

Disaster Risk Reduction in Sri Lanka

Status Report 2019



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UNDRR

UN Office for Disaster Risk Reduction

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About this report

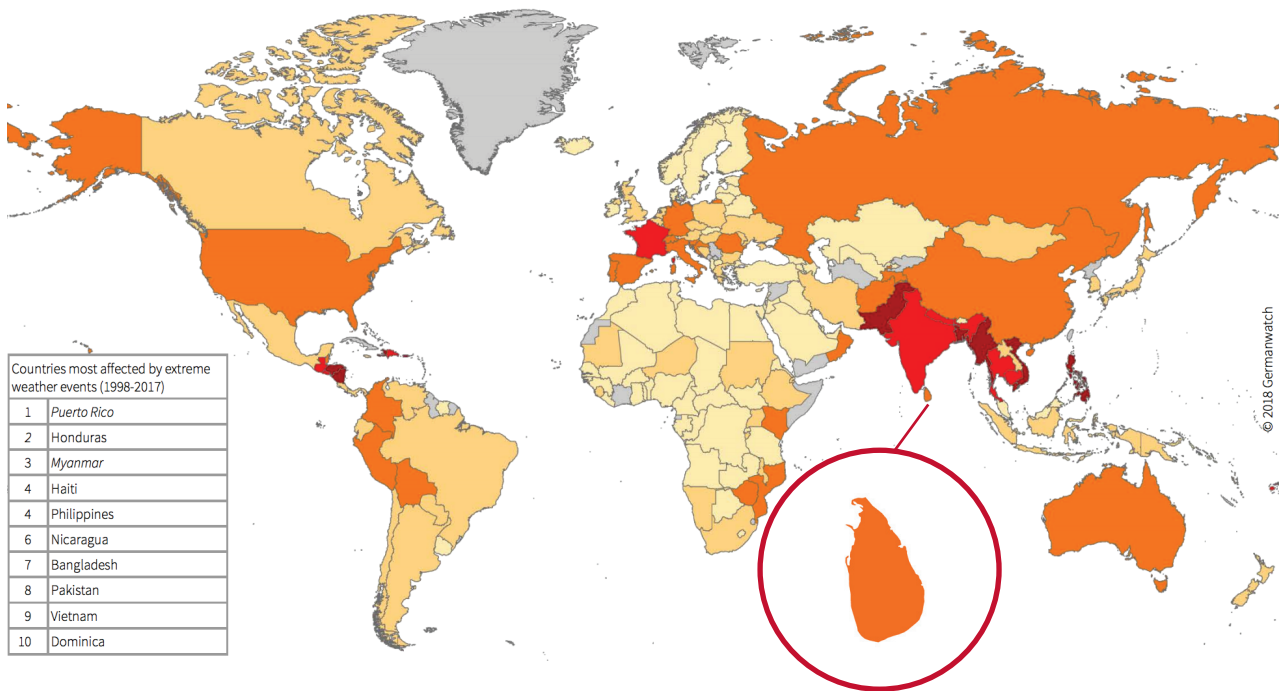
The Disaster Risk Reduction (DRR) report provides a snapshot of the latest DRR progress Sri Lanka has achieved under the four priorities of the Sendai Framework. It also highlights some of the key challenges surrounding the issue of creating coherence among the key global frameworks at the country level; and makes recommendations for strengthening the overall Disaster Risk Management (DRM) governance by government institutions and other stakeholders at national, sub-national, and local levels.

The UN Office for Disaster Risk Reduction and the Asian Disaster Preparedness Center acknowledge the governments, international organizations and stakeholder representatives who provided their valuable contribution and feedback to this report. It was made possible by the generous contribution made by the Government of Australia, Department of Foreign Affairs and Trade, as part of the Partnership Framework with the UN Office for Disaster Risk Reduction on 'Supporting Implementation of the Sendai Framework.'

The findings, interpretations, and conclusions expressed in this document do not necessarily reflect the views of UNDRR or of the United Nations Secretariat, partners, and governments, and are based on the inputs received during consultative meetings, individual interviews, and the literature reviews conducted by the research team. While every effort has been made to ensure the accuracy of the information, the document remains open for any corrections in facts, figures and visuals.

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UNDRR (2019). Disaster Risk Reduction in Sri Lanka: Status Report 2019. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific



Countries most affected by extreme weather events (1998-2017)

1	Puerto Rico
2	Honduras
3	Myanmar
4	Haiti
4	Philippines
6	Nicaragua
7	Bangladesh
8	Pakistan
9	Vietnam
10	Dominica

Climate Risk Index: Ranking 1998 - 2017 1- 10 11 - 20 21 - 50 51 - 100 >100 No data

(GermanWatch,2019)

POPULATION 2018	
Total Population (million)	21.44
Urban Population (million)	3.9 (18.41%)
Population Density Per Km ²	331
ECONOMIC INDICATORS	
Gross Domestic Product in Current \$US	87.17 billion
GDP Per Capita (\$US)	4,065.22
GDP Growth (Annual %)	3.1%
HUMAN DEVELOPMENT	
Human Development Index	0.770
HDI Rank	76
Income Level Category	Upper-Middle income

Climate Risk Index

Rank 31 / Medium Risk*

INFORM Risk Index

Rank 97 / Medium Risk**

* Climate Risk Index of 2019 analyses the extent to which countries have been affected by weather-related losses between 1998-2017 (GermanWatch, 2019). However, it should be noted that the CRI may not provide an accurate presentation of the future risk due to the fact that it measures data of past events (which may not always be available depending on the country). Thus, low CRI score does not accurately indicate low climate risk in the future.

** INFORM risk index is a global tool which measures the risk of humanitarian crises and disasters based on 50 indicators assessing hazards, vulnerability and capacity (resources available to mitigate the impact) (INFORM, 2019)

1. Introduction

The island of Sri Lanka is located in the Indian Ocean, separated from the subcontinent of India by the Gulf of Mannar and the Palk Strait. The country is also relatively small, covering a total land area of 65,610 km². Nevertheless, the island still encompasses a variety of ecological zones from tropical forests, highlands and lowland plains to diverse coastal belts (CFE-DM, 2017). Most of the country consists of lower plains with the elevation between 30 to 200 meters.

In terms of administration, Sri Lanka consists of nine provinces, which are further divided into 25 districts. The governance of districts consists of 331 Divisional Secretariats, under which 14,022 Grama Niladhari, or village officers, operate to carry out administrative duties at lowest levels of administration. Juridical and executive powers over the nation are exercised by the multi-party Parliament and the president, both of which are elected by people's vote.

Sri Lanka is affected by various hazards, including weather related events such as cyclones, monsoonal rain, and subsequent flooding and landslides (Ministry of Disaster Management, 2019). Droughts are also common due to variations in the monsoons followed by lightning strikes, coastal erosion, epidemics and pollution. Of these, localized and seasonal flooding are forming the greatest threat to the populations, and the flood risk profile is rising due to the expected increase in the impact and frequency of hydro-meteorological hazards (GFDRR, 2017). Indian Ocean tsunami of 2004 highlighted Sri Lanka's vulnerability to infrequent, high-impact events as well (Ministry of Disaster Management, 2019).

