# CYCLONE RISK PREPAREDNESS AND RESPONSE IN RAKHINE STATE, MYANMAR: INSTITUTIONAL BASED ANALYSIS

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## Abstract

Rakhine State is claimed to be the most disaster-prone area in the country. Rakhine state faced 13 times of cyclones between1948-2017. Among them the cyclone that hit the area in 1968 killing 1037 people and cyclone Marlar that lashed in 2006 leaving 37 deaths were the most destructive. Myanmar ranks first as "most at risk" country in Asia. Tsunami, Cyclone and storm surge affected all coastal areas (2004 Indonesia Ocean Tsunami, 2006 Marlar Cyclone, 2008 Nargis Cyclone, 2010 Giri Cyclone, 2015 Komen Cyclone). National Disaster Management Committee was reformed in 2016 in Rakhine state for preparedness and emergency response plan. Risk perception is strongly associated with disaster preparedness because individuals must perceive a risk to be motivated to initiate preparedness actions (Kanakis et al (2016). Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) was introduced (lastly updated in 2017) and a year later the legislation passed the Natural Disaster Management Law. In the Action Plan of 2017, 32 priority actions have been formulated. For these priority actions, responsibilities are defined for different administrative and spatial levels. The paper based on the institutional preparedness and response for cyclone risk in Rakhine state. Semi-structured interviews, Likert scale and qualitative methods to analyse experts interviews such as institutions in Sittway town which are involved in disaster risk management and preparedness are also conducted with ward administrator and local experts and different institutions. twenty expert interviews conducted were in beginning of 2020. Statistical data collected from Department of Disaster Mangement, Natural Resource and Environmental Conservation etc;. This paper examines how risk preparedness varies among institutions and community levels.

**Keywords:** Rakhine state, awareness, preparedness, risk, cyclone, Likert

## Introduction

Rakhine State is the least developed of Myanmar's 14 states and regions and is characterized by widespread poverty, weak infrastructure and a lack of opportunities for employment and income generation. This is exacerbated by the state's vulnerability to natural disasters, and prolonged internal displacement of around 140,000 IDPs as a result of communal violence. The World Bank has estimated poverty incidence in Rakhine to be the highest in Myanmar at 78% - set against a national average of 37.5% - and it is thought that some 416,000 people are in urgent need of humanitarian assistance. Rakhine state has seven main risks: flooding, cyclone, tsunami, landslide, forest fire, earthquake and river bank erosion. Among all this paper focuses on cyclone risk. Rakhine state is located approximately between latitudes 17°30' north and 21°30' north and longitudes 92°10' east and 94°50' east. It has an area of 36,762 square kilometres (14,194 sq mi) (Figure 1).

Coastal areas in Myanmar which have been affected by cyclones include mostly Rakhine state and Ayeyarwaddy Region. The Rakhine state was prioritized for the development of a specific Contingency Response Plan (CRP), due to the existing protracted emergency with 140,000 IDPs and other affected populations, the high levels of vulnerability, low levels of preparedness in communities, and the limited local capacities and resources (Myanmar Emergency Response Preparedness Plan (ERPP) 20. 2014. In Myanmar, multi-hazard risk assessments have been conducted in some hazards prone areas, such as the delta and Rakhine State (assessment carried on

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by UNDP). These initiatives should be extended to other hazards prone areas to cover the whole country. Taking into consideration climate change, multi-hazard risk assessments should also cover climate change risks. Rakhine state is particularly vulnerable to the impact of tropical cyclones – in particular the townships of Sittway and Maungdaw. Local communities and institutions interviewed on hazards and risks recently identified cyclones and associated storm surges as the primary hazards in the 13 coastal townships of Rakhine state. One of the other key elements of the development challenges facing Rakhine state is the limited scope of livelihood prospects and opportunities for income generation. This has created a cycle of food insecurity and indebtedness where food insecure households take out loans to meet immediate needs. The situation contributes significantly to the instability that constitutes a major push factor for irregular migration. Compounding the already challenging circumstances is the impact of natural disasters on livelihoods. Farmers are affected by cyclones through damage of crops/paddy fields, livestock, seeds and key assets, with the result that they often experience difficulty in restarting their farming and cultivation activities. Similarly, fishermen are at risk of losing their vital equipment and having their boats damaged in cyclones or storm surges.

