity building, collaboration and partnership for disaster risk governance
Priority Action 4	Capacity building for understanding disaster risk	Priority Action 8	Ensuring inclusiveness in disaster risk reduction
Priority Area 3: Promoting comprehensive risk-informed private and public investments in disaster risk reduction for resilience		Priority Area 4: Enhancing disaster preparedness for effective response and to “build back better” in recovery, rehabilitation, and reconstruction	
Priority Action 9:	Promoting investment for building resilience	Priority Action 13	Strengthening disaster preparedness for effective disaster response
Priority Action 10	Promoting public investment in disaster risk reduction	Priority Action 14	Development of multi-hazard early warning system for disaster preparedness
Priority Action 11	Promoting private investment in disaster risk reduction	Priority Action 15	Promoting community-based disaster risk reduction
Priority Action 12	Increasing disaster resilience through risk transfer, insurance, and social security	Priority Action 16	Strengthening communication and dissemination system for disaster preparedness
		Priority Action 17	Capacity building for search and rescue
		Priority Action 18	Promoting “build back better” approach in recovery, rehabilitation, and reconstruction

Source: Nepal Government Ministry of Home Affairs (2018) ¹³¹

Since the promulgation of the Constitution of Nepal in 2015, the structure of the state as well as the distribution of state power have been well defined, and divided under federal lines.¹³² Within this, the institutional provisions of DRRM at the federal, provincial, and local level have also been well-defined, and are as follows:

Table 6.2: Institutional Provisions of DRRM at the Federal, Provincial, and Local Level

Institutions by level	Functions
National Council for Disaster Risk Reduction and Management (NCDRRM)	<ul style="list-style-type: none">  Approval of national disaster management policies and plans  Provides direction to the executive committee and national authority  Policy guidance to the provincial and local levels  Management of financial resources for disaster management  Evaluation of disaster management activities
National/ Federal Level Executive Committee	<ul style="list-style-type: none">  Submits the national policies and plans to the council  Implementation of disaster risk reduction, disaster response and rehabilitation and mitigation-related policies and programs depending upon the limits of approved policies and plans by the council  Implementation and approval of the disaster risk reduction strategies and programs  Determines the role of public, private, and Non-Government Organizations (NGOs) on disaster management  Determines the role and responsibilities of the concerned ministries, departments, and other institutions regarding disaster management.  Institutional capacity building of national, provincial, and district and local levels of disaster management.  Incorporates disaster management-related courses from the school level to higher education.  Vulnerability assessment and hazard mapping
	<ul style="list-style-type: none">  Implements the plans, programs, and decisions approved by the council and executive committee  Works as a resource center for disaster reduction and management  Studies and conducts research on the issues, causes, and mitigation measures regarding landslide, flood, earthquake, climate change, land-use change and other different hazards and disasters.  Provides financial and technical assistance to provincial and local levels to prepare periodic plans related to disaster management.  Involves private bodies, NGOs, and local community in disaster management  Formation of search and rescue team for national, provincial, and local levels and builds their capacities to handle disasters  Mobilizes security forces, and search and rescue teams.  Awareness creation about disaster management
National Disaster Reduction and Management Authority (NDRMA)	<ul style="list-style-type: none">  Implements the plans, programs, and decisions approved by the council and executive committee  Works as a resource center for disaster reduction and management  Studies and conducts research on the issues, causes, and mitigation measures regarding landslide, flood, earthquake, climate change, land-use change and other different hazards and disasters.  Provides financial and technical assistance to provincial and local levels to prepare periodic plans related to disaster management.  Involves private bodies, NGOs, and local community in disaster management  Formation of search and rescue team for national, provincial, and local levels and builds their capacities to handle disasters  Mobilizes security forces, and search and rescue teams.  Awareness creation about disaster management

Province/ State Level	Province Disaster Management Committee (PDMC)	<ul style="list-style-type: none"> 🏠 Implements the disaster-related medium-term and short-term policies, plans, and programs at the provincial level based on the approved national policies and plans from the council. 🏠 Facilitation and coordination for effective preparedness activities of the local disaster management committee 🏠 Coordination with national, provincial, and local levels to ensure the effectiveness of the activities of search and rescue. 🏠 Makes standards for rescue item management 🏠 Management of drinking water, food, clothes, and medicines in areas affected by disaster. 🏠 Recommends to GoN the declaration of emergency in areas affected by disaster. 🏠 Moves people in danger to safe places. 🏠 Establishment of disaster management information systems and installation of Early Warning Systems (EWSs)
Local Level	District Disaster Management Committee (DDMC)	<ul style="list-style-type: none"> 🏠 Implements the policies, plans, and programs approved by the council, executive committee, and provincial committee 🏠 Preparation and implementation of Disaster Response Plans for the district 🏠 Mobilizes the emergency operation center (EOC) of the district 🏠 Conducts search and rescue work in the affected areas 🏠 Management of dead bodies due to disasters 🏠 Management of drinking water, food, clothes, and medicines in areas affected by disaster 🏠 Keeps security forces intact 🏠 Coordination of national and international assistance during disasters 🏠 Information flow about disasters
	Local Disaster Management Committee (LDMC)	<ul style="list-style-type: none"> 🏠 Design and implementation of local disaster management plans 🏠 Allocation of budget for disaster reduction 🏠 Coordination of public, private, NGOs, local volunteers, and social mobilizers to conduct disaster management activities 🏠 Implementation of building codes and standards/guidelines 🏠 Formation of disaster preparedness committees at ward and community level 🏠 Training of mock-drills 🏠 Management of rescue and relief in affected areas • Establishment of disaster management information systems and installation of Early Warning Systems (EWSs) 🏠 Activates the emergency operation center (EOC) at local level

Source: Disaster Risk Reduction and Management Act (2017)¹³³

Though the division of responsibility is clear at the superficial level, bureaucratic barriers continue to create tremors underneath the surface. For example, unseen to the eye, the conflicting provisions in Acts such as Water Resource Act (1992) and Building Act (1998) with Local Government Operation Act (2017) means that there are blurred lines between roles and responsibilities¹³⁴ and may reduce accountability. Such inconsistencies must be resolved and clarified by decisive bodies of the state, before moving on to cooperating on a regional scale to avoid confusion and guarantee the smooth running of trans-boundary issues and concerns. A recent example was a massive landslide in Sindupalchowk district on 16 June 2021 in which the local, provincial, and center of Kathmandu had to all move in tandem to save lives and property.

NATIONAL/FEDERAL LEVEL



- **National Council for Disaster Risk Reduction and Management**
The decision-making body
- Executive Committee – Planning & implementing DRR national policies
- **National Disaster Reduction and Management Authority**
Research institute & implementing local DRR plans

PROVINCE/STATE LEVEL



- **Province Disaster Management Committee**
Implementing medium and short-term plans, resource management

LOCAL LEVEL



- **District Disaster Management Committee** – Planning for disaster response
- **Local Disaster Management Committee** – Implementing disaster response & DRR programs

DISASTER TRANSCENDING BORDERS



Floods, earthquakes, forest fires, and volcanoes have significant cross-border impacts.

Good governance, regional stability, economic prosperity, and sound environmental management are required to have minimal impacts on a disaster.



Disaster: Transcending Borders

Disasters spill over borders, overflowing political, social, and economic boundaries.¹³⁵ “The occurrence and impact of disasters due to natural hazards are not confined to a country’s political boundary. Floods, earthquakes, forest fires and volcanoes have significant cross-border impacts. Some examples of cross-border impacts of disasters include Koshi floods in Nepal-India (2008), Kashmir earthquake (2005), Indian Ocean Tsunami (2004), and recurrent tropical cyclones in Bangladesh and India. Good governance, regional stability, economic prosperity and sound environmental management are required to have minimum impacts of a disaster.”¹³⁶

ICIMOD’s recent report states that areas such as the Koshi basin is a “trans-boundary environment”, meaning “disasters such as glacial lake outburst floods, landslides, sedimentation, floods and droughts are common in the basin and require collaboration across sectors and policy makers, academics, practitioners and communities.” There must be two-way collaboration and coordination in order to design and implement solutions that reduce the likelihood as well as impact of disasters and support the building of resilience. “Disasters are often trans-boundary in nature and require collaboration across administrative and political boundaries.”¹³⁷

Moreover, such natural disasters are common not only in Nepal, but also in neighboring South Asian countries:

Table 6.3: Major Hazards of the South Asia Region

Country	Key hazards
Afghanistan	Earthquake, drought, floods, landslides, extreme winter conditions, avalanches, sand and dust-storms, agriculture pests
Bangladesh	Cyclone, floods, drought, epidemic
Bhutan	GLOF, flash floods, landslides, earthquake, forest fire, epidemic
India	Flood, Earthquake, cyclone, tsunami, epidemic, landslides, forest fire
Maldives	Tsunami, floods, cyclone, earthquake
Nepal	Flood, landslides, earthquake, epidemic, GLOF, avalanche, fire
Pakistan	Earthquake, floods, landslides, sand-storm, drought, avalanche
Sri Lanka	Tsunami, floods, landslide, drought, cyclone

Source: Kafle (2017)¹³⁸

The recurrence of similar disasters in the South Asian region means that there is room for best practices to be shared in order to be better prepared. The most recent disasters in Nepal have been earthquakes, floods, landslides, forest fires/wildfires, and the forever looming disaster of GLOFs.

Glacial Lake Outburst Floods (GLOFs)

ICIMOD's 2001 inventory of glaciers, glacial lakes, and GLOFs counted 3,252 glaciers and 2,323 glacier lakes in Nepal, 20 of which are very vulnerable to flooding. Since the 1960s, 23 GLOF events have been recorded in Nepal. Out of the 23 events, ten GLOFs had a trans-boundary impact as damage occurred both inside and outside Nepal, specifically in the Tibet Autonomous Region (TAR). The notable Dig Tsho GLOF in 1985 destroyed a Hydroelectric Project. The source of the event was inside the TAR, further showing the necessity for international regional cooperation to address the disaster.¹³⁹

In recent times, two major GLOF events with catastrophic trans-boundary impacts were reported.¹⁴⁰ The first event occurred on July 2016 in Zhangzangbo valley, in the TAR of China, causing damage along the Bhotekoshi River in Nepal.¹⁴¹ The second event occurred on 20 Apr 2017 in Barun Valley, Nepal. Both demonstrate the disastrous impact and far reach of GLOFs that is not contained within borders. Yet again, these events highlight the need to carry out continuous investigations to evaluate the risks of GLOFs, and integrate trans-boundary action plans into mitigating the effects of disasters.

Wildfires

Wildfires are another recurring disaster, and the year 2021 has been comparatively worse, again owing to rising global temperatures. Statistical analysis significantly highlights a strong association of forest fire with precipitation (0.67) and temperature (0.41).¹⁴² In March of this year, Nepal saw a particularly high case of wildfires. The Nepal Disaster Risk Reduction Portal updated an expansive list of fire from all across the country, spreading at alarming rates, so much so, that the

country was clouded in smoke, and the government was forced to shut schools for four days as the Air Quality Index pointed to numbers above 400, which is categorized as hazardous.¹⁴³ Between November 2020 to March 2021, there were 2,700 wildfires, a nearly 15-fold increase from last year.¹⁴⁴ Apart from sending warnings and shutting schools thereby keeping the health of children in mind, the government took little action. There has been a wider call for accountability and meaningful action by the government. Above average landslides are also likely this year due to forest fires, which make the areas much more vulnerable to floods. One disaster has become a catalyst for many more, and thus preparedness is essential on all fronts. "Apart from cities blinded by plumes of smoke from the forest fires, there was also cross-border industrial pollution, smoke from crop residue burning, as well as wind-blown desert sand dust, which have been particularly acute in the past months."¹⁴⁵ This reiterates how disasters are not limited within borders. It leads to the question that if disasters are not limited to borders, then why should preparedness, planning, and cooperation of disaster be limited to within borders?