The rapid growth of tourism and industry have contributed to the growth of the GDP since 2009, and it has increased at an average rate of 5.8% despite some slowdown during the past few years (The World Bank, 2019). However, inequality in wealth distribution has increased despite the decline in poverty; the richest quintile had 53.3% of the total household income, while 80% population shared the rest (ADB, 2015).

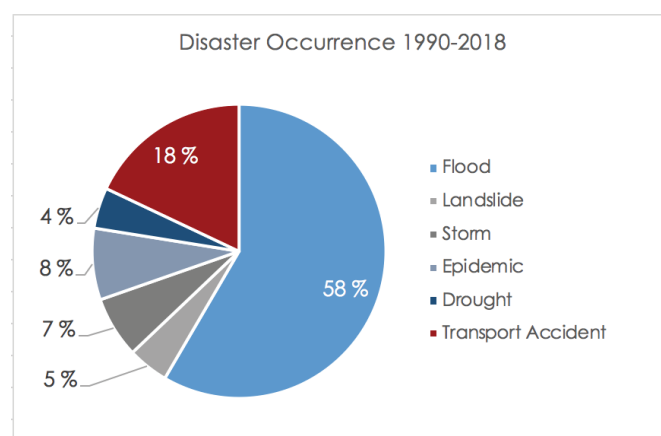


Figure 1. Disaster occurrence between 1990-2018 (CREC, 2019).

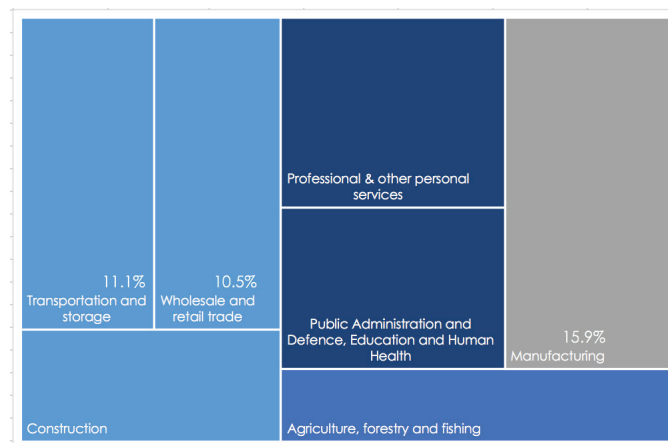


Figure 2. Largest industries contributing to, and their portion of the GDP in % in 2019 (Central Bank of Sri Lanka, 2018).

1.1 Demographic Characteristics

The total population of Sri Lanka exceeded 20.2 million in the 2012 population census (Department of Census and Statistics, 2012), and has reached 21.4 million by the most current estimates. In 2012, 28.7% of the people were concentrated to the western province, making its population density 1,621 persons per km² as opposed to the national average of 331. Most of the people (72%) still reside in rural areas (The World Bank, 2016). In terms of ethnic distribution, the population consisted of Sinhalese (74.9%), Sri Lankan Tamil (11.2%), Indian Tamil (4.1), Sri Lankan Moor (7.9%) according to the 2012 housing census (Department of Census and Statistics, 2012).

Along with the psychological and social aftereffects of the civil war, aging population is another issue in Sri Lanka – it has been estimated that by 2030, 1 in every 5 people will be above 60 years (UNFPA, 2018). The population is aging faster than in any other South Asian country, and already 2.6 million people (12.4% of the population) are above 60 years old (UNFPA, 2018). This creates multiple challenges for the future, as the elderly are often more vulnerable to disasters due to lack of social support and lack of income, or because they are more likely to be subject to social exclusion. Currently, a pension scheme for the elderly with a history in informal work, and a comprehensive system for health care, are yet to be established in the country (UNFPA, 2018).

1.2 Economic Impact of Disasters

Sri Lanka was among the three most affected countries in the 2017 estimate in terms of weather-related loss events, ranking second highest on the Climate Risk Index which measures fatalities and economic losses occurring as a result of extreme weather (Eckstein, et al., 2019). Unusual events such as the 2017 flooding following a strong monsoon, contribute to the risk status, as the event caused more than 200 fatalities and displaced more than 600 000 people across 12 districts (Eckstein, et al., 2019). Economic losses following the 2017 flooding increased by 50% when compared to the previous decade between 2007 and 2016.

Sri Lanka is habitually affected by recurring disasters, which have caused recorded damages of nearly \$US 7 billion between 1990-2018. However, the total extent of damages in reality is undeniably greater due to costs arising from unrecorded local events and smaller scale events such as regional flooding. The impacts of chain of recurring disasters have affected the country's development as much as the rare events of catastrophic proportions. Flooding between 1990-2018 has caused over US 2 billion dollars in damages (half of which occurred in 2016), while the tsunami of 2004 caused an estimated US 1 billion dollars of damages according to the Preliminary Needs Assessment (ADB, JBIC & the World Bank, 2005).

The yearly monsoons, associated flooding and landslides cause the most damages in terms of economic impact and human casualties. In 2016, Cyclone Roanu induced heaviest recorded rainfall in more than 18 years, inducing exceptional flooding in 24 of the 25 districts, and covered a land area of 1400km² (Alahacoon, et al., 2018; MoNPEA & MoDM, 2016). Furthermore, the event affected nearly half a million people and caused a combined damages and losses of over US 600 million dollars. Kelani river basin and landslides in Aranayake were responsible for most of the deaths and damages. Social sector (mainly housing, land and settlements) accounted for 53.5% of the total impact, while productive sectors (industry and commerce, followed by agriculture and fisheries) suffered 33% of the total amount (MoNPEA & MoDM, 2016).

The 2017 flooding caused by Cyclone Mora affected fifteen southern districts of the country, induced major landslides which disturbed the operations of tea, rubber and coconut plantations, and destroyed numerous paddy fields, not to mention the damages to the infrastructure (MoNPEA & MoDM, 2017). The cost of 2017 floods and landslides amounted to approximately US 415.5 million dollars, with inflation accounted for. The impact was highest to the social sector, where housing, education and health carried the brunt of the damages (46%), and 80% of it took place in rural areas (MoNPEA & MoDM, 2017). The disaster affected districts were also actively involved in agriculture, trade and services which contributes to the costs of damages and losses.

Also, floods and droughts contribute to the costs of sustaining national healthcare. On average, the economic costs associated with said events to healthcare has been estimated to be 52.8 million USD yearly, with 78% of the costs originating from droughts (De Alwis & Noy, 2017).

