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## MYANMAR DISASTER RISK PROFILE

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## *Letter from the editors*

The Emergency and Disaster Reports is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This present monographic issue is dedicated to the disaster risk profile of Myanmar. Burma or Myanmar, officially called The Union of Myanmar, is the largest country of South-East Asia. Burma takes up an area of 676,552 km<sup>2</sup> area, with 52,797,000 inhabitants. The country is divided in 14 states, the states are divided into districts, and these consist of townships that include towns, ward and village-tracts.

The Union of Myanmar had experienced a significant number of disasters in the last years, most of them natural, but not less importantly, technological ones and emergency complex.

This disaster risk profile covered natural and technological disasters occurred in Myanmar during 50 years (1964-2014).

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**ACRONYM**

- ASEAN: Association of Southeast Asian Nations
- ADMER: ASEAN Agreement for Disaster Management and Emergency Response
- ADCM: ASEAN Committee on Disaster Management
- ADPC: Asian Disaster Preparedness Center
- AMCDRR: Asian Ministerial Conferences on Disaster Risk Reduction
- BSP: Burma Socialist Program Party
- CDC: Centers for Disease Control and Prevention
- CIFP: Country Indicators for Foreign Policy
- CPB: Communist Party of Burma
- DRR: Disaster Risk Reduction
- ERAT: ASEAN Emergency Rapid Assessment Team
- FAO: Food and Agriculture Organization
- GMS: Greater Mekong Sub-region
- HFA: Hyogo Framework for Action
- IDPs: Internal Displacement People
- IPCC: Intergovernmental Panel on Climate Change
- KIO: Kachin Independent Organization
- KUN: Karen National Union
- MMR: Maternal Mortality Rate
- NGOs: Non Governmental Organizations
- OCHA: Office for the Coordination of Humanitarian Affairs
- PONJA: Post Nargis Joint Assessment
- PONREPP: Post-Nargis Recovery and Preparedness Plan
- RS: Richter Scale
- SSA: Shan State Army
- U5-MR: Under 5 Mortality Rate
- UNISDR: United Nations Office for Disaster Risk Reduction
- UN: United Nations.
- UNDP: United Nations Development Program
- WHO: World Health Organization

## **1. OBJETIVE**

The main objective of this profile is to research update information about natural and technological disasters occurred in Myanmar during the last 50 years (1964-2014). In addition, information related to Myanmar conflict during the named period was collected as well. The specific objectives in order to develop the Disaster Risk Profile of Myanmar are describe as follows:

- To identify the frequency of each different disaster during the last 50 years.
- To evaluate health, development and economic impacts of the disasters.
- To define the main hazards and the vulnerability factors of the country.
- To identify the disaster prevention and response strategies implemented in the country.
- To identify the structure and characteristics of the emergency and disaster response system.

## **2. INTRODUCTION**

It is well known that disasters in the world produced by natural hazards are an increasing reality. The Union of Myanmar had experienced a significant number of disasters in the last years, most of them natural, but not less importantly, technological ones and emergency complex.

Based on the disasters occurred in the last 50 years we can analyze the different and most common hazards that could affect the country. Having considered this period of time we will try to break down the main disaster risk factors present in the country. Bearing in mind this point we need to examine the determinants that make Myanmar exposed to different hazards and the conditions that make the country vulnerable to a specific kind of disaster.

The United Nations highlighted the importance of building resilience by using knowledge, experience and lessons learned from the past. In this report we will expound the strategies implemented in order to improve the disaster prevention and response<sup>1</sup>. The knowledge of the structure and characteristics of the emergency and the disaster response system is essential to determine those weak aspects that need to be enhanced.

## **3. BACKGROUND**

Burma or Myanmar, officially called The Union of Myanmar, is the largest country of South-East Asia. Burma takes up an area of 676,552 km<sup>2</sup> area, with 52,797,000 inhabitants<sup>2</sup>. The capital is Yangon, situated in the southwest region, although since 2006 Naypyidaw, located in the central region, has been declared the new administrative capital in order to facilitate the commercial contacts.

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<sup>1</sup> What is Disaster Risk Reduction? The United Nations Office for Disaster Risk Reduccion. UNISDR. Available: <http://www.unisdr.org/who-we-are/what-is-drr>

<sup>2</sup> WHO. Available: <http://www.who.int/countries/mmr/en/>

The limits are China in the North, the Andaman Sea in the South, Laos and Thailand in the East and India, Bangladesh and the Bay of Bengala in the West<sup>3</sup>. The country is divided in 14 states as we can see on map 1, the states are divided into districts, these consist of townships that include towns, ward and village-tracts.

Mandalay Region has the largest population and Yangon Region is the most densely populated. The smallest population is Kayah State. In terms of land area, Shan State is the largest and Yangon Region is the smallest.

Each state or region has a Regional Government or a State Government consisting of a Chief Minister, other Ministers and an Advocate General. Legislative authority would reside with the State Hluttaw or Regional Hluttaw made up of elected civilian members and representatives of the Armed Forces.

Figure 1. Myanmar States.



<sup>3</sup> Myanmar. Enciclopedia Britannica; 2003. Available: <http://global.britannica.com/EBchecked/topic/400119/Myanmar/52565/Land>

### **3.1. Political history**

From 1964 until 2010 the country was a dictatorship and the population suffered military repression. During those decades the country was internationally isolated and as a result couldn't develop properly. All the resources were controlled by the regime making the population more and more impoverished.

During this time, the tensions between different ethnic groups increased. In 1947 a new state had established by President Aung San, following the Panglong Agreement which was based on a voluntary association of ethnic groups for the creation of Union of Burma, the establishment of a decentralized federal structure, political equality and the right to self-determination for the member states of the Union. This Agreement was far from reality in the following years. From 1948 to 1962, U Nu, Aung San successor, who undertook a process of unification of the State through the establishment of Buddhism as the official religion. In the face of its multi-ethnic, multicultural and multi-religious diversity, the new State was created under the imposition of unification<sup>4</sup>.

The reaction to the continued failure of the Panglong Agreement moved in two different directions. On one hand, radical groups were formed and opted armed rebellion against the central government. The other reaction was undertaken by the more moderate groups, led by Sao Shwe Thaik, the first President of the Union of Burma, who organized the so-called Taunggy conference in 1961, which brought together the Chin, the Kachin and the Shan along with other groups such as the Karen, the Karenni/Kayah, the Mon and the Rakhine/Arakan. This movement conceived in Taunggy constituted what would later be known as the «Federal Movement». The idea was balancing the representation for all ethnic groups in the parliamentary chamber called the «House of Nationalities». However, the reality was that the Burmese dominated the Assembly, due to their larger population.

After this, in 1974 General Ne Win unified through language and with the introduction to socialism, founding Burm Socialist Program Party (BSPP). The Armed Forces, known as the Tatmadaw, was made as a tool of the State to ensure the construction of the State unitary model. Hundreds of military groups were formed all over the country to gain more control over the insurgents who had sprung forth from all the ethnic groups<sup>5</sup>.

At the same time, slowly, with the support of the Communist Party of Burma (CPB), the insurgent groups began to control Burma's easternmost borders in Kachin State. The three strongest ethnic groups were the Karen National Union (KNU), Kachin Independent Organization (KIO) and Shan State Army (SSA), which maintained about 5,000 troops in certain positions around the country. Seeing that the insurgents controlled the black market and in order to block their funding, Ne Win decided to

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<sup>4</sup> Maria del Mar Hidalgo García. Chapter thirteen: The ethnic conflicts in Myanmar: Kachin. Geopolitical Overview of Conflicts 2013. Spanish Institute of Strategic Studies.

<sup>5</sup> The Dynamics of Sixty Years of Ethnic Armed Conflict in Burma. The Dynamics of Sixty Years of Ethnic Armed Conflict in Burma. Burma Center for Ethnic Studies. Peace and Reconciliation; 2012. Available: <http://burmaethnicstudies.net/pdf/Analysis%20Paper%20No%201.pdf>

withdraw the most valuable banknotes. This measure brought up the devaluation of the money and the increase of the protests against the government.

In 1990 the National League of Democracy started gaining more and more sympathizers but the government under the repression regime arrested some opponent leaders like Aung San Suu Kyi, Peace Nobel Prize Winner. . It took eighteen years from the 1990 elections for a referendum to be held to approve the new constitution in 2008

In 2010, after years of protests led by a Buddhist monk, in the elections celebrated that year, the National League of Democracy was denied the right to participate, even though on 30th March 2011 the military committee was dissolved with the announcement of the liberation of 6,359 prisoners under the responsibility of the new government. This was the beginning of the development of the country that permitted new relationships with Europe and US. Since then, Thein Sein, current President of the Republic of the Union of Myanmar, has launched a series of measures to drive the country's democratic process, end the ethnic conflicts and achieve social and economic development. However, there is still much to do, not only in terms of economic point of view, but also when it comes to the management of the whole country<sup>5</sup>.

### **3.2. Religion**

In Myanmar exist 135 national groups speaking over 100 languages and dialects. The major ethnic groups are Kachin, Kayah, Kayin, Chin, Mon, Bamar, Rakhine and Shan. The main religion is Buddhist (89% of the population), followed by Christianity (5%), Muslim (4%), Animist (1%) and other (1%)<sup>6</sup>.

### **3.3. Principal resources of the country**

Farming is the principle resource of the country, with the most fertile fields located in a strip along the Bay of Bengal, in particular rice crops. Jungle and forest cover 49% of the territory, a vast part of it has teak wood, which is very valuable for trade. There are also pine, bamboo, rubber, oak, and a lot of fruit trees in the coastal region.

Regarding fauna leopards and tigers are common in Myanmar, and elephants are used to work in the wood industry. 147 animal species are endangered. Fish is consumed locally and it is the principle protein source of the Burmese diet.

The mining sector is also another rich resource of the country. The mines are located in the mountain region in the west of the country and along the Tenasserim coast, where minerals such as jade, rubies, sapphire are extracted, followed by copper, nickel and silver.

### **3.4. Education**

Primary education is free and obligatory. 86,2% of the adult population ARE literate. The most important universities are in Yangon and Mandalay<sup>7</sup>.

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<sup>6</sup> Burma (Myanmar) Disaster Management Reference Handbook. Center for Excellence; 2014. Available: <http://www.coe-dmha.org/shared/pdf/disaster-mgmt-ref-hbks/disaster-mgmt-ref-hdbk-2014-burma.pdf>

<sup>7</sup> Education for All. The Government of the Republic of the Union of Myanmar. Ministry of Education.



### **3.5. Economy**

The country is opening up to trade, encouraging foreign investment, and deepening its financial sector. The recent currency reform is one of many initiatives in this direction. The government is deepening and broadening the reforms to improve monetary and fiscal management while facilitating trade and foreign direct investment and removing structural impediments to growth. The adoption of market oriented economy will ensure private sector participation. The priority seem to be the improvement of the agriculture sector progress, for sufficiency of people in food and clothing sectors. The use of modern machinery and technology boosts the agricultural production. With expanding job opportunities in the market economy system and every citizen being able to work, increasing individual income will contribute to the growth of GDP<sup>8</sup>.