Regional Cooperation

Some attempts at regional cooperation have been made by institutions such as the SAARC Disaster Management Centre; however, these efforts have been neither cohesive nor consistent to compensate for the management gaps in the whole region. A joint report published by ESCAP, ADB, and UNDP calls for "a renewed focus on people and inclusive cooperation and underscores that environmental sustainability must become central to economic and physical integration efforts."¹⁴⁶

For South Asia to progress in DRRM, examples from other regions must be taken into account. The Asian Development Bank (ADB) in coalition with the Canadian government started an initiative, the Integrated Disaster Risk Management Fund (IDRM), and summarized six valuable lessons from their assessment of the Southeast Asian region.¹⁴⁷ These points intertwine well with the National Strategic Plan of Action (see above). Mentioned below are

the six lessons by the IDRM and the Priority Areas and in brackets are the Actions of the National Strategic Plan with which they coincide.

- i)** Enhanced risk identification and analysis
(Priority Area 1)
- ii)** Increased investment in disaster risk reduction
(Priority Area 3)
- iii)** Improved access to disaster risk financing
(Priority Action 8; 12)
- iv)** Scaling up of community-based and gender-focused approaches
(Priority Action 8; 15)
- v)** Increased regional cooperation on IDRM
(Priority Action 2; 7)
- vi)** Enhanced knowledge and tools for IDRM
(Priority Action 3; 4; 14; 16)

As the Sendai Framework is a widely shared and used template across regions,¹⁴⁸ using it alongside the National Strategic Plan of Action will lay a reliable foundation on which to explore options of regional cooperation. With all willing member states starting on the same page, reference to the various stages of DRRM as well as measurable goals will ensure a smoother transit to meeting the targets of the Framework.

Data integration and analysis are important and need to be strengthened in order to help reduce the risks and impacts of water-related disasters, including floods, landslides, and droughts, the prediction of which rely greatly on science and technology for early warnings.¹⁴⁹ At the federal level, this responsibility should be taken by the NDRMA. From there onwards, data integration must take place across the region, with all member states of SAARC. There is a desperate need for a sole platform which acts as a “one stop” for South Asia on the knowledge and data sharing of disasters.

At a workshop conducted by ICIMOD in 2019,¹⁵⁰ various gaps were found in Climate Services, which were intended to be addressed at a Regional Forum for climate services in South Asia. The key takeaways were:

- i)** Communication between the scientists who create the data and the policymakers who use the data must be improved.
- ii)** Improved equipment and technological systems are needed in order to predict patterns and produce data more accurately.
- iii)** The water storage as well as hydrological system in Nepal and Pakistan must be improved.
- iv)** There is a need for better understanding of sea level rise, particularly for Bangladesh.
- v)** There is a demand for improved collaboration and communication between regional science centers.
- vi)** Basing government policies on science would bridge the gap between idea creation and implementation.
- vii)** Smoother trans-boundary data sharing channels are needed.
- viii)** New reference data or reanalysis of current data is needed to develop validity and reliability of the information on hand.
- ix)** Both users and providers of data must discuss what data are useful from a policy context vs. what data it is possible to provide.
- x)** Capacity building must also include training on how to analyze data.
- xi)** Infrastructure should be in place to collect, apply, and disseminate data, as well as using it as a basis for policies.

RECOMMENDATIONS

Improve communication of information between researchers and policymakers

Improve the water storage as well as the hydrological system in Nepal and Pakistan

Smoother transboundary data-sharing channels are needed

Infrastructure should be in place to: collect, apply and disseminate data, as well as use it as a base for policies.



Improve equipment and technological systems to increase accuracy of data and prediction

Improve collaboration and communication between regional science research centers

New reference data or reanalysis of current data to develop validity and reliability of the information on hand

The given takeaways could be used as a baseline for creating and upholding a regional network for DRRM, as these learnings and suggestions have come from those who work in the field, and are not from only one country, but rather from learnings and experiences from the South Asian region.

There have been various events, workshops, and meetings held on the theme of creating a sustainable interconnected platform for DRRM in South Asia, yet there is still a long way to go. The above discussed frameworks, which are more interconnected than meets the eye, as well as exemplary practices and suggestions from those who work in the field must be aptly applied in order to ensure a collective approach to DRRM. The need for such a platform is becoming more and more urgent as global temperatures continue to rise, and the duration of disasters increases.

In addressing all the gaps that need to be filled in South Asia, small-scale resourcefulness must not be overlooked. It must be acknowledged that this

project itself is an effort for promoting regional cooperation. Authors in the South Asian region have been offered this opportunity, an initiative by the Konrad Adenauer Stiftung (KAS), whose continuous efforts to create a diverse pool of knowledge are truly appreciated. Collaborations such as this certainly pave the right path to further strengthening regional cooperation, bringing together area experts and key country information, and creating a valuable collection of research accessible to public and private stakeholders.

7

Pakistan



Introduction

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PAKISTAN'S VULNERABILITY TO CLIMATE-INDUCED HAZARDS



Pakistan is ranked as the **5th** most vulnerable country to climate change (according to a 2020 report from German Watch).



Pakistan has faced "some of the highest disaster risk levels in the world, ranked **18** out of **191** countries by the 2020 Inform Risk Index".



Pakistan lost **9,989** lives, suffered economic losses worth **\$3.8 billion**, and witnessed **152** extreme weather events from 1999 to 2018.



The global average by 2080-99 is estimated at **3.7°C** under the highest emission estimates.

Pakistan's vulnerability to climate-induced disasters is very high. Over the past decade, it has ranked among the top 10 on the Global Climate Risk Index. Reducing disaster risk and increasing the resilience of people and systems are essential for the national development of the country. Various types of disasters cost Pakistan 1.2 to 2 billion U.S. dollars annually.¹⁵¹

This study examines the vulnerability to climate-induced disasters, existing policy framework and disaster risk governance institutions, the degree of disaster preparedness at local and national levels, and how it can be enhanced through regional cooperation and international partnerships.

This study also analyzes disaster risk reduction preparedness through the prism of the Sendai Framework that identifies four priorities areas:

- i) understanding of disaster risk,
- ii) strengthening of disaster risk governance to manage disaster risk,
- iii) investing in disaster risk reduction resilience, and
- iv) enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction. What are the existing policy framework and disaster risk governance institutions in Pakistan?

How can disaster preparedness be enhanced through regional cooperation and international partnerships? Methodologically, the study draws upon document analysis supplemented by other data sources and semi-structured interviews.

DISASTER TYPES FACED BY PAKISTAN INCLUDE:



Mapping Pakistan's Vulnerability to Climate-Induced Hazards/Disasters

Pakistan is situated in a vulnerable geographical location, where the intensity and frequency of extreme weather events is high. German Watch, in its report for 2020, ranked Pakistan as the fifth most vulnerable country to climate change. The country has faced “some of the highest disaster risk levels in the world, ranked 18 out of 191 countries by the 2020 Inform Risk Index.” The country lost 9,989 lives, suffered economic losses worth 3.8 billion U.S. dollars and witnessed 152 extreme weather events from 1999 to 2018. A joint study by the Asian Development Bank (ADB) and World Bank (WB) (2021) on Climate Risk Country Profile has placed Pakistan among the top risk-prone countries in terms of increase in average temperatures and the resultant economic and social losses. The study observed that “Pakistan faces increase in average temperatures significantly above the global average with a potential rise of 1.3 degrees Celsius – 4.9 degrees Celsius by the 2090s over the 1986–2005 baseline”.¹⁵² The global average by 2080–99 is estimated at about 3.7 degrees Celsius under the highest emission estimates. During the last century, average annual temperature over Pakistan increased by 0.6 degrees Celsius, in agreement with the global trend.

Climate change is likely to intensify the melting of Himalayan glaciers and variability of monsoon rains, and increase the frequency and severity of extreme events such as floods and droughts. Different parts of the country are exposed to various climate-induced disasters — the coastal areas are prone to sea level rise, cyclones, the low-lying places of the Indus are increasingly vulnerable to riverine flooding, while the northern region is highly vulnerable to landslides, snow storms, avalanches, and GLOFs.

Floods and GLOFs: Pakistan has high exposure to flooding (ranked jointly eighth), including riverine flooding in the Indus basin, flash floods, glacial lake outburst floods (GLOFs), and coastal floods connected with tropical cyclonic activity (ranked jointly 40th). The 2010 floods alone affected 18 million people; killed 1,984, displaced 150,000 families, and caused economic losses worth 10.1 billion U.S. dollars. Karakoram Glaciers, earlier considered stable have indicated declining stability, increasing the risk of GLOFs. Within this context, 80 per cent of the Hassanabad village has been found to be highly exposed to large-scale flooding in the near future, and the low-lying areas of the Hunza River are susceptible to catastrophic damage as they are in the vicinity of the Shishper glacier which has shown highly anomalous behavior due to melting during 2018–2019.¹⁵³ The ADB-WB report has projected an increase in the number of people affected by flooding, with a likely increase of around five million people exposed to extreme river floods by 2035–44, and a potential increase of around one million annually exposed to coastal flooding by 2070–2100.

Droughts: In terms of drought, Pakistan is ranked 43rd. The frequency of droughts is growing, especially in the province of Sindh and Balochistan which receive low annual rainfall.¹⁵⁴ There is the possibility of two primary types of drought affecting the country: metrological caused by precipitation deficit and hydrological resulting from deficit in surface and subsurface water flow, in the larger river basins. Droughts were so severe in 2000 and 2002 that the livelihoods of individuals were destroyed. More than 3.3 million people were affected in Baluchistan and Sindh provinces, thousands of people were forced to migrate, and millions of livestock were killed. According to one estimate, the 2001 drought was so severe that the economic growth rate was reduced from an average of six per cent to only 2.6 per cent.¹⁵⁵

Heatwaves: Pakistan's vulnerability to heat waves is increasing. In June 2021, parts of the country including the capital, Islamabad, witnessed an extreme heat wave. As a result, there is a 15–20 per cent greater peak demand for power. It is expected that by 2030, annual heat accumulation may increase by up to 32 per cent in Sindh and Punjab. Between 1997 and 2015, Pakistan was hit by 126 heatwaves, around seven per year with increasing frequency, duration, and intensity. The population at risk of heatwave is very large as witnessed during the 2015 heatwave, when an estimated 65,000 people were hospitalized with heatstroke. With the sea level rise, climate change may also threaten coastal communities.¹⁵⁶

While large-scale disasters have negative impacts on Pakistan's economic growth and human life, the disaster risk is also driven by social vulnerability. Pakistan's vulnerability ranking (37th) is driven by its high rates of multidimensional poverty. Women and children are amongst the highest risk groups. Climate-induced migration is also rising. Low-income households are the most affected. Pakistan, however, scores slightly better in terms of its coping capacity (ranked 59th).¹⁵⁷

Pakistan's vulnerability ranking **37th** is driven by its high rates of multidimensional poverty.

Pakistan ranks among the **top 10** on Global Climate Risk Index.