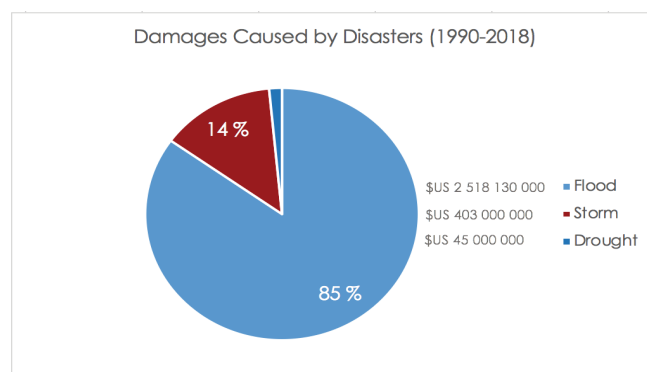


Figure 3. Damages caused by Disasters (USD) between 1990-2018 in Sri Lanka (CRED, 2019).

1.3 Social Impact of Disasters

Despite the recurrent disasters and past conflicts, the number of households falling below the poverty line is among the lowest in the region, and Sri Lanka has made significant progress in poverty reduction. Currently, the percentage of poor households in Sri Lanka stands at 3.1% according to the 2016 Household Income and Expenditure Survey (Department of Census and Statistics, 2016), and the poverty headcount index has fallen from 22.7 in 2002 to 4.1 in 2016. It is a remarkable achievement in the sense that the levels of poverty are lower than in other post-conflict or otherwise comparable countries – however, poverty remains relatively high vis-à-vis the country's level of development (The World Bank, 2017).

Disasters of the last decade have had several impacts on the populace. During the years 2005-2015, flooding in Sri Lanka Affected 64% of the population (MoNPEA & MoDM, 2017). The cyclone Roanu in 2016 affected mostly metropolitan areas such as Colombo and Gampaha, which have high population densities, and also house the highest numbers of people living in poverty (MoNPEA & MoDM, 2016). Majority of the schools affected were also within these districts (101 out of 172). 65 health centers were affected, and 382 education buildings out of 2122 suffered damages.

It is important to note that while the poorest often suffer the most in times of adversity, they are also more vulnerable to the ripple effects. For example, it has been established that the quality of education in the rural areas is lower due to lack of skilled teachers, and the relatively high cost of education to families results in children from lower-income background dropping out from schools (MoNPEA & MoDM, 2016; MoNPEA & MoDM, 2017). Thus, disasters affecting education have a higher impact on children who are already facing inequalities in the schooling sector. Loss of livelihoods (such as small-scale farming) or destabilized food security also heavily affect the poor.

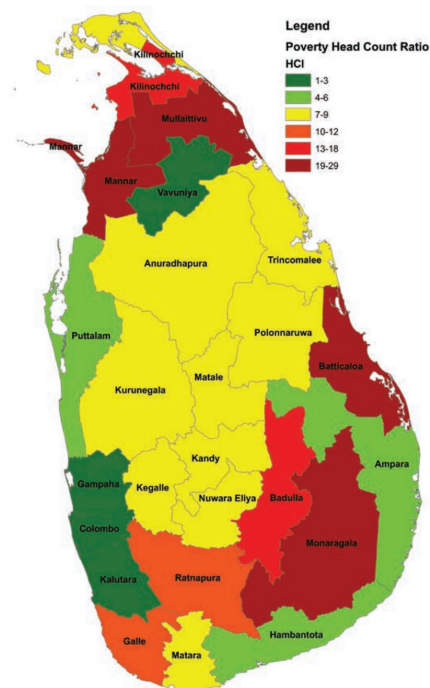


Figure 4. Distribution of Poverty headcount in Sri Lanka in 2014 (MoNPEA & MoDM, 2016)

2. Disaster Risk Profile

The most common hazards in Sri Lanka are seasonal and localized flooding and landslides across the country, followed by cyclones, storm surges, droughts and high winds. The Disaster Management Act of 2005 recognizes 21 natural and man-made hazards from cyclones (with 16 making landfall during the past 130 years), earthquakes, fires and epidemics to radiological emergencies, nuclear disasters and coastal erosion (The Government of Sri Lanka, 2005). However, due to diverse topography and environments, the occurrence of disasters varies greatly. Also, it is worth noting that during the last decade, occurrence of natural hazards has increased by 22 times mainly due to an increased impact of hydro-meteorological events (Ministry of Disaster Management; A-PAD, 2016).

2.1 Hazards and Climate Change

Sri Lanka has two distinct monsoon seasons which are usually followed by flooding due to extreme rainfall. They also have significant spatial variability. The Southwest monsoon in May-September affects southern and Sabaragamuwa provinces the most, while during the Northeast monsoon (in December-February), eastern, northern and north-central provinces are most prone to flooding (Ministry of Disaster Management, 2019). In addition to this, tropical cyclones and depressions forming in the Bay of Bengal usually affect the country by bringing in high levels of precipitation (JBA, 2019).

Given the low-lying, undeveloped areas in many parts of Sri Lanka, flooding remains to be the key hazard that affects livelihoods, property and people – five million people have been affected between 2000 and 2013 by 25 large-scale flooding events (JBA, 2019). Also, despite significant improvements in the early warning systems and response capacity, numbers of lives lost have increased during the past decade due to flash flooding induced by unorthodox precipitation levels (Ministry of Disaster Management, 2014). Between 2016-2018, 539 casualties were recorded in the EmDat database, which is almost 40% of all recorded casualties since the year 1990 (CRED, 2019).

Despite receiving abundant rainfall annually, droughts have had similar widespread impacts over the country. In 2016-2017, the country experienced a drought which was considered to be worst such event in the past 40 years, affecting 20 districts and approximately 1.8 million people (CFE-DM, 2017). Country-consultations revealed that water scarcity, related to the drought risk, is considered as the most pressing issue now, and in the future.

20% (approximately 13,000 km²) of Sri Lanka's land area is considered to be vulnerable to landslides in ten administrative districts in the southern inland regions (Ministry of Disaster Management; A-PAD, 2016). They most often occur in places where water drainage systems are inadequately maintained (such as tea plantations) and where steep slopes have been cut into for expanding housing, plantations and road infrastructure. All districts of Sri Lanka are also prone to lightning strikes. They peak during the two inter-monsoon periods, with April having the seemingly highest occurrence of events (Ministry of Disaster Management; A-PAD, 2016). Many of these hazards are affected (and often enhanced) by climate change and varying weather patterns.

Sri Lanka is highly vulnerable to climate change due to its low elevation and high dependence on the ecological systems. Agriculture sector is expected to suffer the highest costs, especially in districts such as Anuradhapura, Jaffna and Mullaitivu in which communities rely on farming activities (Wickramasinghe, 2019). Substantial share of Sri Lankas foreign income follows the export of crops, which are vulnerable to changes in annual weather patterns (Ministry of Mahaweli Development and Environment, 2016). Despite the contribution of agriculture to GDP remains relatively low, approximately 1.8 million farming families were engaged in paddy cultivation in 2016 (MoNPEA & MoDM, 2016). Thus, extreme events and climate change threatens not only the livelihoods of millions, but also endangers the nation's food security – the rice production requires a yearly increase of 2.9% due to population projections (MoNPEA & MoDM, 2016).