## **4. METHODOLOGY**

Different data-based resources such as PubMed, Web of Science, academic Google, Scielo, Cochrane and Scopus have been reviewed in order to find articles with current information on the topic. The following key words have been used: Disasters, Myanmar, Risk, Vulnerability, Hazard, Conflict.

The main source of information to regard the disasters occurred in Myanmar was EM-DAT from CRED website. First of all, advanced research was done in order to access to the entire list of disasters occurred in the last 50 years. The findings were analyzed with excel source to realize the disaster frequency each group and types of disaster.

In order to gain more specific information about the type of hazards that have struck Myanmar other sources were utilized: Relief Web, OCHA, WHO, Prevention Web, UNISDR.

## **5. HISTORY OF DISASTERS IN MYANMAR**

A disaster event is known as a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources<sup>9</sup>.

The Union of Myanmar has been stroke for different type of disasters, natural, technological and some man-made disasters such as ethnic conflicts. In this section of the paper we will review and analyze the disasters occurred in the last 50 years. The criteria that an event should include to be considered as a disaster are:

- 10 or more people reported killed.
- 100 or more people reported affected.
- Declaration of a state of emergency.
- Call for international assistance.

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<sup>8</sup> Country Profile. Myanmar. Available: <http://www.moh.gov.mm/file/COUNTRY%20PROFILE.pdf>

<sup>9</sup> ISDR Glossary 2007.

An important point of this analysis is to understand different disasters terms that are going to be used in this report.

The term injured is used to name the number of people suffering from physical injuries, trauma or an illness, requiring immediate medical treatment as a direct result of a disaster.

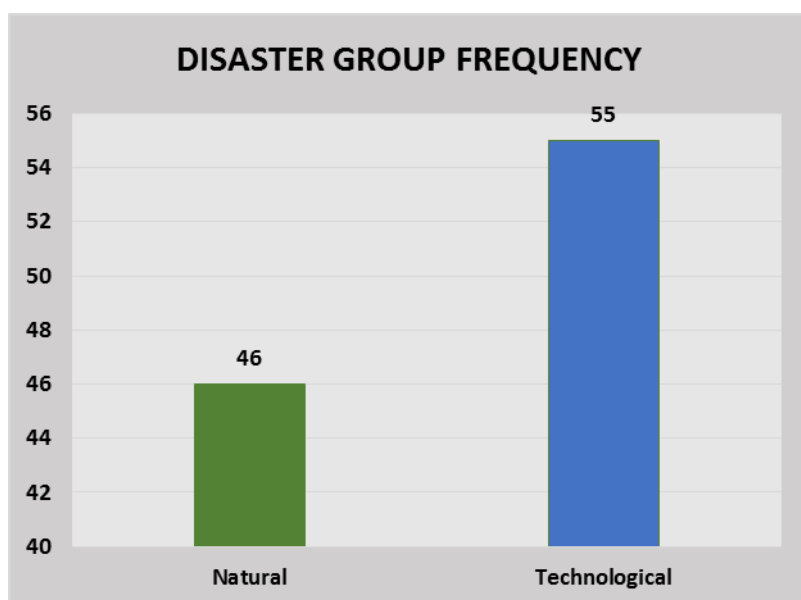
Homeless is referred as the number of people needing immediate assistance for shelter.

The number of affected is the people that require immediate assistance during a period of emergency. This may include displace or evacuated people. Immediate assistance includes subsistence basic needs like food, water, shelter, sanitation and health care.

Disasters are classified by group as Natural, Technological, Man- made disasters and Complex Emergencies.

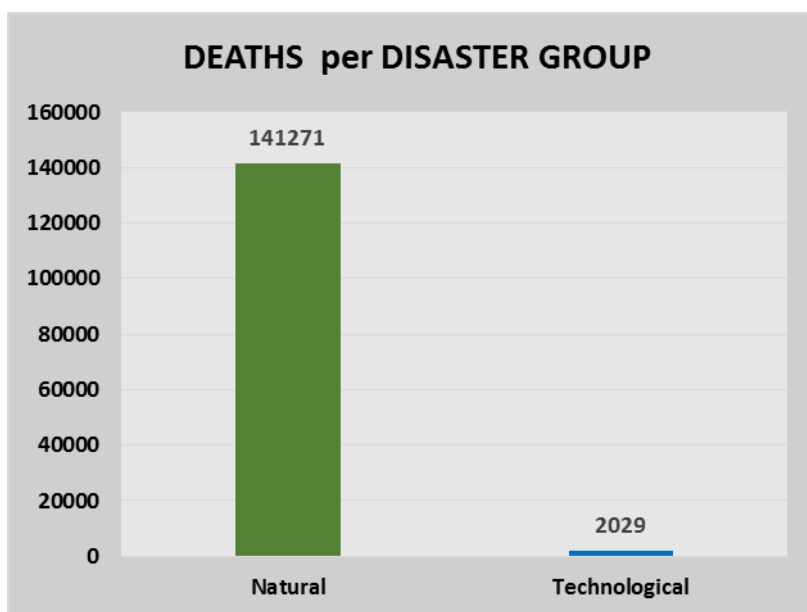
The first part of the analysis will examine Natural and Technological disasters found after an EM-DAT advance research. According to this research the frequency of the disasters occurred in Myanmar depending on the group of a disaster belongs to (natural or technological) has been obtained. We could think that natural disasters are more frequent than technological ones, however after reviewing the data that we could obtain in EM-DAT web page during the named period of time, we realized that 46 natural disasters and 55 technological disasters occurred, so technological disasters seem to be the most frequent ones (Figure 2).

Figure 2 (EM-DAT data)



Despite this, natural disasters become with many more human lives lost. The total number of deaths derived from natural disasters are 141,271, assuming that deaths are the number of confirmed dead, missing and presumed dead. In the other hand, the total number of death related to technological disasters are 2,029 (Figure 3).

Figure 3 (EM-DAT data)

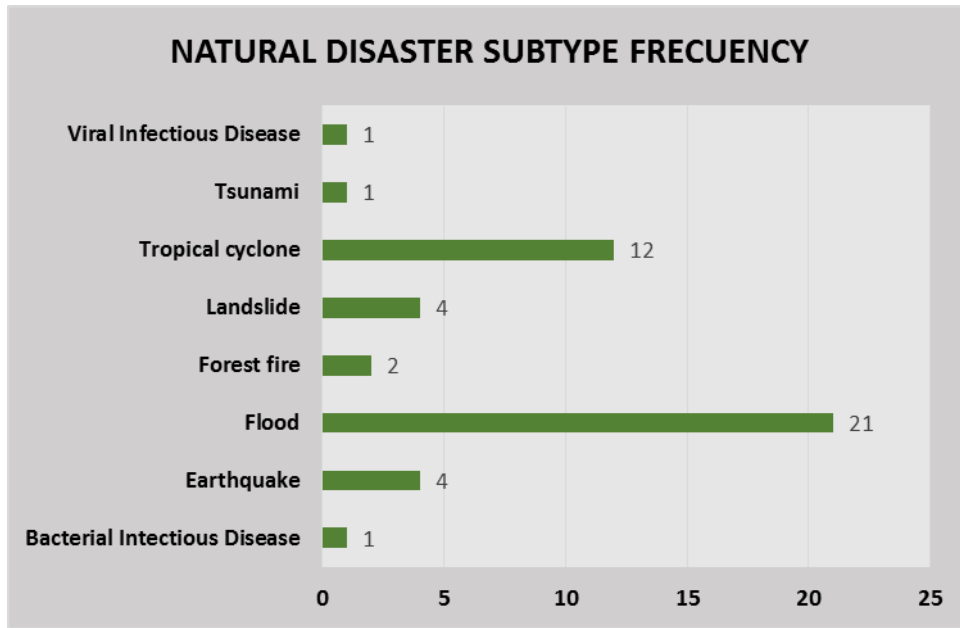


As we can observe, the impact from natural and technological disasters can be very different, then we will analyzed separated in order to acquire the particular characteristics in terms of impact.

### 5.1. Natural Disasters: Health Impact

Floods are the most frequent natural disaster in Myanmar (21 events), as they had reach 45.7% from the total subtypes until the moment, followed by tropical cyclone (12 events) that reach the 26%. Then, as we can see on figure 4, the country have been hit by earthquakes, landslides, forest fires, tsunami and bacterial and viral diseases, in than frequency order.

Figure 4 (EM-DAT data)



Tropical cyclones count into with the largest number of deaths, coming up with 140,357. 98% of these deaths are derived from the same event, Nargis Cyclone in May 2008, that also let 2,420,000 of total affected people, corresponding to the 36,5% from the total subtypes, this number includes injured, homeless and affected people.

As we have already mentioned, floods are the most frequent natural disaster. Excluding Nargis Cyclone, the impact derived from floods is much higher than the impact due to cyclones. In addition, as we will analyze Nargis Cyclone in the next section, this specific event generated a significant flood which caused affected many people. Having considered this we can say that floods have been the most devastating events in Myanmar. They left 2,317,146 affected people, 304,156 homeless and 136,655 total damaged (in terms of USD). These numbers differ a lot from cyclone impacts, although cyclones are still the cause of the highest number of deaths and injured people. Another relevant point is that in terms of homeless people floods left 304,156 people without shelter, however the 109,000 homeless due to cyclones just belong to Nargis event (table 1).

Table 1. Natural disasters impact in the last 50 years (EM-DAT data)

DISASTER SUBTYPE	OCCURRENCE	DEATHS	INJURED	AFFECTED	HOMELESS	TOTAL AFFECTED	TOTAL DAMAGED
Flood	21	558	110	2317146	304156	2621412	136655
Tropical cyclone	12	140357	20280	3616364	109000	3745644	4079388
Landslide	4	125	16	146351	0	146367	0
Earthquake	4	112	356	19415	3152	22923	4770

Forest fire	1	8	0	58588	20000	78588	11000
Tsunami	1	71	0	12500	3200	15700	500000
Bacterial Intectious Disease	1	10	0	800	0	800	0
Viral Infectious Disease	1	30	0	0	0	0	0

Remaining cases are much less frequent. Landslide and earthquake count with the same number of cases (4), and a similar number of deaths, 125 and 112 respectively. The number of injured people that belongs to earthquakes is 356, in contrast with the 16 injured caused by landslides. Landslides count, however, with 146,367 of total affected which is the largest of the rest of the events occurred. Forest fire events have also a relevant number of 78,588 total affected, which is above earthquakes, tsunami and biological events. The tsunami registered in the research is the one occurred in 2004 that hit several countries. Even though this event had much more impact in other countries such as Indonesia and Sri Lanka, it reached Myanmar and left 71 deaths, 15,700 total affected and 500,000 total damaged.

### 5.2. Natural Disasters: Economic Impact.

In terms of economy natural disasters losses reached 4,731,813 USD. 98% of the total damage belongs to cyclones, principally due to cyclone Nagris. The devastating tsunami occurred in 2004 which struck several countries (Indonesia, Malasia, Sri Lanka, India, Tailandia and Myanmar), was the second most serious in terms of economic impact with 500,000 USD in losses.