Table 7.1: Summary of Natural Hazards in Pakistan from 1900 to 2020

Disaster Type	Disaster sub-type	Event Count	Total Deaths	Total Affected	Total Damage (Thousand USD)
Drought	Drought	1	143	2,200,000	247,000
Extreme Temperature	Cold wave	3	18	0	0
	Heat wave	15	2,936	80,574	18,000
Floods	Flash flood	24	3,590	22,114,253	10,184,118
	Riverine flood	43	9,229	34,967,357	9,727,030
	Others	39	5,286	23,863,294	2,670,030
Landslide	Avalanche	12	567	4,435	0
	Landslide	9	222	29,707	18,000
	Mudslide	2	16	12	0
Storm	Convective storm	15	402	1,906 0	0
	Tropical cyclone	7	11,555	2,599,940	1,715,036
	Others	7	184	2,988	0

Source: European Commission (2020)¹⁵⁸

Table 7.2: Selected indicators from the INFORM 2019 Index for Risk Management for Pakistan

Flood	Tropical Storm	Drought	Vulnerability	Lack of Coping Capacity	Overall Inform Risk	Rank
(0–10)	(0–10)	(0–10)	(0–10)	(0–10)	(0–10)	(1–91)
8.8	3.8	5.2	5.7	5.5	6.1	22

Source: European Commission (2021)¹⁵⁹

DISASTER RISK REDUCTION (DRR)

The Government has adopted the Sendai Framework for Disaster Risk Reduction.



Pakistan Vision 2025 is in line with the Paris Agreement on Climate Change 2015 and UN SDGs 2015.

Pakistan's Disaster Risk Reduction Approach

Pakistan is trying to develop a comprehensive National Disaster Risk Reduction Policy that increases the resilience of communities and the physical infrastructure at local and national levels and is in line with the Sendai Framework for Disaster Risk Reduction, the United Nations Sustainable Development Goals (2015–2030), the Paris Agreement on Climate Change 2015, and Pakistan Vision 2025. The government has adopted the Sendai Framework for Disaster Risk Reduction 2015–2030 which is the global blueprint for disaster risk reduction. The Sendai Framework that succeeded the Hyogo Framework for Action 2005–2015¹⁶⁰ reinforces the shift from managing disasters to managing risk, and also establishes resilience-building as a shared vision of the 2030 Agenda. Pakistan's Disaster Risk Reduction Status Report 2019 by the UNDRR indicated improvements but also identified key challenges in the way of integrating global frameworks at the country level.

a) Understanding Disaster Risk

The impacts that disasters have on humans are not solely dependent on their exposure to the hazard, but also on how capable they, and their surroundings are, of anticipating, resisting, and recovering from their effects.¹⁶¹ The National Hazard and Risk Assessment, conducted in 2011, is the nation-wide mechanism serving as a key baseline document for risk-sensitive development planning at the national, provincial, and local levels.¹⁶² The 2013 Disaster Risk Reduction policy identified the low level of risk awareness and knowledge as a policy challenge. This related both to the mapping and understanding of a number of key hazards and the underlying dynamics and

causes, and to the lack of sound data and analysis of vulnerability. In 2016, the National Disaster Management Authority (NDMA) developed comprehensive policy guidelines for the conduct of Multi Hazard Vulnerability and Risk Assessment (MHVRA) and made them mandatory. This provides national standard methodology to conduct multi-hazard risk assessment but there is still a lack of institutionalized capacity to provide baseline data and risk profiles for different geographic areas of the country which is essential risk-informed holistic DRM policy development.

b) Strengthening Disaster Risk Governance to Manage Disaster Risks

Pakistan's DRM policy and plans and governance institutions have evolved since 2006 in the wake of the 2005 earthquake. The National Disaster Management Authority (NDMA) is the lead agency for disaster preparedness and management which formulated a Disaster Risk Reduction Policy (2013) with the wider participation of all stakeholders including all provinces, state of AJ&K, and regions. The policy lays emphasis on risk assessment, prevention, mitigation, and preparedness. Earlier, the National Disaster Risk Management Framework (NDRMF) 2007–2012 specified a wide-ranging DRR agenda and subsequently the National Disaster Management Plan (NDMP) 2012–2022 provided a mechanism to manage all types of disasters by formulating disaster risk reduction policies, strategies, and actions by involving all stakeholders. The NDMP envisaged several plans including Master Plan, Human Resource Development Plan on Disaster Management, Multi-Hazard Early Warning System Plan, and Instructors' Guidelines on Community-based Disaster Risk Management (NDMA, 2012). In addition, the National Institute

of Disaster Management — a technical and training institute — was established with the financial support of international donors to build institutional capacity. Major programs comprise capacity building of disaster management bodies at the federal, provincial, and district levels.

At the federal level, the National Disaster Management Commission (NDMC) is headed by the Prime Minister with the NDMA functioning as its secretariat to coordinate overall implementation. Similarly, at the provincial level, Provincial Disaster Management Commissions have been set up which act as decision-making bodies and are headed by the respective Chief Minister of the Province, with Provincial/Regional Disaster Management Authorities performing as secretariat.

At district level, District Disaster Management Authorities (DDMAs) have been established to be responsible for the whole spectrum of DRM in their jurisdiction (NDMA, 2015). In addition, under the National Disaster Management Act (2010), the NDMA can call on the armed forces, police force, or any other person or group to assist in disaster management. Pakistan's armed forces are closely involved in all aspects of humanitarian assistance and disaster response.

The disaster risk governance is, however, marred by overlapping functions of DRM agencies and operators at national and local level that create gaps in the chain of command. It should be highlighted that the policy framework and institutional mandates envisage a holistic DRM approach but government interventions continue to be more reactive and do not prioritize preparedness and risk reduction (Status Report, 2019).

c) Building Capacity in Disaster Risk Reduction for Resilience

Pakistan has taken steps to invest in disaster preparedness but it lacks financial and technical capacity. The National Disaster Management Act, 2010 established a National Disaster Management Fund (NDMF), managed by the federal government with the objective of improving risk financing capacity and securing funding to materialize planned

DRR interventions. In addition, each one of the provincial governments and district administration will set up separate disaster management funds. Currently, PDMA and DDMA have low financial capacity and face budgetary constraints in relation to DRM activities. International donors have provided financial resources to strengthen Pakistan's DRM capacity. In 2016, ADB approved a 200 million U.S. dollars loan that included support for the establishment of the NDRMF. The World Bank has also extended support to DRM funds at the provincial level. In December 2020, it approved 300 million U.S. dollars for two projects — Sindh Resilience Projects and the Solid Waste Emergency and Efficiency Project — which will help build resilience to floods, droughts in the province, and urban flooding in Karachi.

To reduce the socio-economic vulnerabilities of the poor, social safety net schemes have been aligned to deal with disaster-induced financial shocks. These include the Workers Welfare Fund, Employees Old-Age Benefits Institution, Zakat Fund, Pakistan Bait-ul-Mal, and Benazir Income Support Programme (BISP).

Pakistan is also making efforts to mainstream DRR into development planning processes. Risk-sensitive DRR investment has become mandatory in development planning and the approval of projects. It has been made compulsory for government agencies to complete disaster risk screening using a DRR checklist as part of the official procedures of the Planning Commission,¹⁶³ before the approval of projects' implementation.

d) Enhancing Regional Cooperation and International Partnerships

Pakistan has made efforts to join regional and international platforms to expand cooperation in disaster risk reduction.

The HKH Call to Action to Sustain Mountain Environment: Pakistan has joined the HKH Call to Action initiative by the International Centre for Integrated Mountain Development (ICIMOD) that includes enhancing ecosystem resilience, and regional data and information sharing. The

Ministry of National Food Security and Research (MoNSFR) is a nodal ministry of the ICIMOD. In a high-level policy dialogue on an HKH Assessment Report, held in 2019, Pakistan floated the idea of the establishment of an HKH Council, similar to the Arctic Council, and solicited regional science-policy-business dialogues in this regard.¹⁶⁴

The ICIMOD, AKAH, and GB-DMA signed a tripartite agreement in 2018 to develop a Disaster Risk Management Plan for Gilgit-Baltistan. The AKAH and GB-DMA also committed to developing a mechanism for the sustainable operation, repair, maintenance, and ownership of the community-based flood early warning system (CBFEWS) installed in Gilgit Baltistan.

SAARC and Disaster Risk Reduction platforms:

SAARC member states have signed a SAARC Action Plan on Climate Change that recommends cooperation on climate risk modeling, sharing information, particularly meteorological data, and capacity building in early forecasting and adaptation measures. The region has the Disaster Management Center (SDMC) and South Asian Forum on Preparedness for Regional Disaster Response on the Implementation of the SAARC Agreement on Rapid Response to Natural Disasters. The SDMC has developed the South Asian Disaster Knowledge Network, or SADKN, in order to capture the various streams of knowledge on DRM in the South Asian region. The SADKN is an open platform that allows for information sharing on hazards, vulnerabilities, risks, and disasters.

Collaboration with UN Agencies: Pakistan has received substantive support from UN agencies that are involved in the full scope of disaster risk reduction and disaster management, including assessment, planning, coordination, response, and recovery. The UN team in the country has a lead role in establishing the Inter-Agency Standing Committee (IASC) and in coordinating periodic UN-NGO meetings to monitor responses. UN agencies have a key role in capacity building, providing technical support to federal, provincial, and district administrations in policy formulation and disaster management planning. The UNDP is among the most active agencies in supporting

Pakistan's disaster risk reduction (DRR) planning, long-term ecological resilience building, and climate change adaptation. It is deeply involved in programs to scale-up Glacial Lake Outburst Flood (GLOF) risk reduction in northern Pakistan.¹⁶⁵

e) Enhancing disaster preparedness for an effective response to “Build Back Better” in recovery, rehabilitation, and reconstruction

Disaster preparedness is crucial for response and recovery ahead of disaster. Efforts are underway to strengthen the emergency response and coordinating mechanism for crisis management that include the National Disaster Response Plan (NDRP-2019), Host Nation Support Guidelines for Foreign Assistance to Pakistan during Disasters (2018), and National Monsoon Contingency Response Directive. The outlook of the monsoon situation is issued before its onset and response guidelines comprise three levels: local emergency response is by DDMA while provincial level and national level response is led by the NDMA. Specific needs and the vulnerability of women and children have been recognized, and a Gender and Child Cell (GCC) under the NDMA was created in 2010. For post-disaster recovery, ad hoc recovery management bodies have been formed with a plan for early recovery and recovery interventions. Enhancing build back better began in 2010 with the Guidelines for Mainstreaming Disaster Risk Reduction in Early Recovery of Floods envisaging recovery across eight clusters — community physical infrastructure, governance, water and sanitation, health, education, housing, agriculture and food security, and nonfarm livelihood.¹⁶⁶

Although Pakistan's efforts in regard to building resilience for disaster risk reduction are appreciable, they face many challenges of operationalization, capacity, resources, and weak regional collaboration.

DISASTER RISK POLICY



Understanding Disaster Risk

Multi Hazard Vulnerability & Risk Assessment (MHVRA) policy in 2016 - set national standard methodology to conduct multi-hazard risk assessment.

Strengthening Disaster Risk Governance to Manage Disaster Risk

National Disaster Management Plan (NDMP) 2012-2022 - mechanism to manage disaster risks by formulating disaster risk reduction policies, strategies and actions.



