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Exploring Community practices for Disaster Risk Reduction in Maldives - Applying the Lessons Learned from Disaster Occured in Japan

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The findings, interpretations and conclusion presented by own work, with the lectures and experiences received from the journey of Visiting Researcher Program. Further all the sources of information included in the report is acknowledged from secondary sources and does not signify the views of the Asian Disaster Reduction Center (ADRC) or National Disaster Management Authority (NDMA)

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ACRONYMS

CBDRM	**COMMUNITY BASED DISASTER RISK MANAGEMENT**
CBDRR	Community Based Disaster Risk Reduction
CCA	Climate Change Adaptation
CERT	Community Emergency Response Team
DMC	Disaster Management Center
DRR	Disaster Risk Reduction
EOC	Emergency Operation Center
EOM	Emergency Operation Management
ERCP	Enhance Resilience Planning and Strengthening Community Preparedness
FDMA	Fire and Disaster Management Agency
IDMP	Island Disaster Management Plan
IDPS	Internally Displaced Persons
MMS	Maldives Meteorological Services
MRC	Maldives Red Crescent
NDMA	National Disaster Management Authority
NDMC	National Disaster Management Center
NEOP	National Emergency Operations Plan
NPA	National Police Agency
SNS	Social Networking Services
STELCO	State Electrical Company
USAID	United States Agency for International Development

CHAPTER 1

1.1) INTRODUCTION

Many scholars addressing international development issues including climate change adaptation (CCA) and disaster risk reduction (DRR) have been advocating for a more holistic, integrated response to community development for decades. As the fact disasters can wipe out years of development outcomes, it takes a minute to destroy the livelihoods, exposing people to greater risk of extreme poverty, disease and poor health.

Sustainable risk reduction incorporating DRR and CCA requires assessment of what seems unsustainable. Although, a common misnomer equates risk reduction with risk elimination, the DRR paradigm reflects an understanding that prudent risk-taking is basic element of survival. Integrated CBDRR incorporating climate related concerns require identification of perceptions of vulnerability from different stakeholder groups, iterative analysis toward agreed-upon vulnerability levels, assessment to determine unacceptable amounts of these levels that need reduction solutions, mainstreaming with other considerations in community and wider community development planning. Hence, implementing a Community Based Disaster Risk Management (CBDRM) approach should integrate and developed in the community to overcome from mega disasters. Therefore, this research plan has been made with the lessons and techniques obtain from the drills and past disasters occurred in the Japan.

1.2) BACKGROUND AND SIGNIFICANCE OF THE RESEARCH

The republic of Maldives is at heightened risk due to its low elevation, with 85% of its all islands, positioned less than 1 meter above mean sea level. The geographic vulnerability of atolls, formed from coral reefs, make them inherently susceptible to even minor sea level increases, accentuating the severity of the threat posed by climate change. This vulnerability becomes a shortcut to extensive land loss, resulting in displacement and homelessness of the population as habitable areas shirk. Further, the limited land area of nations compounds this problem. Additionally, the reduction in habitable land due to rise of sea level exacerbates existing social and economic challenges.

While natural disasters cannot be desisting, Maldives formed the National Disaster Management Center after the rapid devastating Indian ocean tsunami crises occurred in December 2004. Prior to Tsunami, Maldivian community has not actively discussed or addressed the need of disaster

mitigation plans, preparedness, nor the community practices that enlarged in such crises. This is mainly because the community faced relatively few hazards such as floods, surges and fire incidents.

Similar with DRR and CCA is multi-dimensional where coordination, integration and synergies among processes and activities depend on the policy level, either national or international. Few Researchers have mentioned National Government across countries in South Asia tend to mandate different departments to deal with the two issues independently, with a few exceptions. Although both have international development policy implications DRR and CCA have always operated as silos but have improvements over the years. However, there are still many challenges in integrating DRR and CCA and many countries including Maldives are still on early stage. As these two concepts have been acknowledged but underrepresented.

Nevertheless, adopting adequate risk reduction approaches can considerably reduce the scale of damages and losses and protect prior development gains. Improving early warning systems, managing drills, advocating community people about various disasters, managing and identifying risks, hazards, capacity maps are the achievements that a country can implement in order for preparedness, mitigation and protecting each life. Therefore, this research would enable to understand the community practices that Japan has implemented after the Mega disasters such as Great East Japan Earthquake and Great Awaji Earthquake. Further implementing CBDRM approaches across Maldives would overcome from a mega disaster such as occurred in the 2004.

1.3) SPECIFIC AIMS

The overall objective of this study is to understand the importance of CBDRM approaches and understanding the risk and other associates factors which seek vital in disaster risk reduction, mitigation and preparedness stage. As Japan has severe disasters occurred in the past, the country has implemented and established many approaches and key ways whereby, community can have applied which help to overcome from the disaster as soon as possible, further protecting the livelihood and saving people when disaster occurred. However, in the case of Maldives, effective preparedness decisions and actions for mega disasters have not been implemented yet, after the lessons learned from 2004 Indian Ocean Tsunami. Therefore, this research will seek to help, implementing few practices in the Maldives from the lessons learn from the Japan's Mega Disasters.

CHAPTER 2

2.1) RISK PROFILE OF MALDIVES

The Maldives is renowned for its white sandy beaches, pristine turquoise waters and unique underwater marine life. It consists of approximately 1,190 coral islands grouped in a double chain of 26 atolls, spread over roughly 90,000 square kilometers, making one of the most disparate countries in the world. The Maldives archipelago stretches 823km north to south and 130km east to west. Over 99% of the Maldives is made up of the sea; only 0.331! (115 square miles) of its 35,000 square mile surface area is dry land.

The islands that make up the Maldives are very small (most can be walked across in 10 minutes; only a few are longer than 2 kilometers) and low-lying (they rarely reach more than six feet above sea-level). This makes them particularly vulnerable to sea erosion. Back in 1812 and again in 1955, devastating gales destroyed many northern islands, while in 1987 the capital, Male City was flooded by a severe storm. If, as some scientists predict, global sea level continues to rise as a consequence of global warming, it will pose a particular risk to the Maldives.

The nation's geographic placement, coupled with the physical and geo-climatic characterizes of its islands located near the equator in the Indian Ocean, exposes it to a range of natural hazards. These hazards encompass earthquakes, predominantly in the Southern region, as well as tropical cyclones, storms, thunderstorms, heavy rainfall, drought, floods resulting from intense rainfall, storm surges, swell waves and tsunamis. The country consistently faces significant risks, marked by frequent, though low-impacts events such as monsoonal flooding, sea surges and persistent phenomena like coastal erosion, saltwater intrusion, and other climate-related risks. Moreover, since the 2004 Indian Ocean Tsunami, numerous island in the Maldives encounter freshwater shortages during the dry season due to heightened salinity and groundwater contamination. To address this, the government annually allocates substantial funds to provide emergency drinking water to communities on affected islands.

A disaster is an abrupt and catastrophic occurrence resulting in extensive harm, loss and devastation to both life and property. The extend of damages caused by disasters is incalculable, fluctuating based on geographic locations, climate conditions, and the characteristics of the Earth's surface, as well as the level of vulnerability. These events have profound effects in the

psychological, socio-economic, political and cultural conditions of the affected region and its inhabitants.

2.2) HAZARDS AND DISASTER RISK

The Maldives is one of the most vulnerable countries in the world, Being the flattest and lowest elevated nation with average height of 1.5 meters, Maldives faces multi-hazard risks and threats from the global warning and climate change induced sea level rise and extreme weather events. Maldives is one of the fewer countries which do not have any natural higher grounds. Not a single piece of land is higher than three meters above mean sea level. Generally, urban or rural, all the islands are coastal communities. All the human settlements, industries and critical infrastructure are located near the shoreline. Airports, hospitals, schools, power plants and more than 40% of houses lie less than 100 meters from the sea. Due to the close proximity to the coastline, several households are prone to severe climate hazards.

Geologically, Maldives is located of the Indian Tectonic Plate which makes Indian Ocean ring as the main area of concern. There are two main subductions zones in this ring, the plate boundaries near Sumatra, Indonesia and the Makran coast. Large magnitude earthquakes in subduction zones tend to create Tsunamis, hence these areas are given a special importance. The frequency of natural disasters of large scale is relatively low in Maldives. However, the 2004 Indian Ocean Tsunami brought devastating impacts to the life of its people, economy and development progress. With the realization, discussions and mindfulness for disaster preparedness began among the communities. Back then locals had a belief that Maldives is a country safe from catastrophic disasters with little to no historical records. Hence, 2004 Indian Ocean Tsunami came when no one was prepared, now knowing what Tsunami is.

