# General Overview of Disaster Risk Reduction and Resilience Strategies

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### Abstract:

Disaster risk reduction and resilience, should be seen as a concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. The major threat emanates from an increasingly interconnected and interdependent social, technical and biological systems and complex risk landscape. In developing countries, disasters represent a major source of risk for the poor and can potentially destroy development gains and accumulated wealth. It should be noted that while the term "disaster reduction" is sometimes used, the term "disaster risk reduction and resilience" provides a better recognition of the ongoing nature of disaster risks and the ongoing potential to reduce these risks. At a time when climate change is increasing the frequency and severity of extreme weather events, disasters will continue to be major impediments to sustainable development so long as the economic incentives are to develop in hazard prone locations. Integrating disaster risk reduction into investment decisions is the most costeffective way to reduce these risks; investing in disaster risk reduction is therefore a precondition for developing sustainably in a changing climate. In this manuscript, an attempt has been made to simplify our understanding of the core idea and processes involved in Disaster Risk Reduction and Resilience with an intention to disseminate it in to an ever-expanding community of students, researchers and professionals. It seeks to increase the likelihood that the book chapter is fully taken advantage of at the above stated scales of interest.

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**Keywords:** Disaster Risk Reduction, Resilience, Sustainability, Awareness-raising, Preparedness, Strategies, Conceptual Framework

#### Introduction

Disasters have always threatened human communities (Brunsma and Picou 2008). Disaster events and catastrophes have become routine in the 21st century, e.g., hurricane Katrina in 2005, the Wenchuan Earthquake in 2008, and the Tohoku earthquake off the Pacific coast of Japan in 2011 (Wang et al.,2018) to just name a few. Between 2019 and the first quarter of 2020 has witnessed the deadly European heat waves, floods in Asia, wild fires in California and Australia and manmade fire in Amazonia. At a regional level, Asia was the most vulnerable continent with 40% of all disaster events, accounting for 45% of the total deaths and 74% of the people affected by disasters globally (CRED Crunch April 2020) to the recent cyclonic onslaughts of tropical cyclones battering on both the Indian coasts, cyclone Amphan in the eastern coast of India and Bangladesh, leaving a trail of damage and destruction on one of the poorest global communities.

It is such devastations which leaves scars and questions the credibility of the political systems and their policies related to disaster risk reduction. They have a moral obligation to provide timely information and credible knowledge base to the afflicted. Their incompetency to deliver timely relief and manage sustainably is alarming.

Estimates have shown that approximately 3.8 million km2 and 790 million individuals are exposed to at least two natural hazards, while 0.5 million km2 and 105 million individuals are exposed to three or more natural hazards. In particular climate change has demonstrated an increase in the magnitude, frequency and geographic distribution of natural disasters (Maleksaeidi *et al.*, 2017). These statistics demonstrate the critical multi-hazard environment to which the global population is exposed. The combination of human and economic losses, together with reconstruction costs, makes natural disasters both a humanitarian and an economic crisis (Brofman et al., 2019, Dilley *et al.*, 2005). The underlying processes for both risk and resilience exist within the social order itself, societies, communities, and organizations have the power to reduce risk and become more

resilient. Citizen preparedness strategies play a key role in reducing the effects of hazards that cannot be mitigated. A shift in the focus of managing disasters is the present demand. To manage the underlying process that create risk, to have a clear approach and understanding towards handling an impending risk and disaster. So a conceptual shift from responding to events to managing risk must be at the fore, acting collectively in handling an existing and a potential risk factor (Olson *et al.*,2020, Brofman *et al.*, 2019). Future global catastrophes also threaten the human community as the pandemic spread of diseases and the inevitable daily threat of armed conflict pose risks for the future.

The United Nations Office for Disaster Risk Reduction (UNISDR) has defined DRR as "the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development" (UNISDR 2010).

Disaster risk is an intrinsic characteristic of human society, arising from the combination of natural and human factors and subject to exacerbation or reduction by human agency. Disasters have an enormous impact on human development. Globally, events such as earthquakes, floods, and droughts contribute to tens of thousands of deaths, hundreds of thousands of injuries, and billions of dollars in economic losses each year. In developing countries, disasters represent a major source of risk for the poor and can potentially destroy development gains and accumulated wealth (World Bank 2014,O'Brien *et al.*, 2008, Hardin 1968). Since the beginning of the 1990s, the United Nations has been promoting efforts to change the paradigm of disasters, advocating for the incorporation of disaster risk reduction efforts worldwide as a way to reduce the effects of natural hazards on vulnerable communities.

This has been recognized by the UN Member States around the world which led to the adoption of the Sendai Framework for Disaster Risk Reduction 2015-2030. Between 2015 and 2030, Member States around the world are expected to conduct a variety of efforts within the context of the four Priority Areas contained in the Sendai Framework, as a way to reduce risks with the goal of

minimizing losses due to the manifestation of hazards of natural origin. The four priority areas are:

i. Understanding disaster risk, ii. Strengthening disaster risk governance to manage disaster risk, iii. Investing in disaster risk reduction for resilience, iv. Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (UN-SPIDER 2019).