Building Capacity in Disaster Risk Reduction for Resilience

The National Disaster Management Act, 2010 - establish National Disaster Management Fund managed by federal government

Aim - Improve financial management in disaster management

Enhancing Regional Cooperation and International Partnership

The HKH Call to Action to Sustain Mountain Environment - enhance ecosystem resilience, data and information sharing.

Disaster Risk Management Plan of Gilgit-Baltistan 2018.

SAARC & Disaster Risk Reduction platforms - recommend cooperation on climate risk research & capacity building in early forecast and adaptation.

Collaboration with UN Agencies.



Enhancing Disaster Preparedness for Effective Response to "Build Back Better" in Recovery, Rehabilitation and Reconstruction

- The National Disaster Response Plan (NDRP-2019)
- The Host Nation Support Guidelines for Foreign Assistance to Pakistan During Disasters (2018)
- National Monsoon Contingency Response Directive



Aim for All: To strengthen emergency response and coordinating mechanisms.

Challenges and Way Forward

Building an Integrated Resilience Framework:

DRR in Pakistan is still reactive and there is a need to make it more proactive. For instance, the Disaster Management Act 2010 emphasizes mainly institution building and action plan development for mitigating disasters. The Act does not directly mention disaster risk reduction and there are no directions with regard to the budgetary mechanisms.

Capacity Building for Preparedness, Prevention, and Mitigation:

Currently, the DRR legislation has decentralized the core responsibilities to provincial and district levels, but they are not yet matched by institutionalized capacity, in particular at the district level. As a result, capacities at community level are quite low. In fact, in many national-level ministries and agencies as well as provincial-level departments capacity is lacking to apply DRR to specific sector policies, plans, and interventions. The NDMA needs to enhance its capacity to act as the main facilitator of DRR in the country and provide overall support and technical guidance to line agencies, i.e., PDMA, DDMA, SDMA-AJK, and GB-DMA.

Enhancing Early Warning Systems (EWS):

Collaboration, information sharing, and networking have been the backbone of successful disaster response and preparation.

Disseminating information to those trying to assist at times of emergency has been crucial for efficient and effective disaster response. In Pakistan, the PMD is responsible for early warning of natural hazards (cyclones, heavy rains or storms, heat waves, floods, and earthquakes) and for monitoring the country's glaciers in order to issue a warning in the case of GLOFs. But its capacity needs to be strengthened. Pakistan needs to invest in its EWS capacity by upgrading installed technologies in order to manage river flooding and the growing challenge of urban flooding. The country needs to install at least 13 weather radar stations to deal effectively with river floods and other extreme events.¹⁶⁷

Collaboration at Regional and International Levels:

There is an urgent need to develop trans-boundary collaboration in information sharing by integrating early warning systems. There are several seasonal streams and tributaries of the Ravi and Sutlej that flow from India to Pakistan and cause seasonal flooding. In addition, hydro-metrological incidents in the upper Indus basin cause flooding which devastates the lives of the people living downstream. An effective early warning can reduce human as well as material losses. The World Meteorological Organisation can help India and Pakistan to develop mechanisms for sharing meteorological and environmental data. Japan and China are already providing technical assistance to Pakistan in installing EWS.



CHALLENGES

- DRR in Pakistan is still reactive
- The DRR legislation are not yet matched by institutionalized capacity
- Lack of early warning systems
- Poor transboundary collaboration in information sharing



RECOMMENDATIONS

- Build Integrated resilience Framework
- Capacity Building for preparedness, prevention, and mitigation
- Enhancing Early Warning Systems (EWS)
- Collaboration at regional and international levels

Conclusion

Pakistan has taken substantive steps to follow the Sendai Framework but there are still several gaps that need to be addressed. Increasing the understanding of disaster risk and climate impacts is among the highest priorities but there is a lack of available baseline vulnerability data to build the resilience of local communities to disasters. Further, lack of technical capacity and resources are limiting the collection, analysis, and management of disaster information at the lower levels of government. Roles of NGOs, CBOs, and people-organized groups are still peripheral in the DRR domain and limited mostly to relief distribution. DRR collaboration is very weak at the SAARC level. With increased frequency and intensity of disaster events, emergency response capacity has to be strengthened, especially for floods as recurrent hazards.



8

Sri Lanka



Introduction

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Being a small island situated in the middle of the Indian Ocean, hydro-meteorological hazards are by no means novel to Sri Lanka. From the very dawn of time, the monsoon has been the most formidable external force that exerts a decisive impact on the life and death of the people of the Island. The monsoon winds that routinely brought rain clouds from very far to feed the thirsty paddy fields, the people, flora, and fauna with water more or less determined the rhythm of the daily life, culture, and civilization. Further, the seasonal and long-ranging monsoon winds and waves offered a highway for cultural connectivity, trade, and commerce between the maritime centers of civilization. By the same token, its early or late arrival would cause havoc disrupting the whole life pattern. By living with monsoons for generations, the communities on the island, depending on where they live, have developed knowledge forms and acquired necessary skills for coping with the vicissitudes of winds and waves. All these constitute an integral part of their traditional knowledge system. The social resilience in the face of natural disasters evolved as an in-built part of traditional social culture.

However, climate change is a relatively new phenomenon and its impact on the monsoon is increasingly felt day by day. Global climate change and the disruption of the local ecological balance due to deforestation and other man-made factors make extreme weather conditions more frequent and severe. In this context, a new vision for disaster management has become an urgent priority. The central argument of this paper is that socio-cultural factors should be given adequate attention when designing and implementing measures during all phases of disaster risk reduction: pre-event preparedness and mitigation, emergency responses, and post-disaster recovery and reconstruction. Traditional knowledge and the socio-cultural dimension of risk management should be unpacked to reinvent necessary social ethos to rebuild social resilience to face disasters. The paper first traces how the frequency and intensity of disasters have increased in the recent past. Then it proceeds to identify different institutional structures put in place by the state to address disaster management problems. Finally, the paper brings into focus the importance of the socio-cultural dimension of disaster management and emphasizes the need for an integrative approach that combines modern technology, institutional web, and the socio-cultural milieu.



Cyclones, floods, landslides, droughts, and coastal erosion.



The most devastating natural disaster that Sri Lanka has experienced in the recent past is the **Tsunami** of December 2004, with over 35,000 dead and almost a million displaced.



This disaster highlighted the need for a systematic **disaster risk management** approach to face such a massive catastrophe.



Sri Lanka failed in pre-disaster risk management, especially with regard to **disaster preparedness** including early warning & disaster mitigation.

Disaster Contours in Sri Lanka

As a country in the tropical region, most of the disasters in Sri Lanka are mainly hydro-meteorological-related. These include cyclones, floods, landslides, droughts, and coastal erosion. Another category of disasters that Sri Lanka frequently encounters during rainy seasons is mosquito-borne illnesses such as Dengue fever and rodent-borne diseases such as Leptospirosis.

The most devastating natural disaster that Sri Lanka has experienced in the recent past is the Tsunami of December 2004, with over 35,000 dead and almost a million displaced.¹⁶⁸ It affected two-thirds of the coastline of the country, over 1,000 kilometers in total. Nearly 234,000 families were affected and over 1,000,000 houses were destroyed. Over two-thirds of the country's fishing boats were wrecked. It highlighted the need for a systematic disaster risk management approach to face such a massive catastrophe.

The country was totally unprepared when the Tsunami struck. The first tsunami waves hit the eastern coast of Sri Lanka at approximately 6.40 a.m. on 26 December about one hour and forty minutes after the earthquake. A secondary wave struck approximately 20 minutes later. The western coastal area was hit by the tsunami waves much later. The tsunami hit the southern coastal city of Hambantota at about 9:10 a.m. and Peraliya on the south-western coast, where the train tragedy took place, at 10:10 a.m., and three and a half hours after the first wave, the tsunami hit the eastern coast of Sri Lanka. If an emergency disaster early-warning communication system had been in place, much of the human disaster on the western coast could have been avoided.

A spontaneous response came from the local community. The people in the areas not affected stood up to the occasion. The outpouring of public sympathy and the massive community response was remarkable. People in cities and villages organized themselves to provide immediate food and other requirements. According to Sisira Jayasuriya, et al.,

In the immediate aftermath of the tsunami, Sri Lankans responded not only with shock, grip, and horror but also with a massive outpouring of courage and humanity that transcend barriers of race and creed. In the days that followed, with support arriving from international organizations, they were able to successfully ensure that survivors were fed, clothed and sheltered, the injured provided with medical attention, and thousands of bodies were cremated or buried.¹⁶⁹

Despite its usual year-end hibernation, the Government also responded swiftly by declaring an emergency in the affected districts. A national emergency was declared and security services were deployed.¹⁷⁰ However, the mobilization of the instruments of the state, other than the forces was chronically slow.

The initial success in meeting the immediate challenges could not be maintained in addressing medium and long-term rehabilitation and reconstruction tasks. Unlike immediate relief and humanitarian needs, the task of rehabilitation and reconstruction required a broader approach which needed proper coordination among a number of relevant agencies. Moving from emergency shelters to permanent housing, restoring livelihoods and the construction of infrastructure facilities required proper planning, mobilization of various institutions/agencies, and the conversion of international pledges into concrete commitments. State intervention was indeed imperative in post-tsunami rehabilitation and reconstruction. The involvement of government institutions in the process of rehabilitation and reconstruction became excessively politicized and bureaucratized.

All in all, the Sri Lankan track record on risk management of the tsunami disaster was a mixed one. Sri Lanka utterly failed in its pre-disaster risk management, especially with regard to disaster preparedness including early-warning and disaster mitigation. In contrast, it was fairly successful in attending to emergencies immediately after the Tsunami. In the five years after the tsunami, the communities that were badly affected have, on their own, emerged once again as vibrant entities laying aside the traumatic experience.

In view of the gravity of the disaster it was a remarkable achievement. Why could the island nation not maintain the same rigor and progress in post-tsunami rehabilitation and rebuilding? Poor coordination among domestic and foreign agencies, reluctance of some donors to cooperate with government institutions, and balancing political considerations and humanitarian assistance to the needy delayed the progress of housing construction and moving the displaced from transitional to permanent dwellings.

In the period following the catastrophe, hydro-meteorological hazards became more frequent and severe. Two factors seem to have contributed to the increase in extreme weather conditions — climate change and environmental degradation. The impact of climate change was painfully witnessed almost regularly in the last decade. Sri Lanka is considered as one of the most vulnerable countries to the effects of climate change. According to the Sri Lanka Disaster Management Reference Handbook,

The country was ranked as the sixth most affected in the world in 2018, according to the Global Climate Risk Index released in 2020; the Index looks at extreme weather events and analyzes to what extent countries and regions have been affected by impacts of weather-related loss events (storms, floods, heat-waves, etc.). Climate change is attributed as a factor in Sri Lanka experiencing increasingly severe monsoon rains, which, in 2018, killed 24 people, displaced 6,000, and affected 170,000.¹⁷¹

Another main precipitating factor is the environmental degradation for which deforestation is the root cause. Between 1990 and 2010, Sri Lanka lost an average of 24,500 hectares (1.04 per cent) of forest per year, losing 20.9 per cent (around 490,000 hectares) of its forest cover.¹⁷² The impact of deforestation is direct and multifarious. The forest cover absorbs water during heavy rains and helps to release it evenly as clean fresh water throughout the year.