Furthermore 44% of the GDP is generated in the coastal regions, and fisheries and tourism have both become increasingly important economic activities (Ministry of Disaster Management; A-PAD, 2016). Thus, climate change and processes such as coastal erosion and growing coastal human settlements are increasing the long-term climate risks as sea levels continue rising and the impacts of hydro-meteorological hazards grow more severe. Indeed, agriculture, fisheries, tourism and coastal infrastructure have been identified to be highly vulnerable sectors to sea level rise, mean temperature increase and climatic variations (Ministry of Disaster Management; A-PAD, 2016). Human activities in Sri Lanka often worsen the impact of hazards and climate change. For example, wetlands, which are considered to play a vital role in water retention processes, are being converted for urban development, reclaimed or used as waste dumpsites, which enhances the impacts of floods (MoNPEA & MoDM, 2016). Deforestation is another issue, because slopes with low vegetation are more prone to landslides.

2.2 Exposure

As illustrated by the past disasters discussed in this report, most of the country is exposed to either frequent hydrometeorological events or rare disasters of catastrophic-scale. However, within this, there are nuances of varying exposure, often determined by household resources, level of education (or disaster awareness) and by gender, ethnicity and other factors.

Due to the relatively small island setting, the demand for land in the growing urban areas has led to the expansion of cities to land prone to flooding and landslides, and which are often deemed unsuitable for habitation (Dissanayake, et al., 2018). The outskirts of the metropolitan region of Colombo are pushing into wetlands along the Kelani river basin, which results in environmental degradation and increased exposure of the local population (Friedrich, 2017).

The poor are also disproportionately exposed to the environment, especially in the case of flooding, epidemics and droughts. It has been found out that individuals who do not have access to in-house toilet nor have their own water sources are more likely to end up being hospitalized in the aftermath of flood disasters due to contamination of water sources (De Alwis & Noy, 2017).

In terms of epidemics, the weekly dengue occurrence seems to correlate with multiple variables interlinked to climate change (amount of rain, temperature raise, sunshine, humidity and wind), and the occurrences are especially high in regions with high population density (Ehelepola, et al., 2015).

In terms of epidemics, the weekly dengue occurrence correlates seems to correlate with multiple variables interlinked with climate change (amount of rain, temperature raise, sunshine, humidity and wind), and the prevalence of vector-borne diseases is especially high in regions with high population density (Ehelepola, et al., 2015).

2.3 Socio-economic Vulnerability

The vulnerability to landslides has been identified to be a socio-economic issue. Due to the fact that different trees, vegetation and their root patterns have an impact on slope stability (Giadrossich, et al., 2017), landslides are more common in areas which suffer from loss of vegetation and increased human-mediated erosion due to cultivation of fields (Hewawasam, 2010; Turkelboom, et al., 2008). Thus, the issue then becomes interlinked with household income, because many of the poor rural communities rely on cash crop products and their land on a high-risk area as their main source of income – thus, many cannot afford to consider the risks of land degradation (Perera, et al., 2018; Prasanna & Gnanatheepan, 2018).

Poverty is also linked to flooding and subsequent displacement, because the economic hubs of Colombo and Gampaha, which command high prices and suffer from lack of land, continue to attract migration. In fact, 40% of the country's poor inhabit informal settlements in the outskirts of the urban areas of the capital region, driven by the search of opportunities and services (Friedrich, 2017). As mentioned earlier, many of these settlements are built up on floodplains, which means that the poorest demographics are most vulnerable to flooding events and habitually end up being displaced (Friedrich, 2017). In the rural regions, low-income households which depend on natural resources as their sole livelihoods and are most vulnerable to financial losses resulting from floods and droughts due to lost agricultural products (De Silva & Kawasaki, 2018). Concerns for the impacts of climate and hazards to agriculture are significant given the fact that 26.1% of the employed are working in agriculture (Central Bank of Sri Lanka, 2018).

Remote communities and regions are also often disadvantaged in the aftermath of disasters. This is largely the result of inaccessibility due to poor road conditions, lack of infrastructure and transport facilities, which have sometimes resulted in unequal distribution of aid in certain regions (Wickramasinghe, 2019; MoNPEA & MoDM, 2017). Wealthy households are more sheltered against remoteness as they have the capacity to meet the needs for response and recovery through self-financing and access to insurances (Keerthiratne & Tol, 2017).

Finally, gender disparities are apparent in the country. Women have been identified to be disproportionately vulnerable in the PDNAs of 2016 and 2017, although the exact mechanisms contributing to gender inequalities were not identified (MoNPEA & MoDM, 2016; MoNPEA & MoDM, 2017). The FAO in Sri Lanka suggested that the relatively equal access to education has not led to significant improvements in labor force participation nor in gender equality (FAO, 2018). Furthermore, women lack access to training, markets and land ownership, all of which are critical elements in the production of agricultural goods, and mostly engage in less-productive subsistence farming (FAO, 2018). Women have also been found out to be more physically vulnerable to flooding due to different employment status than that of men, gendered social roles (such as taking care of the needs and safety of elderly and children) and due to lack of gender sensitivity in policy making (De Silva & Jayathilaka, 2014).

2.4 Physical Vulnerability

Poor land-use planning and utilization have been highlighted in the most recent disasters from 2016 to 2018 – unstable river banks resulting from sand mining, loss of natural buffer zones, blocking downstream waterways and construction in retention areas all contribute to the increased risks of flooding and landslides (MoNPEA & MoDM, 2017; MoNPEA & MoDM, 2016). Houses most affected in the 2016 flooding were located in high-risk areas, and were of inadequate design; in the urban areas, 65% of the affected houses were makeshift or semi-permanent constructions (MoNPEA & MoDM, 2016). Same applies to landslides, because at the local levels, unplanned cultivation of paddy fields increases the likelihood of severe damages in the studied areas of Kegalle, for example (Perera, et al., 2018).

Apparently, there have been approximately 10,000 unregulated buildings in Colombo which have been demolished in 2017 among other high rise buildings which have been constructed without authorization (Economy Next, 2017). Some of informal areas of the cities also lack infrastructure and services, which is creating significant amounts of pollution to the environment along with being increasingly exposed to hydrometeorological hazards (Dissanayake, et al., 2018). Furthermore, urbanization has been found to be another driver of degradation due to lack of infrastructure, energy production methods and increased transportation in the area, along with pollution from industry and agriculture (Azam & Khan, 2015).

2.5 Future of Disaster Risks in Sri Lanka

Climate change risks in Sri Lanka are high (figure 5). By 2050, it has been expected that the GDP will experience a decline of 7.7%, corresponding to a loss of US\$ 50 billion, and that 19 million people are currently inhabiting hotspots which will suffer severe impacts of the temperature change of 1°-1.5° degrees (Mani, et al., 2018). Living standards of people are expected to reduce by an average of 7-7.5%, especially in the Northern and North Western Provinces which are home to significant numbers of poor and displaced people, not to mention the fact that the western province contribute to over 40% of the overall GDP (Mani, et al., 2018).