Rakhine state effected 13 times of cyclones between 1948-2017. Extremely Severe Cyclonic Storm (Nargis) caused the worst natural disaster in the recorded history of Myanmar during early May 2008. Poverty and low infrastructures increase vulnerability and capability to recover from disasters. The millions of people injured, and many encountered hunger hungry and homelessness. More than 700,000 homes were fully or partially destroyed. Nearly 75 percent of health clinics were destroyed. The UN estimates that as many as 2.4 million people were affected. Nearly 140,000 people died and 2.4 million were severely affected. (Myanmar: Cyclone Nargis 2008 Facts and Figures. Published: 3 May 2011 12:16 CET)

International Organization for Migration (IOM) Myanmar has been implementing DRR Projects since 2012 and has carried out necessary measures for the rehabilitation of damages caused by Cyclone Nargis (2008) and Cyclone Giri (2010) based on regional experience and less on learned from IOM's response. IOM supports state and township governments by increasing their capacity and readiness to manage disasters and to reduce their impact. IOM and Disaster management committee Rakhine state had drawn Rakhine State Emergency Response Contingency Plan in 2019 (IOM, 2019).

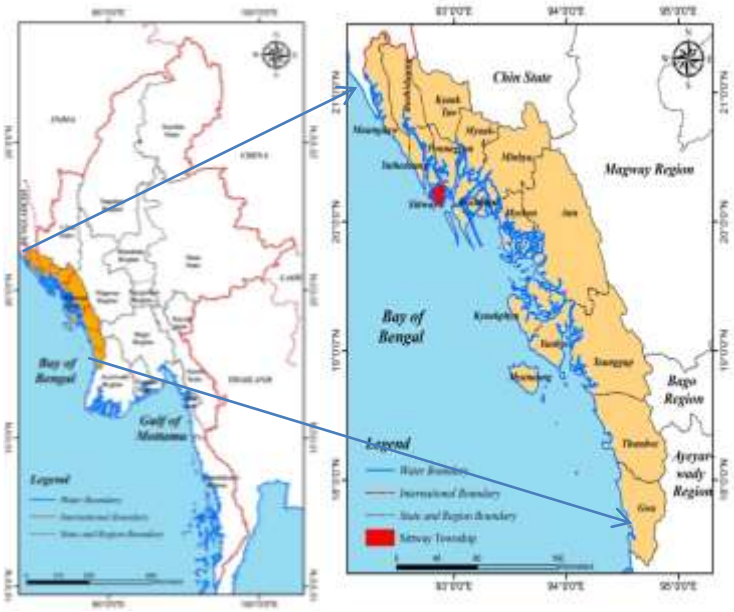
Developing countries, such as Myanmar, have often failed to implement risk management strategies: awareness and preparedness. Risks preparedness is one of the important things within the disaster management cycle. Preparedness is defined by United Nations International Strategy for Disaster Reduction (UNISDR) as knowledge, capabilities and actions of governments, organizations, community groups, and individuals ''to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions''. Preparedness efforts range from individual level activities (such as first aid training), to household actions (stockpiling of equipment and supplies), community efforts (training and field exercises), and governmental strategies (setting up early warning systems and contingency plans, the development of evacuation routes, and public information dissemination).

Risks have inflicted a heavy cost on human, material and physical resources. It is strongly associated with disaster preparedness because individuals must perceive a risk to be motivated to initiate preparedness actions. (Kanakis et al. 2016).

IOM has been active in Rakhine State since Cyclone Giri (2010) with emergency health and shelter support. IOM currently is active in Rakhine State in the fields of Camp Coordination and Camp Management (CCCM) capacity-building support, disaster risk reduction (DRR), IOM Myanmar mainly works in five townships – Maungdaw, Myinbya, Pauktauw, Sittwe, and Myebon

– which are the most risk prone of natural disasters and which have the highest number of IDP caseloads. (IOM appeal (Myanmar / Rakhine state) (April 2016 - April 2018)

IOM leads a consortium implementing the Program for Improved Disaster Management and Resilience against Natural Disaster in Rakhine State (IDM-RAND) targeting Sittway, Minbya, Myebon, Pauktaw and Maungdaw Townships in partnership with Agency for Technical Cooperation and Development (ACTED), Asian Disaster Preparedness Center (ADPC), Swiss Center for Development Cooperation in Technology and Management (SKAT) and Swanyee Development Foundation, funded by the United States Agency for International Development (USAID) / Office of US Foreign Disaster Assistance (OFDA).