Together, these four priorities aim for "the substantial reduction of disaster risk and losses in lives, livelihoods and health in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries" (UNFCCC 2017). The Sendai Framework solidifies a paradigm shift from managing disasters to managing current and future risks, bringing in resilience-building as the core target to be reached by 2030.

The scientific tenor of the Sendai Framework visibly calls for stronger understanding of disaster risks and root causes, access to reliable data at the scales where action needs to be taken. Developing risk assessment and maps at local level, and long-term multi-hazard and solution-oriented research, strengthening scientific capacity to assess risks (including vulnerability and exposure). It further recommends timely interpretation and use of risk information and cooperation between scientists, policymakers, and stakeholders to support the science-policy interface through evidence based decision making. Thereby, providing a broader global awareness of the social and economic consequences of natural disasters.

In this Artical the author has not endeavored to create a new knowledge, but has rather compiled the existing knowledge on Disaster Risk Reduction and Resilience, with an intention to disseminate it into an ever-expanding community of students, researchers and professionals. It seeks to increase the likelihood that the paper is fully taken advantage of at the above stated scales of interest.

#### **Conceptual Framework for Disaster Reduction**

Disasters, caused by natural and man-made hazards, are more frequent, long lasting and far more destructive than the previous one.

Recognition of the increased impacts of disasters led to the creation of the International Strategy for Disaster Reduction (UNISDR) in December 1999, which serves as secretariat for the International Strategy for Disaster Reduction (ISDR) system and was adopted by the United Nations Member States in 2000 (Poterie and Baudoin 2015).

The 2030 global policy agenda, comprising the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda for Sustainable Development, the Addis Ababa Action Agenda, the Paris Agreement on Climate Change, the New Urban Agenda and the Agenda for Humanity, together have strengthened the understanding of the issue of risk and the means to dealing with them. The common message they convey is on understanding the core aspects of risk creation and propagation-exposure and vulnerability, as well as the hazard characteristics and their dynamic interactions-all aimed at sustainable development and resilience(Selmi *et al.*, 2016).

More recently, in 2019, Mami Mizutori, the Special Representative of the U.N. Secretary-General for Disaster Risk Reduction, has reflected on the issue succinctly: "The Sendai Framework can be seen as the connecting tissue for all 2030 agreements with its goal on the reduction of existing risks, prevention of the creation of new risks, and building long-term resilience" (Mizutori 2019).

Disaster Risk Reduction (DRR) is the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (UNDRR 2018). DRR describes the development and application of policies, strategies and practices that minimize vulnerabilities and disaster risks throughout a society, to avoid (prevent) or to limit (mitigate and adapt to) the adverse impacts of hazards, within the broad context of sustainable development.

Sharing information and experience for the purposes of public information and all forms of education and professional training are

important for creating a culture of safety. Equally, the crucial involvement of local community action new forms of partnership can be motivated by the acceptance of shared responsibilities and cooperation. Traditionally, disaster management follows four phases of an emergency event such as mitigation (preplanning), preparation, response, and recovery (ISDR 2004).

The Hyogo Framework for Actions (HFA) has outlined the roadmap for DRR, encompassing governance, risk assessment and early warning, knowledge and education, reduction of underlying risk factors in the context of development and disaster preparedness and response. The HFA has set five priorities for promoting DRR which are as follows:

- Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
- I Identify, assess, and monitor disaster risks and enhance early warning.
- Use knowledge, innovation, and education to build a culture of safety and resilience at all levels.
- Reduce the underlying risk factors.
- Strengthen disaster preparedness for effective response at all levels.

Hence, the International Council for Science (ICSU), the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UNISDR) has taken a global, multi and inter-disciplinary programme, entitled Integrated Research on Disaster Risk (IRDR) to addressing the challenge of natural and human induced environmental hazards, mitigating their impacts, and improving related policy-making mechanisms. Strategic goals of the IRDR Programme (2013-2017) are as follows

- Promote integrated research, advocacy and awareness-raising.
- Characterization of hazards, vulnerability, and risk.
- Understanding decision-making in complex and changing risk contexts.
- Reducing risk and curbing losses through knowledge-based actions.

- Networking and network building.
- Research Support.

Attainment of these goals would lead to a better understanding of hazards, vulnerability and risk; the enhanced capacity to model and project risk into the future; greater understanding of the decision making choices that lead to risk and how they may be influenced; and how this knowledge can effectively lead to disaster risk reduction.

Strategies for DRR include hazard, vulnerability and capacity assessments. Local-level strategies should be linked with appropriate top-down strategies and local government interventions. Successful DRR creates resilient communities, while ensuring that vulnerability is not increased through development efforts or other externally initiated activity. Therefore, multiple actions with multiple stakeholders are needed for managing the risk of disasters in a way that also promotes development (Begum *et al.*,2014).