Furthermore, as evidenced earlier, increases in the temperature, rainfall and humidity will likely increase the prevalence of vector borne diseases such as dengue. Also, in the case of increased flooding (especially in areas with unmanaged waste), communities and people living in poverty without access to adequate sanitation will become increasingly affected by diarrheal diseases, which in turn contributes to the increasing costs of maintaining public healthcare. Leptospirosis and other rodent-borne diseases have also been found to correlate with monsoon seasons, and an increase in the prevalence of dysentery, hepatitis and typhoid is also expected as a result of climate change induced flooding, and droughts (WHO, 2015).

The management of drought hazards in a setting where the availability of safe water is dwindling, large-scale investments will be required to mitigate the impacts on agriculture and people. Evidence indicates a trend of increased precipitation over Sri Lanka (Mani, et al., 2018; Alahacoon, et al., 2018), adding to the concerns of growing disaster and climate risks, which will undoubtedly affect the people and the economy negatively if left unmanaged. For example, the variations in the average temperature and rainfall will

affect agriculture, hence endangering livelihoods and the availability of locally produced staple crops and food as well.

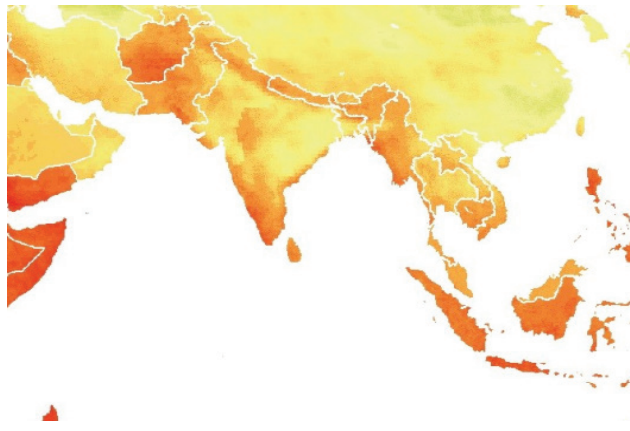


Figure 5. Climate risk in Sri Lanka (Maplecroft, 2017).

3. Disaster Risk Reduction and Climate Action Interventions

Sri Lanka has been facing an immense task to manage the disasters and climate change risks efficiently. To illustrate the efforts being currently undertaken to strengthen the DRR and CCA in the country, this chapter provides an overview into the disaster risk management infrastructure from the perspective of Sendai Priorities, Sustainable Development Goals, and the Paris Climate Agreement.

3.1 Sendai Framework for Disaster Risk Reduction

Priority 1. Understanding Disaster Risk. A risk profile was carried out with technical support from concerned agencies, technical institutions and academia, prioritizing 5 hazards - floods, drought, landslides, cyclones and coastal hazards (tsunami, sea surges, sea level rise and coastal erosion). Hazard profiles have further been developed to cover hazards such as landslide maps by National Building Research Organization (NBRO), coastal hazard profile by Coast Conservation and Coastal Resources Management Department, flood hazards with maps by the Irrigation Department, and drought and cyclone hazard profiles by Agriculture Department, University of Peradeniya and Department of Meteorology (DMC, 2015). Sri Lanka Disaster Information System (DesInventar) and Sri Lanka Disaster Resource Network (SLDRN) have been improved and updated as well, with an aim to establish a data hub for risk assessments and impact analyses to determine risk trends in the future (DMC, 2014).

Since December 2017, RiskInfo or Sri Lanka Disaster Risk Information Platform - an (open online portal to host the country's geospatial data and interactive maps of multiple hazards) was launched under the Open Data for Resilience Initiative (OpenDRI), with GFDRR and the World Bank support. This is a major step to achieve systematic compilation of geospatial hazard data from different government agencies and

stakeholders in uniformed format. The DRM operators are also utilizing the DesInventar disaster database to further support the management of disaster information. These repositories of risk information are also used as decision support tools and for development of the National Spatial Data Infrastructure (NSDI) (DMC, 2017). For landslides, a detailed research and comprehensive field study on landslide risk has been conducted under different initiatives with technical lead of the NBRO as a designated national focal point for landslide risk management. Vulnerability databases have also been established to help in estimating and measuring the impacts of disasters to people.

At local level, good practices for preparing local hazard maps have been established. Approximately 100 communities prone to tsunami, flood and landslides have been provided with local hazard maps (TheWorld Bank & GFDRR, 2012). Also, a comprehensive flood and drought risk modelling in ten river basins is currently being developed under the World Bank-funded Climate Resilience Improvement Project (CRIP). Comprehensive river-basin risk information is envisaged to inform the development of basin level flood and drought risk mitigation investment plans (Ministry of Agriculture, 2019).

Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk. Since the Indian Ocean tsunami of 2004, Sri Lanka has increased its efforts in building a comprehensive multi-hazard disaster management infrastructure. The tsunami led to wide reforms, and the Disaster Management Act of 2005 was established. It also mandated the establishment of the National Council for Disaster Management (NCDM) and its operative office, the Disaster Management Centre (DMC).

Since then, the country has not lacked policy updates. In 2007, National Disaster Management Coordination Committee was established to advance the implementation of the Hyogo Framework for Action (Friedrich, 2017), and the National Disaster Management Policy was adopted in 2010 to act as the main governing mechanism for disaster management. It includes important considerations such as participation of local level authorities, supports multi-stakeholder approaches and determines standards for response and relief. The work between 2006-2016 was largely guided by the overall development vision for Sri Lanka, "Mahinda Chintana", which was a ten-year overarching policy framework prioritizing sustainable, private sector driven economic growth, significant social development and adequate natural resource management (Department of National Planning, 2006).

Also, Sri Lanka has adopted the Strategy for Sustainable Development and established a National Council for Sustainable Development to achieve socially equitable and ecologically sustainable economic growth through eradication of poverty, social development and by ensuring competitiveness (Ministry of Environment and Renewable Energy, 2011).

In 2014, the NCDM approved the Sri Lanka Comprehensive Disaster Management Program (SLCDMP) for 2014-2018 to ensure the security of Sri Lanka by reducing disaster and climate risks by minimizing impacts on people, properties and the economy through establishing an enabling environment for participatory DRM based on multi-hazard assessments (Ministry of Disaster Management, 2014). It is guided by the Mahinda Chintana, Development Policy Framework, and the Public Investment Strategy of 2014-2016, and supported by the Disaster Management Policy, National Climate

Change Adaptation Strategy for Sri Lanka 2011-2016, and the National Action Plan for Disability.

Under the SLCDMP, Sri Lanka has started the process for improving capacity of local level operators by institutionalizing local level support in the SLCDMP planning (Ministry of Disaster Management, 2014). The National Disaster Management Plan of 2013-2017 further mandated a multi-sector approach under which all sub-national levels of administration, NGOs and grass-root level organizations will have their operational plans which conform with the national DRM plan to translate policies into tangible action (DMC, 2019).