**Source:** Myanmar Survey Department, 2020

**Figure 1** Location of Rakhine State

## Research aim and key research questions

The aim of this research is to understand the risks challenges for Rakhine state in detail, in order to establish a comprehensive, integrative risk preparedness and response. This paper examines the past disaster experiences and loss of economic basis. This study also examines the profile and predictors of institutions and community disaster risk perception, awareness using preparedness knowledge, prior disaster experiences. Following research questions were set up:

1. What are the preparedness and response of institutions to meet the local people's needs and their results?
2. How is the state of awareness in the disasters and their risks?

In order to achieve the main aim the following objectives have been set up:

1. to analyse the preparedness and response of the respective institutions
2. to investigate the perception of the institutions according to their awareness for cyclone risk

These objectives have to do on the different institutions and different levels in particular the institutional/organizational level (authorities who are involved such as township administration, authorities of University, Department of disaster management, Natural resource and environmental conservation office etc.).

## Materials and Methods

The conducted semi-structured interviewed contains in particular parts which ask in detail for the awareness of the people towards disasters (in particular for the cyclone), their own preparedness and their expectations towards activities of authorities/organizations in case of an extreme event as well as their knowledge and experiences about disaster protection and rescue measures.

The qualitative method was used in this paper as a main approach. Altogether 30 expert interviews with members of different institutions involved in the disaster issue have carried out conducted in 2020. (length: 45 min to more than an hour). The interviews were recorded (Bryman, A. (2012). Statistical analysis was also used in Risk assessment. Data collected from General Administrative Department, Natural Resources and Environmental Conservation, Department of Disaster Management, Fire Service Dept, and etc;

## Finding and Suggestions

Myanmar is prone to cyclones and April, May and October to December are considered to be cyclone months based on the last 100 years record. In the last four decades, six major cyclones hit Myanmar; 1968 (Sittwe cyclone), 1975 (Pathein cyclone), 1982 (Gwa cyclone), 1994 (Maundaw cyclone), 2006 (Mala cyclone) and 2008 (Nargis cyclone). The Sittwe cyclone led to a loss of 1037 lives (MAPDRR, 2019-2015). Rakhine state includes five districts and 17 townships: Mrauk-U, Sittwe, Maungdaw, Kyaukphyu and Thandwe see (Figure 1). Rakhine state has seven main types of risk. Among them flooding is most frequent than others and the cyclones are most severe problems and cause more damage in Rakhine state, particularly cyclone in 1968: 1307 people lives and Marlar cyclone in 2006: 37 people lives and 428.56 million lost. The History of Cyclones in Rakhine state (1948-2015) and risk assessment by ranking are shown in Table (1) and Table (2).

**Table 1 History of Cyclones in Rakhine state (1948-2017)**

| No. | Year | Name of Cyclone | Effective area | Damage |
|---|---|---|---|---|
| 1 | 6 – 8 October 1948 | | Sittway | Some people lives, 10 million kyats lost |
| 2 | 22-24October 1952 | | Sittway | 10 million k |
| 3 | 15 - 18 May 1967 | | Kyaukphyu | 20 million k |
| 4 | 20-24October 1967 | | Sittway | 2 people lives, 10 million k |
| 5 | 7-10 May 1968 | | Sittway | 1037 people lives, 17537people lost, 10 million k |
| 6 | 12-17 May 1978 | | Kyaukphyu | 200 million k |
| 7 | 1–4May 1882 | | Gwa | 27 lives, 82.4 million k |
| 8 | 16-19May 1992 | | Thandwe | 27 lives, over 150 million k |
| 9 | 2 May 1994 | | Maungtaw | Over 59 million |
| 10 | 25-29 April 2006 | Marlar | Gwa | 37 lives, 428.56 million |
| 11 | 22 October 2010 | Giri | Kyauukphyu | 254720 people lost |
| 12 | 2015 | Komen | - | - |
| 13 | 31st May 2017 | Mora | 11 Tsps | |

**Source:** Department of Disaster Risk Reduction, Sittway, 2020

Seven main risks in Rakhine state which include flooding, cyclone, tsunami, landslide, forest fire, earthquake and river bank erosion are shown in Table 2. The risks are defined into three rankings by their capacity in 17 townships: high, middle and low. Among 17 townships, Gwa township is higher in risk level than other townships and four main types of risk that affected: the area are Cyclone, Tsunami, Forest fire and River bank erosion.