The most common effect of climate change in the country is hydro-meteorological hazards caused by frequent cyclones and floods. Cyclones such as

Roanu in 2016, Mora in 2017, Burevi and Amphan in 2020, and YAAS in 2021 manifested the increasing occurrence and severity of the hazard. As Sri Lanka—Disaster Management Reference Handbook notes,

Cyclone Roanu the poor and the marginalized that bear the brunt of than 18 years. This led to flooding in 24 of Sri Lanka's 25 districts, covering 1,400 square kilometres (540 square miles), affecting almost half a million people, and causing 600 million U.S. dollars in damage. In 2017, Cyclone Mora brought flooding that affected 15 districts in the south and caused major landslides.¹⁷³

At the same time, the country is experiencing severe monsoon rains and resultant devastating floods and landslides in a row. The landslide that occurred in Aranayake in May 2016 destroyed an entire village, killing 144 people with 96 reported missing and making several hundred destitute as their houses were buried under rubble. Again, in May 2017, unprecedented heavy monsoon rains caused flash floods and landslides, killed more than 210, and displaced 630,000 people across 15 districts. During the 2018 severe monsoon period, floods and landslides killed 24 people, displaced 6,000, and affected 170,000. Then in December 2019, heavy rains, flooding and landslides resulted in 16 deaths, with more than 7,000 people displaced.¹⁷⁴ In December 2020, before Cyclone Burevi hit the east coast, the evacuation of more than 75,000 people contributed to minimizing the damage. However, the heavy rainfall following Cyclone Burevi affected more than 100,000 people and destroyed 4,000 houses fully or partially.¹⁷⁵

The paradox of the impact of climate change is that Sri Lanka experiences spells of drought in between floods. The worst drought in four decades occurred in the period of October 2016 to October 2017, affecting 2.2 million people. From March to May 2020, a severe drought hit over 500,000 people in eight provinces (14 districts). The severity of the drought was such that the government was compelled to make arrangements to distribute drinking water to six provinces.

Another type is marine disasters. The latest event of such nature was in May 2021. A fire erupted on HM X-Press Pearl with hundreds of tons of chemical and plastic nurdles on board and blazed away for several days. Within a day or two, partially burnt debris and tons of plastic nurdles had washed up on Sri Lanka’s western coastline. The immediate impact of the disaster on the marine environment manifested in the form of dead dolphins and sea turtles washed up on the western coast. “The Department of Wildlife said they had received information of more than 70 turtles, many sea birds, eight dolphins and a juvenile Blue Whale found dead.”¹⁷⁶

Disaster Management: Institutional and Policy Frameworks

Sri Lanka gained independence in 1948 with the immediate memory of massive and island-wide floods in 1947. Since then, there has been a continuous record of devastating windstorms and floods. Until 1996, however, there was no single institutional mechanism within the government for disaster management. Natural disasters were handled by a number of institutions under the rubric of social services. The first initiative in the direction of improving and strengthening disaster management activities was taken in 1994 when

President Chandrika B. Kumaratunga established the National Disaster Management Centre (NDMC) under the Ministry of Social Welfare. The NDMC was mandated to take overall charge of coordination activities relating to the disaster management including, inter alia, preparedness, mitigation, post-disaster response and recovery, and long-term rehabilitation and development. The NDMC initiated pioneering work to set up the necessary legal and institutional framework for disaster management. The Disaster Management Bill and the National Disaster Management Plan were prepared in draft form by the NDMC in 2000. But it could not be formally adopted due to the government change in 2001.¹⁷⁷

The high human toll, massive economic cost, and deep social impact caused by the 2004 Tsunami highlighted the need for a systematic and a comprehensive policy framework for disaster management. Having considered it a national priority, a bi-partisan Parliament Select Committee was appointed on 10 February 2005. The mandate to the Committee included,

Investigate whether there was a lack of preparedness to meet an emergency of the nature of the Tsunami and to recommend what steps should be taken to ensure that an early warning system be put in place

DISASTER MANAGEMENT POLICIES



Natural disasters were handled by a number of institutions under the rubric of Social Service.

The high human toll, massive economic cost, and deep social impact caused by the 2004 Tsunami highlighted the need for a systematic & comprehensive policy framework.





Local communities have developed knowledge and skills to cope with the challenge posed by nature.

Disaster Management Act: Set up **National Council for Disaster Management**

- Head by President & Prime Minister
- Decision-making body



Disaster Management Center

- Implement national & sub-national disaster management programs

Role of NGO: Enhance community capacity through **Community-based Disaster Risks Management (CBDRM)**

- e.g. Community Tsunami Early-warning Center (CTEC)



*and what other steps should be taken to minimize the damage caused by similar natural disaster.*¹⁷⁸

The Select Committee presented a report covering many aspects of disaster risk management. The report highlighted serious shortcomings in the prevailing institutional framework. Upon its recommendations, the draft Disaster Management bill was passed into law — The Sri Lanka Disaster Management Act, No. 13 of 2005.

The Disaster Management Act of 2005 brought forward significant changes to the institutional framework for disaster management. The National Council for Disaster Management (NCDM), a top-level political body headed by the President and Prime Minister as the Chairman and Vice Chairman, was established.¹⁷⁹ A Disaster Management Center (DMC) was set up under the NDRC as an implementation arm and the lead agency for disaster management. It is mandated with the responsibility of implementing and coordinating national and sub-national level programs for reducing the risk of disasters with the participation of all relevant stakeholders. Further,

District and Divisional-level Disaster Management Committees and District Disaster Management Committees were established. In February 2006, the Cabinet Ministry of Disaster Management and Human Rights was established and it was renamed as the Ministry of Disaster Management in April 2010.¹⁸⁰

Certain inherent shortcomings can be seen in Sri Lanka's political culture and administrative behavior that hamper a systematic approach to disaster risk management. Disaster management is considered a juicy plum that gives access to state resources. As a result, the institutions that deal with the issue are dispersed in several ministries. This hinders an integrated approach, proper planning, and coordination. The lack of preparedness, poor planning and coordination, and conflicting statements by policymakers about the extent of the damage were clearly mirrored during the HM X-Press Pearl incident.

The state is not the sole actor in disaster risk management. Another important aspect is the major role that INGOS, NGOs, and private sector

institutions are playing. Their involvement, especially in Community-Based Disaster Risk Management (CBDRM) activities is crucial in engaging Disaster Risk Communities (DRCs) in the identification, analysis, treatment, monitoring, and evaluation of disaster risks, and enhance their coping capacities.¹⁸¹ Many of the International Humanitarian organizations coordinate through the UN Country Team. The Community Tsunami Early-Warning Center (CTEC) in Peraliya is a good example.¹⁸² The Sarvodaya Community Disaster Risk Management Centre, Moratuwa, should also be noted for the role that NGOs can play.

Societal Resilience: Socio-cultural Dimension of Disaster Management

Having experienced various disasters for generations, traditional communities have developed the knowledge and skills to cope with the challenges posed by nature. Before disaster comes to their doorstep, traditional communities prepare well. The memory of how the people in the valley of Kalu Ganga prepared for the floods in the rainy season in bygone days is still alive among the older generations. They recall how villagers got together to repair boats and rafts in the village by shramadana (voluntary labor) for use in the event of floods. By observing the specific behavior of birds and animals, villagers decoded the early warning signals given by nature. Because of this knowledge and skills, traditional communities are more resilient vis-à-vis natural disasters. It is essential to unpack the traditional knowledge acquired as how to live with the environment and synergize it with modern technology.

Building societal resilience in the face of natural disasters is also crucial. The political body also plays a crucial role in building social resilience and mobilizing the strengths of civil society. In order to transform political will into national will, an organic articulation between the civil and political domains is essential. When the totality of disaster management is considered, three main components should receive equal attention:

- i) disaster preparedness,
- ii) meeting the challenge, and
- iii) mitigation of effects.

But the role of the state is crucial, while the link between the political and civil domains is fundamental.

Figure 8.1: Disaster Risk Management



In all three components, the socio-cultural dimension must be given due attention in policy planning and implementation. Minna Thaheer argued that disaster management sans conflict sensitivity is a recipe for disaster. Thaheer correctly points out,

Usually, it is the poor and the marginalized that bear the brunt of these disasters caused by climate effects, which can also be attributed to causes created by other human agency. Variability of climate and natural hazards impact the daily rhythm of life, which determines social cohesion.¹⁸³

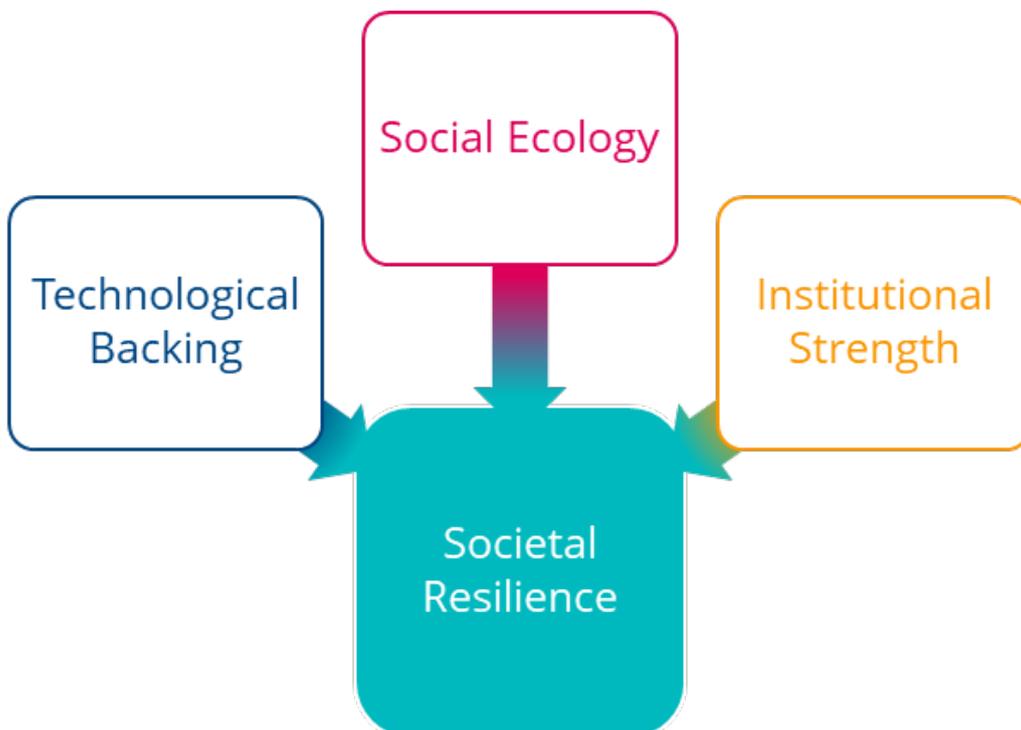
Accordingly, the activities of “other human agency” should also be given due attention in disaster risk management planning.

Some socio-cultural characteristics, ingrained in the behavior of Sri Lankan society, should be brought into focus. The extended family and community networks and the readiness to extend help to others should be noted in this context. They contribute to absorb shocks both psychologically and materially. This was clearly illustrated in the aftermath of the tsunami. The second characteristic is the readiness to forget the past sufferings and to look to the future. The short memory of the Sri Lankan people is always referred to in a negative sense. As far as societal resilience in the face of disasters is concerned, it has some positive aspects. Thirdly, the belief that Sri Lanka cannot be subjugated for long and will bounce back is important in building societal resilience in the face of disasters.