The disaster risk management approach, as represented in figure1 below, is generally accepted to consist of the following:

- Risk assessment and analysis
- Risk management and
- Risk communication



Fig:1 A Framework For Disaster Risk Reduction (Source: ISDR 2004, pp15)

#### **Risks Assessment and Analyses**

Risk assessment includes the identification of hazard agents (seen as hazards risk factors eg; tsunamis, flooding, oil leakage, and urban fires), exposure and consequence assessment, and risk characterization.

Risk assessment can play a critical role in impact modelling before an event strikes (in the days leading up to a cyclone, for example), or it can provide initial and rapid estimates of human, physical, and economic loss in an event's immediate aftermath. Moreover, risk information for resilient reconstruction needs to be available before an event occurs, since after the event there is rarely time to collect the information needed to inform resilient design and land-use plans (GFDRR 2014).

#### **Risk Management**

Risk management encompasses all those activities required to reach and implement decisions on risk reduction or elimination. Once a risk has been characterized, an informed decision can be made as to what control measures, if any, are needed to reduce the risks or eliminate the hazard. Control measures can consist of any action for risk reduction or elimination. Often control measures involve reducing the probability of occurrence or the severity of an incident.

Risk management also must start at the lowest possible level of government administration and community with each level accepting responsibility for an appropriate level of mitigation, preparedness, and response and/or recovery activity. This includes strengthening and supporting community level initiatives on disaster risk reduction and encouraging active participation or involvement of people in the process of risk assessment, planning, implementation of disaster risk management strategies and activities.

An increase in the frequency of disasters and consequent impact on lives and livelihoods has led communities to develop some coping mechanism/strategies based on their existing capacities.

#### **Risk Communication to the Public**

The risk management process cannot be successful without a plan for providing and receiving information to and from the public and such end-to-end systems need to be established and effectively functioning well before an emergency occurs. The Sendai Framework promotes a people-centered approach and the use of a participatory process in decision making that responds to the needs of users and is sensitive to social and cultural aspects, gender, and age. The severity of the impacts of a disaster depends strongly on the level of exposure and vulnerability (Terry and Goff 2012) in the affected area. Evidence indicates that overall risk has increased worldwide, largely due to increases in the exposure of persons and assets and possibly increases in inequality, which is a shaper of vulnerability, thus calling for greater attention to these dimensions of risk (Cavallo and Ireland 2014).

### **Disaster Scenario**

Since 1980s, there have been an increasing trend in disaster related losses as total reported losses amounted to US\$3.8 trillion. Such events further trap more people in poverty as poor and marginalized households tend to be less resilient and are faced with greater difficulties to recover from their impacts. Disaster risk is increasing mainly as a result of growing exposure of people and assets to natural hazards (World Bank 2019, CRED 2018).

Records maintained by Centre for Research on the Epidemiology of Disasters (CRED) show that disaster frequency appears to be increasing, from about 100 events per decade in the 1900-1940, to 650 per decade in the 1960s, to 2000 per decade in the 1980s. By the 1990s this number had reached almost 2800 events per decade. The increase in reported disasters can be partly explained by a higher number of small and medium-level events that are related to natural and human-induced or socio-natural phenomena. While the number of geophysical disasters has remained fairly steady, the number of hydrometeorological disasters has increased significantly over the decades. An increase in global costs of weather-related disasters alone have increased from an annual average of USD 8.9 billion in 1977-1986 to USD 45.1 billion in the 1997-2006 period (O'Brien *et al.* 2008).

Recent estimates by CRED (2018) show that between 1998 and 2017 climate-related and geophysical disasters killed 1.3 million people and left a further 4.4 billion injured, homeless, displaced or in need of emergency assistance. In 1998-2017 disaster-hit countries also reported direct economic losses valued at US\$ 2,908 billion, of

which climate-related disasters caused US\$ 2,245 billion or 77% of the total. This is up from 68% (US\$ 895 billion) of losses (US\$ 1,313 billion) reported between 1978 and 1997.

In absolute monetary terms, over the last 20-year, the USA recorded the biggest losses (US\$ 945 billion), reflecting high asset values as well as frequent events. China, by comparison, suffered a significantly higher number of disasters than the USA (577 against 482), but lower total losses (US\$ 492 billion). As economic data for such losses are hard to get, the World Bank has calculated that the real cost to the global economy is a staggering US\$ 520 billion per annum, with disasters pushing 26 million people into poverty every year. Inequality is even greater than available losses data suggest because of systematic under-reporting by low income countries.

Georeferencing an analytical technique is being employed by CRED, to have an in-depth understanding of EM-DAT data to reveal the relative vulnerabilities of rich and poor, and quantify how the human cost of disasters increases in cases where national income levels decline. This has helped reveal the high proportion of loss in low income countries (130 people per million) to only 18 in high income countries. This proves that people exposed to natural hazards in the poorest nations were more than seven times more likely to die than equivalent populations in the richest nations (UNDRR 2018, ESCAP/CDR 2017,O'Brien, *et al.*, 2008).