In third place, floods have caused 136,655 USD in losses. Although in the last 50 years 21 floods have occurred in Myanmar, the economic losses we mention only correspond to 3 of them. However, in cyclone cases we can tell that 11 of them had caused economic losses. Following these events, we can observe, in table 1, that a forest fire which occurred in 1979 had caused 11,000 USD in losses and two earthquakes which took place in the analyzed period generated losses of 4,770 USD.

### 5.3. Natural Disasters: Cyclone Nagris impact.

Cyclone Nagris deserves particular attention in the history of Myanmar Disasters since it is considered as the worst catastrophe Myanmar has ever faced. This cyclone made landfall into the night of 2 May 2008 and crossed south of the country during two days, devastating Ayeyarwady Delta and Yangon regions.

A storm surge of between 3.5 and 7 meters high and wind speeds reached up to 194 kph causing, as we already mention, 140,357 people killed. It has been found that

53,800 of these people were refer to as missing. Also 2,4 million people were affected<sup>10</sup>.

Over 600,000 hectares of agricultural land were submerged by the food caused by the cyclone. 60% of all paddy fields were destroyed and 63% of freshwater ponds were damaged. 50% of animals died drowned, fishing boats were destroyed and food stocks and agricultural implements were swept away<sup>6</sup>. 3000 schools seemed to be damaged and thousands of homes were destroyed in Irrawaddy Delta region<sup>11</sup>.

Access to the zone was a major challenge for relief efforts after the disaster hit. Delta's streams and limited road network posed serious logistic problems<sup>12</sup>. 'Much of the delta is reachable only by boat, even in normal times, but many boats were destroyed in the storm - limiting the ability of storm survivors to find food, water and medical assistance'. (Safe the Children Report, 19-may-2008).

Hygiene and other public health education aspects were also crucial points of concern. 'Even the concept of washing hands and covering food was a novel idea for some communities when I was there. 'Many people did not even understand the connection between mosquitoes and malaria and therefore could not take the steps necessary to protect themselves and their families.' (Joanna Maclean. Red Cross Red Crescent worker)<sup>5</sup>.

Nargis Cyclone loses reached 4,000,000 USD, that is 84,5% of the total losses related to natural disasters in the last 50 years. Research has shown that the total economic loss of the cyclone reached approximately 2.7% of the projected 2008 GDP<sup>13</sup>.

#### **5.4. Technological Disasters: Health Impact**

The most frequent technological disaster in Myanmar are fires. The main causes of fires are kitchen related accidents and negligence which account for 83% of all fire cases<sup>14</sup>. As we can see in figure 5, the sum of all transport accidents makes this type of disaster even more common than fires. In EM-DAT data base these transport accidents are divided into separate subtypes depending on what means of transport was involved in the event. Within transport accidents the most frequent ones are those which occurred on water.

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<sup>10</sup> Cyclone Nargis and talk of climate change. Anthony Mwangi, IFRC, Geneva. 5-Nov-2008. (<http://www.ifrc.org/en/noticias/noticias/asia-pacific/myanmar/cyclone-nargis-and-talk-of-climate-change/>)

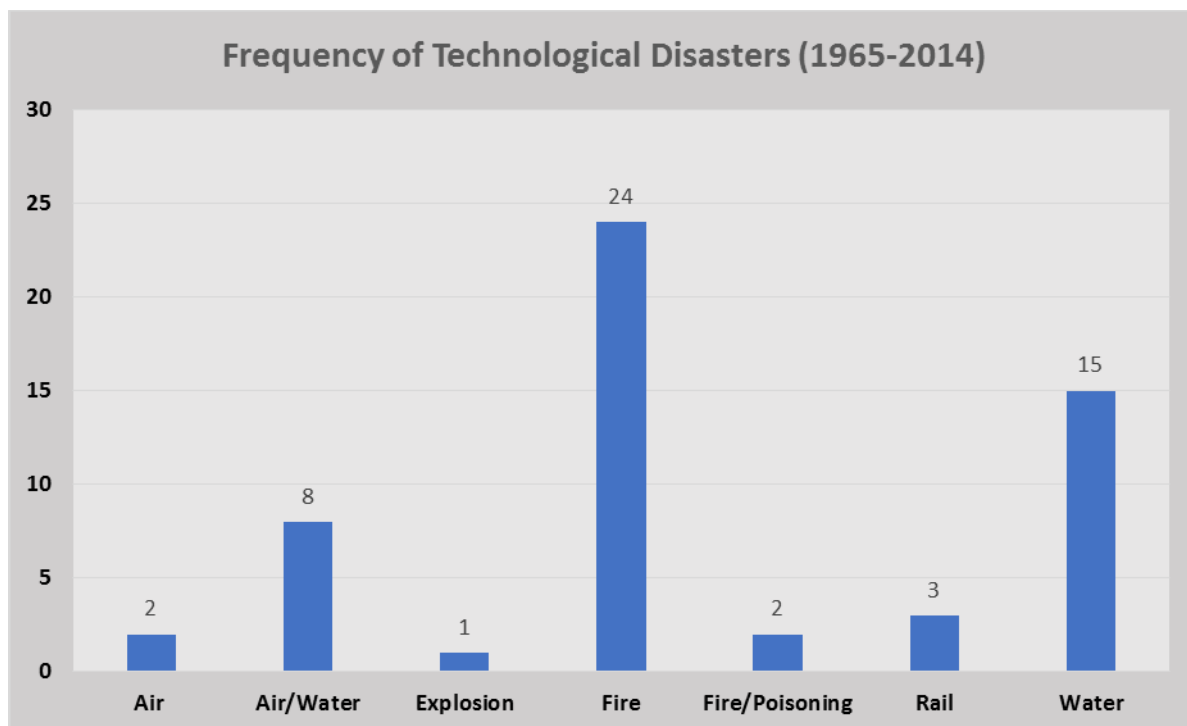
<sup>11</sup> Save the Children reaches 160,000 cyclone survivors in Myanmar. Safe the Children Report, 19-may-2008. (<http://reliefweb.int/updates?search=nargis>).

<sup>12</sup> Two weeks after the cyclone and people are still in desperate need, says former Myanmar based aid worker. Report from International Federation of Red Cross And Red Crecent Societies. 16-may-2008. (<http://reliefweb.int/updates?search=nargis>).

<sup>13</sup> Resilient Development Planing in Myanmar. Deputy Minister. Ministry of National Planning and Economic Development. Union of Republic of Myanmar. January 2003.

<sup>14</sup> Hazards Report.

Figure 5.



The deaths caused by these water transport accidents are significantly high, in particular taking into account the fact that they occur approximately 50% less often than fires. The total number of deaths derived from water transport accidents are 1030 (50.8% of the total deaths), however the ones derived from fires reach 222 (10.9%). (Figure 6).

The events which are registered as Air/Water accidents correspond to aircraft accidents. Some of them correspond to Myanmar airline companies and some do not but they have been registered as Myanmar accidents because they occurred in Myanmar water territory.

Water transport accidents is a relevant point to consider. Research has shown that these events could be derived from the use of inadequate boats under unsuitable conditions by displacement people.

The report estimates that 53,000 people departed irregularly by sea from the Bay of Bengal in the 12 months ending June 2014 – a 61 per cent increase over the previous 12 months. In the two years following the June 2012 outbreak of inter-communal violence in Myanmar's Rakhine state, some 87,000 people – mostly Rohingya but also Bangladeshis among them – embarked on the dangerous journey in search of safety and stability.

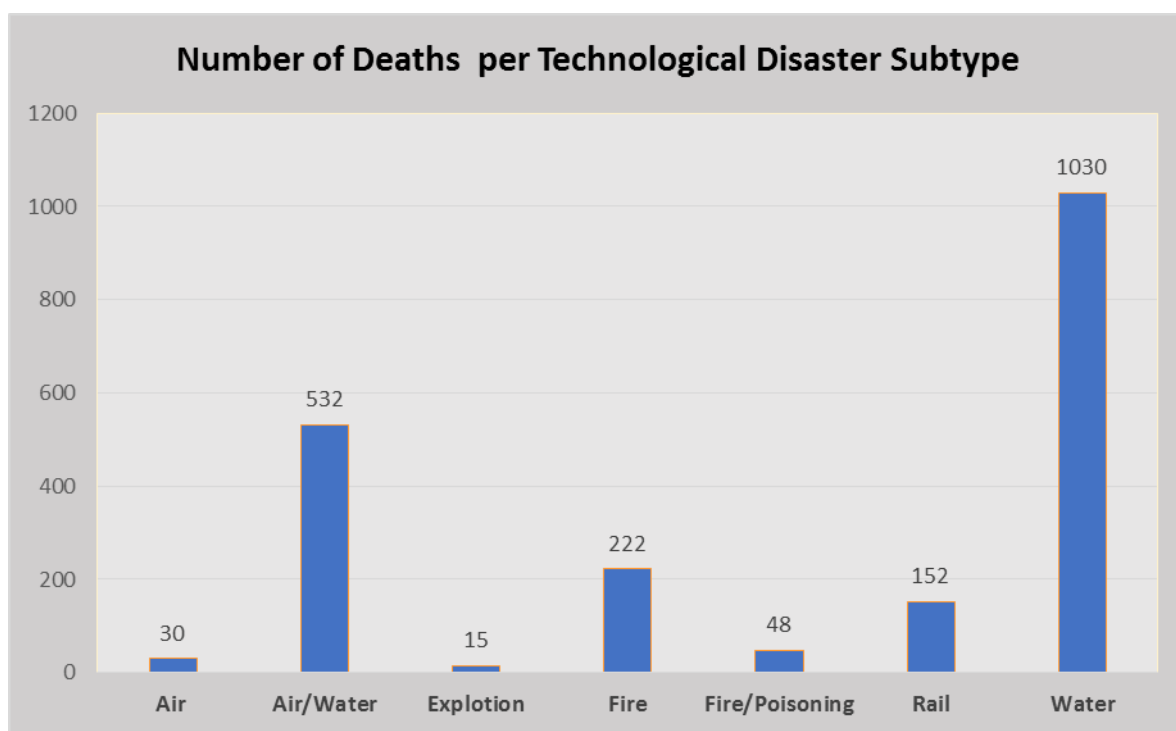
The main sailing season has continued to be between October and the first quarter of the year when seas are calmer. Departures were mostly from Teknaf in Bangladesh and Maungdaw in Myanmar, with smaller numbers from Sittwe. Typically, passengers

were ferried on small boats to larger fishing or cargo boats that could each hold up to 700 people. Most were men, but there were also rising numbers of women and children who were usually kept in separate quarters.

Most passengers our staff interviewed said they paid between US\$50 and US\$300 to board the boats and were at sea for an average of one to two weeks. Some waited for up to two months for their boat to take on more passengers. Many said they fell sick along the way. There are also unconfirmed reports of deaths due to illness, heat, a lack of food and water and severe beatings when people tried to move. Some passengers reportedly jumped off boats in desperation. Others went missing when, in one example, they were forced to swim ashore after nearing the coast off Thailand.

