CHAPTER 6: Climate Change and Human Habitats: Towards a Framework for Sustainable Disaster Risk Management

Abstract

The purpose of this chapter is to review the interplay between human habits and climate change-related disaster management. This is against the background that disasters are increasing both in intensity and frequency in most parts of the world and these disasters are influenced by climate change. Heatwaves, storms, floods and droughts are negatively affecting communities, resulting in loss of lives, livelihoods, infrastructure and overall socio-economic development. The study reviewed academic and development literature to understand global and regional experiences on the existence and responses to climate-related disasters. Disaster risk reduction includes deliberate efforts that are initiated to minimise vulnerabilities and disaster risks throughout. Key emerging issues point to the need to put local communities at the centre of disaster risk management. The actions of locals are important, both in adapting and mitigating climate change. Disaster risk management needs to be coordinated at the international, national, subnational, local, household and individual level. People at a local level have their own traditional and indigenous ways of responding to disasters and these may need to be integrated into scientific evidence.

INTRODUCTION

Climate change disasters have frequented many countries across the globe. The IOM (2017: iii) observes that:

> natural disasters are increasing in both frequency and intensity, exacerbated by climate change and posing threats to lives and livelihoods and development progress made thus far.

This is evidenced by the occurrences of cyclones, floods, earthquakes, droughts and rising of the sea level (Davis-Reddy and Vincent, 2017). Climate change is defined as:

> a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable periods (UNFCC, 2012: 12).

A disaster occurs when extreme events such as cyclones, heatwaves and storms, strike a vulnerable society (UNECA, 2017). The risks associated with climate disasters are increasing and affecting countries, regions, cities, rural and peri-urban areas. The most vulnerable people and communities are hit hard by the impacts of climate change-related disasters (Faye, Ribot and Turner, 2019). Responding to climate change calls for certain habits that influence both mitigation and adaptation to climate change. This study uses desk review to evaluate climate change disasters and human habitats in response to the disasters. This is done to influence possible solutions for sustainable disaster risk reduction.

BACKGROUND AND OVERVIEW

Human habits are defined as regular tendencies or practices that are engrained in people and which are influenced by several factors including culture, attitudes, emotions, values, ethics, authority, rapport, hypnosis, persuasion, coercion and/or genetics (Marien, Custers and Aarts, 2019). These factors are key in influencing people's actions and pursuits, both in causing and responding to climate-related disasters (Beckage *et al*., 2018). Climate is defined as the average of the weather conditions at a particular point on the earth and is expressed in terms of expected temperature, rainfall and wind conditions based on historical observations (Werndl, 2016). Climate change is seen through changes in temperatures, rainfall patterns and the frequency and distribution of weather events such as droughts, storms, floods and heatwaves and sea-level rise (Werndl, *ibid.*). Climate and weather are different as weather describes the state of the atmosphere; the degree to which it is hot or cold, wet or dry, calm or stormy, clear or cloudy (Beckage *et al*., 2018). Weather events are described as extreme if the weather events have reached unexpected, unusual and high or the highest degree (African Centre for Biodiversity, 2020). An extreme event describes the occurrence of a value of a weather variable above (or below) a threshold value near the upper (or lower) ends of the range of its observed values in a specific region (IOM, 2017; Godfrey and Tunhuma, 2020).

Since time immemorial, mankind has been learning to adapt to the occurrence of disasters and hazards and practising mitigatory

measures to reduce the occurrence of human-induced disasters (NARRI, 2016; Godfrey and Tunhuma, 2020). Climate change has emerged as one of the causes of disasters and hazards in many countries across the globe (NARRI, 2016; IOM, 2017). The recurrence of climate-related disasters "is empirically traced with incidents including death, asset loss, food and water insecurity, lack of access to health services, disruption in access to market services and above all disrupted livelihoods" (NARRI, 2016: 1). Table 1 presents the climate-related disasters that affected the largest populations between 1995 and 2015.

Table 1: Climate-related disasters between 1995 and 2015 *(IOM, 2017)*

Disaster	Number of people affected	Number of people dead
Flood	2.3 billion	157 000
Drought	1.1 billion	22 000
Storm	660 million	242 000
Extreme temperature	---	164 000

Whilst the statistics presented in Table 1 are reliable, some sources argue that these statistics reflect only figures of reported deaths and the number of people affected (NARRI, 2016). There are chances that the statistics even go high because there are some impacts of climate change disasters that are not reported. In addition to the disasters highlighted in Table 1, cyclones have been affecting and killing many people mostly in low- and middle-income countries (Godfrey and Tunhuma, 2020). The impacts of climate-related disasters are not uniformly distributed (UNFCC, 2012). Low- and middle-income countries have high vulnerability levels and this increases their vulnerability. Brown *et al.* (2012) observe that low- and middle-income countries are the worst affected because of the following reasons: limited adaptive capacity at a national, sub-national and local level, location of settlement in areas prone to disasters, lack of social protection policies, the dependence on natural ecosystems and the availability of disaster frameworks that are not mainstreamed to policies and practices in different sectors. Climate change poses a

major threat to sustainable development at the micro and macro levels (African Centre for Biodiversity, 2020).