Event	2018	Average (2000-2017)
Drought	0	1,361
Earthquake	4,321	46,173
Extreme temperature	536	10,414
Flood	2,859	5,424
Landslide	282	929
Mass movement (dry)	17	20
Storm	1,593	12,722
Volcanic activity	878	31
Wildfire	247	71
Total	10,733	77,144

#### Table1: Death Toll by Disaster Type (2018 vs. average 21st Century)

#### Source: CRED-UNSIDR 2019

Event	2018	Average (2000-2017)
Drought	9,368,345	58,734,128
Earthquake	1,517,138	6,783,729
Extreme temperature	396,798	6,368,470
Flood	35,385,178	86,696,923
Landslide	54,908	263,831
Mass movement (dry)	0	286
Storm	12,884,845	34,083,106
Volcanic activity	1,908,770	169,308
Wildfire	256,635	19,243
Total	61,772,617	193,312,310

# Table 2:Total Number of People Affected by Disaster Type(2018 vs. average 21st Century)

#### **Drivers of Disaster Risk**

There is a strong correlation between disaster and development. Inappropriate development can increase levels of vulnerability to disaster risk and disasters negatively affect poor countries' development. In addition to climate change, the main drivers of risk are poorly planned and managed urbanization, environmental degradation, poverty and weak governance and gender inequality (UNISDR-WMO, 2012).

The major drivers to disaster risk has been the substantial growth of population and assets in at-risk areas. Migration to coastal areas and the expansion of cities in flood plains, coupled with inappropriate building standards, are among the main reasons for the increase. As reported climate related disasters accounted for 74% (US\$2.6 trillion) of total reported losses, 87% (18,200) of total disasters, and 61% (1.4 million) of total lives lost (CRED 2018, World Bank 2014).

In support of these estimations, based on Intergovernmental Panel for Climate Change (IPCC) reports, it is projected that climate change will increase the frequency and intensity of the most severe weather related hazards over the decades. In addition to climate change, the main drivers of risk are poorly planned and managed urbanization, environmental degradation, poverty and weak governance. Disaster vulnerability can be reduced as a direct product of sound development. Effective risk management strategies can help in reducing disasters in the short to medium term, while reducing vulnerability over the longer term. Few countries have the tools, expertise, and mechanisms to consider the potential impact of disaster risk on their investment decisions. They rarely account for disaster losses, collect data, and assess risks systematically. As a result, they are not able to direct the necessary resources to protect their investments and reduce their exposure to future disaster impacts (World Bank 2014).

Over the past decade more than 1.5 billion people have been affected by disasters that have cost at least US\$ 1.3 trillion. Climate change, weak governance, and an increasing concentration of people and assets in areas exposed to natural hazards are driving disaster risk upwards, especially in poor and fragile countries(CRED-UNISDR 2018).

Another major underlying driver to disaster risk is the prevailing gender inequality. Research has shown that women are more at risk of being affected by disasters and their aftermath. The multiple levels of discrimination that women are prone to (in education, healthcare, employment, and control of property) are some notable drivers that inevitably make women more vulnerable in and after a crises (Selmi *et al.*, 2016). They are likely to suffer increased poverty rates, higher rates of sexual violence, and a lack of adequate housing in the aftermath of a disaster (Henrici *et al.*, 2010). Likewise, women are not adequately represented in the decision-making authorities and the sociocultural attitudes and norms hinder their participation when it comes to decision-making (Chineka *et al.*, 2019).

#### Disaster risk reduction: a shared responsibility

In today's world, societies are confronted with rapid change. Therefore, the value of disaster risk reduction can only be realized through rigorous identification and continuous evaluation of the relationships that exist between the beliefs and conditions in which people live, the changing environment people inhabit and depend upon for their livelihoods, and the forces of nature (ISDR- RAED 2011)

Most importantly, disaster risk reduction relies on the consequences of collective decisions made and individual actions taken or not taken. The emergence of a disaster reduction culture is conditioned by the following contexts and processes:

political context;

- sustainable development in its three related contexts: sociocultural, economic and environmental; and
- regional considerations linking disaster reduction and sustainable development (ISDR 2004).

In this context it can be noted, "shared responsibility" attributes to increased responsibility for all. It recommends that state agencies and municipal councils adopt increased or improved protective, emergency management and advisory roles. In turn, communities, individuals and households are expected to take greater responsibility for their own safety and to act on advice and other information given to them by the government agencies. Shared responsibility is not about equal responsibility, there are some areas in which the state is bound to be more responsible than the community (Wilkins and Mc Carthy 2009).

## **DRR** and Sustainability

Promoting sustainability in disaster reduction means recognizing and making the best use of connections among social, economic and environmental goals to reduce significant hazard risks. This entails abilities to reduce exposure and aid recovery from infrequent largescale, but also more common smaller-scale, natural and humandriven events.