An explosion has been registered as a technological disaster, its cause is not clear although the government use to blame this blast events to ethnic minorities but it haven't been confirmed<sup>15</sup>. No information has been found about poisoning events.

Figure 6.



Another relevant point is even though fires are not the main cause of deaths, they have the biggest impact have in terms of total affected and total damaged (Table 2). This seems to be due to the damage of houses, crops, public structures, etc.

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<sup>15</sup> Hla Thu A. Myanmar festival bombings kill eight, wound 94. Available: <http://www.reuters.com/article/2011/06/24/us-myanmar-blasts-idUSTRE75N1EX20110624>.



Table 2.

Columna1	OCURRENCE	DEATHS	INJURED	AFFECTED	HOMELESS	TOTAL AFFECTED	TOTAL DAMAGED
FIRE	24	222	228	217457	36439	254124	270204
WATER TRANSPORT ACCIDENT	15	1030	49	44	0	44	0
AIR/WATER TRANSPORT ACCIDENT	8	532	0	0	0	0	0
RAIL ACCIDENT	3	152	91	0	0	91	0
AIR	2	30	32	0	0	32	0
FIRE/POISONING	2	48	123	0	0	123	0
EXPLOTION	1	15	65	0	0	65	0

### 5.5. Technological Disasters: Economic Impact

All the losses in terms of USD correspond to fires. This seems to be caused by the loss of structures since the number of homeless is significant. However, there is a lack of information on this field.

### 5.6. Complex Emergencies: Health and Economic Impacts

Complex Emergencies are considered by CDC as “a situation affecting large civilian populations which usually involves a combination of factors including war or civil strife, food shortage and population displacement, resulting in significant excess of mortality.

These long term situations have a significant impact on public health and the country's development. Injuries, deaths and structures destroyed are direct effects of the conflict. Besides this, there is a large list of indirect impacts as a consequence of these kind of complex situations. Displaced populations, food shortage, lack of health assistance and human rights abuses are some of the direct impacts of conflicts.

The dictatorship suffered by Myanmar for 45 years had a tremendous impact on the development of the country and a lot of people had suffered its consequences in several ways. In this part of the analysis we have focused on research information about the impact of the conflict.

#### A. Eastern region conflict

Since 1962, Burma had been controlled by a succession of military regimes which are considered as one of the most oppressive dictatorships in the world. A report from Back Pack Health Worker Team published in 2006, when the military regime led by Senior General Than Shew was still controlling the country, highlighted different health indicators measured during 2002 as a consequence of the chronic emergency that the

country had been facing during that period. We will use them in order to measure the impact of the conflict on the population's health.

As we have already mentioned in the background the most affected people by this repression were those minority groups who have occupied the eastern region of the country, along the borders, particularly the one with Thailand. Several groups in this region had tried to resist the repression, which was one of the reasons why the regime (Tatmadaw soldiers) created a special policy aimed to increase army control over the insurgents and the local population. This population was relocated in controlled areas and rice fields and food storage facilities were destroyed. This measure was accompanied by severe actions such as executions, expropriations and tortures. Furthermore, ethnic minority women were systematically raped by Tatmadaw soldiers, which was used to intimidate those who opposed the regime.

Basic Health Indicators:

Life expectancy at birth was 61 years during the period studied.

High mortality rates were reported among eastern population in 2004. Under-5 mortality rate (U5MR) was 221 per 1000 live births and differs considerably from national data which reported 106 per 1000 live births.

Research suggested in some eastern conflict areas maternal mortality rate had reached 1200 per 100,000 live births, which is similar to other under-developed countries at the time such as Somalia and Rwanda.

By 2002, 40% of the national expenditures were spent on military issues, in contrast with 10% and 3% that were spent on education and health services respectively.

Basic health assistance such as childhood vaccination, insecticide-treated mosquito nets and vitamin A supplements were neglected by the regime.

The hospital services were deplorable, people were forced to bribe the medical staff in order to receive treatment besides having to pay for the assistance. At times they were forced to look for medicine on the black market.

It has been found some suggestions about severe and moderate children malnutrition, in some areas reaching over 10% of the children. Moreover, many children were eating one meal per day, with an important lack of basic nutrients<sup>16</sup>.

Landmine, used by military and also ethnic armies, have been another relevant cause of injury and death<sup>17</sup>.

## **B. Rakhine State conflict**

It has been found that the Rakhine, known as the indigenous people of the state, have always been the dominant group in Rakhine State due to its large population, owning most of the land and controlling the economy. On the other hand, the mostly Muslim

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<sup>16</sup> Life, Liberty and the Pursuit of Health - BPHWT 10-year report;2011. Available: <http://www.burmalibrary.org/show.php?cat=1987>

<sup>17</sup> Chronic Emergency. Health and Human Right in Eastern Burma. Back Pack Health Work Team; 2006. Available: <http://www.burmalibrary.org/show.php?cat=2263&lo=d&sl=0>

Bengali people have worked as domestic workers and labourers for Rakhine businesses.

It has been found that the Rakhine, known as the indigenous people of the state, have always been the dominant group in Rakhine State due to its large population, owning most of the land and controlling the economy. On the other hand, the mostly Muslim Bengali people have worked as domestic workers and labourers for Rakhine businesses.

Rakhine State was occupied by the British at the beginning of the 19th century. From then on a large number of foreign people arrived in the region, including the Bengali. Besides this, major divergences between both groups increased the lack of understanding, such as religious and traditional practices, cultural and social norms. Gradually, counting with outside group support, Bengali began to control business and to seize political and economic opportunities.

Since then both communities have attacked and killed each other from time to time. The last significant spread of violence took place in 2012 with a consequent large number of deaths, injuries and livelihood losses. Overall 192 people were killed, 265 people were injured and 8,614 houses were destroyed. The impact amongst the two communities is summarized in table \*. These data were facilitated by the government, which differs significantly from the data provided by Rakhine and Bengali communities, being almost double compared to that of the government, as we can see in table 4.

Table 3. Deaths, injuries and losses amongst the Bengali and Rakhine communities.

Impact	Deaths	Injured	Home destroyed	Business destroyed
Bengali	134	117	7422	75
Rakhine	58	148	1192	45

Table 4. Deaths and injuries provided by each community.

Impact	Reported by Bengali	Reported by Rakhine
Deaths	219	128
Injured	117	148

Furthermore, religious buildings were destroyed by both sides, such as Buddhist monasteries and mosques. Public buildings were destroyed by Bengali such as electricity generating stations, medical dispensaries, schools and police spots. Rakhine did not destroy any state-owned property<sup>18</sup>.

The lack of agreement between these two communities had a considerable economic impact. The demand for goods and services decreased and consequently people lost their jobs which in turn decreased family incomes. At the same time, the prices increased, gradually forcing people into significant poverty.

<sup>18</sup> Final Report of Inquiry Commission on Sectarian Violence in Rakhine State. Republic of the Union of Myanmar. 8 July 2013. Available: <http://www.ibiblio.org/obl/show.php?cat=1241&lo=d&sl=1>

Research has shown that U5-MR and MMR are decreasing significantly overall the country, from 112 deaths per 1,000 live birth in 1999 to 66 deaths per 1,000 live birth in 2010. We don't have the U5-MR data for 1999 or 2010, however, as we mention before, U5-MR in 2004 in Eastern region was twice as high as the overall U5-MR in 1999. This can help to have an idea about the big different between the general country indicators and the situation in these conflict regions

## **6. HAZARDS**

Once we know the history of the most frequent disasters in Myanmar we will resume the principal hazards that the Union of Myanmar is exposed to and the particular regional vulnerability that might be associated. The hazards will be classified according to the following categories of disaster they cause, Natural, Technological and Man-made disasters.

### **6.1. Natural Hazards**

Myanmar is exposed to multiple natural hazards. The term natural hazard is understood as the process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Burma has been periodically hit by natural disasters, therefore knowing the type of natural hazards and the vulnerability related to them is essential to reduce them.

Reviewing different reports and the most common disaster in the country have helped to highlight the principal aspects about the hazards that usually strike Myanmar. This will be useful in order to understand the way these events occur and in which way they may affect most vulnerable populations. This understanding will come out with the main ideas in order to improve preparation and mitigation in these circumstances.

#### **6.1.1. Cyclones**

The Bay of Bengal is a typical place for the tropical cyclone generation. Myanmar coastal region is exposed to the threat of cyclones. These event are composed by three destructive forces: strong winds (reach 120 mph), heavy rains (more than 5 inches in 24 hours) and storm surges (higher than 10 feet). Storm surge is the main cause of damage, although it depends on the vulnerability of the place hit by the cyclone. A statement from the Department of Meteorology and Hydrology mentioned in a Myanmar hazard report, mention that the most severe cyclones have occurred during the pre-monsoon period from April to May. They assume that May is month with highest possibility for a cyclone to cross Myanmar coast. Nevertheless, the post-monsoon (from October to December) shouldn't be undervalue, since these events are also common although they are less severe<sup>19</sup>.

The Hazard Profile consulted show that Myanmar coast has been crossed by 34 cyclones from 1947 to 2007, of which 7 cyclones claimed lives, mainly due to the accompanying storm surge. They mention a particular event occurred in Sittwe in 1968

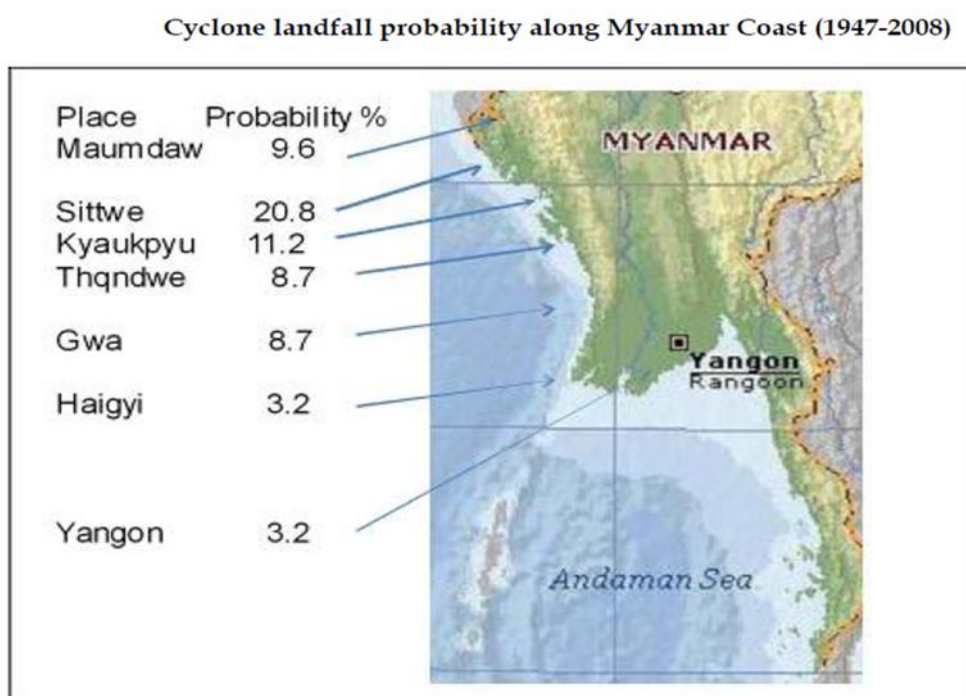
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<sup>19</sup> Myanmar Hazard Profile-2009.

which claimed 1037 deaths<sup>5</sup>. Our analysis have registered 8 cyclones which claimed lives from 1964 to 2007, from then on another 2 took place, including the devastated Cyclone Nagris in 2008 . Having considered this research, hence the importance this type of hazard.