Disaster risks emanating from climate change is increasing both in intensity and frequency. As IOM (2017: 9) puts it,

> disaster events often lead or contribute to additional associated catastrophic events – compound disasters – where multiple vulnerabilities reinforce each other and create a secondary disaster event.

This is true considering disasters that emanate from the impacts of climate change. For instance, communicable diseases and epidemic outbreaks such as cholera and waterborne diseases have been reported in victims of cyclone Idai in countries like Malawi and Mozambique who were temporarily located in tents (African Centre for Biodiversity, 2020). In addition to that, food crisis in most countries in southern Africa is a result of erratic rainfall patterns and droughts (UNECA, 2017). This adds to new vulnerabilities to mankind and calls for new measures to both adapt and mitigate the effects. Social-economic, environmental, political and spatial vulnerabilities in disaster-prone areas determine the impacts of disasters on people (Wenger, 2017). Ultimately, this results in disaster frameworks that are integrated and comprehensive. The resilience to disasters and the ability to anticipate, cope, recover and adapt to disasters reflect the presence and efficiency of disaster risk management and governance structures (UNISDR, 2015).

CONCEPTUAL FRAMEWORK

Minimising the risks associated with climate change-induced disasters should be considered in all sectors at an international, regional, national and local level (IOM, 2017). This study looks at the interplay between climate, climate change, human habitats and disaster risk management. Disaster risk reduction remains important as studies and experiences reveal that climate disasters are increasing in frequency and intensity (Wenger, 2017). This study looks at the trends, experiences and impacts of climate change across various countries and how the disaster risks can be reduced. Disaster risk reduction is viewed as a deliberate effort that is initiated to minimise vulnerabilities and disaster risks. This avoids and limits the adverse impacts of hazards and contributes to the realisation of the sustainable

development agenda. Whilst a growing number of countries, non-governmental organisations (NGOs) and research organisations are engaging in adaptation, mitigation and development activities using a variety of approaches (UNISDR, 2015; Wenger, 2017; UNECA, 2017; African Centre for Biodiversity, 2020), little emphasis has been put on human habitats in response to climate change. Human habitats are key in mitigating and adapting to climate change. They are instrumental in framing disaster risk management frameworks and this should be emphasised in all spheres (NARRI, 2016). Human behaviour is instrumental in reducing the causes of climate change such as reducing greenhouse emissions and also in limiting the impacts of climate change on humanity (*ibid*.).

THEORIES UNDERPINNING THE STUDY

RESILIENCE THEORIES

Resilience is defined as the ability of a system to bounce back and continue functioning after a shock. Major forms of resilience are engineering resilience, ecological resilience and evolutionary resilience (Folke, Colding and Berkes, 2003; Davoudi and Porter, 2012; Peters *et al*., 2019). The work resilience emerged from the engineering resilience to describe the ability of a system to return to equilibrium or steady-state after a disturbance. In this context, resilience is measured by the system's resistance to disturbance and also the speed at which the system gets back to equilibrium (Folke, Colding and Berkes, 2003). In the 1960s, the concept of resilience increased in recognition and entered the field of ecology. In this context, resilience was used to describe "the ability to persist and the ability to adapt" (Davoudi and Porter, 2012: 300). This differs from engineering resilience as there are many equilibria to which a system will adapt (Folke, Colding and Berkes, 2003). Evolutionary resilience has emerged to challenge both engineering resilience and ecological resilience (*ibid.*).

The evolutionary resilience approach considers that a system changes with or without a disturbance over time. What this means is that after a disturbance, a system will not necessarily need to bounce back to its original form but will must transform to adapt to the expected future

change (Davoudi and Porter, 2012). German Development Cooperation (2017: 15) defined disaster resilience as:

> the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses such as earthquakes, drought or violent conflict – without compromising their long-term prospects.

Over the decades, the concept of resilience has been evolving (Hamilton, 2012). The concept has found its way in almost all sectors (*ibid*.). There are key principles that are adopted in this study. Figure 1 illustrates the key factors that comprise resilience.