National Adaptation Plan for Climate Change Impacts of 2016-2025 was devised by the government, with a focus on mainstreaming adaptation to key vulnerable sectors such as agriculture, livestock and fisheries, water, health, human settlements, energy and tourism (Ministry of Mahaweli Development and Environment, 2016). The NAP was also intended to tie together different plans and legislative pieces (including the Coastal Zone Management Plan, National Physical Plan, the agriculture policy and Haritha Lanka Programme) with linkages to climate change, along with current policy documents such as SLCDMP. As of now, while realizing the challenges of having produced numerous policies and overlapping frameworks, the government has begun developing the National Disaster Risk Management Plan for 2018-2030, which carries on the work conducted previously. However, the new plan will have an enhanced focus on the actual implementation of policies at all levels, with participation of various sectors highlighted as the key objective.

IMPLEMENTATION	LEGISLATION/POLICY	SCOPE	PURPOSE
NDMC, DISASTER MANAGEMENT CENTRE AND THE MINISTRY OF DISASTER MANAGEMENT	Disaster Management Act (2005)	National, Provinces, Districts	Mandated the establishment of the NDMC and the DMC. Intended to enhance the disaster operations through coordination of stakeholders and localization of operations.
DISASTER MANAGEMENT CENTRE	The Roadmap for Disaster Risk Management (2006-2016)	National, Provinces, Districts	Shifting the focus from reactionary measures to proactive approach, in consideration of preparedness, response, mitigation and risk reduction.
MINISTRY OF DISASTER MANAGEMENT, DISASTER MANAGEMENT CENTRE	National Policy on Disaster Management (2010)	National	Intended to complement the core elements of other Acts and plans for different Ministries, departments and local governments (such as land use planning to achieve "how things should be".

IMPLEMENTATION	LEGISLATION/POLICY	SCOPE	PURPOSE
DISASTER MANAGEMENT CENTRE, STAKEHOLDERS, PRIVATE SECTOR	Sri Lanka National Disaster Management Plan (2013-2017)	National, Provinces, Districts, NGOs, CSOs, Community leaders, etc.	Continuation to the 2006-2016 plan, with an aim to establish a multi-sectoral, inter-ministerial and inter-agency mechanism for DRM, based on all phases of disasters and in consideration of international agreements and frameworks.
DISASTER MANAGEMENT CENTRE, STAKEHOLDERS	National Emergency Operations Plan (NEOP) (2013)	National, Provinces, Districts	Developed under the 2013-2017 plan, NEOPs are intended to specify and identify roles of various stakeholders in different response scenarios to enhance coordination.
PARTNERSHIP STRATEGY	Comprehensive Disaster Management Programme (2014-2018)	National, Provinces, NGOs, private sector	Focus on risk reduction and on creating enabling environments. Interventions are based on multi-hazard risk information and aligned with international frameworks.
THE GOVERNMENT, PRIVATE SECTOR, CSO'S, CBO'S	National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)	National, Provinces, Districts and Communities	Identifies sectoral climate adaptation needs based on risk information, and identifies the overall national plan, roles, cross-cutting issues and key stakeholders. National Adaptation Fund (NAF) is proposed as well.
PARTNERSHIP STRATEGY	(Draft) National Disaster Risk Management Plan (2018-2030)	National, Provinces, Districts, Communities, NGOs, Private Sector, CBOs etc.	Based largely on the same principles as the program of 2014-2018, but with a focus on actual, tangible implementation at all levels with monitoring and evaluation. Participation is highlighted as the key objective.

Table 1. National disaster and climate risk reduction policies, plans and legislation in Sri Lanka

Priority 3. Investing in Disaster Risk Reduction for Resilience. Investing in resilience building against hydrological-meteorological hazard is crucial for Sri Lanka which is prone to flooding, droughts and landslides. So far, investments have been focusing on developing robust systems for hydrological and meteorological hazard monitoring and supporting hazard modeling, improved forecast capacity and data analysis for timely early warning.

Investing in flood and drought mitigation has become crucial element in spatial planning and area development plans, as reflected in different on-going initiatives with funding support from international aid agencies. Mega-development projects such as economic and physical regeneration of Metro Colombo area through the Metro Colombo Urban Development Program (MCUDP) demonstrates the integration of flood risk considerations into urban development. Such initiatives are also important to enhance capacities of concerned agencies, essentially the Ministry of Defense and Urban Development, Urban Development Authority (UAD), and development practitioners working with risk-sensitive infrastructure planning and urban facilities development through their engagements in the program.

Similarly, the program on Mainstreaming Disaster Risk Management at Urban Level, supported by the GFDRR, is an investment in human resources which builds technical capacity of the government to conduct flood and landslide risk assessments, urban risk assessments as well as aids in integrating risk reduction into urban planning (GFDRR, 2014). Capacity building and training has been initiated for district and divisional officers to improve their technical knowhow on disaster risks assessment and integrate DRM themes into development planning (TheWorld Bank & GFDRR, 2012). In 2015, 300 local government officials were trained on mainstreaming DRR into local government sector (DMC, 2015). Continuation of such efforts reflects investment in human resources which is crucial for anchoring DRR into local development.

Integrating DRR across sectors is indicated in the National Disaster Management Plan 2013-2017 which guides concerned agencies on possible DRR mainstreaming interventions. This encompasses disaster risk sensitive physical planning and regional structure planning, development control by UDA and Local Authorities, Disaster Impact Assessment (DIA) for new developments, mainstreaming DRR during reconstruction after disasters, and DRR by Controlling the Use of Natural Resources. This provides a solid actionable guide for development practitioners across sectors and levels.

However, budget deficit is noted as a major constraint to implementing planned activities, and the country's DRR initiatives are reliant on financial support from international donors and development partners to bridge financial gaps. Strengthening financial resilience has become another priority for Sri Lanka.

The establishment of Development Policy Loan (DPL) with a Catastrophe Deferred Draw-Down Option (or CAT DDO), with support from the World Bank following the 2016 floods and landslides, has allowed different disaster risk financing options to be explored to better cope with the fiscal burden of the government. The CAT DDO has focused on contingency spending, compensation to affected populations as well as on mainstreaming DRR into various sectors under the Comprehensive Climate and Disaster Resilience Program (CRIP), started in 2014, with the underlying goal of achieving fundamental changes and mainstreaming of disaster risk management practices in priority sectors. On-going initiatives aligned with this include Disaster Risk Financing and Insurance in Sri Lanka to manage disaster related contingent liabilities and conduct analytical analyses for informing resilient investment planning, and the Adaptive Social Protection System to advance the design of a disaster-linked social protection mechanism (Ministry of Agriculture, 2019).

Priority 4. Enhancing disaster preparedness for effective response to “Build Back Better” in recovery, rehabilitation and reconstruction. Institutional arrangements for early warning systems are established with country-wide coverage. The system comprises technical agencies (including Meteorological Department, Geological Survey and Mines Bureau) responsible for hazard monitoring of each hazard type and disseminating early warning through the Emergency operation Centre of the DMC, responsible for conveying the warning message to the general public through Provincial Councils, Districts Divisions, Local Authorities GN Divisions, local police & military, local volunteers and CBOs. For localized hazards, a system is in place adopting bottom-up and top-down citizen-centered approach for hazard alerts and early warnings, employing networks of local stakeholders including local government, private sector, Red Cross, NGOs, and civil society (DMC, 2014).