CHAPTER 3

3.1) DISASTER MANAGEMENT SYSTEM IN MALDIVES

In the aftermath of the 2004 Indian Ocean Tsunami, the establishment of the National Disaster Management Center (NDMC) was initiated through a presidential decree. As the center initially tasked with coordinating the recovery process and relief efforts in response to the tsunami, the government subsequently expanded the NDMC's mandate to include disaster preparedness and risk reduction. After several years, with the enactment of the Disaster Management Act 28/2015 on December 2018, achieved the greatest milestone leading to the creation of National Disaster Management Authority (NDMA). Post the 2004 Indian Ocean Tsunami, there has been a dedicated emphasis on enhancing national-level disaster preparedness. An annual observance on December 26, known as National Unity Day, serves as a commemoration of the 2004 Tsunami and provides a platform for national institutions and civil organizations to advocate for improved disaster preparedness in the country.

3.2) ADMINISTRATIVE SYSTSEMS IN MALDIVES

There are 20 administrative atolls and 05 city councils in the Maldives with over 940 councils' member in 187 administrative islands.

In April 2010 the Decentralization Act was passed by the parliament. This act formalized the roles and responsibilities of atoll and island councils and required that they be democratically elected. The Local Government Authority was established in late 2010 and the first local council elections were held in February 2011

3.3) INTRODUCTION TO NATIONAL DISASTER MANAGEMENT AUTHORITY

National Disaster Management Authority (NDMA) was established by Former President Ibrahim Mohamed Solih as per the Disaster Management Act (28/2015). With this, all staff, assets, ongoing work of NDMC has been transferred to NDMA.

Currently, NDMA is carrying out a more holistic model, where in the process of hazard identification and mitigation, community preparedness, integrated response efforts, and recovery

are planned for and undertaken contiguously within a risk management context to address issues of vulnerability.

One of the most important objectives of NDMA is to mainstream disaster risk reduction at the national level. This includes planning processes, establishing agreed standards, developing procedures and policies. This work is guided by the National Community-based Disaster Risk Reduction Framework. Several other documents and processes are in development or have already been institutionalized, including the Relief Guideline, Framework for managing internally displaced persons (IDPs) and the National Emergency Operations Plan (NEOP). Significant internal re-structuring has taken place to meet the demands of a changing social climate and environment. In addition to this, NDMA is mandated to undergo the following strategies, focusing on emergency relief and response, disaster preparedness and mitigation.

- In the event of disasters natural and otherwise, identify immediate response and relief requirements, and organize and coordinate ways to provide relief aid with other authorities concerned.
- Ensure that the basic necessities are provided for those whom become uninhabitable due to disasters both natural and otherwise until temporary shelter can be arranged.
- Establishing a strong mechanism of working in association with concerned government and non-government authorities in order to ensure that the disaster risk reduction remains a top priority
- Conduct researches on the devastation caused by natural disasters as well as the impacts of epidemic and pandemic in a small country like Maldives, and using the outcomes of the research, compile and publish a set of rules and regulations to be followed for any actions taken.
- Establish and coordinate the legal and administrative systems required to have government ministries, private sectors, groups and organizations and individual citizens coordinate for any work that needs to be carried out in a centralized manager due to natural disasters or otherwise

NDMA Strategic Framework

Our Role	Our Purpose	Our Mission	Our Vision
We are the lead for Disaster Risk Management and Emergency Response	Working towards a resilient Maldives that ready and prepare for emergencies and disasters	Save Lives and Protect Livelihood	A resilient Maldives

Figure 1. NDMA Strategic Framework (Source Adapted from: NDMA Annual Report 2024)

3.4) LEGAL FRAMEWORK AND DISASTER MANAGEMENT ACT

The legal foundation for institutions and organizations involved in disaster risk reduction and emergency response activities in the Maldives. According to Figure X the legislation focuses on the government's responsibility to safeguard its citizens, protecting their health, welfare, property, and the environment from natural and human-induced disasters. Given the susceptibility of the Maldivian territory to various risks and emergencies, there is a need for proactive measures to reduce vulnerability. This involves not only responding to disasters, but also actively mitigating their impacts. To address these concerns, a comprehensive national emergency response guideline is vital, covering disaster preparedness, relief efforts, and the protection of lives and property. Following bullets points are the main purpose of the act.

- Ensure the protection of individuals from both natural hazards and man-made disasters
- Integrate guidelines addressing disaster risk mitigation and preparedness
- Minimize disaster risk through the adoption of a comprehensive national strategy, identifying responsible entities for managing disaster risk and outlining their respective duties
- Provide support during emergency situations and coordinate relief efforts, incorporating guidelines for effective coordination
- Define the roles and responsibilities of City Councils, Atoll Councils, and Island Councils in reducing disaster risk and facilitating mitigations during emergencies

- Raise public awareness on reducing disaster risk and enhancing coping capacity in emergency situations, incorporating guidelines for safeguarding individuals and promoting resilience
- Integrate disaster risk reduction policies into sustainable national development projects
- Foster individual's responsibility and accountability in disaster risk reduction and mitigation efforts

3.5) EMERGENCY RESPONSE MECHANISMS

Detailed below are the institutional arrangements, roles and responsibilities to ensure effective and efficient emergency response, established at different levels through the Disaster Management Act.

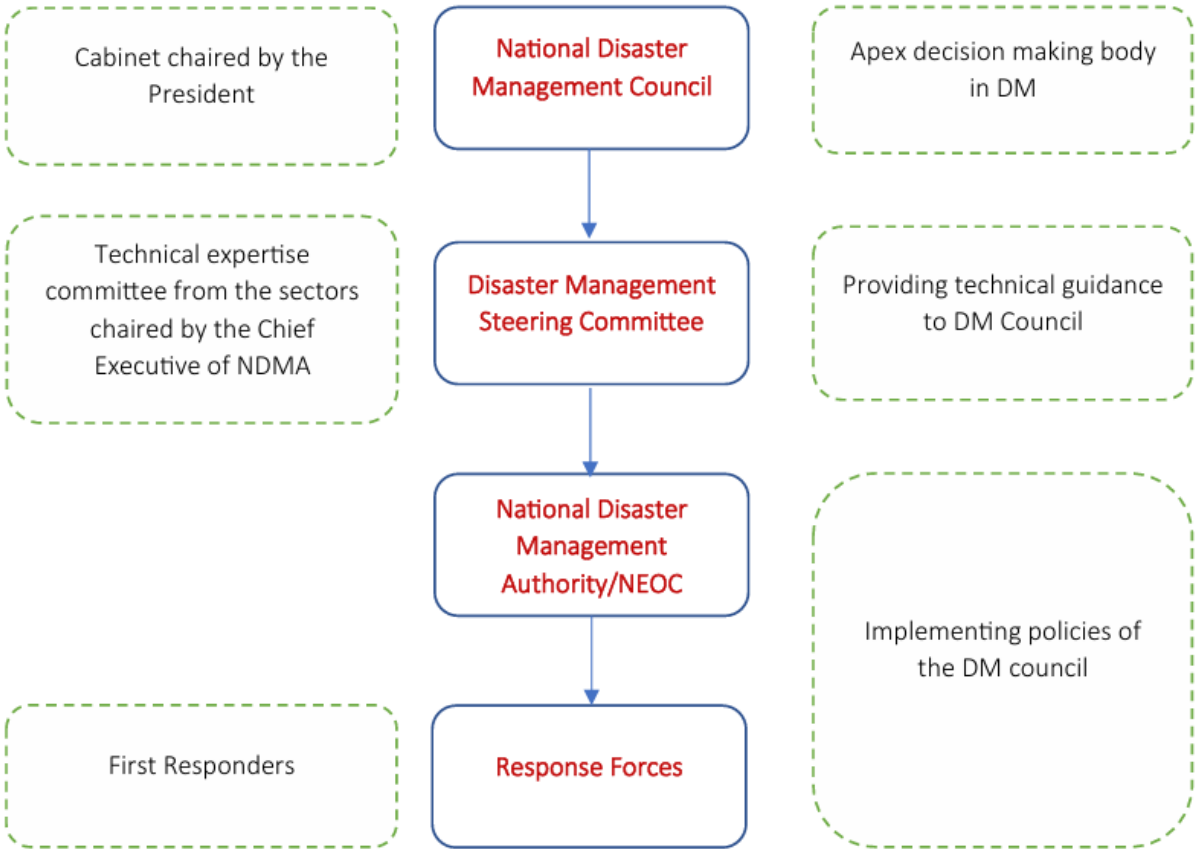


Figure 2: Emergency Response Mechanism in Maldives

If disaster occurs at City, Atoll and island level, City Mayor or Council President or the person in charge of the island will play a lead role with local level stakeholders. The City / Atoll/ Island Councils / DMC also interacts with both national and local volunteer groups for timely dissemination of information to vulnerable communities and to responding and coordinating agencies.

3.6) NATIONAL EMERGENCY RESPONSE FORCES

In the Maldives, disaster response operates across three tiers: national, city / atoll and island lebels. Detailed below illustrates the response tools implemented at each level to guarantee a proficient and effective emergency response. Each level is assigned distinct roles and responsibilities tailored to the nature and scale of emergencies.