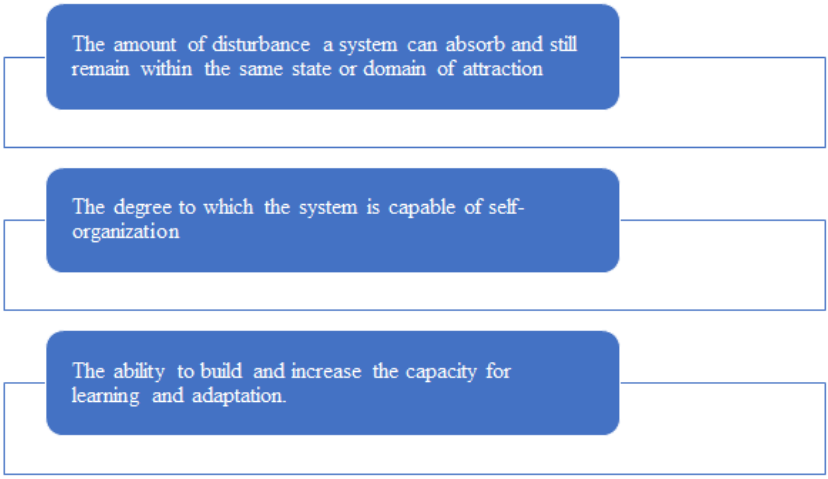

Figure 1: Three crucial characteristics of resilience *(Peters et al., 2019)*

Figure 1 indicates that resilience is a multi-faceted concept. It addresses both recovering after disasters have occurred and learning from past mistakes and avoiding future damages (Lavell *et al*., 2012). A system needs not only recover from stress and shocks, but also needs to be able to learn and adapt to future disasters (Wenger, 2017). This implies that a system needs to self-organise in response to the social, economic, environmental and political circumstances surrounding it.

The resilience theory has its limitations in its applicability. The first limitation emanates from the lack of consensus in defining the concept of resilience (Davoudi and Porter, 2012). This creates various interpretations and uses in different contexts. In addition to the limitations, the theory of resilience has been criticised, that it is only outcome-based and ignores explanations as to how the desired outcome is reached (Folke, Colding and Berkes, 2003). Processes of reaching the desired outcome are critical in reaching the outcome. However, the theory is silent about the processes of reaching the outcome.

RISK THEORIES

The IOM (2017) defines risk in the context of the following variables: hazard, vulnerability, exposure and resilience. Disaster risk is defined as:

> the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period, determined probabilistically as a function of hazard, exposure, vulnerability and capacity Jiang *et al*., 2017: 4).

A risk occurs after the occurrence of the hazard phenomenon. In this context, a hazard is defined as:

> a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation" (UNOOSA, 2020: 1).

A hazard is a dangerous incident that occurs and a disaster happens if dangerous incidents affect people negatively (Jiang *et al*., 2017). This study adopted the Cultural Theory of Risk (CTR) to explain the linkages between disaster risk and people's habits that are contextually influenced. The CTR holds that risks are framed by people's cultures and this influences people's responses to climate-related risks (Mcneeley and Lazrus, 2014). How risks are framed corresponds to different types of worldviews and these worldviews are embedded in people's values, beliefs and habits (Hamilton, 2012). The four worldviews are presented in Figure 2.

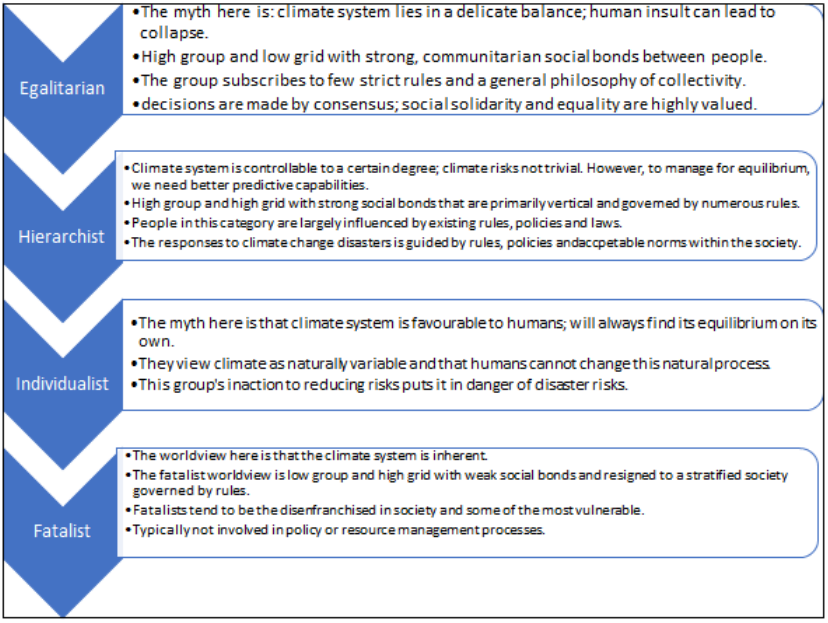

Figure 2: The CTR's four competing worldviews (Mcneeley and, Lazrus, 2014)

The CTR has its limitations that are worth reviewing. The theory has been criticised based on the complexities and ambiguities associated with it (Hamilton, 2012). This has invited a diversity of conceptualisations among cultural theorists (*ibid.*).