**Table 2 Risk Assessment in 17 townships, Rakhine state**

| No. | Township | Flooding less than 4, 4- 6(over 6 ft) | | | Cyclone (50-100 mph) | | | Tsunami | | | Landslide | | | Forest Fire | | | Earthquake | | | River bank Erosion | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | H | M | L | H | M | L | H | M | L | H | M | L | H | M | L | H | M | L | H | M | L |
| 1 | Amm | | ✔ | | | | ✔ | | | ✔ | ✔ | | | ✔ | | | | ✔ | | ✔ | | |
| 2 | Buthidaung | | | ✔ | ✔ | | | | | ✔ | | ✔ | | ✔ | | | | | ✔ | ✔ | | |
| 3 | Gwa | | | ✔ | ✔ | | | ✔ | | | | ✔ | | ✔ | | | ✔ | | | | | ✔ |
| 4 | Kyaukphyu | | | ✔ | ✔ | | | | ✔ | | | | ✔ | ✔ | | | | | ✔ | ✔ | | |
| 5 | Kyauktaw | ✔ | | | | ✔ | | | | ✔ | | | ✔ | ✔ | | | | ✔ | | | | ✔ |
| 6 | Maungdaw | | ✔ | | ✔ | | | | ✔ | | ✔ | | | ✔ | | | | ✔ | | | | ✔ |
| 7 | Mynbya | ✔ | | | | ✔ | | | | ✔ | | | ✔ | ✔ | | | | ✔ | | ✔ | | |
| 8 | Mrauk U | ✔ | | | | ✔ | | | | ✔ | | ✔ | | ✔ | | | | ✔ | | ✔ | | |
| 9 | Mannaung | | | ✔ | ✔ | | | | | ✔ | | | ✔ | ✔ | | | | | ✔ | | | ✔ |
| 10 | Myebon | | ✔ | | ✔ | | | | ✔ | | | ✔ | | ✔ | | | | ✔ | | ✔ | | |
| 11 | Pauktaw | | ✔ | | ✔ | | | | ✔ | | | | ✔ | ✔ | | | | | ✔ | ✔ | | |
| 12 | Ponnagyun | | ✔ | | | ✔ | | | | ✔ | | | ✔ | ✔ | | | | | ✔ | ✔ | | |
| 13 | Yanbyne | | | ✔ | | ✔ | | ✔ | | | | ✔ | | ✔ | | | | | ✔ | | | ✔ |
| 14 | Rathedaung | | | ✔ | ✔ | | | | | ✔ | | ✔ | | | ✔ | | | | ✔ | ✔ | | |
| 15 | Sittway | | | ✔ | ✔ | | | ✔ | | | | | ✔ | | | ✔ | | | ✔ | ✔ | | |
| 16 | Thandwe | ✔ | | | | | ✔ | | ✔ | | | ✔ | | | | ✔ | ✔ | | | | | ✔ |
| 17 | Taunggoke | ✔ | | | | | ✔ | | ✔ | | ✔ | | | | ✔ | | | ✔ | | ✔ | | |

**Source:** International Organization for Migration (IOM), Sittway town, 2019

Risk assessment in Rakhine State is analyzed on hazards, damage of people, impact on services, and loss of materials, institutions and vulnerability. Among the seven risks in Rakhine state, flooding ranks first and cyclone includes in the second ranking. But the amount of damages percent was by cyclone was higher than other risks between 1948 and 2015 with 16.39 percent of total damages see table (3).