The figure provided below illustrates the probability of cyclone landfalls along Myanmar coasts<sup>5</sup>. The usual track of cyclones generated in Bengal Bay shows that the northern coast of Myanmar seems to have more risk of being hit by a cyclone. However, the suddenly southward shifting of Cyclone Nagris suggests that we cannot assume cyclone will not cross the southern coastal zone of Myanmar in near future.

Figure 8.



(Myanmar Hazard Profile-2009)

The high stocking level in Ayeyarwady and Yangon States was the main reason of the high impact of Cyclone Nagris. This was not the first time this states suffer a cyclone strike. Ayeyarwady Division was affected by two cyclones which claimed lives. They occurred in 1975 and 2006, with 304 and 37 losses of life respectively. The number of deaths differs slightly from the data collected from EM-DAT, where the impact on death is registered as 200 and 34 respectively.

### 6.1.2. Storms surge

‘Storm surge is an extraordinary flooding due to a storm. It generally occurs due to waves generated by the strong wind in tropical revolving storms. Waves higher than 10 feet may be experienced due to a landfall cyclone. Extent of damage depends on the vulnerability of the place of landfall.’ (Myanmar Hazard Profile-2009).

Research has shown that the main factors associated to the storm surge height are based on the origin and the path of the storm, average velocity, water depth, time and density of seawater.

Within the data collected in our paper storms surge are not specified. We can assume that some of the floods registered as disasters were developed by a storm surge. This assumption can be valid for cyclones, as we know they can generate these storms surge. During Cyclone Nargis, the highest flood levels were recorded. The path of the storm surge in this case run along 200Km of the coast line which was 50% covered by river mouths<sup>12</sup>.

### **6.1.3. Floods**

Ayeyarwady, Chindwin, Sittaung and Thanlwin are the four major rivers in Myanmar. Some big cities are strategically situated along these river since they provide easy access to water.

The diverse topography of Myanmar different type of floods can be seen. Ayeyarwady Delta region is prone to riverine floods, this basin covers 404,200square kilometers of the country which is densely populated. In the mountainous areas in north and east flash floods can be seen in the upper reaches of the river systems when heavy rainfalls strike those regions. As we mention in above sections coastal areas can be hit by cyclones and storms surge. Finally urban areas can suffer localized floods due associated factors such as cloudburst, saturated soil and poor infiltration rates inadequate drains. The breakage of water resistance structures as dams, dykes and levees can be the main problem in some rural areas<sup>12</sup>.

During May and October, the country receives practically all its rainfall, when flooding and landslides are more common.

As we already know from the analysis of the disasters history of Myanmar, floods are the most frequent disasters, therefore one of the major hazards in the country. Besides the impact on deaths, floods became with infrastructure damage, important economic loss and health problems like outbreaks of water borne diseases.

Furthermore, the impacts of climate change and global warming can make the water level reduce in the central Dry Zone, resulting in water shortages. However the water level in the Delta Region will rise due to the change of sea level. This assertion is supported by IPCC.

### **6.1.4. Droughts**

The dry zone in Myanmar covers an area of 67,700 sq km in the Central Inner Basin. It occupies part of Sagain, Magway and Mandalay Divisions. The dry zone is surrounded on three sides by mountain ranges and opens towards the south.

The precipitation in the dry zone is controlled by the monsoon circulation system. The annual precipitation is less than 750 mm, while the national average precipitation is 2353.06 mm. The dry zone receives 3.2% of the country's total rainfall, comprising 10% of the total area of the country.

In Myanmar, 12% of the land is under cultivation. Approximately 35 % of the cultivable land is in the dry zone. It is the most important region in the prodction of vegetable oil, which includes sesame and sunflower. Other important crops are rice, millet, cotton and tobacco.

The soils have eroded to a varying degree and in some places it has been completely removed by water and wind erosion. The underlying bedrock, which is predominantly sedimentary, is made of sandstones, shale and slates. The result are loamy sands that are thin and poor in nutrients.

Deforestation is another major concern. The heavy cutting of forests to fire brick kilns for construction of stupas and pagodas is said to have been the primary cause of forest destruction since 11 AD. The inevitable consequence of forest destruction was a drastic change in climate, gradually moving from bad to worse. The increased population led to the extension of agriculture field and thus encroachment of reserved and protected forests. In addition, it also led to an increased demand for domestic fuel as well as industrial usage. The livestock population has also resulted in an increase of grazing which is destructive for plantation and plant growth.

The deterioration of natural resources such as soil erosion and deforestation has made the agricultural production base unstable. The natural resources of the dry zone are being depleted more rapidly than nature can renew itself.

No droughts have been registered as natural disaster in Myanmar. However, according to climate change statements dry zones all around the world will increase in a long term scale. While it could be less clear in the short term, in the long term it could increase the vulnerability of the population, by gradually destructing the country's main resources.

#### **6.1.5. Earthquakes**

Geographically, Myanmar is an earthquake-prone region as it lies in one of the two main earthquake belts in the world, known as the Alpide Belt which starts in the northern Mediterranean in the west, and then extends eastwards through Turkey, Iran, Afghanistan, the Himalayas, and Myanmar to finally end in Indonesia.

Earthquakes in Myanmar have resulted from two main sources, namely:

- The continued subduction of the northward-moving Indian Plate underneath the Burma Platelet (which is a part of the Eurasian Plate).
- The northward movement of the Burma Platelet from a spreading centre in the Andaman Sea.

The Sangaing Fault is the most prominent active fault in Myanmar. It strikes the country from north to south and into the Andaman Sea. Six  $>7.0$  earthquakes occurred near the Sangaing Fault during the last 1930 and 1956, resulting in severe damage in Myanmar, including 610 deaths, the generation of landslides, and liquefaction. Although no  $M \geq 7.0$  earthquakes have occurred since 1957, these inland earthquakes are a hazard in Myanmar, as are giant tsunamigenic earthquakes in the northern Bay of Bengal. Possibility of strong and major earthquakes along the Sangaing Fault is considerable. (Myanmar Hazard Profile-2009).

Within the data registered in this report 4 earthquakes have occurred in the last 50 years. In 2011 a 6.8 earthquake struck the Shan State near the Thai border with a considerable impact of 21,277 people affected and 74 deaths. The other one, which had claimed 38 deaths, occurred in 2012, affecting 1,486 people in total.

Although scientists have created seismic zone maps in order to know the most seismic prone zones. Since the prediction of these events is one of the biggest challenges which need to be overcome if their consequences are to be reduced, they continue working on the matter. Certain assumptions have been made in order to predict these events, 'some large segments of the active faults have not exhibited any significant seismic activity in the past 50 to 75 years, indicating that the faults are apparently locked and stress is accumulating in those segments (e.g., the southern segment of the Sagaing Fault which is close to Yangon and Bago cities, and the central segment which is close to Mandalay and Sagaing cities)'. (Myanmar Hazard Profile-2009). As predicting these events is still a challenge the population of Myanmar should be prepared to improve their resilience.

#### **6.1.6. Tsunamis**

As we could see before, Myanmar is indeed an earthquake-prone country as it lies in one of the two principal earthquake belts of the world, the Alpide Belt. There were also records of moderate Tsunami generated by two large magnitude earthquakes, which originated in the Andaman-Nicobar Islands. [These are 31 December 1881 Car Nicobar Earthquake (7.9 RS) and 26 June 1941 Andaman Island Earthquake (7.7 RS)]. The tsunami registered as a disaster in our analysis is the one generated by the giant 2004 Sumatra Earthquake which also caused moderate damage in some parts of the Myanmar Coast. In view of these, it is evident that Myanmar is vulnerable to hazards from moderate and large tsunamis along its long coastline.

'After 2004 Tsunami, scientists from Geological Survey of Japan could find at least three large tsunami records in the Bay of Bengal and Andaman Sea region during a time period of 2,800 years. The last one to occur before 2004 was dated as of 550 to 700 years ago, therefore they assumed that a big tsunami might occur in about 500 to 700 years'. (Jankaew et al., 2008).

Myanmar has a long coastline, which is about 2,400 kilometers long. It consists of three main segments: Rakhine (formerly Arakan) Coast in the northwest, Ayeyarwady (formerly Irrawaddy) Delta in the middle, and Taninthayi (formerly Tenasserim) Coast in the south.

The northern Rakhine Coast, adjacent to Bangladesh, consists of some large offshore islands. The intervening areas between these and the coastline are marshy and partly covered with mangrove forests. Therefore, this setting provides partial protection from tsunami waves. However, the Southern Rakhine Coast is generally rocky and sandy with three popular resort areas which means it is comparatively more vulnerable to the tsunami hazard.

The Ayeyarwady Delta is a large delta with wetlands and mangrove forests, thus providing partial protection from tsunami waves. The delta front is wide with shoals in some places, slowing down the tsunami speed. Immediately to the east lies the mouth of Sittaung River, which is a wide estuary that widens southwards to form the Gulf of Mottama.

The Taninthayi Coast could be divided in two parts geographically: the northern part which is rocky and bare and the southern part where the Myeik (Mergui) Archipelago



is, and which consists on more than eight hundred islands. The islands are sparsely populated, with human settlement mainly on the east coast, in the shadow sides from tsunami waves. Moreover, the southern part is partially covered with mangrove forests, thus providing partial protection from tsunami waves. These factors indicate that the southern part is comparatively less vulnerable to the tsunami hazard.

#### **6.1.7. Landslide**

Myanmar has two mountainous provinces: namely the Western Ranges and the Eastern Highland. The steep slopes, unstable geologic conditions, and heavy monsoon rains combine to make the mountainous areas hazard-prone areas in Myanmar. As a consequence of the population growth more settlement have been developed in prone areas.

The main factors that influence slope stability are:

- Gravity and slope gradient
- Hydrogeologic characteristic of the slope
- Presence of troublesome earth materials
- Processes of erosion
- Man-made causes
- Geological conditions
- Occurrence of a triggering event

Shan-Tanintharyi Block is composed of the oldest rock units in Myanmar. Due to the long-term erosion and weathering, different erosional and weathered features such as scarps, steep slope and karst topography have occurred. Highly weathered nature and heavy rain along the eastern part of this province has experienced many types of landslides.