APPROACHES TO UNDERSTANDING DISASTER RISK MANAGEMENT TO HUMAN HABITATS

Different interpretations and understandings about climate change and disaster management exist. These are mainly influenced by context factors such as social, economic, environmental and political factors (NARRI, 2016). In addition to that, there are also institutional factors that influence the understandings and perceptions about disaster risk management (IOM, 2017). There are experts in formal institutions who rely on science to model and understand disaster risks (Lavell *et al.*, 2012). This group of people use mainly quantitative approaches to estimate the probability of risks and the consequence of risks (Godfrey and Tunhuma, 2020). Complex climate models are used, for instance,

to predict climate variables such as rainfall, temperature and cyclones. This is reflected by weather updates at a national level (African Centre for Biodiversity, 2020). On the other hand, some non-experts use intuition and experience to interpret, understand and predict disaster risks (Brown *et al.,* 2012). This group mainly uses:

> more readily available and more easily processed information such as their own experiences or vicarious experiences from the stories communicated through the news media and their subjective judgment as to the importance of such events (Lavell *et al.,* 2012: 47).

Past experiences with disasters are referred to by non-experts in responding to disasters. Disasters, however, vary in intensity and recently they have increased in frequency (Godfrey and Tunhuma, 2020). This increases the risks to non-experts whose responses are limited to past experiences. Deviations of disasters from past patterns of disasters result in the mismatch between people's behaviours and reality and this creates high chances of risks. The variations in understanding disaster risks point to the need for accurate information about current and future climate and climate-related disasters and risks. Integrating knowledge from experts and non-experts is important in bridging the gap. Despite noting this, Lavell *et al.* (2012) point out that accurate predictions about future disasters are highly uncertain and this means that they sometimes fail to influence people's actions. There are some instances where people are informed about imminent disasters, but nothing happens.

It is acknowledged that the risk of climatic shifts to human health and survival is diverse, with risks being more dominantly felt in the most vulnerable or poor regions as they are usually amplified by the pre-existence of high rates of climate-sensitive diseases (McMichael, 2014). Some areas become more vulnerable because of a combination of factors, including the availability of financial resources such as savings, the extent of infrastructural quality and the ability of government structures and community organisations, to provide safety nets and social capital to people (UN Habitat, 2011).

Figure 3 shows some of the impacts that climate change has on human health.

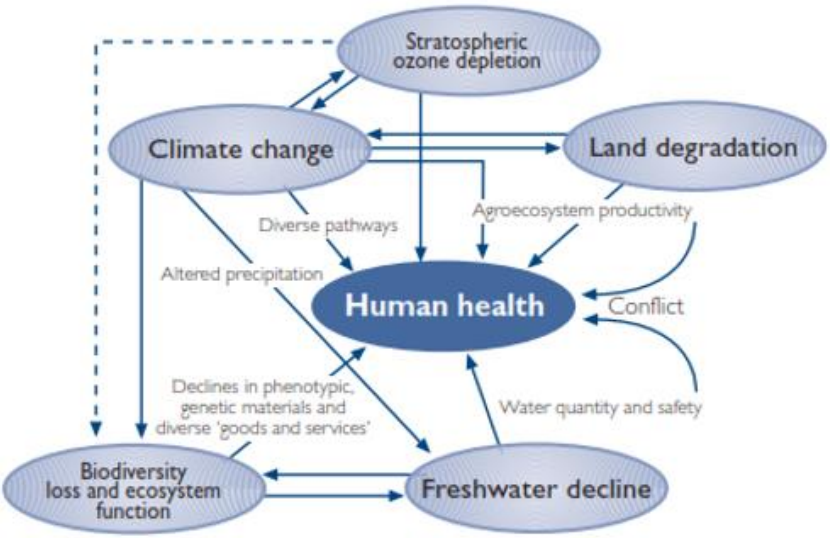

Figure 3: Interrelationships between major types of global environmental change, including climatic change *(McMichael et al., 2003)*

It can be noted that some of the human actions such as land degradation have resulted in climatic changes that would, in turn, cause the depletion of the ozone layer, leading to the rise of atmospheric temperatures on earth. Climatic changes have also altered the amount of safe drinking water as it has declined from groundwater aquifers through altered or reduced precipitation levels. All these factors affect human habitats as they are forced to adapt to the negative effects caused by climatic changes.

In Bangladesh, for instance, the area is prone to tropical storms, whose intensity have increased throughout the years. In1991, a hurricane killed at least 138 000 people and left 10 million people homeless (UN Habitat, 2011). Through massive efforts by government and international organisations to reduce risk, early warning signs have been developed and public shelters to host the evacuated have been erected and in 2007, when 8-10 million Bangladeshis were exposed to the Sidr Cyclone, a 32-fold reduction in the death toll was recorded and Bangladesh's capacity for learning and adaptation was proven (Paul 2009 in UN-Habitat, 2011). At a regional level, the recent cyclone Idai

of 2019 affected Mozambique, Malawi and Zimbabwe. Many people were left homeless in most parts of Zimbabwe's Manicaland province of Chimanimani and Chipinge areas. Such disaster occurrences need African governments to plan on evacuating populations in case of any future cyclone disasters. In creating sustainable human settlements, countries need to move towards a framework for sustainable disaster risk management and this shall be highlighted.