The bottom line for any country, especially the poorest, is to build sustainable communities with a social foundation that provides for health, respects cultural diversity, is equitable and considers the needs of future generations. All countries require a healthy and diverse ecological system that is productive and life sustaining a healthy and diverse economy that adapts to change and recognizes social and ecological limits. This cannot be achieved without the incorporation of disaster reduction strategies, one of six principles of sustainability supported by strong political commitment. The motivation to invest in disaster risk reduction is very much a poverty reduction concern. It is about improving standards of safety and living conditions with an eye on protection from hazards to increase resilience of communities.

A safer society to withstand disasters may be argued as a case of

ethics, social justice and equity. It is also motivated by economic gains. Socio-economic development is seriously challenged when scarce funds are diverted from long-term development objectives to short-term emergency relief and reconstruction needs. Environmentally unsound practices, global environmental changes, population growth, urbanization, social injustice, poverty, conflicts, and short-term economic vision are producing vulnerable societies. The impact of development on disasters in an increasingly unstable world should be fully embraced if disaster risk reduction is to yield its expected benefits.

This takes on particular urgency in the face of long-term risks brought about by climate change which goes much beyond environmental degradation or mismanagement of natural resources. Development-as-usual is blind to risk and fuels disasters which threaten further development (ISDR 2004).

UNDP's disaster risk reduction efforts aim to risk-inform development in line with the goals and targets of the SDGS and the Sendai Framework for Disaster Risk Reduction. This poses a critical threat to achieving the Sustainable Development Goals (SDGs). Specifically, UNDP works with country partners to strengthen national and subnational policy, legal and institutional systems; foster greater coherence of disaster risk reduction and climate adaptation efforts; provide access to risk information and early warning systems; and strengthen preparedness and response measures. Together, these efforts strengthen the resilience of countries and urban and rural communities (UNDP 2020).

Table 3.	Targets	on	Disaster	Risk	Resilience	in	the	Sustainable
Developr	nent Goa	als						

Sustainable Development Goals	Targets on Disaster Risk Resilience
Goal 1: Ending poverty in all its forms everywhere	Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that

	help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
Goal 3: Ensure healthy lives and promote well-being for all at all ages	Target 3d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Target 4a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non- violent, inclusive and effective learning environments for all
Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation	Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
Goal 13: Take urgent action to combat climate change and its impacts	Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

Source: ESCAP/CDR (2017)

# Aproaches to Reduce Disaster Risk: International Strategies and Frameworks for Action

#### The Yokohama Strategy

The Yokohama Strategy and Plan of Action for a Safer World was adopted in 1994 following the United Nations World Conference on Natural Disaster Reduction, held in Yokohama, Japan. It is the first document providing guidelines at the international level for preparation for and prevention and mitigation of disaster impacts. The Yokohama Strategy was a product of the International Decade for Natural Disaster Reduction (1990-2000) and, more specifically, of the World Conference on Natural Disaster Reduction held in 1994. The importance of community involvement in DRR has been enshrined in these two international events.

#### The Hyogo Framework for Action 2005-2015

The following decade (2000s) represents a shift in the way DRR is perceived, moving from a strong focus on coping capacities and relief interventions to an increased attention brought to risk preparedness and prevention.

Hence, DRR became a popular idea with the World Conference for Disaster Reduction held in Kobe, Hyogo, Japan in mid-January 2005. The conference coincidentally took place in the aftermath of the 2004 tsunami in the Indian Ocean, which affected millions of people and raised public awareness about so-called "natural" disasters, their risks, and their serious impacts. The outcome of the conference, the Hyogo Framework for Action 2005-2015 (HFA), is probably the most significant international document popularizing the notion of DRR. The 2000-2009 decade is also critical in terms of shifting concerns around disaster issues, with an increased focus on risk preparedness. The focus of this approach is seen evolving both in academia as well among major organizations working in the ?eld of DRR (Poterie and Baudoin 2015).

# The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)

The HFA was a 10-year action plan, effective from 2005 to 2015. During this decade, disasters around the world continued to produce human, economic, infrastructure, and ecological losses, especially in the most vulnerable and poorest nations. A review of the HFA resulted in the Sendai Framework for Disaster Risk Reduction 2015-2030. The scope of the Sendai Framework is broader than the HFA, with an enhanced focus on "large and small, sudden and slow-onset of disasters caused by natural and man-made hazards and related environmental, technological and biological hazards". Thus, commitments to support DRR were renewed when HFA came to an end (Tiernan *et al.*, 2019).

It comprises a voluntary set of targets and priorities to foster increased resilience to present and future hazards and to prevent setbacks to development as the result of small and large disasters. In addition, SFDRR also intends to reflect new challenges that characterize today's world, namely climate change, increased globalization, and the development of new technologies and expertise in the field of risk prediction and early warning systems (Poterie and Baudoin 2015).