There is a belief that Sri Lanka is destined to face misfortunes because of the “curse of Kuveni”. But it will emerge ultimately, because the God Uppalavanna had been mandated to give protection to the Island by the King of Gods (Sakka).¹⁸⁴ These historical myths and rituals have had deep cultural significance in the face of calamities and linger in the contemporary social psyche through songs and other expressions. These cultural traits and beliefs could be used in building social resilience.

However, it is not possible to rely solely on socio-cultural terms for building societal resilience. In the present context, technological backing and institutional network play a crucial role. The true social potential could be mobilized only through institutional structures, both formal and informal. Technology at all levels plays an important role in enhancing societal resilience. Societal resilience can be understood in relation to three elements: socio-cultural milieu (social ecology), technological backing, and institutional arrangement.

Figure 8.2: Societal resilience



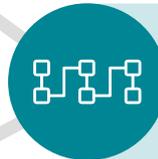
RECOMMENDATIONS

Unpack the traditional knowledge acquired on how to live with the environment and synergize it with modern technology.



Mechanism should be in place to avoid confusion and duplication of disaster management responsibilities between ministries

The political body plays a crucial role in building social resilience and mobilizing the of civil society.



Coordination and collaboration between state institutions and NGOs needs to be developed.

An organic articulation between the civil and political domains is essential.



It is necessary to pay attention to the traditional knowledge systems.

The ethno-political sensitivities should be given due attention in all three interrelated phases of disaster management – **pre-event measures, emergency response measures and post-disaster measures.**



Socio-cultural dimension must be given due attention in policy planning and implementation.

The societal resilience can be significantly enhanced by effective use of new technology backed by use of institutional and social networks.

Sri Lanka has gone a long way in setting organizational structures and policy formulations to address disaster management since the Tsunami. Disaster management today has become a key policy domain in statecraft. In order to enhance this further, attention and action are necessary in the following four areas: First, as a number of Ministries handle different disaster management functions, mechanisms should be in place to avoid confusion and duplication. Disaster management functions are dispersed among the Ministry of Disaster Management, National Council for Disaster Management, Disaster Management Centre, the Meteorological Department, the National Building and Research Organization and National Disaster Relief Services Centre. Effective coordination is of foremost priority. Second, coordination and collaboration between state institutions and NGOs needs to be developed. Third, it is necessary to pay attention to the traditional knowledge systems regarding environmental protection and living with natural disasters in all aspects of disaster management planning and implementation. Culture is the depository of traditional knowledge and its related skills can be combined with modern technology to build societal resilience to face natural disasters. Finally, in a multi-ethnic society like Sri Lanka, especially in the context of the post-conflict environment, the ethno-political sensitivities should be given due attention in all three interrelated phases of disaster management — pre-event measures, emergency response measures and post-disaster measures.



Thailand



Introduction

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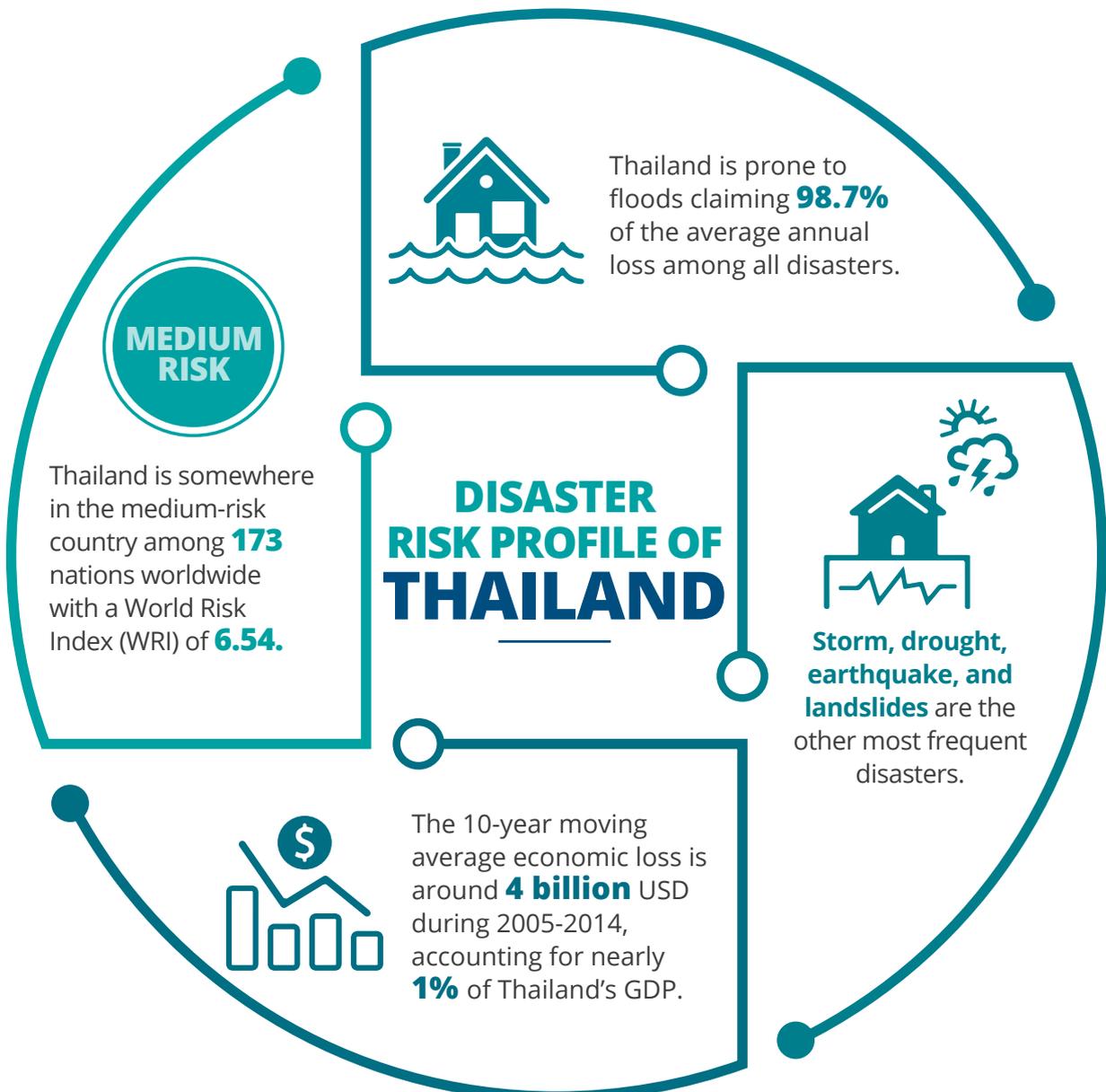
During the evolution of human civilization, humanity has endured several natural disasters. Natural disasters are inevitable but they can be prevented or their potential threat can be mitigated. With the advancement in technology, humanity has developed the potential to minimize disaster risk, but conversely, it has increased the extent of hazards too.¹⁸⁵ During the past few decades, industrialization, urbanization, population growth, unequal distribution of natural resources, and hunger for rapid economic growth have led to the heavy deterioration of the natural environment. Consequently, the likelihood of natural disasters and the potential risk has increased.^{186,187} In addition, new hazards such as radiation, toxic chemicals, new pathogens, pollution, poor infrastructural design, etc. have been emerging.¹⁸⁸ In such circumstance, global drivers such as socio-economic disparity and climate change are likely to increase the burden on Disaster Risk Management (DRM).^{189,190}

The world's urban population has increased by around 67 per cent (from 33 per cent to 56 per cent) within 60 years of the period since 1960.¹⁹¹ Thailand experienced a 161 per cent (from 19.6 per cent to 51 per cent) growth rate in the same period. Also, the urban population of the world is projected to reach 68 per cent by 2050. Such an increment in concentrated settlements is likely to increase vulnerability and exposure. Issues such as poverty and extreme inequality in wealth distribution also increase vulnerability, ultimately increasing the disaster risk. Today, "World's one per cent richest have twice the wealth as 6.9 billion people" and "Half of the world's population is still living on less than 5.5 U.S. dollars per day".¹⁹² With a 9.9 per cent poverty rate, Thailand finds itself in a better position (17th) among 164 nations worldwide.¹⁹³ However, there are other issues to worry about, especially the physiography of the country and climate change.

Most of the kingdom's territory is flat which makes it highly vulnerable to floods. Bangkok, the capital city itself is in the floodplain of the Chao Phraya River. Rapid urbanization, destruction of wetlands and encroachment of riverbanks are increasing the flood risk even more. Moreover, climate change is likely to worsen the situation. Evaluation of historical data shows that the mean annual temperature of Thailand has increased by 0.014 ± 0.031 degree Celsius per year¹⁹⁴ while the annual precipitation exhibits a mixed trend¹⁹⁵ with an increment in average wet-day precipitation intensity. However, there is a decrement in the number of wet days.¹⁹⁶ Moreover, the mean sea level is found to be rising around 5 mm/year and is projected to rise 1.07–1.18 mm/year rise until 2100 under Representative Concentration Pathway (RCP) 8.5 in the Gulf of Thailand.^{197,198}

Future climate projection in Thailand shows an increment in mean annual temperature up to 4 degree Celsius under the RCP8.5 emission scenario till the end of this century, whereas mean annual precipitation is expected to undergo a negligible to 25 per cent increment along with intensification of heavy precipitation and dry spells.^{199,200} Regarding the future hydrology, results from different studies vary between a decreasing trend²⁰¹ negligible increment^{202,203,204} and an increasing trend.^{205,206} Besides, all the studies have consistently estimated an increment in high flows and a decrement in low flows.²⁰⁷ This is likely to increase flood and drought risk in the future all over Thailand. The result was further supported by a study in the Chao Phraya River basin which estimated around a 31 per cent reduction in the production of dry season irrigated rice due to droughts within the next two decades.²⁰⁸

Since we cannot change the population, land-use, economy, climate change and so on within a limited timeframe, the safety of any region from any possible disaster event relies mostly upon the preparedness of the people living within the exposed region. Hence, for any nation, it is essential to possess a strong “Disaster Risk Management System” and close coordination with regional and global institutions to overcome any anticipated disaster events. In this study, we discuss Disaster Risk Management Systems (DRM) of Thailand and its efforts towards Disaster Risk Reduction (DRR) considering a few examples of disaster events from the past. Here, we aim to provide an insight on disaster risk profile, disaster management systems, and Thailand’s response to notable disaster events in the past.