Emerging disaster risk management seeks to reduce society's vulnerability to extreme events. This approach acknowledges that extreme events occur but prioritise reducing the impacts that emanate from those extreme events (Godfrey and Tunhuma, 2020). This is achieved through addressing the social, ecological, political and economic characteristics that define a society (Lavell *et al.,* 2012). Reducing the vulnerability to disasters means addressing the underlying factors that both cause a disaster and those that create the vulnerability (German Development Cooperation, 2017). Two factors are, therefore, critical in understanding disaster risk, and they are the likelihood of the disaster and the vulnerability to the disaster (Godfrey and Tunhuma, 2020). The interaction of these two factors results in different risks to society. Figure 4 presents disaster risks emanating from the interaction between disaster likelihood and vulnerability.

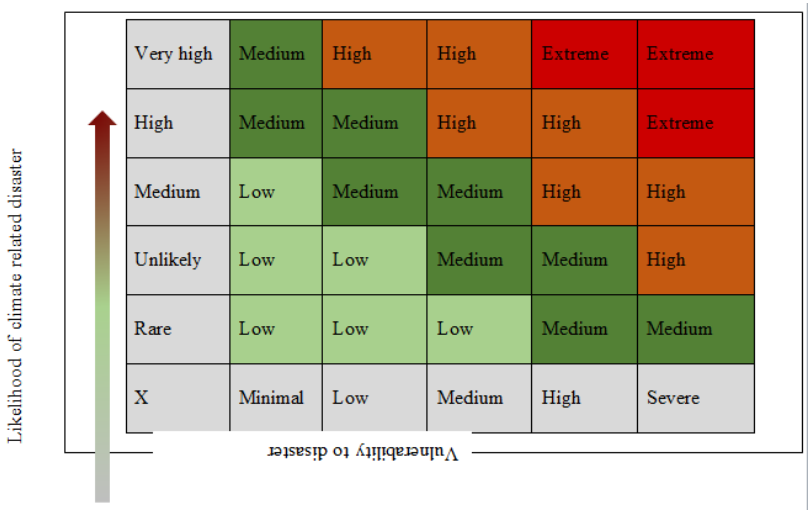

Figure 4: Disaster risk matrix *(Adopted from the German Development Cooperation, 2017)*

GLOBAL, REGIONAL A LOCAL CASE STUDIES

Sometimes people have the habit of overlooking theoretical risks. Risks are considered to be theoretical if the disasters are yet to be experienced, but predictions are suggesting high probabilities of disaster occurrence (Peters *et al.,* 2019). Current risk concerns may be driven by recent experiences rather than underlying loss potential. This usually results in complacency until the actual disaster occurs (German Development Cooperation, 2017). Risk perception drives policy and action at the national, sub-national and local level (Godfrey and Tunhuma, 2020).

Context and the locals are important in framing disaster management approaches. As Peters *et al.* (2019: 7) put it, disaster risk management,

> strategies must be tailored to the context to 'ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and the development and implementation of policies, strategies, plans and programmes of specific sectors, with a cross-sectoral approach, which should be tailored to localities and the context.

Responding to disasters is linked to the traditional, indigenous and local practices that people are subjected to (Godfrey and Tunhuma, 2020). These factors are critical in shaping human habitats either in support of or against good disaster risk reduction measures (Peters *et al.,* 2019). Factoring in those traditional, indigenous and local knowledge and practices is a major step towards eliminating disaster risks.

Efforts are, however, being made at all levels to improve disaster response. For instance, Figure 5 presents international frameworks on disaster reduction and climate change that have been launched since 1988.

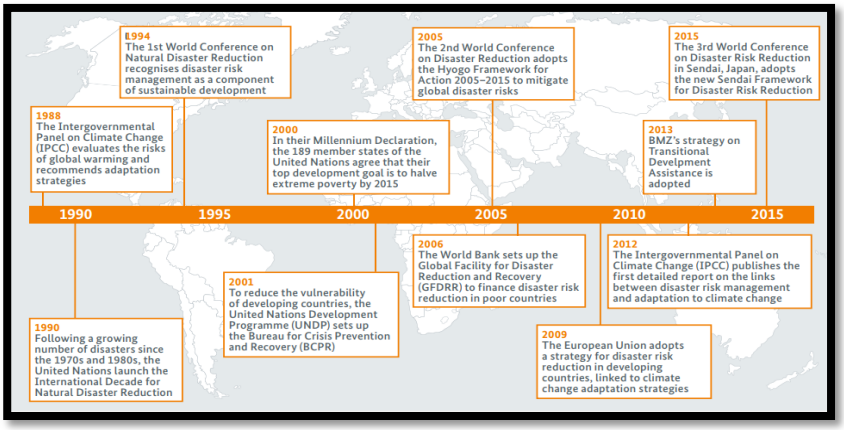

Figure 5: Historical development of international disaster reduction approaches *(German Development Cooperation, 2017: 21)*