In western Fold Belt the landslide hazards are commonly occurred along the eastern flank of the ranges, Kale-Ti Dim-Falam road and Kale-Ta Mu road. The main causes of landslides in this province are abnormally high pore-water pressure, which rises during the rain storms, cutting down of natural vegetation, under cutting erosion, and digging of slope toe.

The landslide hazard of Ayeyarwady River Banks is related with the seasonal rise of river water level. In rainy season, the water level of the Ayeyarwady River is high, and large amount of water may enter the banks, producing bank storage phenomena. When the water level suddenly drops in the hot season, the stored water in the bank is left unsupported. Therefore, bank failure tends to occur along the river after the flooded water has receded. Thus, the landslide hazard has been occurred along the banks.

Yangon area is situated at the southern extremity of a long narrow spur of the Bago Yoma. The central part of the area is higher than its limbs. Most types of the landslides occurred in this area are creeps, earth flow and slumps or block slides.

The western Ranges has experienced many types of landslides and earth, movement, i.e. rock falls, rock slides, soil avalanche and mud flows of various scales due to the wedge failure, plane failure, toppling, and circular failure. The direct impact of

landslide in this region is the damage of the infrastructure rather than human settlement because these areas are sparsely populated.

#### **6.1.8. Biological hazards: Malaria**

Malaria is an important threat for Southeast countries. As we could see in the World Malaria Report, 2013, "An estimated 3.4 billion people were at risk of malaria in 2012. Of this total, 2.2 billion were at low risk (<1 reported case per 1000 population), of whom 94% were living in geographic regions other than the African Region. The 1.2 billion at high risk (>1 case per 1000 population) were living mostly in the African Region (47%) and the South-East Asia Region (37%)."<sup>20</sup> The Greater Mekong Sub-region (GMS) is the main area where multidrug-resistant parasites are breeding. This area includes Cambodia, China's Yunnan Province, Laos, Myanmar, Thailand and Vietnam. Malaria control efforts have been increased by WHO in this region in order to restrain artemisinin resistant parasites.

Myanmar is the most afflicted region in the GMS. Its geographical location and the great migration within the country are important factors leading to the transmission of drug resistance parasites. The borders with China and Thailand have a large population of ethnic minorities and at the same time lack appropriate health assistance. The political instability does not help to control malaria situation in these locations. Furthermore, some epidemiological and demographic data seem to be missing, especially in the case of minorities. These conditions are essential to planning a quality public health policy.<sup>21</sup>

### **6.2. TECHNOLOGICAL HAZARDS**

Since Myanmar is a country which is passing through a developing process, probably technological structures will be expanding. Safety and education measures are essential in order to avoid technological disasters. This is just a hypothesis. In this section we will talk about fires, which is the most frequent disaster and it is considered as an important hazard by the moment.

#### **6.2.1. Fire**

Fire hazard is the most frequent hazard in Myanmar and it also accounts for approximately 70% of the disasters. Our analysis register fire disasters in both groups, Natural and Technological, as it is designated in EM-DAT web page. Searching to clarify the causes of these disasters we realized that most of them have been developed by a combination of different factors, such as meteorological conditions (high temperatures), the use of flammable construction materials, unplanned development and other social factors<sup>22</sup>. The main causes of fires are kitchen and negligence related

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<sup>20</sup> World Malaria Report 2013, WHO. Available: [http://www.who.int/malaria/publications/world\\_malaria\\_report\\_2013/en/](http://www.who.int/malaria/publications/world_malaria_report_2013/en/)

<sup>21</sup> Li N, Parker DM, Yang Z, et al. Risk factors associated with slide positivity among febrile patients in a conflict zone of north-eastern Myanmar along the China-Myanmar border. *Malaria Journal* 2013, 12:361.

<sup>22</sup> Disaster Preparedness and Resilience: Myanmar. Available: <http://www.give2asia.org/disaster-preparedness-and-resilience-myanmar-1/>.

accidents which account for 83% of all fire cases. Another relevant cause is uncontrolled land and forest fires, mostly resulting from human activities such as the use of open burning techniques for conversion of forestland to other land uses<sup>12</sup>.

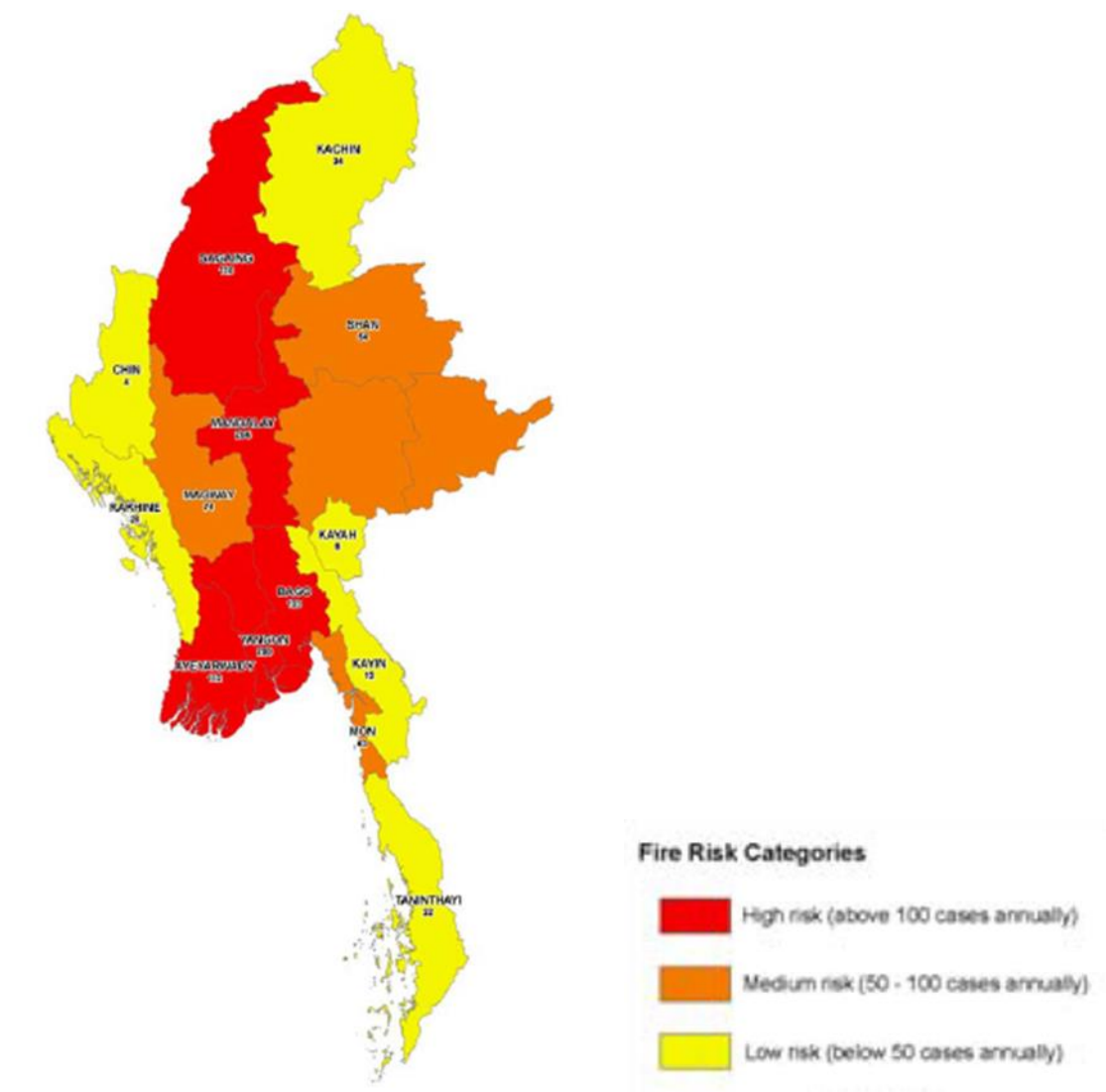
The most affected areas by these kind of events are Yangon, Mandalay, Ayeyarwady, Sagaing and Bago. These account with 63% of the total fire cases. January to May period is the high season for fires<sup>12</sup>.

Table 5 shows the fire risk-wise Divisions/ States, Number of Districts, Townships, Area and Population. (Myanmar Hazard Profile-2009).

Fire Risk Zone	Divisions/ States	<sup>25</sup> No. of Townships	Area In sq. miles	% total area	Population	% of total population
High	Yangon, Bago, Ayeyardwady, Mandalay, Sagaing	167	83,538	32	33,431,000	60
Medium	Magway, Mon, Shan	89	82,208	31	13,361,000	24
Low	Rakhine, Kachin, Kayah, Kayin, Chin, Tanintharyi	68	96,812	37	8,604,000	16
<b>Total</b>		<b>324</b>	<b>261,228</b>	<b>100</b>	<b>55,396,000</b>	<b>100</b>

This research based on the fire incidents from 1983-2007, bearing in mind this the States and Divisions have been categorized into High, Medium and Low Fire Risk Zones. Providing this information, risk zone maps can be done as the one illustrated bellow<sup>12</sup>.

Figure 9: Fire Risk Map (Based on Fire Cases from 1983 to 2007)



(Myanmar Hazard Profile-2009)

### 6.3. HUMAN RIGHTS HAZARD: ETHNIC CONFLICTS

Ethnic conflicts in Myanmar Union could act as a disaster hazard in the country. This situations had derived on human rights violation in some cases. This is an important issue that some groups of population still face at the moment. Despite the democracy transition, instability, especially in states like Rakhine, is keeping the international community alert on the ongoing violation of human rights.

As we mention in the background Myanmar had faced conflict events since its independence from Britain in 1948. These conflicts take part between the central government and ethnic minorities, who are demanding autonomy, coupled with the isolation imposed by the military regime, have been the main obstacle to Myanmar

establishing itself as a democratic state and achieving a level of development which is commensurate with the country's wealth<sup>23</sup>.

The continuing ethnic tensions, both internally and at its borders, makes the possibility of a long-awaited period of peace and stabilization. A rapprochement between the government and the armed groups is a priority if the country is to achieve stability. Otherwise, the lack of security could be perpetuated by the presence of the military in the government and by ongoing armed activity.

Current situation about conflict in the country could start with the sign of a peace agreement between government and representatives of the KIO on 13 May 2013 in the presence of representatives from China, the UN and eight armed groups. The aim of President Thein Sein was for the peace agreement to be extended over the long term. However, by June, troops from the Myanmar army and Kachin insurgents had clashed twenty-one times since the signing of the agreement, which suggests that the conflict is not yet over<sup>24</sup>.

An important factor to consider for the resolution of the conflict is the prevention of the financing of armed groups, which in large part is related to smuggling and drug trafficking. Myanmar is the second largest opium producer in the world, with an estimated 25% of total world production. It is also the main source of amphetamines and opiates in South-east Asia. Despite efforts to the contrary by the government, poppy cultivation increased by 17% in 2012. The largest increase occurred in eastern and northern Shan State and in Kachin State. Everything seems to indicate that this increase is related to the instability caused by the conflict in Kachin. There are several reasons given by experts: more income for the local population than what they would receive for other crops, financing of armed ethnic groups and the illicit activities of military groups (People's Militia Forces) located in zones of conflict<sup>23</sup>.