### What is Disaster Resilience?

Disaster resilience is part of the broader concept of resilience - 'the ability of individuals, communities and states and their institutions to absorb and recover from shocks, whilst positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty'(Combaz 2014).

#### **Box 1: Definitions of Disaster Resilience**

**The Sendai Framework (2015):** 'the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management' (UNFCCC 2017).

**DFID** (2011): '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 longterm prospects'.

**Hyogo Framework of Action (UNISDR, 2005):** 'the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure' (Combaz 2014).

Resilience can be conceptualized as a characteristic of a system when considered as a whole. Traditionally a "stable" system was defined as strong, static and resistant to change (Manyena 2006). Now, a stable system is understood as one that is flexible and able to adjust to stress, remaining more or less the same within a range of conditions. A resilient system is one with the best adaptive capacity in the face of extreme stress (Tiernan *et al.*, 2019). It can well be understood as a system which:

i) Remain stable in the face of external perturbations and stresses,

- ii) Recover following a major disruption, and
- iii) Adapt to new circumstances

This equilibrium- and response-based understanding of resilience has similarly persisted in its application to public policy, where resilience has become an increasingly prevalent expression for understanding the persistence and stability of social systems.

It is hence obvious that the present social science research on resilience often takes on a macrolevel systemic approach which is nearly similar to the study of resilience in natural systems. Resilience is well understood and adopted in ecological and environmental studies which have not found parallels in other disciplines. System is increasingly the subject of analysis in ecology and environmental studies, which has been seen being borrowed by social sciences (Capano and Woo 2017).

This is clearly visible as many international development agencies have used resilience as the basis for linking actions on climate change adaptation (CCA), disaster risk reduction (DRR), social protection, humanitarian response, peace-building and food security programming. Nevertheless, resilience can be seen as a link by having created a common language and goal-setting in the diverse post-2015 agreements: the Sendai Framework for Disaster Risk Reduction, the United Nations Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change and the World Humanitarian Summit framework (Tanner *et al.*, 2017).

## **Components of disaster resilience**

# Table 4: The core elements of disaster resilience as depicted in DFID's framework

Context	Whose resilience is being built - such as a social group, socio-economic or political system, environmental context or institution.
Disturbance	What shocks (sudden events like conflict or disasters) and/ or stresses (long-term trends like resource degradation, urbanization, or climate change) the group aims to be resilient to
Capacity to respond	The ability of a system or process to deal with a shock or stress depends on exposure (the magnitude of the shock or stress), sensitivity (the degree to which a system will be affected by, or will respond to, a given shock or stress), and adaptive capacity (how well it can adjust to a disturbance or moderate damage, take advantage of opportunities and cope with the consequences of a transformation)
Reaction	A range of responses are possible, including: bounce back better, where capacities are enhanced, exposures are reduced, and the system is more able to deal with future shocks and stresses; bounce back, where pre-existing conditions prevail; or recover, but worse than before, meaning capacities are reduced. In the worst-case scenario, the system collapses, leading to a catastrophic reduction in capacity to cope with the future.

Source: Combaz (2014), pp2

Manyena (2006) opined that disaster resilience has been described as both an **outcome** and a **process**. Practices focused on outcome have tended to adopt top-down reactive approaches which can favour the state of affairs and take attention away from inequalities resulting from insecurity and disaster. As a process, building disaster resilience involves supporting the capacity of individuals, communities and states to adapt through assets and resources relevant to their context. Also it may be considered as enhancing people's rights and addressing socio-economic, gender and environmental inequalities that exacerbate vulnerability (Combaz 2014).

#### **Resilience in the global development frameworks**

Disaster risk and resilience received insufficient emphasis in the

original Millennium Development Goals (MDG) agenda, despite the close relationship between disaster impacts and sustainable development. Resilience is a pre-condition for sustainable development in general and more specifically for fighting poverty, hunger and malnutrition (UNISDR 2015).

Building on the Yokohama strategy and in recognition of the need to address the multidimensional aspects of disaster risk from a development perspective, the Hyogo Framework for Action (HFA) 2005-2015 provides a strategic and systematic approach to reducing vulnerabilities and risks to hazards, involving the identification of ways to build the resilience of nations and communities to disasters. Although the progress varies from one country to another, the main global achievement is the change of mind-sets from crisis management to risk reduction with an emphasis on prevention and preparedness. The multi-stakeholder and multi-sector nature of the Hyogo Framework for Action provides guidance on how disaster risk reduction contributes to sustainable development (UNSIDR - WMO 2012). Soon after HFA, the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 besides other areas has focused on the prioritization of health risks from hazards and the need to focus on health resilience. It promotes collaboration amongst the disaster risk reduction, climate change adaptation and science communities to develop strategies that protect and manage health risks arising from extreme weather and climate events (Tiernan et al., 2019).