GLOBAL CASE STUDIES

Whilst efforts are being made to improve responses to disasters, Wenger (2017) posits that many countries are lacking long-term resilience strategies. The responses to climate-related disasters are maladaptive because of the following: settlements developed on vulnerable areas, weak capacity for learning from past disasters, international frameworks not mainstreamed in national policies and practices, the neglect of locals in policy planning, to mention but a few (Brown *et al.,* 2012; Faye, Ribot and Turner, 2019). Efforts, including locals in reducing disasters associated with climate change, are gaining traction. Synergy, collaboration, coordination and development of multidisciplinary and multiagency schemes are increasingly seen as positive attributes for guaranteeing the implementation of disaster risk reduction and disaster risk management in a sustainable development framework (Wenger, 2017; African Centre for Biodiversity, 2020; Godfrey and Tunhuma, 2020).

All over the world, people are at risk of being affected by climate-change disasters owing to the increase in the occurrence and extreme weather events (Godfrey and Tunhuma, 2020). The German Development Cooperation (2017) predicts that in the next 15 years, over 350 million people are at risk of disasters from extreme events and climate change. The predictions are even expected to get worse if the disaster risk management approaches are not improved both at the

international, national, sub-national and local level (UNECA, 2017). Experiences from the Philippines (see Box 1), however, point out the key benefits derived from programmes that influence the habits of local in responding to disasters. Locals are at the focal point because they are the ones directly impacted by disasters. So it is important to make sure that they participate in all levels of disaster management (Davis-Reddy and Vincent, 2017).

There are also interesting disaster management experiences that can be observed in countries like Bangladesh, Haiti and El Salvador

Box 1: Disaster management in Philippines

Philippines is one of the countries prone to a number of climate-related disasters. For instance, the country faces, on average, 30 major floods within a year. People in the islands are unable to adequately protect themselves and the infrastructure from the extreme events that occur. The disasters have been resulting in social, economic, and environmental losses. In response to this, the Government of the Philippines prioritised disaster risk management. Key issues that remained unaddressed include the lack of early warning systems, disaster plans and precautionary measures. Up until 2005, there was weak coordination between central government, local authorities and local communities in responding to disasters. In 2005, this gap was rectified by programmes that accommodated the participation of local authorities, non-state actors and local communities. For instance, Local Flood Early Warning Systems were established in 10 provinces in the country and the public could benefit from the information and adjust behaviours and attitudes. By 2014, there were 18 LFEWS that were being functional and local populations were directly participating. Simple but effective means of communication through mobile phones are used to interpret flood levels or increases in water levels in upstream rivers. This trigger influences the spheres of government to make evacuation plans well before disasters struck and also the locals will have the opportunity to prepare for floods. This program perfectly works well because it influences the habits of locals in anticipating, reporting and recovering from disasters.

Source: German Development Cooperation (2017)

(German Development Cooperation, 2017; Peters *et al.,* 2019). The populations of the countries have insufficient coping and adaptation capacity, hence extreme events are resulting in humanitarian disasters. Experiences in these countries however indicate that cooperation between spheres of government, non-state actors and the general public is key in improving disaster responses (Godfrey and Tunhuma, 2020). Participatory processes put the locals at the centre to improve risk assessment and individual responses to events like droughts, floods and cyclones (German Development Cooperation, 2017). Self-help measures, including bank stabilisation, dykes and

erosion control, are being implemented by locals in response to extreme events (Peters *et al.,* 2019). Figure 6 highlights soil erosion control measures by community members in North-East Haiti as evidence of the community's active local participation in disaster risk management.

Figure 6: Soil Erosion control in North-East Haiti *(German Development Cooperation2, 017: 27).*

METHODS AND TECHNIQUES FOR DISASTER RISK MANAGEMENT

Major guides for disaster risk management are derived from international frameworks which are: Hyogo Framework for Disaster Risk Reduction 2005- 2015 and the latest is the Sendai Framework Disaster Risk Reduction 2015- 2030 (UNISDR, 2015). Key gaps that the Sendai Framework acknowledged in the techniques are over-emphasis on institutions and less on national and subnational policies and strategies and locals not adequately included in international frameworks. As of 2016, the UNISDR (*ibid.*) observes that there were only 147 countries that had clear disaster risk reduction legislation, policies and strategies. However, some of the disaster risk reduction

legislation, strategies and plans were not implemented because of weak disaster governance structures at national and local levels (UNECA, 2017).