Despite the gradual restoration of democracy and the efforts at reconciliation between the different ethnic groups, the situation in Myanmar has not ceased to remain in the spotlight for the international community as a result of the possible continuation of human rights violations and ethnic conflicts.

## **7. VULNERABILITY**

'Vulnerability is the degree to which a population, individual or organization is unable to anticipate, cope with, resist and recover from the impacts of disasters.'  
(Environmental health in emergencies and disasters: a practical guide. WHO; 2002)

### **7.1. Political instability**

As said before, the international community remains concerned about possible violations of human right due to instability, especially in the states like Rakhine. This is despite the democratic transition which has occurred in the recent years.

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<sup>23</sup> Hidalgo García M. The ethnic conflicts in Myanmar: Kachin. In: Spanish Institute of Strategic Studies. Geopolitical Overview of Conflicts. Spain: Spanish Ministry of Defence;2013.341-368.

<sup>24</sup> Johnson C., Lidever M. Testing Ceasefires, Building Trust. Myanmar Peace Support Initiative Operational Review;2014. Available: [http://nis-foundation.org/files/2613/9886/3527/MPSI\\_Report.pdf](http://nis-foundation.org/files/2613/9886/3527/MPSI_Report.pdf)

A Country Indicators for Foreign Policy (CIFP) report indicates that Myanmar reach the top of the list of authority-challenged fragile states, which could be understood as the political uncertainties that are still present in the country.

‘Fragile states are by definition characterized by weak policy environments, which make engagement in them a long term challenge’. (CIFP)

Myanmar occupies the 11th place out of 197 countries, in the 2011 Global Fragility Ranking, and is the most fragile in Southeast Asia. The principal problems found are related to the environmental situation, in terms of available land, security, crime and governance problems<sup>25</sup>.

## **7.2. Impoverishment**

Today, Myanmar is the poorest country in Southeast Asia, with approximately 32% of the population living in poverty<sup>26</sup>. This socioeconomic condition results in the difficulty of the population to access livelihoods such as adequate water and food, proper shelter, education and health assistance.

## **7.3. Food Insecurity**

The Food and Agriculture Organization (FAO) defines food and nutrition security (FNS) as a population’s ‘physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO, 2008).

An FAO report describe that at least 20% of the Myanmar population was undernourished by 2011. Nevertheless, agricultural sector contributes to 42% of the GDP. The main resources are rice and pulses crop, mostly located in central and Delta region. They are also the principal products for export<sup>27</sup>.

Research has shown that the holding of land does not always provide a perfect indicator of FNS. Myanmar’s agricultural policy in favor of rice cultivation and the restrictions to private land ownership in the Myanmar Constitution, indicate important limitations to the associations between landholding and FNS<sup>28</sup>.

Cyclone Nagris in 2008 salted a million acres of rice paddies, killed three-fourths of the area’s livestock and sank half the fishing fleet. This event presents a useful example in order to understand the vulnerability related to the principal resources of the country<sup>10</sup>.

## **7.4. Displacement**

As mentioned in this article, Myanmar has a great variety of ethnic minorities which have suffered the need of flee within the country or even to neighboring countries.

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<sup>25</sup> CIFP report; 2012. Available: <http://reliefweb.int/sites/reliefweb.int/files/resources/1402.pdf>.

<sup>26</sup> The World Factbook. Available: <https://www.cia.gov/library/publications/the-world-factbook/geos/bm.html>

<sup>27</sup> Myanmar and FAO Achievements and success stories. FAO Representation in Myanmar; 2011.

<sup>28</sup> Rammohan A, Pritchard B. The Role of Landholding as a Determinant of Food and Nutrition Insecurity in Rural Myanmar. *World Development*. 2014. 64: 597–608.

Most of the minority populations occupy mountains and border areas. Governmental mismanagement, economic collapse, civil conflicts in border regions and widespread of human right abuses, have been the principal reasons for these people to flee. Some of these displaced people reached neighboring countries and other became Internally Displacement People (IDPs).

The Thailand Migrant Assistance Program estimated that approximately 0.5 to 2 million persons are illegal migrants. There are 9 official refugee camps in Thailand, particularly at the Burmese border, with 112,000 people registered and 50,000 not registered. Some of them have been living in these shelters for the last 20 years<sup>29</sup>.

Internally in Myanmar, there have been estimated 1 to 4 million IDPs throughout the country, although there is a lack of information due to the restrictions of data.

These populations are particularly vulnerable to disasters due to the fact that they are already suffering the lack of adequate health services. The journey to reach a health center can often be very long and dangerous, facing bandits and the risk of landmines on the way. In addition, they have endured human rights abuses, which aggravates the situation.

The results after Yanghee Lee's visit, United Nations Special Rapporteur, to two camps in Rhakine State show the deplorable situation. 'Restrictions on the freedom of movement severely affected basic rights, in particular health services and access to livelihoods, food, water, sanitation and education. While the local health authorities have deployed additional medical professionals and provided mobile clinics, the Special Rapporteur received disturbing reports of deaths in camps owing to the lack of access to emergency medical assistance and owing to preventable, chronic or pregnancy-related conditions. With the forced departure of international NGO's providing critical health services and humanitarian organizations not yet operating at full capacity after the attacks on the United Nations and humanitarian organizations in March 2014, there is now limited access and capacity to work with the Government in providing services and to undertake monitoring, including data collection.' Also, child recruitment by military continues, despite the joined action plan signed in 2012 to prevent this situation from happening. It has been found that around 87,000 people have departed, using boats in hazardous conditions, to Australia, Indonesia, Malaysia and Thailand.

'Allegations were also received regarding violations committed by security forces, including the use of torture during interrogation, the sexual abuse and torture of prisoners, the forced labour and torture of civilians perceive to be sympathetic to KIA, and the rape of woman and sexual violence in conflict.'<sup>29</sup>

The disturbances that still seem to occur in several parts of the country make clear the risk of trigger for further violence.

## **8. DISASTER PREVENTION AND RESPONSE STRATEGIES IMPLEMENTED**

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<sup>29</sup> Yanghee Lee. Report of the Special Rapporteur on the situation of human rights in Myanmar; 2014. Sixty-ninth session. Agenda item 68. General Assembly. United Nations.

Myanmar has supported Hyogo Framework for Action (HFA), along with 167 other countries. The country is also an active participant of the Asian Ministerial Conferences on Disaster Risk Reduction (AMCDRR), which provides a forum for Ministers in charge of Disaster Management from the Asia and Pacific region.

Myanmar is an active member of the ASEAN Committee on Disaster Management (ACDM). This Committee developed ASEAN Emergency Rapid Assessment Team (ERAT) in the aftermath of Cyclone Nargis.

The ASEAN Agreement on Disaster Management and Emergency Response (AADMER) provides a regional comprehensive framework to strengthen preventive, monitoring and mitigation measures to reduce disaster losses in the region.

### **8.1. Myanmar Action Plan on Disaster Risk reduction (MAPDRR) 2009-2015.**

After analyzing the past activities on the field, a list of actions have been named to improve the management of these events. This document includes a questionnaire that was developed by consulting Ministry and National Departments, UN Agencies and NGOs, to identify future DRR projects and also, to review the past profile and the ongoing DRR projects.

Myanmar Action Plan on Disaster Risk Reduction document has done in order to understand the ongoing structure and programs that work together on the preparedness and mitigation for future disasters that could occur in the country. Also the plan has identified some projects which need to be implemented in order to achieve the HFA and AADMER commitments.

The MAPDRR has been designed by a Inter-Agency Task Force under the Chairman of the Relief and Resettlement Department. Other member of this Task Force are 17 Departments from 12 Ministries, UN Agencies (UNDP and UNOCHA), professional institutions, Myanmar Red Cross Society, ASEAN and ADPC.

Four Working Groups were constituted to develop the specific components of MAPDRR, namely:

- Hazard, vulnerability and risk assessment and Multi-hazard early warning systems.
- Policy, Institutional arrangement and further Institutional development and Preparedness and response programs at National, State/Division, District and Township levels.
- Mainstreaming Disaster Risk Reduction into development Community based Disaster Preparedness.
- Risk Reduction and Public Awareness, Education and Training

The propose of MAPDRR is “to make Myanmar safer and more resilient against natural Hazards, thus protecting lives, livelihood and developmental gains”.

The objectives of MAPDRR are the next following list:

- To build a more resilient and safer community through conceptualization, development and implementation of appropriate disaster risk reduction programs and culture of safety;



- To provide a framework for implementing Myanmar's DRR commitments at the global and regional levels, under HFA and AADMER;
- To provide a mechanism where the disaster risk reduction initiatives of all Government Ministries and Departments, supported by UN organizations and other stakeholders, can be coordinated and monitored;
- To provide a conducive environment for mainstreaming DRR into development plans, and programs at the National, State, Division, Township, and Village Tract levels;
- To support mutually beneficial partnerships between the Myanmar Government and their development cooperation partners in DRR programs.

The MAPDRR is composed by the next 7 proposal components:

- a. The Policy, Institutional arrangements and further institutional development.
- b. Hazard, vulnerability and risk assessment.
- c. Multi- hazard Early Warning Systems.
- d. Preparedness and Response Programs at National, State/ Division and Township levels.
- e. Mainstreaming of Disaster Risk Reduction into Development and Mitigation.
- f. Community based Disaster Preparedness and Risk Reduction.
- g. Public Awareness, Education and Training.

## **8.2. Post Cyclone Nargis Strategies Developed**

'The Emergency Response and Assessment Team (ERAT) consists of experienced disaster emergency assessment personnel from ASEAN Member States. ASEAN-ERAT conducts rapid assessments, coordinates with local authorities for the deployment of regional disaster management assets and provides logistics support to the affected countries during disaster emergencies'. (<http://www.ahacentre.org/>)

Myanmar Government headed the Tripartite Core Group, which was created to improve the coordination between Myanmar and the International Community in the humanitarian relief and recovery work post-Cyclone Nargis. This group was constituted with Myanmar Government, ASEAN and UN Agencies compromise.

The disaster risk management priorities were identify and reported on the Post Nargis Joint Assessment (PONJA).

The Post-Nargis Recovery and Preparedness Plan (PONREPP) for the affected areas, launched in February 2009, had prepare recovery responses in the delta for 2009-2011 period to advocate productive, healthy, and protected lives<sup>15</sup>.