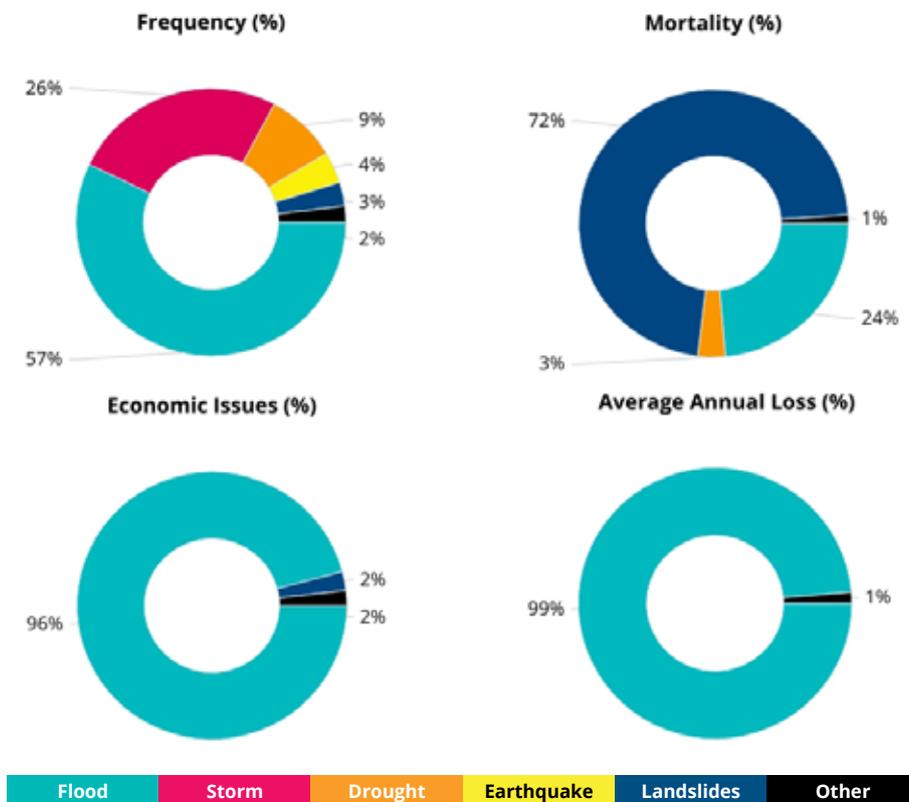


Disaster Risk Profile of Thailand

Located in Southeast Asia, Thailand extends over 513,120 square kilometres of territory characterized by tropical climate with high intensity and low duration convectional rainfall. Owing to such climate, it is prone to floods claiming 98.7 per cent of average annual loss among all disasters.²⁰⁹ Storms, droughts, earthquakes, and landslides are the other most frequent disasters as shown in Figure 9.1. The 10-year moving average economic loss was around four billion U.S. dollars during 2005–2014, accounting for nearly one per cent of Thailand’s GDP which is similar to the Southeast Asian region, however, far better than the six per cent of GDP loss in South Asia.^{210,211}

From a global perspective, Thailand is somewhere near the medium-risk level among 181 nations worldwide with a World Risk Index (WRI) of 6.54 (Figure 9.2).²¹² It is interesting to know it is the least disaster risk country after Laos (4.47) followed by Myanmar (7.18), Malaysia (7.71), Vietnam (10.3), Indonesia (10.39), Cambodia (15.76), Philippines (20.95) and Brunei (22.3) from the Association of Southeast Asian Nations (ASEAN). Moreover, Thailand finds itself in the sixth position among South and Southeast Asian nations, where Maldives is the safest with 2.12 WRI and the Brunei (22.3) the riskiest followed by Philippines (20.96) and Bangladesh (13.4).

Figure 9.1: Frequency, Mortality, Economic issues, and Average annual loss from different disasters in Thailand during 1990 to 2014



Source: CRED (2015)²¹³

Table 9.1: The natural disaster risk profile of the countries over the world in terms of the World Risk Index (WRI) for the year 2018

Ranking	Country	World Risk Index	Region	Ranking among ASEAN member
7	Brunei	22.30	Southeast Asia	1
9	Philippines	20.96	Southeast Asia	2
13	Bangladesh	13.40	South Asia	
16	Cambodia	15.76	Southeast Asia	3
20	Timor-Leste	14.67	Southeast Asia	
40	Indonesia	10.39	Southeast Asia	4
43	Vietnam	10.30	Southeast Asia	5
57	Afghanistan	8.69	South Asia	
72	Malaysia	7.71	Southeast Asia	6
74	Sri Lanka	7.57	South Asia	
81	Myanmar	7.18	Southeast Asia	7
87	Pakistan	6.68	South Asia	
89	India	6.62	South Asia	
90	Thailand	6.54	Southeast Asia	8
121	Nepal	4.71	South Asia	
127	Laos	4.47	Southeast Asia	9
152	Bhutan	2.87	South Asia	
164	Singapore	2.57	Southeast Asia	10
171	Maldives	2.12	South Asia	

Very Low

Low

Medium

High

Very High

*The highest the ranking, the riskiest the country.

Source: Bündnis Entwicklung Hilft & IFHV (2020)²¹⁴

DISASTER RISK MANAGEMENT SYSTEM



Disaster Risk Management Systems in Thailand

Legal System: Plan and Policies

The legislation regarding Disaster Risk Management in Thailand was streamlined after the Disaster Prevention and Mitigation Act 2007 (DPM Act 2007) which revoked the old Civil Defence Act 1979 and the Fire Prevention and Suppression Act 1999. The DPM Act 2007 established the National Disaster Prevention and Mitigation Committee (NDPMC) chaired by the Prime Minister with members from ministries, police and the army along with five intellectuals appointed by the cabinet. The committee exercises its power over policy formulation, coordinates between agencies, and recommends, supports, and promotes DRR, etc.

The DPM Act also stipulates the Department of Disaster Prevention and Mitigation (DDPM) as the central government agency for disaster prevention and mitigation. It also established the DDPM's regional, provincial, and Bangkok centers and provided full authority to the DDPM to confer with relevant government agencies and the private sector for a quick response. In addition to the establishment of legal entities, the DPM Act also enforces National Disaster Risk Management Plan 2016 which defines guidelines for disaster prevention and mitigation operation, evacuation procedures, recovery and restoration of the community and preparedness in terms of all kinds of resources and their deployment.

Thailand has also been amending its plan and policies upon learning lessons from the past. It includes the recently drafted National Disaster

Risk Management Plan 2015 which emphasizes preparedness, synergy within different sectors, and international cooperation and partnership. It has also outlined four strategies: DRR, integrated emergency management, sustainable disaster recovery, and international cooperation for risk management. It is making efforts in regard to preparedness and risk reduction at the national level thereby seeking increased coordination at the regional and global scale. The formulation of several new policies and projects coherent to the international agreements is a piece of evidence.

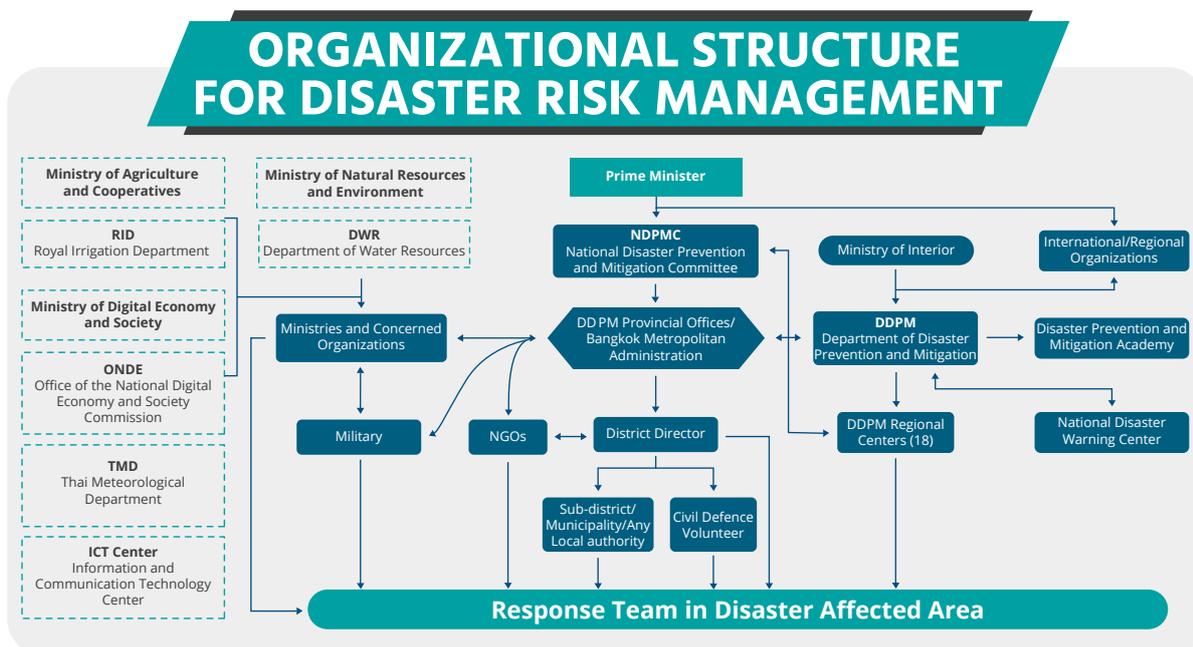
Organizational Structure

The DRM System has a solid institutional foundation as shown in Figure 9.2. The National Disaster Prevention and Mitigation Committee (NDPMC) chaired by the Prime Minister is the institution that takes care of National level policymaking while the Department of Disaster Prevention and Mitigation (DDPM) established in 2002 under the Ministry of Interior (MOI) is the principal governing agency for coordination and management at all levels. It has its head office in Bangkok along with provincial and regional centers to respond at a local level. Besides, Bangkok Metropolitan Administration (BMA) is a dedicated institution for the Bangkok Metropolis. In any disaster event, the Emergency Operation Center (EOC) will be activated to carry out the operation within their respective jurisdiction. If the event is large, Emergency Support Functions (ESFs) will be formed which include 18 tasks comprising logistics, international coordination, medical services, deployment of military equipment, critical facilities and infrastructure, information technology, social welfare, human security, and so on.²¹⁵

The organizational structure for disaster response is also evolving. Recently in 2016, the National Disaster Warning Center, formerly under the Ministry of Information and Communication Technology (MICT) was merged with the DDPM to leverage synergies and efficient delivery of work. Apart from this, international and regional organizations, NGOs, the military, and other relevant ministries and organizations work together in close coordination to respond to and mitigate any probable disaster event.

Disasters are perceived as a global threat to sustainable development; thus, the approach to risk management should not be bounded within a nation. At times it requires a collective approach. The on-going COVID-19 pandemic is the best example of this. Thailand comprehends the facts and works in close relation with organizations such as the United Nations Office for Disaster Risk Reduction (UNDRR), Asian Disaster Reduction Center (ADRC), Association of Southeast Asian Nations (ASEAN), Southeast Asian Ministers of Education Organization (SEAMEO), Regional support office for East and South-East Asia (ECHO E & SE Asia), Regional Consultative Committee on Disaster Management (RCC), and particularly, the DRM in ASEAN.²¹⁶

Figure 9.2: Organizational Structure of Disaster Risk Management in Thailand



Source: ADRC (2021)²¹⁷

Major Disaster Events in Thailand

Thailand has experienced several natural disasters during the past few decades. The nature of these disasters varies in terms of magnitude and frequency. Investigation of past disasters and their critical analysis helps to improve our understanding and preparedness for future events. Here major

disaster events that occurred since 1962 are shown in Figure 9.3.^{218,219,220} Figure 9.3 shows that COVID-19 which seems to be the least frequent of its kind has already claimed 4,509 lives and is expected to contract Thailand's economy by at least five per cent in 2020.^{221,222}