Comprehensive strategies, including locals, were not put in place in many countries. Some countries (51) did not even have any kind of national-level document for implementing disaster risk reduction. At a regional level, there were frameworks, like the Arab Strategy for Disaster Risk Reduction 2020, the African Strategy for Disaster Risk Reduction 2006-2015, the Strategy for Disaster Risk Reduction and Emergency Preparedness and Response in the Asia Pacific Region 2009-2015 (Wenger, 2017; UNECA, 2017; African Centre for Biodiversity, 2020). Disaster risk management used to be mainly a function of the state. However, the global and regional frameworks on disaster reduction are emphasising mainstreaming disaster risk reduction at the district, provincial and national levels (UNECA, 2017). This targets the long-term vulnerabilities that result from the social, economic and environmental factors (Faye, Ribot and Turner, 2019). As a result, the number of actors participating in disaster risk reduction are increasing and this is more effective. Individual responses are a critical factor of consideration in risk management.

Efforts have been made on building community awareness and mobilisation. These include public awareness campaigns, dissemination of policies and plans to communities and sensitisation of communities to disaster risk (Davis-Reddy and Vincent, 2017). These activities are done to influence action at a local level. The basis of these initiatives is that information is key in influencing the right action before, during and after the disaster. Early warning system measures are being implemented to influence actions such as planting of drought-resistant crops, the development of evacuation houses, the development of resilient infrastructure and for the community to implement local disaster reduction measures (African Centre for Biodiversity, 2020; Godfrey and Tunhuma, 2020). However, the challenges emanating from these initiatives are that sometimes the language used to disseminate information is not all-inclusive enough to accommodate all groups of people (Lavell *et al.,* 2012). More so, the communication channels used sometimes leave other groups of

people without access to this important information (Godfrey and Tunhuma, 2020).

Risk identification and assessment is another technique that is used to manage risk. This can be done both before and after the disaster (Faye, Ribot and Turner, 2019). Pre-disaster risk assessment and post-disaster damage estimation are more linked presumed. On pre-disaster risk assessment, the focus is more towards appraising the probabilistic or deterministic damage forecasts (Heather, 2014). On post-disaster risk assessment, the emphasis is on analysing the disaster that occurred to develop risk models and influencing disaster recovery measures (Davis-Reddy and Vincent, 2017). In many instances, disaster risks are complicated. However, understanding the risk is important in influencing measures that protect societies and the environment. Proper risk assessment methodologies are needed. These may include trend analysis and modelling and many other qualitative and quantitative risk analysis methods. There is no risk identification method that is 100% accurate (NARRI, 2016). However, the risk identification methodologies are critical in influencing policy options and actions for the protection of citizens and society (Lavell *et al.,* 2012).

THE QUESTION OF SCALE IN HUMAN HABITATS IN MANAGING DISASTER RISK

The extent of damages that result from climate-related disasters is dependent largely on how people are prepared to face the risks. This includes human perception and behaviour towards responding to disasters. Heather (2014: 10) states,

> how people perceive climate change risk is informed by their social interactions and cultural worldviews comprising fundamental beliefs about society and nature.

However, current disaster risk management practices do not fully consider human behaviour, habits and perspectives (UNECA, 2017). This is evidenced by experiences in many developing countries where people ignore early warning systems up until the disasters such as cyclones strike (Davis-Reddy and Vincent, 2017). For instance, such experiences have been noted in Southern Africa. Some people were affected because of defying evacuation orders from governments

(African Centre for Biodiversity, 2020). This reflects the importance of personal human behaviour, habits and perspectives at the advent of disasters.

The behaviour and habits of people before, during and after the disasters, is critical in both limiting the impacts of the disaster and recovering from the disasters (Faye, Ribot and Turner, 2019). However, this personal behaviour requires support from national governance structures. For instance, there are traditional and indigenous knowledge systems about climate change that local people usually have. This indigenous and traditional knowledge that people have influences their habits and behaviour before, during and after the disasters (Godfrey and Tunhuma, 2020). For instance, local people have early warning systems about rainfall patterns that influence the types of crops. However, new evidence emerging points out the need for integration of traditional and knowledge systems with scientific evidence, bearing in mind the changes in climatic patterns (African Centre for Biodiversity, 2020). Some of the traditional knowledge systems that used to apply might not be relevant or may need to be updated.

Integrating knowledge of how people deal with disasters and disasters themselves is important in managing disaster risks. In many instances, however, more emphasis is given to the scale of disasters and not the scale of people's perceptions, habits and behaviours (German Development Cooperation, 2017). It is what people do before, during and after disasters that matters most (Brown *et al.,* 2012; NARRI, 2016; Godfrey and Tunhuma, 2020). This raises the issue of disaster information dissemination. The disaster information needs to be prepared in a manner that recognises what local people know (Davis-Reddy and Vincent, 2017). More emphasis needs to be on influencing people's habits at all stages of disaster occurrence (Hamilton, 2012).