## **9. INSTITUTIONAL STRUCTURE FOR DISASTER MANAGEMENT IN UNION OF MYANMAR**

The National Disaster preparedness Central Committee, under the Prime Minister, is composed of a 36 member Committee and Sub-committees. National Disaster Preparedness Management Working Committee, under the Secretary (I) of State Peace and Development Council, manages and coordinates the Disaster Management activities. Then each ministry each has constituted its Executive Sub-Committee for

Disaster Management, which have specific responsibilities. We will describe them as follows:

- 9.1. Information and Education (Information Minister) to:
  - educate on disaster preparedness by various means such as curriculum, newspaper, journal, magazine, television broadcasting and radio transmission;
  - disseminate the information during different phases namely before disaster, during-disaster and after-disaster to the concerned masses; Release news after verification;
  - To disseminate information on hazard prone areas and forecast on likely situation to the concerned masses;
  - To review the awareness activities on disaster preparedness and make it more effective;
  - To oversee and manage the information and educating activities organized at different levels;
  - To make arrangements for the timely communication of necessary disaster news and information to people in disaster prone regions through printed materials, airplanes & helicopters, and through radio broadcasts.
- 9.2. Emergency Communications (Communication, Posts & Telegraphs Minister) to:
  - set up an emergency communication system and occasionally conduct mock drills;
  - impart training on communication for the concerned organizations;
  - maintain records of mobile phone numbers, fax numbers and technical terms and frequencies of communication facilities and provide it to the responsible persons;
  - make arrangements for immediate communication as soon as early warning is received;
  - provide an auxiliary communication system should be set up to get continuous weather forecast from neighboring countries and international Meteorology and Hydrology departments during the emergency period;
  - set up a communication system which will be used by the supervisory organizations of the central committee to contact vertically and horizontally during their field trip to the disaster affected areas.
- 9.3. Search and Rescue (Minister of Transport) to:
  - prepare for search and rescue activities in the disaster prone regions, based on population and types of disasters (flood, storm, tsunami, fire, earthquake), and offshore islands, flooded plains, low plains, the shelter for victims, immediate relief materials, food and materials for live-saving;
  - constitute and train Regional Search and Rescue Teams;
  - constitute Regional Teams of boats and assign duties to each member; Assign and dispatch Teams to the flood-prone regions;

- prepare and train Team members on rescue during fires and earthquakes;
  - organize and train special teams on rescue from the collapsed buildings during earthquakes; To keep machines, tools and emergency life-saving tools in a state of readiness.
- 9.4. Information of losses and Emergency assistance (Commerce Minister) to:
- assess damage and losses of the affected region through satellite imagery, aerial photographs, reports from aviation and from the field;
  - assess the need for relief materials based on the type of disasters and prepare for emergency period and regional transportation arrangements;
  - make arrangements for distribution of relief materials in coordination with Regional authorities, Security forces and Police forces;
  - constitute relief materials distribution teams at Township Wards and Village Tracts levels;
  - ensure availability of drinking water, water, fuel and emergency medicines;
  - get data on human death toll, losses and damages;
  - make arrangements for Emergency treatment, cremation, restoration of family units and other social activities.
- 9.5. Assessment of Losses (National Planning and Economic Development Minister) to:
- collect, analyze and confirm data on death, damage and losses;
  - estimate and verify data on requirement of relief and rehabilitation activities;
  - keep record of long-term damage such as farms flooded by salt water.
- 9.6. Clearing Ways and Transportation (Rail Transport Minister) to:
- maintain lists of regional transportation vehicles, boats and equipment and machinery for use in emergencies, to manage transportation facilities assigned by the higher level;
  - maintain lists of approach roads and auxiliary approach roads and monitor their condition and carry out maintenance work as necessary;
  - study main water way and approach water ways;
  - keep lists of airports and heli-pads;
  - make arrangements for fuel at the right place and in the amounts required;
  - identify vehicles stops check-points and communication machine;
  - provide a communication device for each vehicle group;
  - maintain lists of Vehicles, Water tank vehicles, Fuel tank vehicles, Ambulances, etc.
- 9.7. Mitigation and Establishing of Emergency Shelter (Cooperatives Minister) to:
- identify activities to be performed for Disaster Risk Reduction;
  - select emergency shelter to be used during disaster.
- 9.8. Health (Health Minister) to:
- formulate and take action for emergency health care;

- prepare emergency hospitals/ clinics/ mobile clinics for affected regions;
  - impart necessary trainings on emergency health care;
  - stock necessary drugs and to have plan for storage and distribution;
  - prepare for epidemic prevention.
- 9.9. Rehabilitation and Reconstruction (Social Welfare, Relief and Resettlement Minister) to:
- collect data on damage and losses;
  - clear debris and undertake relief activities;
  - coordinate on repair, reconstruction activities of education, health, agriculture and other sectors;
  - give technical advice to disaster prone factories, work stations, building, roads and bridges on having early warning system and emergency plan.
- 9.10. Security (Home Affairs Minister) to:
- perform security measures/ activities in disaster affected areas;
  - organize mock drills;
  - prepare action plans on security;
  - report and act under Regional Authorities, during emergency.

## **10. ETHNIC AND HEALTH ORGANIZATIONS**

These organizations work to ensure and improve health on ethnic minority population.

10.1.1. **Burma Medical Association (BMA)**. The objective of this foundation is to attain the highest possible level of health care based on Primary Health Care. In order to ensure this main objective they participate in the matters of health policy and provide technical assistance. Their work is based on the promotion of understanding of the rights to health among health workers and communities. They also promote fraternal relations among medical professionals, exchange experiences and extend medical knowledge<sup>30</sup>.

10.1.2. **Back Pack Health Workers Team (BPHWT)**. The main objectives of these organization is to provide medical assistance, community health education and prevention, and maternal and child health care, among IDPs in Burma. The BPHWT also works on the capacity of the field through workshops and training<sup>31</sup>.

## **11. DISCUSSION**

Several disasters have struck Myanmar throughout its history. The analysis done in this paper has given us the opportunity to observe that technological disasters are more frequent than natural ones, contrary to the idea we could have based on the geographical situation of the country. Natural disasters, however, have caused the

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<sup>30</sup> Burma Medical Association. Available: <http://www.bmahealth.org/>

<sup>31</sup> Back Pack Health Workers. Team Burma Humanitarian Mission. Available: <http://www.burmamission.org/bphwt.php>

largest number of the deaths and, moreover, 98% of these deaths belong to the impact of Cyclone Nagris.

Within the natural disasters group, floods are the most frequent disaster that Myanmar faced during the period studied. The analysis allows to realize that floods have caused the largest number of affected people, if we do not take into account Nagris Cyclone. Additionally, floods have had the most significant economic impact.

The Intergovernmental Panel on Climate Change mentions in different reports the increase, in terms of frequency and intensity, of some meteorological events. During the second part of the period studied, that is in the last 25 years, events related to weather, such as cyclones and floods, occurred almost every year. Bearing in mind this trend, we can assume that climate change might have some influence on the frequency and intensity of floods occurring in the region. It might also have an effect on other natural hazards in Myanmar, such as landslides and forest fires.

In the case of landslides, some of these events are caused by intense rainfall. Scientists have announced that the probability of intense rainfall will increase in XXI century<sup>32</sup>. On the other hand, having reviewed our research we can come to the conclusion that forest fires are more frequent during hot seasons. Research also supports the idea that an increase in duration, frequency and intensity of high temperature periods will be most probable by the end of XXI century.

The lack of research related to fire disasters is worth stressing, especially given the fact that they are the most frequent disasters in the country. Most events focus on natural disasters, which contrasts with the impact of fire events in terms of economic losses and total affected people.

In the last 50 years Myanmar faced four earthquakes, two of which have claimed lives. The results have shown that these events are not very common, although the damage they can generate is significant, particularly in a country where infrastructure is not prepared to support such earth movements. The main challenge for scientists is the fact that these events cannot be predicted; at the moment mapping prone areas is essential so that adequate resources can be focused on improving the resilience of the population in those areas.

Another relevant aspect to take into consideration is the high number of deaths due to water transport accidents. There is also an absence of precise information on this type of accidents. Some reports note that minority migration could have a considerable influence on the occurrence of such events. Irregular maritime movements have increased as a consequence of the ethnic conflict in Rakhine State during 2012 and the continuing violence continues until present day<sup>33</sup>.

The vulnerability of minority ethnic populations has been mentioned several times in the present report. The dictatorship which was in place in Myanmar from 1964 to 2010 contributed to the impoverishment of the country. This situation had been much worse within ethnic groups, who are still living in deplorable conditions. A considerable

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<sup>32</sup> Fiel C.B. *Managing The Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. Cambridge University; 2012. Intergovernmental Panel on Climate Change.

<sup>33</sup> *Irregular Maritime Movements – UNHCR Regional Office for South-East Asia*. January – June 2014. The UN Refugee Agency. Available: <http://www.unhcr.org/53f1c5fc9.html>

percentage of the population have been forced to flee their homes. Some of them have reached neighboring countries and others live in refugee camps as IDPs, mostly along the country's borders. The disaster risk for these minorities is much higher than for the rest of the population. Even though some NGOs have managed to reach them trying to ensure their basic needs, there is still an absence of adequate quality of life. In many cases human rights abuses have been found. The research has also revealed the misinformation when it comes accurate data regarding these communities. The data found varies greatly depending on the source of information. Besides this we could found significant higher mortality rates within minorities group and rural areas<sup>34</sup>.

These people are considered to be the most vulnerable part of the population in Myanmar, suffering from the lack of basic needs such as health assistance and food security, which in turn result in serious health problems. Also, the loss of their dignity and the human rights violation increase the risk of developing mental problems.

Despite the efforts at reconciliation between ethnic groups, political instability is one of the main challenges for the government during the current transition.

Myanmar Action Plan on Disaster Risk reduction (MAPDRR) 2009-2015 has been developed in order to improve preparedness and mitigation for future disasters that could occur in the country. Myanmar is an active member of the ASEAN Committee on Disaster Management (ACDM) established in early 2003, although the most efforts in this field were made after Cyclone Nagris struck the country. A disaster devastation usually tends to improve future management.

## **12. CONCLUSION**

Several different types of disasters have struck Myanmar over the last years. Technological disasters, particularly fires, are more frequent than natural ones, however cyclones and floods run with an important health and economic impact. There is an increase in the frequency of natural disasters which correlate with scientists' findings related to climate change, which should be taken into account in the disaster management processes. The population should be prepared to face this ongoing increase.

It must not be forgotten that fires are the most frequent events in Myanmar and for this reason research related to these events should be developed to clarify their causes in order to reduce hazards and to improve the response.

Community surveys could be developed in order to improve the level of knowledge about disasters within the population. Such research might help to improve community resilience. In addition, mapping the most affected areas can help to prioritize the resources in terms of preparedness, response and rehabilitation.

Nowadays, Myanmar is going through a period of transition to democracy. Despite reforming in economic and political aspects, the country has conflict locations where human rights violations are still a concern. A significant number of people have been forced to flee; this population is particularly vulnerable in case of a disaster. In order to

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<sup>34</sup> Republic of Myanmar. Unicef Statistics.. Available:  
[http://www.unicef.org/infobycountry/myanmar\\_statistics.html](http://www.unicef.org/infobycountry/myanmar_statistics.html)

improve the ethnic minorities' situation, more efforts should be made to bring the fights to an end. Since the country seems to be far from achieving this goal, more resources focused on the affected population might help to ensure their basic needs and to improve their quality of life.