**Table 3 Assessment on Risk ranking and amount of damages in Rakhine state**

| No. | Types of Risk | Risk by ranking | Damage Amount (%) |
|---|---|---|---|
| 1 | Flooding | H | 17.50 |
| 2 | Cyclone | M | 43.30 |
| 3 | Tsunami | L | 18.10 |
| 4 | Land slide | L | 12.20 |
| 5 | Forest fire | M | 2.00 |
| 6 | Earthquake | L | 2.40 |
| 7 | River bank erosion | M | 4.45 |

**Source:** Interviewed, Department of Disaster Reduction, Sittway, 2020

The cyclone risk areas are defined by wind speed, topography, land use and intensity of wind (IOM). Wind speed of cyclone is based on 50-100 mph. Cyclone risk areas of 14 townships in Rakhine state are shown in table 4.

**Table 4 Cyclone Risk Area in Townships (50-100 miles)**

| No | Township | High risk area (sq/mile) | Middle risk area (sq/mile) | Low risk area (sq/Mile) | Risk Ranking | | |
|---|---|---|---|---|---|---|---|
| | | | | | H | M | L |
| 1 | Amm | 93.11 | 54.81 | 11.42 | ✔ | | |
| 2 | Buthidaung | 99.78 | 66.52 | 115.8 | ✔ | | |
| 3 | Gwa | 43.62 | 43.62 | 62.49 | ✔ | | |
| 4 | Kyaukphyu | 45.24 | 28.1 | 79.21 | ✔ | | |
| 5 | Kyauktaw | 16.42 | 24.8 | 0.77 | | ✔ | |
| 6 | Maungdaw | 45.73 | 68.69 | 212.59 | ✔ | | |
| 7 | Mynbya | 36.55 | 36.55 | 0.05 | | ✔ | |
| 8 | Mrauk U | 28.94 | 30.61 | 0 | | ✔ | |
| 9 | Mannaung | 20.31 | 13.6 | 79.06 | ✔ | | |
| 10 | Myebon | 70.69 | 45.16 | 74.93 | ✔ | | |
| 11 | Pauktaw | 24.34 | 63.16 99 | 99.14 | ✔ | | |
| 12 | Ponnagyun | 24.43 | 34.82 | 33.67 | | ✔ | |
| 13 | Yanbyne | 9.64 | 219.18 | 28.57 | | ✔ | |
| 14 | Rathedaung | 45.24 | 28.1 | 79.21 | ✔ | | |
| 15 | Sittway | 6.28 | 3 | 55.18 | ✔ | | |
| 16 | Thandwe | 67.79 | 67.79 | 13.9 | | | ✔ |
| 17 | Taunggoke | 101.06 | 120.91 | 49.02 | | | ✔ |
| | **Total** | **799.79** | **1103.07** | **1045.25** | | | |

**Source:** Department of Disaster Reduction, Sittway, 2020

### 4.1 Preparedness and response of institutions

The preparedness are usually undertaken to ensure setting up of necessary arrangements, policies, equipment and training in order to deliver efficient response and relief (Arjumand Habib,2012). Natural disaster preparedness should include planning based on the characteristics of natural disasters, preparedness to overcome them and where it is not possible to overcome them, making preparations for evacuation and shelter. The preparedness activities are usually undertaken to ensure setting up of necessary arrangements, policies, equipment and training in order to deliver efficient response and relief. In the post disaster situation, effective response guarantees that affected communities are provided with basic essential needs to begin the process of re-establishing normal community operations (MAPDRR). Nevertheless, the response activities have to be seen in a broader context as a part of the comprehensive set of arrangements which addresses all aspects of disaster management. Disaster preparedness and response of the governmental focal departments, such as Department of Disaster Reduction (DDR) and General Administration Department (GAD), is recognized as the key for strengthening DRR institutions in Rakhine state.

The natural disaster management committee organizes 24 institutions in Rakhine state. Preparedness and response of the committee set up 15 implementations. The followings are preparedness and response for cyclone risk in Rakhine state: Table 5.