At the international level, various strategies for disaster reduction have been implemented and these are shown in Figure 7.

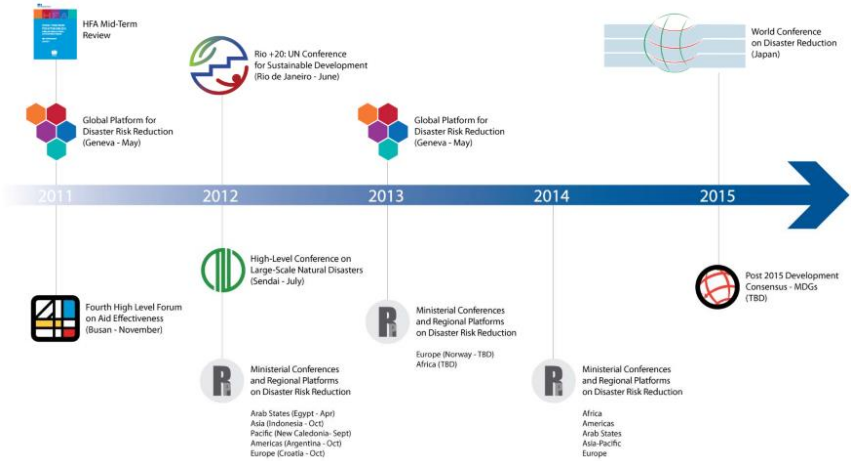

Figure 7: Timeline of main events for post-2015 Framework for Disease Risk Reduction *(ISDR, 2015)*

These events represent some of the milestone events done at the international level for disaster risk reduction from 2011 to 2015. The post-2015 framework on Disaster Risk Reduction (DRR) was a comprehensive strategy that cascaded to the regional and local levels from the international level where focus was mostly on the setting of standards and guiding priorities, the establishment of accountability framework and the development of protocols to enable information sharing, among other measures (Kellet *et al.*, 2014). After the occurrence of an earthquake in Morocco's remote regions, the El Manal Association for women's activities mobilised the youths and women to facilitate emergency response and work together with non-governmental organisations to prioritise the needs of the vulnerable (*ibid.*). In this regard, the needs of the vulnerable are heard and safety nets are then created in favour of the most vulnerable.

DISCUSSION

Comprehensive approaches that accommodate all actors are important in framing disaster risk management that is effective (Davis-Reddy and Vincent, 2017). Many state and non-state disaster risk management initiatives are beginning to encourage an expanded, bottom-up, grassroots approach, emphasising local and community-based risk management in the framework of national management systems (Peters *et al.,* 2019). This approach is important as it accommodates

the habits and behaviour of people at all levels. Whilst national and subnational policies, strategies and plans are important, their effectiveness is sometimes limited by operational challenges if those on the grassroots level are not actively participating. Cooperation between spheres of government, non-state actors and the general public is key in improving disaster responses (Faye Ribot and Turner, 2019). Participatory processes that put the locals at the centre to improve risk assessment and individual responses to events like droughts, floods and cyclones are required.

People need to participate both in policy/strategy formulation and the implementation stage (African Centre for Biodiversity, 2020). They also need to participate at an individual level through disaster identification and adjustment of actions that suit expected disasters (German Development Corporation, 2017). The difficult transition to more comprehensive disaster risk management raises challenges for the proper allocation of efforts among disaster risk reduction, risk transfer and disaster management efforts. At a local level, risk perception is influenced mostly by social, economic and environmental past experiences (African Centre for Biodiversity, 2020). People on their own have their means of assessing disasters and have indigenous ways of responding to disasters. Integrating expert and non-expert knowledge is key to disaster risk reduction (Wenger, 2017). This means that both traditional and indigenous knowledge systems that influence human habitats are integrated with scientific knowledge systems to build comprehensive disaster reduction responses (Lavell *et al.,* 2012).

CONCLUSION AND POLICY OPTIONS

Climate change disasters have frequented in many countries across the globe. Climate change is manifesting in the form of rainfall variability and extreme events such as heatwaves, floods and droughts (Davis-Reddy and Vincent, 2017). The costs of climate change disasters affect mostly the vulnerable populations (the poor and those in marginal areas) who have weak coping mechanisms (UNECA, 2017). However, disasters are not new and since time immemorial, disasters have been happening. What is evolving, however, are the disaster risk management approaches that try to reduce the impact of disasters on society. Climate change is contributing to the increase in frequency and intensity of disasters. Disaster risk management approaches are needed for both adaptation and mitigatory measures

to climate change-induced disasters. Comprehensive disaster risk management approaches that accommodate the grassroots levels are important in improving the effectiveness of disaster risk management approaches. The study recommends mainstreaming international and national policies, strategies and plans for various sectors at the national and local level. Support for community, household and individual measures in fighting climate change disasters is important.