National Emergency Operations Plan (NEOP), developed with the technical support of UNDP Sri Lanka, describes the management arrangements, incident command systems, operations procedure, and the coordination mechanisms for effective response to disasters or emergencies, with roles and responsibilities of different stakeholders specified in disaster scenarios (DMC, 2017). EOCs in all districts have been established and shall be activated in case of emergency. Local authorities (LAs) have received support from central government for building local emergency response capacity as well as provisions of necessary equipment to perform response functions. All District Disaster Management Coordinating Units were established to coordinate emergency response at district level (DMC, 2015).

For providing relief services, the National Disaster Relief Services Centre (NDRSC) was established, while rehabilitation and reconstruction of infrastructure is assigned to Ministry of Economic Development. The National Policy for DRM (2013) has placed specific focus on immediate recovery of essential services and build-back-better for medium- and long-term reconstruction and rehabilitation (DMC, 2014). The Sri Lanka Red Cross has a pivotal role in emergency response and relief with its branch network in all the 25 districts, along with the army and navy troops to support search and rescue operation. Ministry of National Policies and Economic Affairs and Ministry of Disaster Management have jointly conducted Post-Disaster Needs Assessment (PDNA) for major catastrophic event such as Flood and Landslides in 2016 and 2017, with support from international partners, including UNDP, EU and the World Bank.

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

Achieving the Sustainable Development Goals will be a challenge for Sri Lanka – however, the country has taken important steps to institutionalize its approach to achieve the intended targets. Planning for “Inclusive Transformation” has been stated as the overarching theme in the national plan to implement the SDGs in Sri Lanka with the help of the Cabinet Ministry on Sustainable Development (Zoysa, et al., 2016). The government has succeeded in creating coherent and coordinated approach to implementing the SDGs between institutions and stakeholders, increased inclusive planning and made progress in financial commitments (Zoysa, et al., 2016). Department of Census and Statistics houses a committee dedicated to study the SDG data availability and collection for reporting.

The Sustainable Development Act was a step towards actual implementation of the SDGs as it came to effect in 2017 to reduce institutional fragmentation and to enhance coherence. The main objectives were to ensure a legal framework for the implementation of the SDGs and to promote ecological use of resources, as well as maintaining balance between economic, social and environmental sectors (Government of Sri Lanka, 2017). It also mandated the establishment of the Sustainable Development Council to guide future work.

Implementation of the SDGs will be guided by the National Policy and Strategy for Sustainable Development, which is based on the Sustainable Development Act. Furthermore, after the NPSSD is passed in the parliament, all subject ministries, agencies and sub-national operators are required to prepare their own Sustainable Development Strategies to forward implementation (Ministry of Sustainable Development, Wildlife and Regional Development, 2018). Series of multi-stakeholder interactions has significantly built ownership of SDGs across agencies, localized SDGs in sectoral policies. The effort to bring national policies together under the Sri Lanka Comprehensive Disaster Management Programme illustrates an attempt to build coherence between otherwise separate legislative organs. It also linked together DRR and CCA (Ministry of Disaster Management, 2014).

Interventions on CCA have concurrently been undertaken. The Climate Change Secretariat of the Ministry of Mahaweli Development and Environment is the National Focal Point for the United Nations Framework Convention on Climate Change (UNFCCC) and has facilitated CCA initiatives in the country. The National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016 outlines a comprehensive National Climate Change Adaptation Strategy (NCCAS) as basis for prioritized CCA action and investment towards a climate change resilient future. Synergies between socio-economic development strategies, as well as DRM and CCA plans, are also recognized. Current strategic development frameworks are the long-term Vision 2025: A Country Enriched, medium term Public Investment Programme: 2017-2020 and the Sri Lanka NEXT – A Blue Green Era Programme, launched in 2016 as an overarching national flagship program to ensure that the country’s socio-economic development follow a low carbon development pathway (Ministry of Sustainable Development, Wildlife and Regional Development, 2018).

Sectoral Aim	Policies with Linkages to Sendai Framework for Disaster Risk Reduction	Policies with Linkages to Sustainable Development Goals	Policies with Linkages to the Paris Climate Agreement or Environment
National Development	<p>The Road Map for Disaster Risk Management (2006-2016)</p> <p>Sri Lanka National Disaster Management Plan (2013-2017)</p> <p>Mahina Chintana (2006-2016)</p>	<p>Sustainable Development Act (2017)</p> <p>National Policy and Strategy for Sustainable Development (Draft)</p> <p>Establishment of the Ministry for Sustainable Development, Wildlife and Regional Development</p>	<p>National Climate Change Policy (2012)</p> <p>National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)</p>
Environmental Protection	<p>Comprehensive Disaster Management Programme (2014-2018)</p> <p>National Policy and Strategy for Sustainable Development (Draft)</p>	<p>National Policy on Sustainable Consumption and Protection (2018)</p> <p>National Action Programme for Combating Land Degradation of Sri Lanka (2014)</p>	<p>National Biodiversity Strategic Action Plan (2016-2022)</p> <p>National Environmental Policy (2003)</p>
Disaster and Climate Risk Reduction	<p>National Disaster Risk Management Plan (2018-2030)</p> <p>National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2015)</p> <p>Comprehensive Disaster Management Programme (2014-2018)</p>	<p>National Policy and Strategy for Sustainable Development (Draft)</p> <p>National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)</p>	<p>National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)</p> <p>Climate Change Adaptation Strategy for Sri Lanka (2011-2016)</p> <p>National Climate Change Policy (2012)</p>
Vulnerability Reduction	<p>Comprehensive Disaster Management Programme (2014-2018)</p> <p>National Disaster Management Policy (2010/2014)</p>	<p>National Policy on Sustainable Consumption and Protection (2018)</p> <p>National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)</p>	<p>Climate Change Adaptation Strategy for Sri Lanka (2011-2016)</p> <p>National Climate Change Policy (2012)</p>
Urban Development	<p>National Physical Planning Policy & Plan (2011-2030)</p> <p>National Disaster Management Policy (2010/2014)</p>	<p>National Policy on Sustainable Consumption and Protection (2018)</p>	<p>National Environmental Policy (2003)</p>

Table 2. Synergies between the national policies, plans and frameworks by sector

5. Issues in Implementation of the DRR and Climate Policy

Past disasters illustrate the challenges in the implementation of disaster policies in the country. The 2016 PDNA highlights issues such as lack of early warning dissemination at local levels, slow response, lack of community preparedness and lack of coordination and information management between stakeholders (MoNPEA & MoDM, 2016). Lack of information (severity or scope) for the public authorities were also an issue which contributed to the inadequate early warnings, and thus, the public did not respond as effectively (Friedrich, 2017). Also, while the Disaster Management Act of 2005 clearly specified mechanisms, roles and responsibilities for responding to disasters such as the 2016 flooding, lack of capacities for enforcement is a significant challenge in nation-wide events (MoNPEA & MoDM, 2016). Finally, the number of policies and overlapping responsibilities between organizations may create competing roles and lead to confusion.