**Table 5 Preparedness and Response of institutions in Rakhine state**

| No. | Institution | Preparedness/ Response | Outcomes |
|---|---|---|---|
| 1 | Agriculture and Irrigation, Labour, Immigration and Population, Natural Resources and Environmental Conservation, ,Planning and Finance, Social Welfare, Relief and Resettlement, Home Affairs , Livestock, Fisheries and Rural Development, GAD | Data collection: population, animals, schools, building etc; | got real data |
| 2 | Transport office, Electricity department, Fire Service, Department of Meteorology and Hydrology, Police Force, Road and Building Department (SCDC), water Transportation, Department of Disaster Management, rail transportation, Myanmar National Airline, Communications and Information Technology | Define collection point:<br>- use safety way | Reduction from risk |
| 3 | Township Trade organization, Social Welfare, Relief and Resettlement dept, Tsp General Hospital, GAD, Department of Education, Home Affairs, Township Transportation and Telecommunication office, Red Cross Society | Prepared emergency kits (food, water, medicine, recently photo etc;<br>stored enough established warehouse supported from local and external | Response in time |
| 4 | SCDC, Fire service, Tsp Education office, Hydrology and meteorology dept, Health dept, Department of Disaster Management, GAD, Agriculture dept, Transportation and Telecommunication office, Tsp Red Cross Society, News and Information, | Information distribution regarding risk:<br>-viber, Ph, manual,sms | Response in time |
| 5 | Department of Disaster Management, Transportation and Telecommunication office, Hydrology and meteorology dept | Decimated natural disaster law:<br>- survey, discussed, suggested, | Duties and responsibilities |

| No. | Institution | Preparedness/ Response | Outcomes |
|---|---|---|---|
| 6 | News and Information, NGO, GAD, Fire Service Department | Awareness:<br>- announcement, newspaper, pamphlet, survey | Preparedness, less damage |
| 7 | Department of Disaster Management , News and Information, local community | Drills:<br>- Red cross, police<br>- NGO, rescue team<br>- drilled frequently, defined collection point, | Prevention, Evacuate in short time, |
| 8 | Township Trade organization, Social Welfare, Relief and Resettlement dept, Tsp General Hospital, GAD, Department of Education, Home Affairs, Transportation and Telecommunication office, Red Cross Society. | Prepared vehicles:<br>- stay, collection, warehouse | Enough time to prepare |
| 9 | Department of Disaster Management | Prepared funding:<br>- repair | Necessary things |
| 10 | SCDC, Fire service, Tsp Education Office, Hydrology and meteorology dept, Health dept, Department of Disaster Management, GAD, Agriculture dept, Transportation and Telecommunication office, Tsp Red Cross Society, News and Information. | Noticed:<br>- communication<br>- phone<br>- mobile phone | Announcement to public |
| 11 | Tsp Rescue office | Prepared rescue:<br>- district level<br>- township<br>- ward/village | Reduce damages |
| 12 | Department of Health | Prepared for emergency health care plan:<br>- to care during risk time | - reduce side effect from risk<br>-reduce damage |
| 13 | SCDC, Fire service dept, Tsp Education Office, Hydrology and meteorology dept, Health dept, Department of Disaster Management, GAD, Agriculture dept, Transportation and Telecommunication office, Tsp Red Cross Society, Township Trade organization, Social Welfare, Relief and Resettlement dept, Tsp General Hospital, Home Affairs, | Formed: emergency response team, mobile Red Cross team, training, workshop:<br>State<br>District<br>township | Systematically implemented |
| 14 | Department of Disaster Management | Established: Emergency Operation Centre (EOC): capacity enhancement | Getting information in time, report back in time |
| 15 | Rakhine state government , NGO, INGO, CSO, | Rehabilitation:<br>roads and bridges<br>drinking water<br>repair for damage fields<br>livestock and fishing<br>damage building | |

**Source:** Interviewed and IOM, 2020

The Rakhine State Government, the Ministry of Education, and the Department of Disaster Management (DDM) coordinated in cyclone risk reduction. IOM has assisted with the reconstruction of six schools in Ponnagyun, Rathedaung and Buthidaung Townships which were affected by Cyclone Komen in 2015(IOM,2016-18).

### 4.2. The perception of the institutions

The paper analyses on the perception of the institutions to meet the disasters and their results. Analysis is based on interviewees of ten institutions.

**Officer in Department of Disaser Management**

*"*[…] *I give **awareness** training, workshops and drills to basic, middle, high schools and universities, industries, (SMEs) and local communities. I **arranged** workshop: one time per month for schools and universities and one time per three months for industries and public"* (ST 01).