The global development frameworks adopted in 2015 and 2016 are structured around six separate but interrelated agreements: (a) Sendai Framework for Disaster Risk Reduction 2015-2030; (b) 2030 Agenda for Sustainable Development; (c) Paris Agreement under the United Nations Framework Convention on Climate Change; (d) Agenda for Humanity; (e) New Urban Agenda; and (f) Addis Ababa Action Agenda of the Third International Conference on Financing for Development. Building resilience to disasters is a common theme in these frameworks. Collectively, they provide a comprehensive global framework for the Secretary General's call for a "shared understanding of sustainability, vulnerability and resilience" (ESCAP/CDR 2017).

Resilience is featured prominently throughout the Sustainable Development Goals and is regarded as a quality to be "built", "developed" and "strengthened", as a tool to reduce the exposure of people to hazards and as a foundation for inclusive economic growth and prosperity. The term is also used in relation to inclusive and safe cities, and high-quality and reliable infrastructure. Disaster risk reduction and resilience is clearly embedded in nine of the goals and associated targets. These goals and targets are expected to stimulate action over the next 15 years in areas of critical importance for a sustainable and resilient future (ESCAP/CDR 2017).

#### Rationale for a resilience approach to disasters

Disaster resilience programming aims to save lives whilst protecting infrastructure, livelihoods, social systems and the environment. There is a growing recognition of both the severity of natural and man-made disasters and of the inadequacy of international efforts to reduce vulnerability to them, as can be gathered from the following as put forward by Combaz (2014):

- **The frequency and severity of weather-related hazards is increasing.** Climate change 'contributes to more frequent, severe and unpredictable weather-related hazards such as droughts, tropical cyclones, floods and heat waves'.
- **Exposure to all hazards is increasing.** Exposure to natural and man-made disasters has increased and is likely to continue to increase with the effects of climate change. Over the next two to three decades, increasing exposure and vulnerability due to economic and urban development 'will have a greater influence on disaster risk than climate change'.
- **Disasters have set back development.** It is well documented that disasters have set back development gains, aggravated poverty and increased vulnerability. Such negative impacts reflect and worsen inequalities, such as gendered and generational inequalities.
- Disasters and resilience related to natural hazards, violent conflict or state fragility share commonalities and connections, but interventions generally treat these contexts separately. For instance, state fragility, vulnerability to climate change and the risk of mortality from drought seem closely associated. Yet

conflict prevention and DRM are treated separately, with limited crossover and little documented integration

- Disaster resilience has historically been underfunded. Spending on emergency humanitarian assistance has been growing over the years. It has been argued that greater emphasis should be placed on building capacities to reduce vulnerability and support communities to recover themselves
- **Traditional humanitarian and development approaches have been inadequate.** Humanitarian relief is targeted primarily at saving lives rather than reducing vulnerabilities; development assistance has not been sufficiently focused on building community capacity for adaptation; and approaches to DRR have often been decoupled from development, rights and power imbalance.
- Responsibilities and roles need to be better balanced between the fields of development and humanitarian action. Disaster prevention requires long-term development expenditures in addition to humanitarian aid in emergencies.

#### **Benefits of disaster resilience**

Responses to disaster risk is enhanced with resilience which gives a careful consideration for hazards, exposure, risk, vulnerability and capacity. Building resilience to natural hazards can have far-reaching positive effects in fragile states and violent conflicts. Evidence from a range of countries supports the potential contribution of disaster resilience to:

**Saving lives:** disaster prevention has helped limit loss of life to disasters in a number of developed and developing countries. In Bangladesh, for example, the fact that far fewer people were killed by a cyclone in 2008 (3,000) than by a similar one in 1970 (almost 500,000) is attributed to better disaster prevention.

**Protecting infrastructure and livelihoods:** A careful implementation of disaster prevention techniques has been found to curtail the cost of property damage from all hazards.

**Protecting social systems:** community-based DRR has had a positive impact on social resilience through altering attitudes and behaviours towards risk.

**Protecting the environment:** Increased disaster resilience has in some cases been associated with behaviors that preserve the natural environment.

**Supporting broader resilience in contexts of violent conflict or fragility:** countries with well-performing institutions are better able to both prevent disasters and reduce the likelihood of disaster-related conflict.





# **Challenges for Development Policies**

Evidence has it that a multidisciplinary approach to disaster management which involves partnerships of various organizations and community groups plays a critical role during times of disaster (Malalgoda *et al.*, 2010). As the situations confronted by policy-makers have increased in complexity, resilience has increasingly become a topic of interest to governments.

Leadership is sought to drive improvements in disaster resilience. The responsibility for leadership is binding upon all partners within their sphere of influence in a coordinated manner, so as to maximize the benefits from limited resources. The increasing complexity surrounding disasters calls for a more coordinated effort among all stakeholders by widening the circle of responsibility. By collaborating and strengthening existing partnerships among governments, businesses, the non-government sector and communities, can help authorities and civilians alike in disaster prevention, preparedness, response and recovery (Wilkins, and McCarthy, 2009).