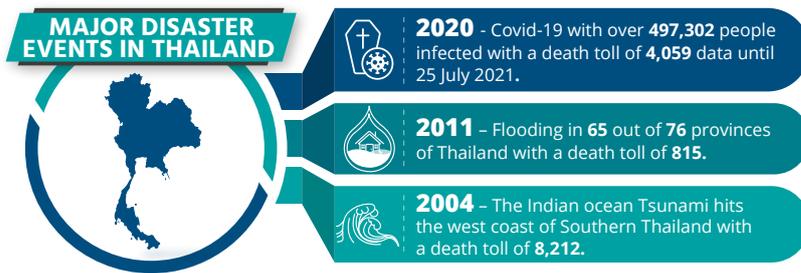
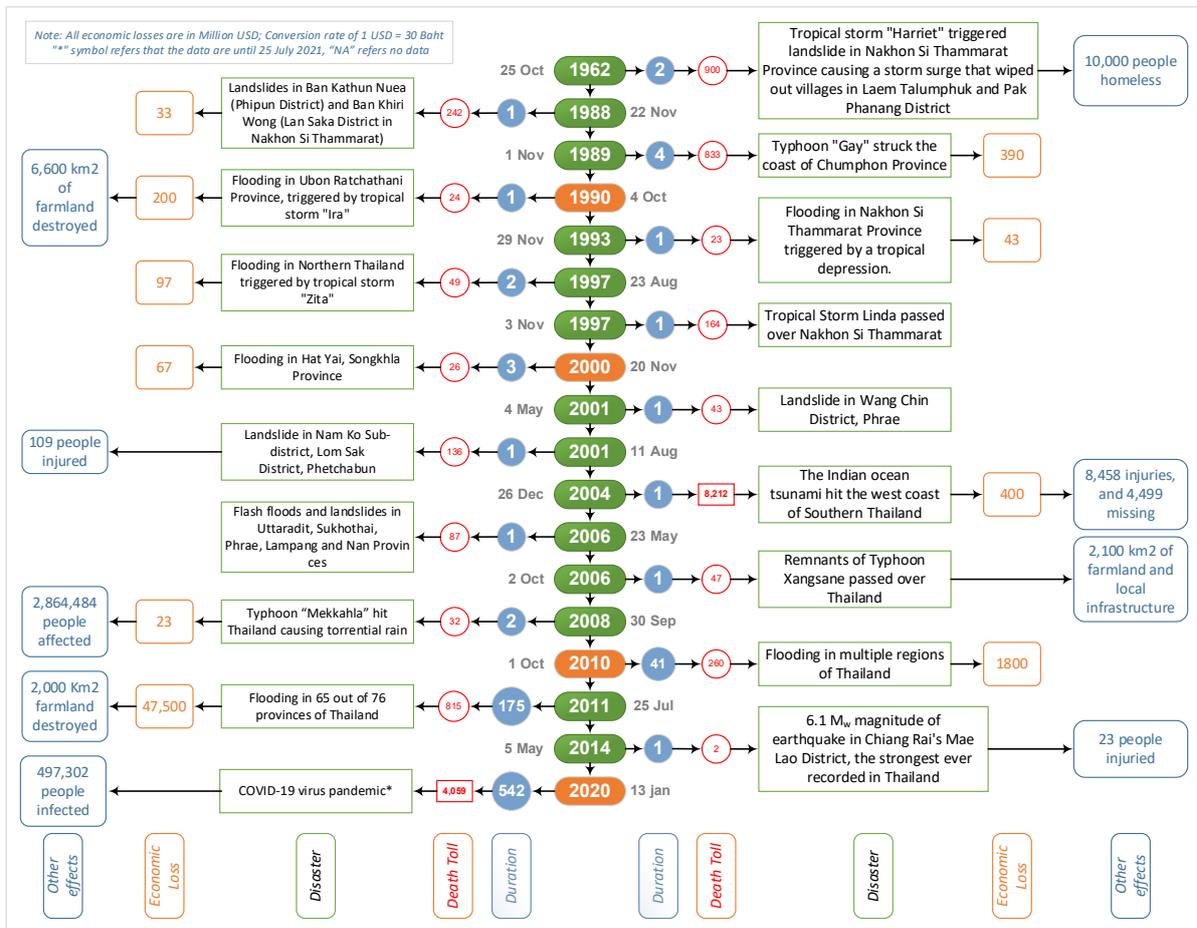


Figure 9.3: Timeline of major disaster events and losses incurred in Thailand



Source: Wikipedia (2012); Thairath (2014); WHO (2021)^{223,224,225}

COVID-19 Pandemic (2020)

Thailand was the first country outside China with a confirmed case of COVID-19. Yet it was able to receive admiration for its effort in its COVID-19 response during the first outbreak. The Ministry of Public Health (MoH) in collaboration with other ministries, especially the MOI and DDPM, along with provincial and local administrations played a vital role during the response and recovery. The few strong aspects were their quick response and action, strong political commitment, proper healthcare facilities, effective communication, and responsive public. However, the situation evolved differently after the second outbreak in December. Some of the weak aspects of Thailand during the COVID-19 response are weak border surveillance, unpreparedness for the worst-case scenario, slow vaccination process and breach of control measures by some Thai elites and businesses in entertainment sector.

The Great Flood of 2011

“The Great Flood of 2011” is reckoned to be one of the most devastating disaster events in modern-day Thailand. Inundating 9.1 per cent of total land areas, it affected more than 13 million people with an estimated loss of 1.43 trillion Baht.²²⁶ Studies have concluded four reasons behind the flood:

- i) “La Ninã” event which increased rainfall by 143 per cent, consequently doubling the runoff,
- ii) Reservoir operation exceeding the threshold storage level just to store water and prevent flooding downstream which was hit by other tropical storms: “Nock-Ten” and “Muifa,”
- iii) Plain topography, rapid urbanization of wetland and flood plains, and
- iv) Poor water resources management and governance.²²⁷

Also, it was found that flood was not an extreme kind in terms of return period; however, the operation of reservoirs to store water for the dry season in the absence of near-time weather forecast data played a major role of amplifying the effect.

Table 9.2: COVID-19 Profile of Thailand (2 September 2021)

Statistics	Thailand	Ranking (among 223 countries)
Active Cases	163,680	17
Total Cases	1,234,487	29
	17,634 per million	129
Total Deaths	12,103	45
	173 per million	132

Source: WHO (2021)²²⁸

Indian Ocean Tsunami (December 2004)

On 26 December 2004, an earthquake measuring around 9.1 megawatt at a depth of 30 metres under the west coast of Northern Sumatra, Indonesia was recorded, causing Tsunami waves up to 30 metres high before heading inland.^{229,230} It is considered one of the deadliest disasters in history, claiming more than 283,000 lives from 14 coastal nations.²³¹ The tsunami hit Thailand's southeastern coastline, 500 away from the epicenter which included the most popular tourist destinations such as Similan Islands, Phuket, Khao Lak, and so on. It claimed around 8,212 lives including 2,448 foreigners, with more than 58,500 people affected from 25 districts and an estimated loss of more than 2 billion U.S. dollars only in Thailand.^{232,233} Fishing, agriculture, and tourism sectors were hit hard along with several environmental impacts such as debris, loss of aquatic habitats, destruction of coral reefs and coastal ecosystems, saltwater intrusion, and land subsidence being left behind.²³⁴

Thailand's response to the tsunami was not strong enough. An official alert was sent only after the first wave hit although there was a 2-hour response period. However, the crisis management was better than most of the affected nations. The overall response can be categorized in terms of short-term and long-term recovery. The short-term response included search operations, coping with the fatalities, assistance to foreigners, the provision of food, water, shelter, and medical services, compensation, and so on while the long-term recovery included support for rehabilitation, recovery of fisheries, businesses, tourism and the environment, social coping, and psychological support.²³⁵

Conclusion and recommendations

Disasters are dynamic and so should be the risk management perspective. Learning from the past and preparing for the future are the best ways to reduce the risk. The importance of coordination between the authorities during the great flood is one of the examples. In addition, the 2011 flood left an important message regarding the importance of flood forecasting and early warning system. Thailand's recent efforts in near real-time FFEWS with automated telemetry stations nationwide is an example of learning from the past. Similar is the case of the establishment of the Regional Tsunami Early Warning System viz. Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) and local Tsunami Early Warning System in Krabi.

Despite these initiatives, Thailand still needs an integrated database system, improvement of its Emergency Operation Service (EOC), and smooth coordination between national and local authorities.

LESSON LEARNED



- The 2011 flood has left an important message regarding the importance of flood forecasting and early warning system



- Thailand's recent efforts towards near real-time **Flood Forecasting and Early Warning System (FFEWS)** with automated telemetry stations nationwide is an example of learning from the past



- Thailand still needs an integrated database system, improvement in Emergency Operation Service (EOC), and smooth coordination between national and local authorities

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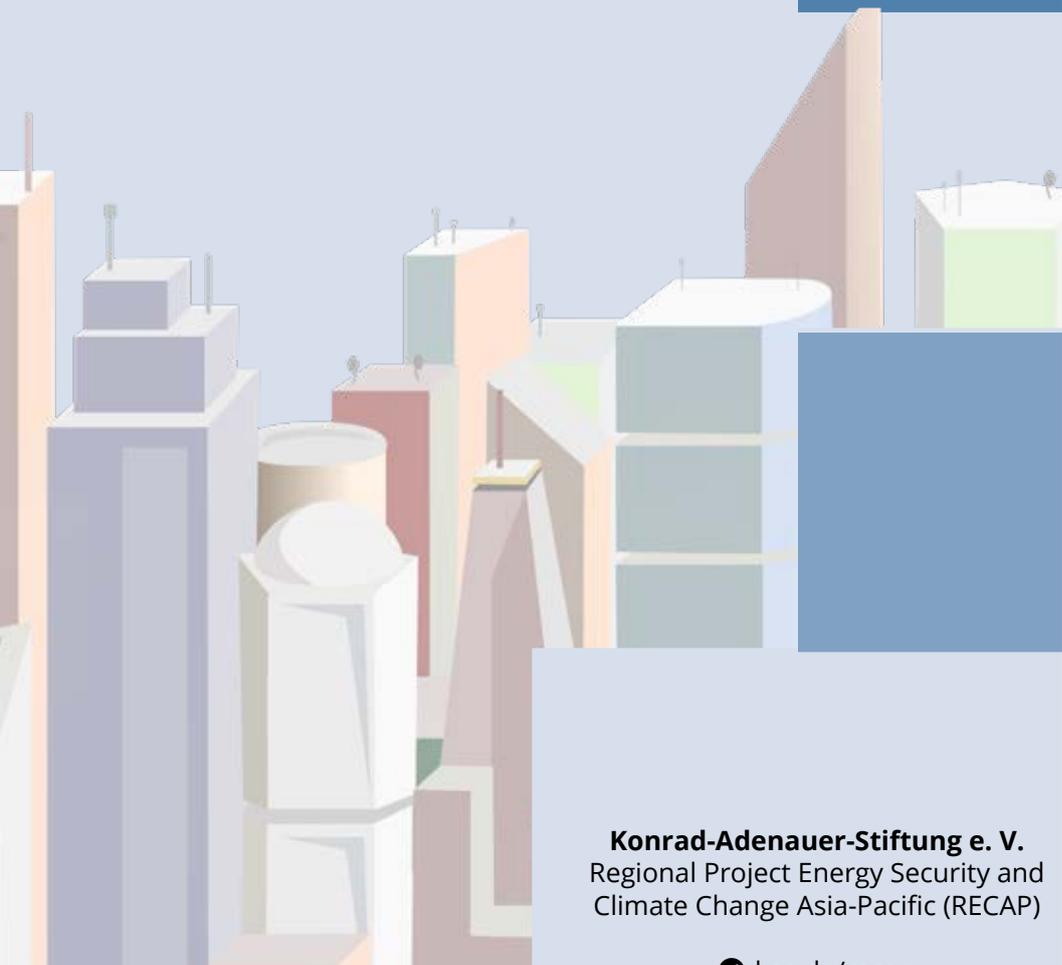
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