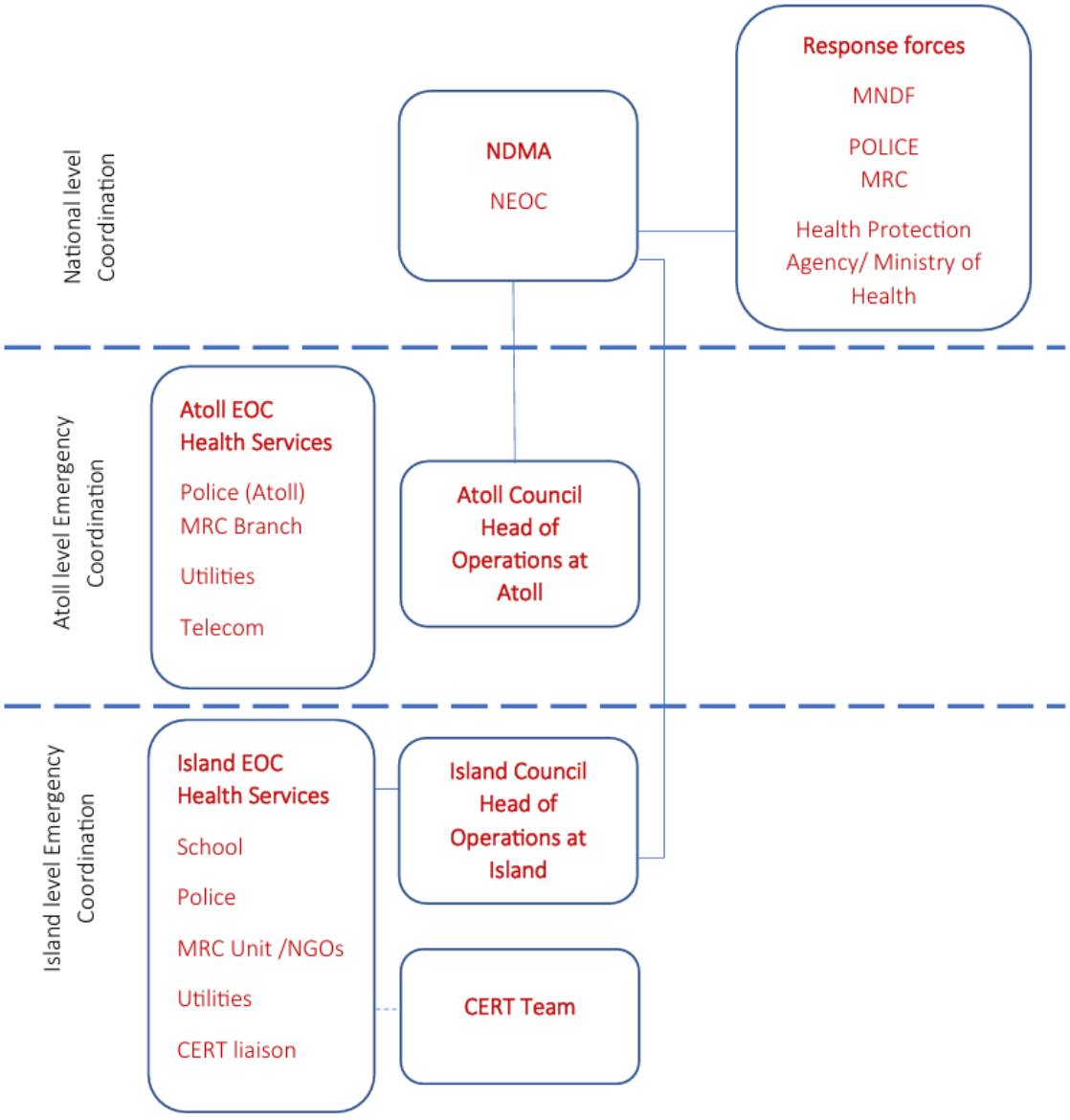


Figure 3; National Emergency Response Form in Maldives

CHAPTER 4

4.1) COMMUNITY BASED DISASTER RISK MANAGEMENT (CBDRM) IN MALDIVES ISLANDS

Community based disaster risk management (CBDRM) is an approach and process of disaster risk management in which communities at risk are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risk in order to reduce their vulnerabilities and enhance their capacities to prevent and withstand damaging effects of hazards. CBDRM contributes to progressive realization of safety, disaster resilience and development of all. In the year 2014 Enhance Resilience and Strengthening Capacity Program (ERCP) program has started and government and development partners has strengthened the resilience of many island communities. After 04 years later the program has been modified and contextualized to cater the need of effective planning that intends to reduce local risks in a cost-effective approach for a geographically isolated island community in the country

Risk reduction management is beyond the capacity of government alone. Multi stakeholders, private sector involvement and participation is more effective to the community. Hence, the concept of 'integration" should applied to community based disaster risk reduction (CBDRR) which incorporates climate related concerns. Most of the Maldivian Islands and communities face the consequences from Hydro Meteorological hazards such as heavy rainfall and floods, surges. CBDRR approaches will identified the usefulness of integrating wider social, economic, environment and political issues contributing for the disaster risk. Many Researcher perceive, CBDRR approach is advocated as a community process whereby communities are helped to analyze their situation through identifying problems and solutions in a process ultimately reducing community vulnerability. (Uchiyama, Ismail, & Stevenson, 2021)

With the intensification of global climate change, the frequency and severity of extreme weather events and natural disasters have increased significantly, posing major threats to societies and ecosystems worldwide. Isolated islands, communities are particularly vulnerable due to limited resources and infrastructure, making it challenging to prepare for and recover from disasters. Therefore, integrating community resilience and disaster management, the framework seeks to identify key attributes that significantly influence adaptive behaviors within communities, such as risk perception, earthquake and tsunami formation and knowledge, disaster prevention abilities, and the establishment of community platforms.

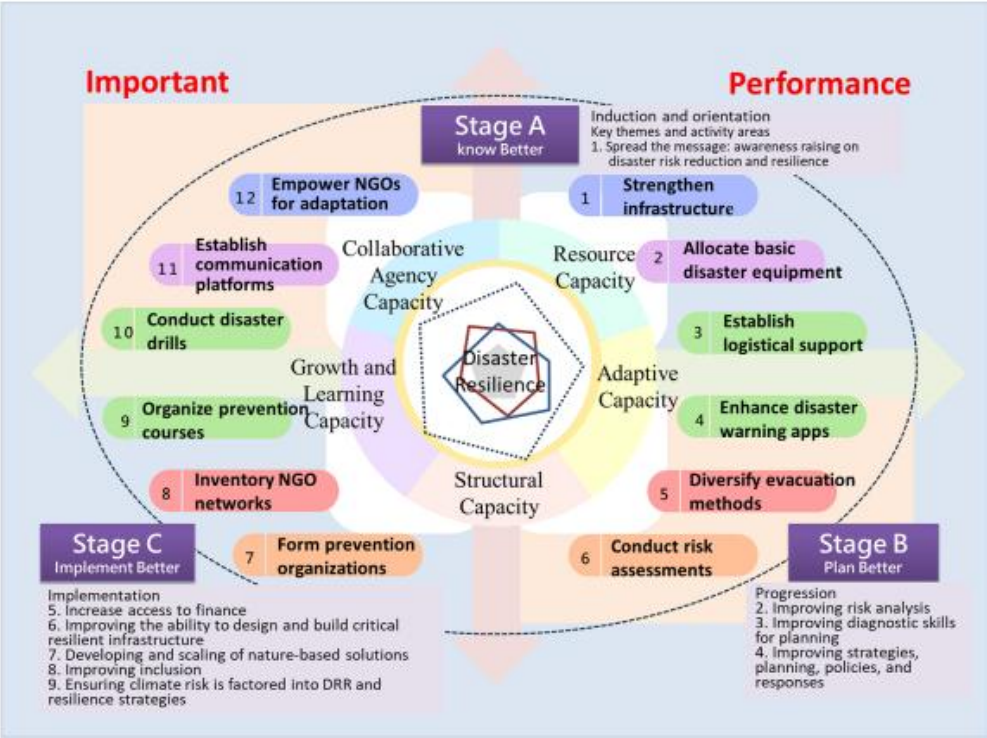


Figure 4: Framework of adaptive capacity for enhancing disaster resilience (Source Adapted from: Research of Chung Lee & Bih-Chuan Lin 2024)

4.1.1) Resources Capacity

Resources capacity is fundamental to disaster preparedness and adaptation. It encompasses the availability and management of essential resources such as food, water, medical supplies and shelter. Adequate resources capacity shortens recovery periods after disaster and aids communities in quickly restoring normalcy. For instance, in the Maldives, the construction of artificial islands and sea walls has significantly improved resources capacity, offering greater protection for strong surges. Similarly, available of pumps, dewatering systems has enable reduce the loss from the flooding events.