Currently, the comparison of different risks and their integration into a multi-risk assessment, as well as communications among different risk communities present a number of difficulties due to differences in methodologies and the levels of uncertainty in hazard and risk assessment, different languages, definitions of concepts and the manner in which risk and hazard are represented. The efficiency of governance systems to address multi-risks depends not only on regulatory and institutional frameworks but also on the capacities of the systems at different levels, from local to global, that are called upon to deal with risks and to entail risk policy and politics (Komendantova *et al.*, 2016).

The rising burden of losses related to disaster and crises suggests that more compelling business cases are needed for investments to build resilience and protect human and environmental systems from damage. Cost-benefit analysis (CBA) has traditionally been used for more straightforward single investments (such as whether to build a new bridge), where data can either be readily estimated from existing documentation or easily measured from observable phenomena (Shreve and Kelman 2014). Some types of investment in resilience lend themselves more easily than others to strong business cases. This can lead to bias in decision-making, with the choice reflecting the available data rather than the best course of action.

In the literature there are arguments which blame inherent administrative weaknesses. The local governments do not include or work with the people and which has left gaps for improvement further making it difficult to make decisions regarding the provision of reasonable solutions for disaster related problems. Local governments are experiencing competing priorities along with limited resources, governments fail to allocate financial resources to disaster management programs and this will affect the proactive decision-making process related to mitigation and preparedness activities (Tanner *et al.*, 2017).

# **Criticism for Disaster Resilience**

As noted by Combaz (2014), there have been criticisms from various quarters with regard to the implementation of disaster resilience. It has been opposed on the ground that it's been a relabeling of long standing approaches as resilience-building, if this has no meaningful effect on how humanitarian or poverty reduction programmes are implemented. Moreover, as a concept, disaster resilience has been depoliticized, placing too much responsibility on the individual and wider society rather than on state, who have the political power to address the underlying causes of vulnerability to disasters. It has also been suggested that the discourse of disaster resilience could stigmatize individuals and communities with low levels of resilience.

While there have been substantial and enabling investments in climate science, neither science funding bodies nor educational foundations have made resources available for "risk and resilience science," particularly in low- and middle-income countries where students cannot easily pursue DRR as a field of study or research. Evidence shows that this represents one of the most substantial obstacles to advancing the field (Ofir and Mentz 2015).

## Conclusions

The rise in disasters globally makes careful planning and a holistic approach to DRR critical. Disasters are now believed to be a manifestation of poor planning and weak policies. Focusing on all elements of disaster risk management (all four phases of the disaster cycle, that is, mitigation, preparedness, response, and recovery) helps to consider how a wide range of activities associated with technology, development, governance, risk management, risk communication, and local capacity influence and approach disaster risk.

The purpose of Disaster Risk Management is to reduce the underlying factors of risk and to prepare for and initiate an immediate response should disaster hit. The concept of "building back better" implies to initiate DRR activities also during recovery and rehabilitation. The paradigm shift to conceptualize DRM as continuum (and no more in phases) reflects the reality, that the transition between pre-during and

post disaster situations is fluid, particularly in countries, which are regularly exposed to hazards.

There is a strong correlation between disasters and development. Inappropriate development can increase levels of vulnerability to disaster risk and, in turn, disasters can negatively affect poor countries' development. On the other hand, unsound development policies will increase disaster risk- and disaster losses. DRR which involves every part of society, every part of government, and every part of the professional and private sector seek to restrict such losses. Integrating disaster risk reduction into investment decisions is the most cost-effective way to reduce these risks; investing in disaster risk reduction is therefore a precondition for developing sustainably in a changing climate.

The countries with the highest exposure to disaster risk often have low capacity to mitigate them. Since 1980, more than two million people and over \$3 trillion have been lost to disasters caused by natural hazards, with total damages increasing by more than 600% from \$23 billion a year in the 1980s to \$150 billion a year currently.

However, if countries should act decisively they can save lives and assets. Most developing countries lack the tools, expertise, and instruments to effectively manage and monitor the potential impacts of disasters into their investment decisions.

In the global context, under the prevailing pandemic and global lockdowns and economic downturns, one of the best practice has been observed by an increasing participation of the non-governmental and community organizations in meeting societal needs. They have come forward in providing relief in the form of food aid to the under privileged most of whom have lost their jobs and means of livelihoods. In the aftermath of the super cyclone Amphan hitting the eastern coast of India in the state of West Bengal, which has crippled the life line and infrastructure. In these challenging times the activities undertaken by these NGOs and community organizations is commendable. It is through their endurance that relief in the form of food, clothes, tarpaulins to provide shelter has reached the affected people deep in the deltaic areas of the Sunderbans where maneuvering through wet soil and decimated resources was by itself daunting.

It can be concluded on the note that disaster resilience is not a stand-

alone activity that can be achieved in a set timeframe, nor can it be achieved without a joint commitment and concerted effort by all sectors of society. But it is an effort that is worth making, because building a more disaster resilient nation is an investment into the future.

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