Although students and public are aware of their training, they have no enough facilities: e.g training aids, cyclone shelters and so on. He said their area is a risk prone area that is why he wants to prepare emergency response facilities and materials.

**Interviewed to University:**

"[…] *As our state is a cyclone risk area I have an **idea** to define the **meeting** place at our university, convocation hall. There are safety ways and they can be reached frequently there by four entrance gates. Beside the hall is **enough space** for about 1000 people but not yet announced this information to my staff. The hall was defined as an temporarily building. I needs to confirm another more safety building.*" […] (ST 02).

He said University is *a meeting place of educated people/stakeholders that is why the respective intuitions should give training, workshops, and drills very frequently at the University.*

According to interview with the **officer of Transportation and Telecommunication office,** *he wants to prepare necessary facilities regarding communications for cyclone risk. Although their department has prepared communication facilities such as mobile, phone, sms,e- mail, satellite data connections and so on, sometime they encountered difficulty for smooth transportation. During cyclone risk, they need to contact with others related departments (police, hospital etc;) for emergency rescue for public from risk areas. But at that time transportation is a hindrance for them.* Some time they need to help their head of office, Yangon. *[…]"* (ST 03)

Most of the cyclone risk areas are coastal in Rakhine state. Whenever the cyclone risk occur, the mobile phone and others telecommunications are disconnected. Water and road transportations are also very difficult all the time in Rakhine.

**Interviewed to expert in Natural Resources and Environmental Conservation:**

As most of the people know that, Rakhine state is a seven risk areas particularly in13 coastal areas in Rakhine. *University Curriculum Disaster risk reduction is an emerging field and requires research and development on its various sub-themes. The sub-component 'Awareness through University Curriculum' aims to create awareness and also promote research. The course will be revised and accordingly course material will be developed. It will have component for research and development in area of disaster risk reduction*" [ST 04]

**One expert**: **Social Welfare, Relief and Resettlement:**

*If cyclone arrives to risk area, we need to move the public to the safe places. So we need human resource and necessary things: enough vehicles. During and after cyclone has affected, the people need to evacuate to the places within three days or 72 hrs. When we move the people, we have to prepare enough space and safety buildings. When we move the people, we estimate distance, time, types of mode (bus or boat) and safety routes. Beside we should list not only numbers of people and goods but also numbers of animals before cyclone hits the areas*

*[ ST 05]*.

**One expert** to Health Department:

*If we want to move the public from risk areas, we need members of government, NGO, INGO, donators, volunteers, expertise from difference fields. We should prepare basic needs (emergency kits: foods, water etc;). Particularly, we should consider for other side effects on people after cyclone [ST 06]*

The paper evaluates and analyzes on the cyclone risk in Rakhine state based on the difference perceptions of difference institutions. Particularly, the paper investigates the preparedness and response of institutions on cyclone risk in Rakhine state.

## Conclusion and recommendations

The institutional preparedness and response in Rakhine state is linked with a lack of knowledge, local community attitudes, infrastructures: particularly transportation and systematic preparedness. Future education, communication and transportation campaigns should be more focused on the needs of intended public, taking into consideration of their usual sources of information and knowledge in relation to preparedness and response. A variety of strategies should be taken to increase community risk awareness, including emergency training, drills and workshop; mobilization of volunteers; emergency day event for publicizing purpose; and mass media (web, TV, radio, etc) campaigns. Women may become the major community because they are responsible for housing arrangements and are more likely to become well prepared than men. It is also important to emphasize the translation process from increased awareness into preparatory actions, possibly through emergency response exercises.

In 1948-2017, 13 times of cyclones battered in Rakhine state. Among them the cyclone in 1968: that took 1037 lives and cyclone Malar were more destroyed in 2006 with a death told of were the most:37 lives destructive (MAPDRR). Rakhine State is particularly vulnerable to the impact of tropical cyclones – in particular the townships of Sittwe and Maungdaw. Local communities and institutions interviewed on hazards and risks recently identified cyclones and associated storm surges as the primary hazards in the 13 coastal townships of Rakhine State.

The main recommend action of this paper relates to: behavior change and attitude modification within communities and stakeholders.

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