4.1.2) Structural Capacity

The organizational structure of a community is essential for effective disaster management. Strong leadership, efficient collaboration mechanisms, and transparent resource allocation are key components of structural capacity. Communities with adaptable organizational structures are

better equipped to manage disasters, coordinate resource distribution, and maintain communications during crises. As leadership plays a vital role in sustaining morale and ensuring efficient resources management during emergencies. Figure 3 illustrates the EOC activation in Island & Atoll and National level. Hence, good collaboration and support with Island Councils and Atoll Councils with island communities would enable to build a strong adaptive capacity during crises and disasters.

4.1.3) Adaptive Capacity

Adaptive capacity is the ability of a community to adjust its strategies and resources in response to changing environmental conditions and the evolving nature of disasters. The key components of adaptive capacity include flexibility in resource allocation, risk awareness and multi-level response mechanisms. Communities that can adapt their real-time responses to emerging threats are better equipped to handle the uncertainties associated with climate change. Technological innovations further enhance adaptive capacity by offering new tools for predicting and managing disasters impact. With the help of Maldives Meteorological Services (MMS) receive the information about changes of monsoon and weather conditions. Further, release alerts ahead, so the community can implement secure ways in order to controlling the major floods in the island.

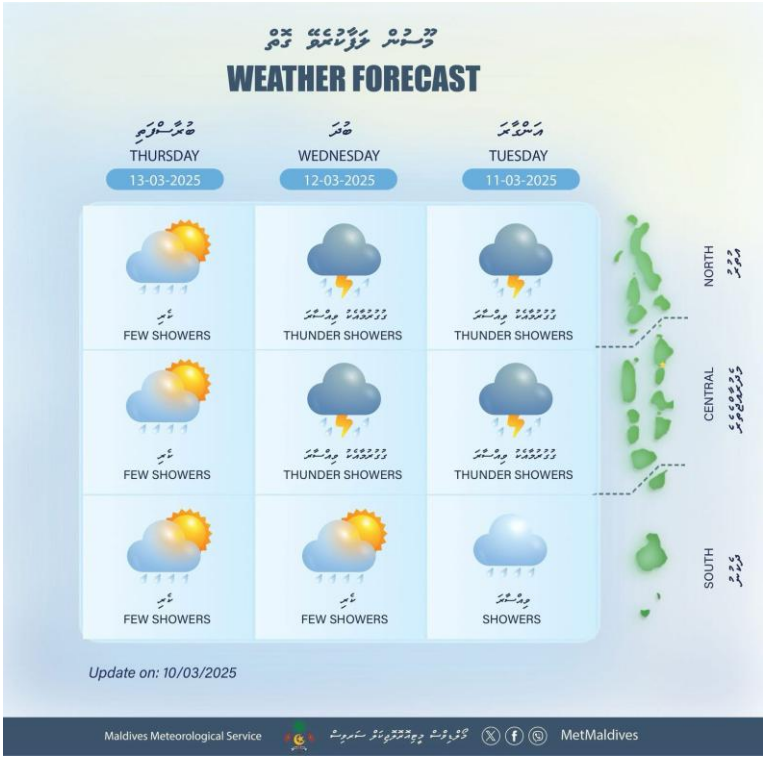


Figure 5: Weather Forecast Information for community (Source Adapted from: Maldives Meteorological Service)

4.1.4) Growth and Learning Capacity

Continuous growth and learning are essential for enhancing the ability of communities to manage disaster risks. Communities that consistently reflect on past disasters, learn from those experiences, and apply lessons learned to further planning are better equipped to face future challenges. This capacity involves knowledge –sharing systems that enable communities to quickly adapt their disaster strategies and enhance preparedness in response to changing risks.

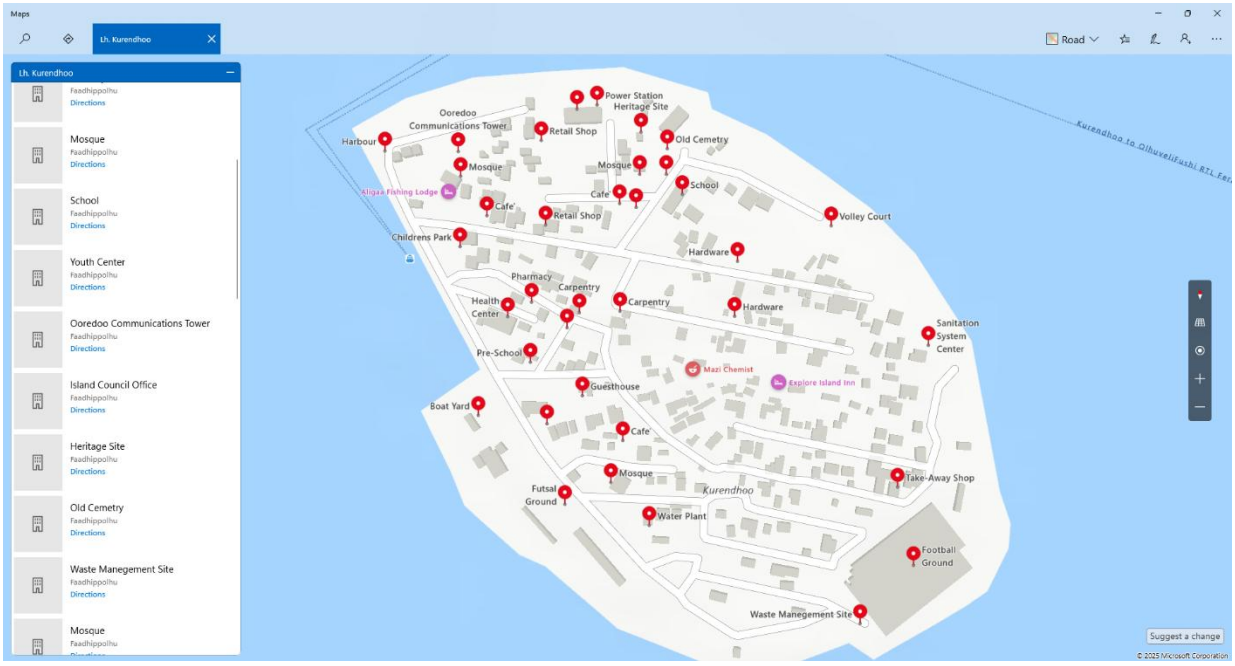
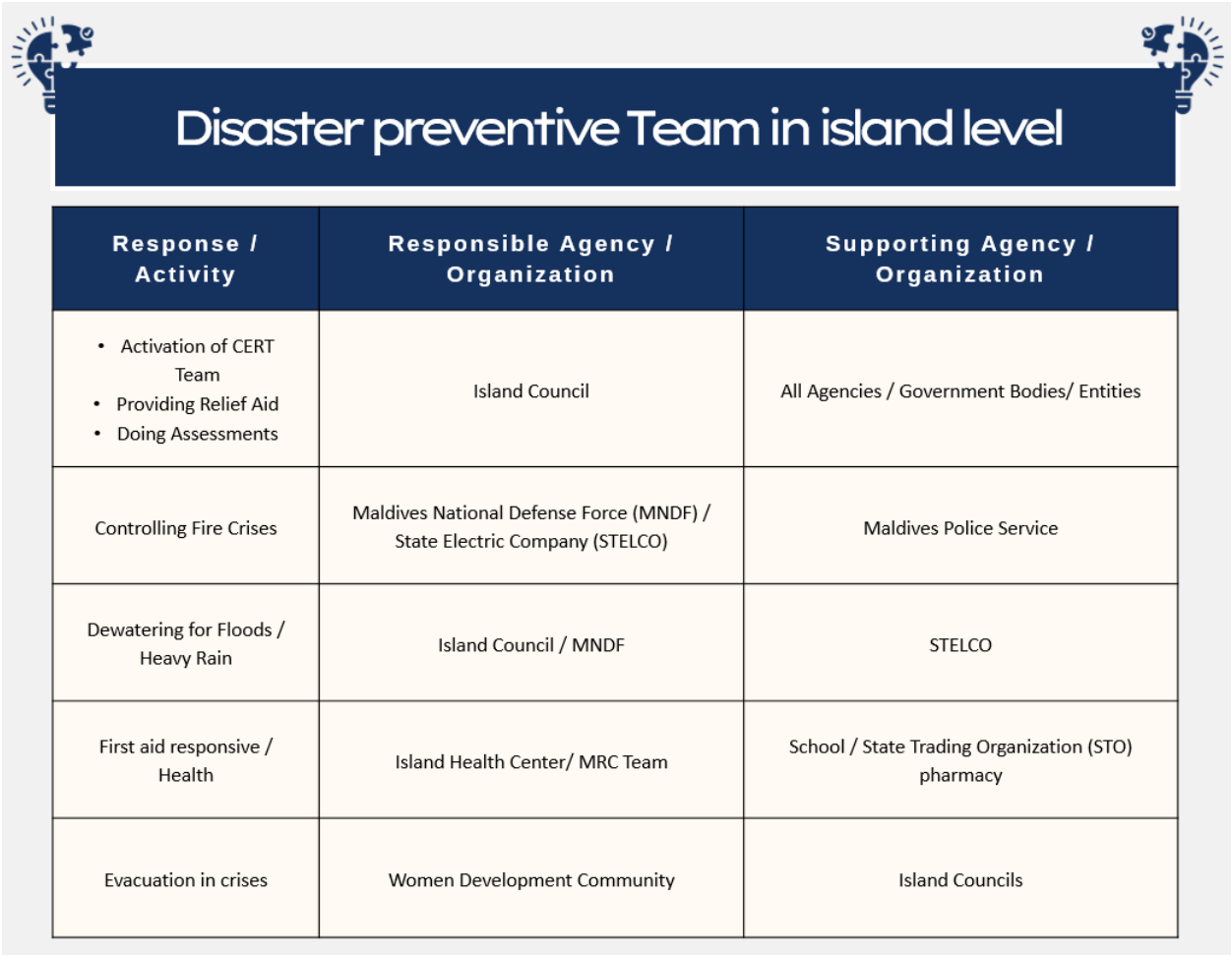