6. Stakeholder Analysis

Sri Lanka has recognized the need to include a range of stakeholders from all levels of governance and from the international community for decades. For the Technical Needs Assessment of 2011 process to mainstream climate change adaptation into all levels of governance and planning, groups from various organizations were involved. The working groups included representatives from the government working in food, health, water, coastal resources and biodiversity (Ministry of Environment and Renewable Energy, 2011). Furthermore, plans devised since 2014 have been based on a partnership approach which includes NGOs, CSOs, CBOs and even grass-root level operators to the official DRM infrastructure.

Humanitarian organizations coordinate through the Humanitarian Country Team chaired by the UN, and since the flooding of 2017, sectoral model similar to the UN cluster system has been developed to improve coordination of NGOs (CFE-DM, 2017). However, the civil society remains largely uncoordinated: there are 20,000 to 50,000 CSOs operating in the country working in advocacy, post-conflict activities and poverty alleviation (ADB, 2013). These operators, especially the Community Based Organizations (CBOs) have a major impact on national disaster management efforts as they are able to provide support in remote regions and can contribute to local development with their detailed knowledge about local livelihoods and community needs.

International Non-governmental Organizations (INGOs) have also been found to play a crucial role in building trust and sustainable peace among communities by bringing different groups together and by bridging bonds in the aftermath of conflicts (Christrup, 2011).

For example, UNDP has been working in Sri Lanka since 1967, now focusing on governance for empowerment and social inclusion as an overarching theme for CCA and DRR operations and development at national and local levels, and with the private sector (UNDP, 2019). UNDP has also helped to monitor aid flows, enhanced capacities and has contributed to the overall socio-economic progress with advocacy and projects (UNDP, 2019). The CARE Sri Lanka was established in 1950, and they have worked to address causes of poverty among the vulnerable groups by focusing on rural communities, conflict-affected populations and plantation residents (CARE, 2019). The Asian Development Bank has also been very influential. Currently, they are building a partnership strategy with a focus on promoting inclusiveness and sustainable productivity enhancement, DRR, CCA and gender equality (ADB, 2019).

7. Future Challenges and Priority Issues

7.1 Challenges

Success of Sri Lanka's DRR and climate change adaptation depends on reducing the vulnerabilities of sectors and increasing the capacity of the people, especially that of the poor (Ministry of Mahaweli Development and Environment, 2016). However, gaps remain within institutional capacity and technology, along with increasing need for knowledge and information about the impacts of climate and disasters to the most vulnerable. Resource mobilization is among the issues due to the government's lack of budgets for climate adaptation interventions.

However, reducing environmental exposure through relocations is not simple. A study conducted in the district of Akuressa revealed that people have, in many cases, grown accustomed to the high risk, perceive their ability to cope with annual flooding adequate, "have a sense of place" due to family ties and social cohesion and perceive the financial constraints of relocation as too great (Askman, et al., 2018). While poverty is often stated as the number one constraint to reducing exposure and vulnerabilities, in some cases, people may not be willing to leave their hometowns, which poses another challenge to the risk reduction work.

Overdependence on fossil fuels for energy production remains as a significant challenge in Sri Lanka. Oil and coal account for 54% of all the electricity production capacity; and imported fossil fuels constitute 25% of the total import expenditure (Nijaam & Nazar, 2017). To achieve the intended 34% share of renewable sources for electricity production, significant investments have to be made in restructuring the country's reliance on fossil fuels. Furthermore, the on-going land and water resource degradation have been stated to be obstacles standing in the way of the graduation from SDGs (Nijaam & Nazar, 2017).

There is also a need to streamline the disaster management infrastructure, policies frameworks and plans under shared objectives, all aligned with the Sustainable Development Goals, Climate action and the Sendai Framework for Disaster Risk Reduction. The current institutional challenges arise from the plethora of policies, overlapping responsibilities and resulting confusion of roles, especially in the phases of response. Furthermore, the implementation of actual policies at the local levels has been an issue due to lack of resources, human capacity and technical know-how.

7.2 Priority Issues

Disaster preparedness and response plans are to be developed for all districts down to the Grama Niladhari (or village officer) Division due to the increasing trend of hydro-meteorological hazard occurrence. Furthermore, there is a need for an inclusive and well-coordinated preparedness and response framework at local level. Best practices for preparing local DRR plans will be developed (ADPC, 2018) to facilitate disaster and climate risk-sensitive local planning. Furthermore, discrepancies between national level DRR efforts and the extent to which these are implemented and rolled out by local authorities must be solved. Issues include the insufficient institutional mechanism for DRR at local level, inadequate communication of national-level decisions, and the lack of consultation of local governments in national-level decision making, and the lack clarity over roles and responsibilities (Malalgoda, et al., 2016). This should be a part of a larger localization of DRR and CR across the country, with the intent to further involve and empower the local communities and authorities in the official disaster management infrastructure.

Data gap (especially in terms of SADD data availability) must to be met achieve systematic monitoring and evaluation of the country's SFDRR progress. Creating national database for systematic damage and loss data collection and analysis has started since 2018 to ensure availability of SADD, physical damage and economic loss by key sectors (Government of Sri Lanka, 2017). Database with vulnerability parameters (including poverty, disaster profiles, housing condition, damage history) is yet to be developed to support risk assessments and relief assistance. There is also a need for scientific data collection for slow on-set disasters (NDRSC, 2018).

Trade-offs between growth and sustainability should also be carefully managed to guarantee that no achieved gains and development are lost in the future due to negative effects which unplanned expansion of industry may sometimes exacerbate. In this context, focus should also be directed towards informal settlements and housing built without consideration to building codes and other standards. Urban slums and other non-engineered buildings have borne the most damages in the past, indicating that future support and investment is required to improve their quality, and the quality of the lives of people inhabiting them.

Improving early warning systems and promoting the use of hazard maps for land-use planning, area development and construction projects, as well as revamping and optimizing the use of these planning tools such as Environmental Impact Assessment (EIA) should be emphasized as well. Furthermore, incorporating disaster risk elements into development planning in general is also among the key priorities. Also, as has been evidenced throughout this report, many of the vulnerabilities follow the lack of (or lack of access to) resources, insurance, adequate housing, opportunities, education and income. Thus, poverty reduction and enhanced equity should be among the upmost priorities for the government. However, poverty reduction should be explored from many angles, including risk transfers, social welfare and subsidies to guarantee that the most vulnerable (low-income farmers and those dependent on the environment) are adequately protected and prepared for the impacts of adverse events. Often, social protection and insurance schemes are not available to those who would be in most need of such services – thus, further investments could be beneficial to safeguard the population.

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