Figure 6: Island Resource Map of Lh.Kurendhoo, Northern Area of Maldives (Source Adapted from NDMA,IDMP of Lh.Kurendhoo

Above figure 6 shows the resource map of Lh.Kurendhoo, located on Faadhippolhu Island (Northern part of Maldives) Frequent flooding and storm surges are the most challenging crises happen in the island. Therefore, it's vital to create a risk and hazards maps, advocating community including special needs people so that if mega disasters happen, community is able to acknowledge the capacities and safer places the island is such disasters.

4.1.5) Collaborative Agency Capacity

Collaborative agency capacity refers to the ability of communities to work together within their boundaries and with external organizations to strengthen disaster resilience. Collaboration is particularly important in resources- limited island communities, were shared resources and collective action enhance disaster response efforts. Collaborative disaster risk governance, which involves governments, NGO's and civil society organization, has significantly improved community resilience by harnessing diverse expertise and resources.



Disaster preventive Team in island level

Response / Activity	Responsible Agency / Organization	Supporting Agency / Organization
• Activation of CERT Team • Providing Relief Aid • Doing Assessments	Island Council	All Agencies / Government Bodies/ Entities
Controlling Fire Crises	Maldives National Defense Force (MNDF) / State Electric Company (STELCO)	Maldives Police Service
Dewatering for Floods / Heavy Rain	Island Council / MNDF	STELCO
First aid responsive / Health	Island Health Center/ MRC Team	School / State Trading Organization (STO) pharmacy
Evacuation in crises	Women Development Community	Island Councils

Figure 7: Role and Responsibilities in Island Crisis Management (Source adapted from; NDMA Lh.Kurendhoo Island Disaster Management Plan

Above figure 7 illustrate the roles and responsibilities that each government office, utilities and other stakeholders has, during the activation of emergency operation in the island level. Therefore, certain people from these agencies and government bodies should involve in CERT team which will be the first responders in the crises management in Island level.

4.2) DEVELOPING ISLAND DISASTER MANAGEMENT PLANS

Disaster Management came to the forefront in the Maldives when the 2004 Indian Ocean Tsunami devastated the people, economy, environment and infrastructure of the country. Since then, with the help of national and international partners, Maldives has been on a race against time to increase its institutional and local capacity to better deal with disaster and emergencies. One important step in increasing the resilience of a country to disaster is to mainstream disaster risk reduction activities into the development process. The key actors in the implementation of risk reduction activities need to be institutionalized at the national level in order to ensure sustainability. There are several developmental partners in the Maldives who are implementing risk reduction activities at the community level. There are sectors and partners who do not directly implement risk reduction projects but nevertheless want to integrate disaster preparedness and risk reduction components into their policies, plans and activities.

In the year 2024 with the help of MRC and NDMA along with volunteers, successfully conducted the training session, and disaster management plan in 04 island mostly on Northern Area including; LH.Kurendhoo, N.Velidhoo, M.Kolhufushi, Ha. Vashafaru. Hence, the overall objective of building IDMP is all of community inclusive participatory process, where through community risk assessment (Hazards, Vulnerability and Capacity Assessment and Mapping) Therefore, this plan will help to identify community stakeholder roles and responsibilities in Disaster Management, develop necessary SOPS that will guide disaster and emergency response in the community.

Below Figure 8, shows the Hazard Map of Lh.Kurendhoo which was developed in the year 2024. The map has created by using the sources of information provided by the community people. Therefore, this map illustrates the most frequent hazards that occurred to this particular island. Furthermore, this map will ease community and local people to understand the most vulnerable area, which takes an account the community to be prepared ahead for such mentioned crises.

Figure 8; Hazard Map of Lh. Kurendhoo, Source Adapted from NDMA Lh.Kurendhoo IDMP 2024

Below Figure 9 shows the Evacuation designed centers which will be more safe in the case of flooding and storm surges. As these location, the chances of getting flood is relatively low. Hence, if heavy rainfall cases, people can evacuate to these designated areas in such emergencies. Furthermore, the red lines indicate the pathway which guide the community to reach these safe zones with the minimal time.

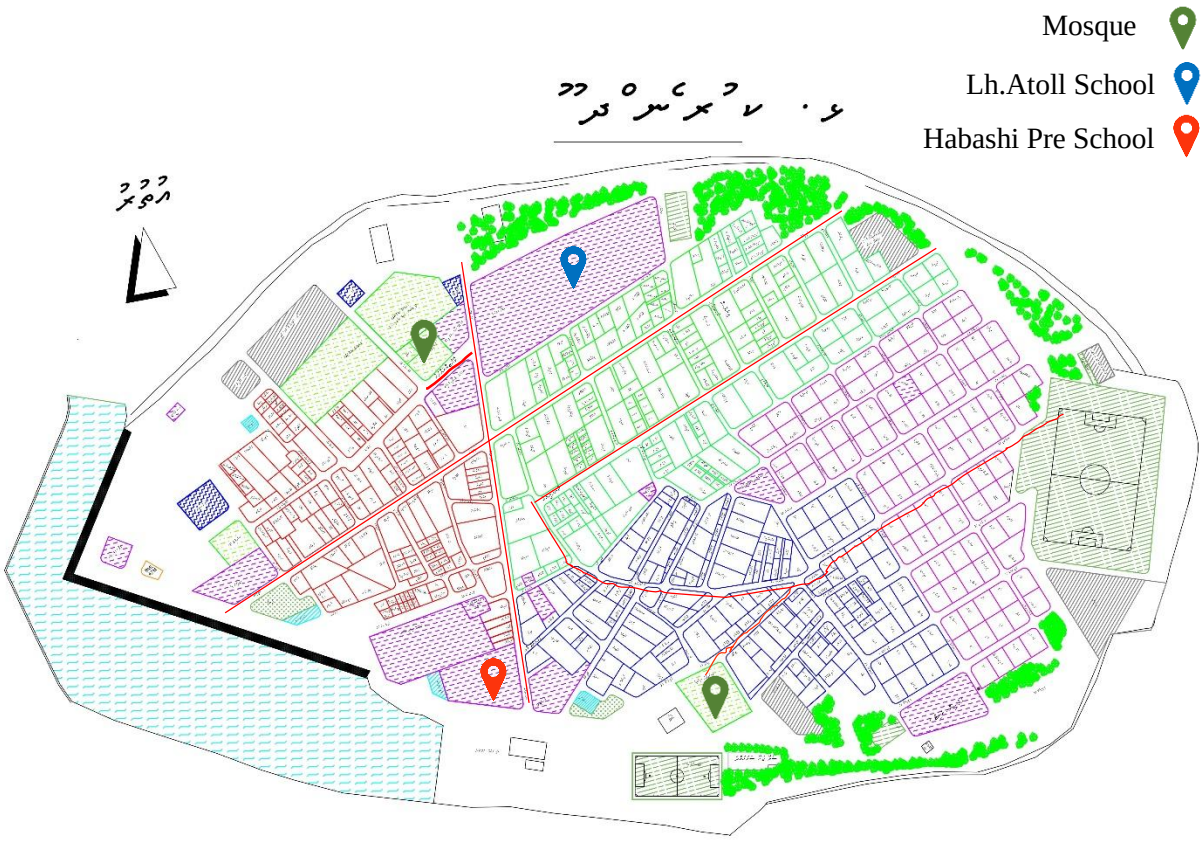


Figure 9: Evacuation Map of Lh.Kurendhoo , Source Adapted from NDMA Lh.Kurendhoo IDMP 2024

4.3) ESTABLISHING COMMUNITY EMERGENCY RESPONSE TEAM (CERT)

In the 21st Century, catastrophic disaster has occurred around the world challenging response capacity at every level. Disaster such as Indian ocean earth quake and tsunami in 2004, earthquakes in Sichuan in the year 2008, tsunami and nuclear disaster in Japan, further floods, tornados, droughts, fires and heatwaves in United States make dramatically clear that overwhelming man-made and natural hazards events are occurring that we are not accustomed to planning for in the course of everyday lives. Nevertheless, the fact that Maldives has rare cases for mega disaster such mentioned above, it's vital the community to be prepare for the obstacles

and damages that may occur any time. Until the Indian Ocean Tsunami occurred in the year 2004 the Maldivian community has taken fewer steps for preparedness and mitigation tactics for the Mega disasters. Most of the community seeks this is due to less occurrence of mega disasters, whereby, majority of the local perceive that Maldives is a safer country. Nevertheless, it's important to be prepared and ready to face the challenges further responding and protecting the community in such time frame.

Due to the geographical boundaries, how the Maldives has formed, its challenged to establish DMC in each island. However, the Island Council should take the responsibilities and formed Emergency Operation management (EOM) in such crises and disasters. Therefore, in each island there should be trained CERT who is capable to cope in such crises, including able to give psychological assistance if required. According to the statistics of National Disaster Management Authority (NDMA) till 2019 from all across Maldives 3,545 people have trained and earned the CERT member certification. Therefore, these members should activate in such crises and support with island EOC team members which illustrates in Figure 10.

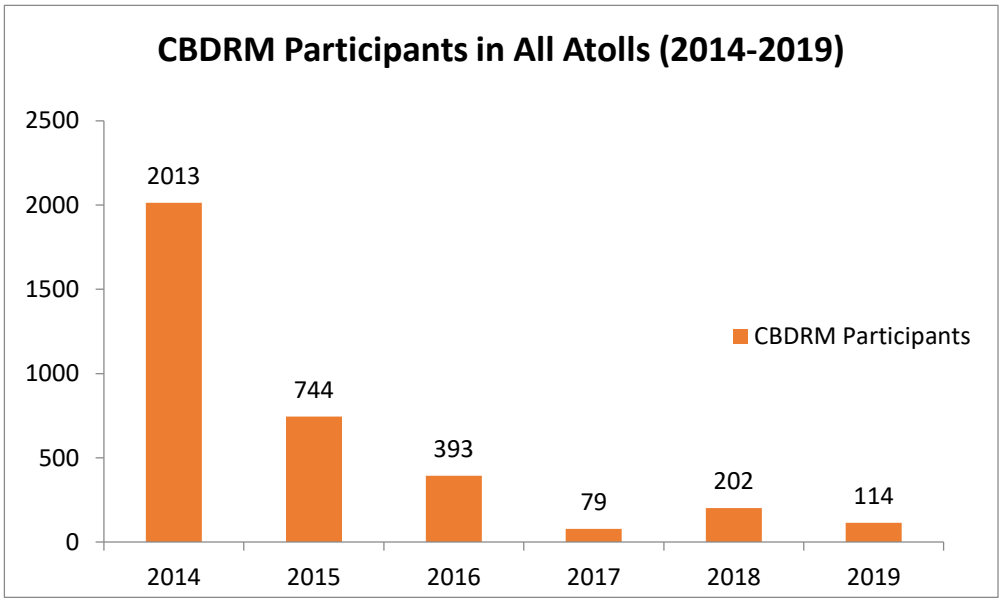


Figure 10 (CBDMR trained participants across Maldives) Source Adapted from NDMA statistics)

Due to the global pandemic situation in 2020, the program was bringing to halt to conduct the training across the Maldives. However, with United States Agency for International Development (USAID) funds and aid Enhance Resilience Planning and Strengthening community preparedness (ERCP) project along with Maldives Red Crescent (MRC) and NDMA was established with the overall goal to enhance and strengthen risk-based resilience planning at island and city level and strengthen locally led preparedness and mitigation actions through systematic capacity building of existing resources and tools in island communities in Maldives. Therefore, at first stage, 05 days lectured information session is conducted in the island, with inclusion of women, utilities, island council, school, health services, elders and different other occupational people to adequate information about disaster risk profile of the Maldives. After completion of this training session, first aid training along with psychological assistance program will be conducted. The priority will be given to the individuals who has joined and completed the first training session. Afterwards, CERT training will be given to the individuals who successfully completed the two trainings. In the concept of Maldives, the CERT training includes, to respond and perform in the case fire and flooding events.

Figure 11 Sand Collection for the prevention on flood

Figure 12; Training with Maldives Fire and Rescue Team and National Disaster Management Authority

CHAPTER 5

5.1) RISK PROFILE AND HIGHLIGHT OF DISASTERS IN JAPAN

Japan, an island country lying off the east coast of Asia. It consists of a great string of islands in a northeast- southwest arc that stretches for approximately 15,00 miles (2,400 km) through the western north Pacific Ocean. Nearly the entire island area is taken up by the country's four main islands, from north to south which is Hokkaido, Honshu, Shikoku, Kyushu. In addition, there are numerous small islands such as Ryuku Island, Island of Okinawa, Izu and Bonin. The capital city is Tokyo in east- central of Honshu, which is one of the famous and world's populous city.

Japan is located in the Cirucum - Pacific Volcanic Belt which is also known as "Ring of Fire" where seismic and volcanic activities occur constantly. Japan and its surrounding areas experience roughly a tenth of all earthquakes that occur in the World. Furthermore, due to geographical, topographical and meteorological conditions, the country is subject of frequent natural disasters such as typhoons, torrential rains and heavy snowfalls, as well as earthquakes and tsunami.

Every year there is a great loss of people's lives and properties in Japan due to natural disasters. Until the 1960's, largescale typhoons with earthquakes caused extensive damage and thousands of causalities. Thereafter, with the progress of society's capabilities to respond to disasters and mitigate vulnerabilities to disasters by developing disaster management systems, promoting national land conservation, improving weather forecasting technologies, and upgrading disaster information communication systems, informing and maintaining early warning signs and systems are the major achievements that Communities has achieved.

Nevertheless, in spite of such efforts, in 1995 Great Hanshin – Awaji Earthquake and Great East Japan Earthquake has led communities suffered a lot. For the purpose of this research, below bullet points give an overview of the disaster and damages caused by these disasters in National level and economy level.

5.1.1) Great Hanshin-Awaji Earthquake

The Great Hanshin- Awaji Earthquake was one of the largest postwar earthquakes in Japan, causing severe damages in a densely populated urban area, claiming 6,434 lives and injuring more than 43,000 people. One of the main characteristics of this earthquake was the major

housing damage that led directly to the deaths of many people. More than 110,000 building collapsed completely or were burned down by fire. Furthermore, 14,951 households within Kobe City suffered either total or partial collapse of their homes. Most of the deaths were caused by the collapse of buildings, especially old wooden houses built according to outdated building standards. The majority of the victims were elderly people and low-income people. The whole of the fault line that extends from Awaji Island to "Rokko Mountain", causing particularly strong tremors in the areas located along the line. The most severely damaged region comprises the 10 cities and 10 towns in Hyogo Prefecture including; Sumoto City, Tsuna Town, Awaji Town, Hokudan Town, Ichinomiya Town, Goshiki Town, Higashiura Town, Midori Town, Seidan Town, Mihara Town, and Nandan Town in Awaji Island. Furthermore, damages were particularly severe in Suma, Hyogo, Nagata, Nada and Higashi-Nada wards, Amagashi City, Ashiya City as well. Outside of Hyogo Prefecture, a seismic intensity of 4 of the Japanese scale was recorded in Toyonaka City and Osaka Prefecture. According to the status of damage as finalized by the Fire and Disaster Management Agency (FDMA) 104,906 houses were totally destroyed and 144,274 were partially destroyed and 269 fires occurred. Also, referring to studies of (Pandey & Okazaki , 2023) about one third of parks in Kobe were damaged. Further, 223 public school, 03 municipal hospitals and 112 private hospitals was partly and completely damaged.

Moreover, FDMA reports highlight much of the infrastructure was destroyed including; 1,579 public buildings, 7,245 sections of road and 330 bridges were collapsed. The Kobe lines of the railways operated by West Japan Railways and private railway companies (Hanshin, Hankyu and Sanyo), as well as the facilities of municipal subway and bus operators, were also considerably damaged, bringing traffic in the region to a standstill. According to reports and statistics released by Hyogo Prefectural Government in December 2011, approximately 2.6 million households were cut off from electricity supply, approximately 845,000 households from gas supply and approximately 1.27 million houses from running water. In addition, approximately 478,000 telephone lines, including exchange and subscriber lines went out of services. These lifeline and vital services was restored by April 1995, whereby, communities, society and households faced challenges during the 03 months after the post disaster.

5.1.2) Great East Japan Earthquake

On March 2011, an earthquake of magnitude 9.0 occurred in the Pacific Ocean off the coast of Japan's Tohoku region. The quake shook the ground as far away as western Japan and lasted for several minutes. A half-hour later, a tsunami of unprecedented force broke over 650 kilometers (km) of coastline, toppling sea wall and other defenses, flooding more than 500 square kilometers of land, and washing away entire town and villages. Furthermore, the devastation left some 20,000 people dead or missing, with most of the deaths caused by drowning. The tsunami leveled 130,000 houses and severely damaged 270,000 more. About 270 railway lines ceased operation immediately following the disaster, and 15 expressways, 69 national highways, and 638 prefectural and municipal roads were closed. Moreover, some 24,000 hectares of agricultural land were flooded. According to the Japanese News and published documents, the areas worst hit was Fukushima, Iwate and Miyagi prefectures.

On a cold Friday afternoon around 14:46, attacked of this massive earthquake led the shaking of Tohoku University School of Medicine for more than 03 minutes. It was one of the long lasting earthquake that the people of East region which previously not experienced. Despite being the greatest earthquake ever recorded in Japan, there were a limited number of human deaths that were directly caused by the collapse of buildings or houses. Definitely, the quake – resistant and quake – absorbing buildings in the Tohoku Region saved a large number of human lives compare to Great Hanshin Earthquake. Figure 11 illustrates the statistical data released by National Police Agency (NPA) with the help of Japan Meteorological Agency to compare both Mega Disasters occurred in the Japan.

	Great Hanshin-Awaji Earthquake	Great East-Japan Earthquake and Tsunami
Date of onset	January 17, 1995	March 11, 2011
Origin time (JST)	05:46:52	14:46:23
Magnitude	7.3	9.0
Epicenter	34.4°N 135.2°E (Awaji Island)	38.3°N 142.4°E (130 km off the Sanriku Coast)
Feature of disaster	Collapse of houses	Tsunami
Dead or missing persons	6,437	18,550*
Injured persons	43,792	6,142*
Main cause of death	Crushing death	Drowning

Figure 13; Comparison of Great Hanshin Awaji and Great East Japan Earthquake

5.2) DISASTER MANAGEMENT SYSTEM IN JAPAN

It is a national priority to protect national land as well as citizen's lives, livelihoods and property from natural disasters. The turning point for strengthening the disaster management system came into effect in response to the immense damage caused by the Typhoon Ise-wan 1959, and led to the enactment of the Disasters Countermeasures Basic Act in 1961 which formulates a comprehensive and strategic disaster management system. Thereafter, the disaster management systems have been continuously reviewed and revised following the lessons learned from large-scale disasters.

Figure 14; Disaster Management System in Japan

Japan's legislation for disaster management system, including the Basic Act on Disaster Management, addresses all of the disaster phase of prevention, mitigation and preparedness, emergency responses as well as recovery and reconstructions with roles and responsibilities among the national and local governments clearly defined. It is stipulated that the relevant entities various disaster countermeasures. The basic Act on Disaster Management has constantly been reviewed and amended since its first enactment, and with lessons learned from the Great

East Japan Earthquake. Figure 13 shows the outline of Basic Act on Disaster Management in Japan.

Figure 15; Basic Act on Disaster Management

Since the reforms of the central government system in 2001, a Minister of State for Disaster Management is placed to integrate and coordinate disaster risk management policies and measures of ministries and agencies. With the revision of the Basic Act on Disaster Management in 2021, the Minister of State for Disaster Management is legally required, and the government's disaster prevention system is being further strengthened in terms of organization. In the Cabinet Office, which is responsible for securing cooperation and collaboration among related government organizations in wide – ranging issues, the Director – General of Disaster Management is mandate to undertake the planning of basic disaster management policies and

responses to large-scale disasters, as well conduct overall coordination. To prepare for disasters, the National Disaster Management Council with the Prime Minister as the Chair and all Cabinet members decides the national government's disaster management policies. Such decisions are carried out by respective ministries and agencies accordingly. In the event of a large scale disaster, the Cabinet Office is engaged in collection and dissemination of accurate information, reporting to the Prime Minister, establishment of the emergency activities system including the Government's Disaster Management Headquarters, overall wide area coordination concerning disaster response measures. Figure 15 Shows the Hierarchy and formation of Cabinet office and related Ministries and Agencies in Disaster Management.

Figure 16; Formation of Cabinet Office and Related Ministries and Agencies

5.3) BASIC DISASTER MANAGEMENT PLAN

The Basic Disaster Management Plan is a comprehensive and long-term disaster management plan forming a foundation for the Disaster Management Operations Plan and Local Disaster Management Plan. It stipulates provision for the establishment of the disaster management systems, promotion of disaster management measures, acceleration of post disaster recovery and reconstruction measures, and promotion of scientific and technological research on disaster management. Since its establishment in 1963, this plan has been reviewed every year revised when deemed necessary. Therefore, the plan was revised entirely in 1995 based on the experiences of the Great Hanshin- Awaji Earthquake. It defines responsibilities of each entity such as the national and local governments, public corporations and other entities. It consists of various plan for each type of disasters, where specific countermeasures to be taken by each entity are described according to the disaster management phases of prevention and preparedness, emergency responses as well as recovery and reconstruction.

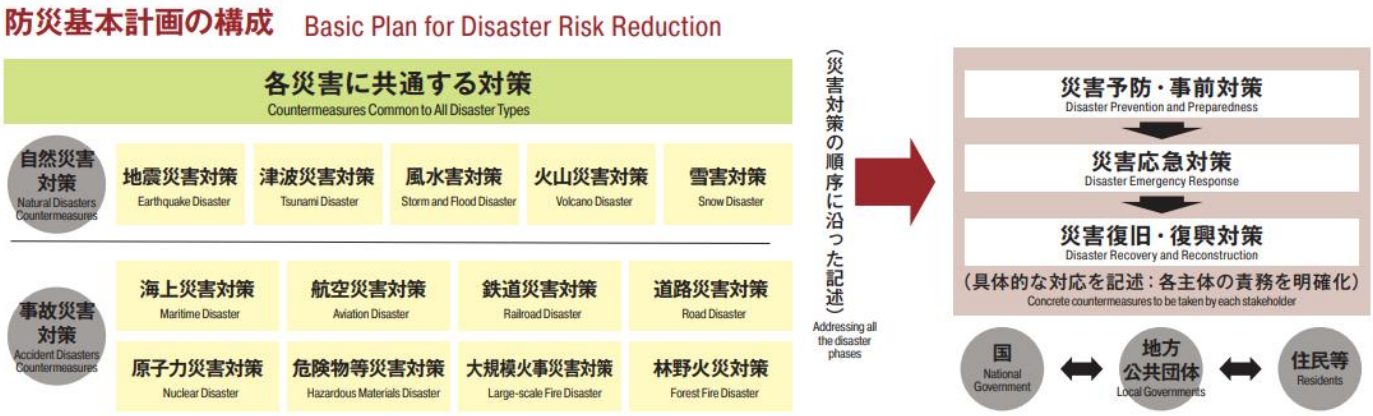


Figure 17; Basic Plan for Disaster Risk Reduction

CHAPTER 6

6.1) CBDRM APPROACHES OF THE LESSONS LEARNS - ACROSS JAPAN

In the vicinity of the Japan and Chishima Trenches, a diverse range of earthquakes have occurred, leading to substantial damage countless times. They include earthquakes at the plate boundary, within the crust plates, megathrust earthquakes with magnitudes above 07 and 08, as well as tsunami earthquakes that causes a large tsunami for comparatively small earthquake. Therefore, the government has been intensively developing measures for these trench type earthquakes in the areas based on lessons learned from such mega disasters.

After the Great Hanshin Awaji Earthquake in 1995, specially in Hyogo Prefecture, different drills, tsunami awareness sessions and learning seminars has conducted which enable young generation, millennials and other community members to act, find evacuation centers, respond and enabling preparedness measures to overcome from such disasters. In order to improve the disaster resilience of the community and to reduce disaster damages, there must be a close cooperation among individuals, families, local community, businesses and relevant entities, to be build momentum for a nationwide movement. Therefore, the government has designated the 01st day of September as the “Disaster Preparedness Day” and the week includes and carry out various events to raise awareness and readiness about the disaster. Disaster Drills and promoting events are held in various parts of the Japan. One of the great achievement is, during these drill and awareness sessions, People with disabilities, special needs and elderly are highly encouraged and participated during such events. Therefore, with different segments, provide various information about emergency food, preparing for emergencies, how to give CPR (cardiopulmonary resuscitation) services in incidents and emergencies, how to respond to alert level with sign languages for the people who is deaf, such things are showcased which is a good practice for community for a sustainable disaster risk management.

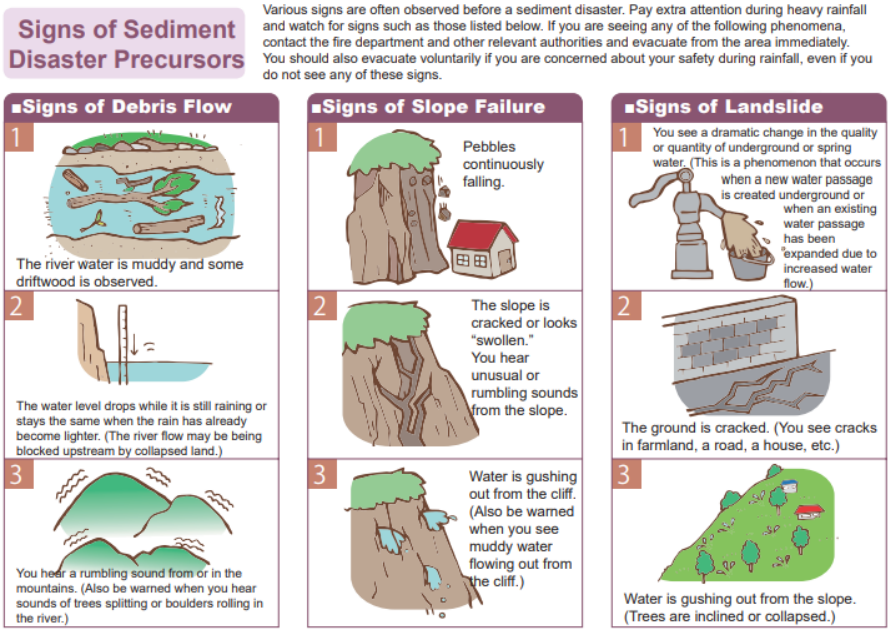


Figure 18 Sign of Sediment Disaster Prevention and awareness adopted in Shikoku

In Japan, there are three types of help for disaster risk reduction (DRR) including; self-help, mutual help and public help. Owing to the massive scale of the 2011 Great East Japan Earthquake and tsunami disaster, municipal governments were severely affected, and their ability to help people was paralyzed. In this situation, community residents were responsible for supporting each other's survival, such as through evacuating from tsunami-affected areas, operating evacuation shelters, and securing adequate supplies of food and water. In essence, communities became first responders. Due to the recognitions of the limitations of public help after this calamity, the importance of self-help and cooperation within each community has been reemphasized. Since the Great East Japan Earthquake, accurate risk assessment by the government and experts, as well as interactive risk communication among the government, experts, and community residents, has been reemphasized to gain a better understanding of local disaster risk and take appropriate actions in times of emergency. Based on the 2011 disaster experience and the lessons learned from it, how to protect individual lives effectively and respond practically to catastrophic situations at the local level are key issues for enhancing community resilience.

Additionally, a school based DRR education program has been developed in Ishinomaki City in the Miyagi Prefecture, the municipality most severely affected by the Great East Japan Earthquake and tsunami. The city experienced the tragic Okawa Elementary School Incident, in which 74 of 1080 pupils under supervision, 10 teachers and 175 local residents were lost as a result of tsunami that came upstream along the Kitakami River. The Okawa Elementary School

failed to meet designated a third tsunami evacuation areas and routes in risk management in advance, and was therefore guilty of negligence. Hence, this incident taught important lessons, such as each school should foresee its own local disaster risk and all school should prepare for effective and practical school disaster safety based on the school district risk assessment with the support of the municipal government and DRR experts. Henceforth, DRR mapping program was developed and practiced from the year 2012 which consists of orientation, town watching, map making, presentation of the produced maps, hazards and vulnerabilities and risk factors associated in multi hazards. The concept of applying "R-DRRMP" in Ishinomaki City thus became one of the main approaches for teachers and students to gain a better understanding of their local disaster risks.

Nevertheless, Kochi City and Kuroshio Town, located in the Kochi prefecture faces the Pacific Ocean and have a history of being effected by earthquakes and tsunamis originating from Nankai trough every 100-150 years. Referencing to (Uchiyama, Ismail, & Stevenson, 2021) minimum tsunami arrival time was around 16 -08 minutes respectively and the water level was above than 15meters. After the Great East Japan Earthquake, both municipalities strengthen their disaster risk reduction measures by building evacuation towers and other facilities and by running evacuations campaigns. Furthermore, working collaborator with municipals, officers, and universities, the area conduct practical disaster preventive measures for local communities for better preparedness in the event of disasters. Also, the community has applied the practice for preparing emergency kits, availability of boxes to so that important thing can take along with when the alert or evacuation order is given.

Figure 19; Tsunami Evacuation Tower in Kuroshio

Figure 20; Community Based DRR Discussion in Kochi Prefecture

In September 2015, heavy rains in the Kanto and Tohoku regions caused massive flooding in Joso City, Ibraki Prefecture. Vast fields occupy the area between the Kinugawa and Kokaigawa Rivers. Historically, the area has occurred flooding several times as ground level is lower than the river level in some area, which ease flooding heavily and spreading the water quickly. When the Kinugawa embankment broke during the rainfall of 2015, one third of Joso City was inundated, even the first floor of the relatively new city hall was flooded. In addition, more than 5000 were completely or partially destroyed and more than 4200 people needed to be rescued. Fortunately, many residents in Joso City were able to take refuge before the flooding and earlier than the residents in other areas. One of the reason for the early evacuation is the city was utilization of a local social networking services (SNS) broadcasting systems. As the system allowed to deliver short textual information to all local residents at the same time. The modern and new system has capability to display textual information on mobiles and smartphones through a single operation on a personal computer. As the rainfall was becoming increasing heavily, the local leader sent a series of short text messages, informing residents about the flood stage of Kinugawa River and issuing evacuation warnings. These SNS messages urged local residents to take early evacuation actions which saved many lives and manage the risk effective manner.

With these potential strategies, consequently the community is well prepared and aware in the act of disaster, hence the Maldivian community can also establish practices like including DRR in the curriculum of the studies. As the case of Ishinomnaki's school- based DRR education program described one of the approach being taken to understand local disaster risk. This program is composed of several steps, including strengthening map-reading skills, understanding the actual geography of the school district, comparing topographical and hazard maps of the school district, confirming local disaster risks by town-watching, and producing DRR maps to present the findings. These are useful steps for both children and adults to realize the collaboration between school and communities in examining local disaster risk and producing original DRR maps. Similarly, in primary and secondary education, young generations can develop and understand the risk factors, vulnerabilities, and capabilities that each island or city has which prevents losing lives from mega disasters.

Additionally, Joso City demonstrates the importance of facilitating daily communication within the community to ensure smooth communication in the event of disaster. While highlighting back 2004 Indian Ocean tsunami, the country Maldives was not established early warning systems, which enables to notify the earthquakes, tsunami and other hazards which come across the Maldives. However, effective early warning systems, would enable the community to be ready for disaster. In the current scenario, Maldives Meteorological services issues alerts in different level, however effective measures, proper system would enable reducing the risk in the case of heavy rain floods, and other disasters.

CHAPTER 07

7.1) CONCLUSION

Establishment of community based disaster risk reduction approaches, managing disasters, preparedness has let many districts, prefecture and cities to cope with the mega disasters. While disasters can strike wide region or nation, that impact is felt at the community level although it may hit one or several communities at once. Majority of the community is aware with the evacuation centers, receive alerts and evacuation orders. However, natural and frequency of the disaster is beyond the control of people. Henceforth, overcoming from these disasters, making cities and town safe and implementing green environmental friendly practices help to cope and overcoming from disasters.

While in the Kochi Prefecture, preparing emergency relief kits in households and enabling rapid evacuations are the main practices that community has established after the great destructions that has occurred in the past. Additionally, community people provide donations and charity, to collect the money to buy necessary items and food supplies in the evacuation centers which is more on investment for DRR.

At Sendia, in the Miyagi Prefecture, people perceive that every house should be constructed in a quake – absorbing or quake-resistant structure, ideally with its own electric power systems. As the fires and tsunami accompanied in past Great Earthquakes in Japan, it is important for many cities to design preventive strategies against both fire and tsunami. Furthermore, starting from the elementary school importance of DRR has inclusive in their daily habitat. Students, local and community people are actively in making hazard maps, risk and vulnerabilities associate in the region. Furthermore, celebrating memorial days to conduct emergency drills and practices for the preventive measures are the key success that has led the country for resilience.

CBDRM approaches for Maldives is way different that applied in Japan. However, the concepts and various lessons learn from these mega disasters are important to be applied in the case of Maldives. Back 2004, the Maldivian Region has no idea or clue what to do when tsunami occurred. It was all new to see the high tides in the low-lying islands. After the great memorial of 20 years, the community has rebuilt and way come forward. However, for mega disasters, preparation, mitigation and preventive rules will only now able to save people in such disaster.