

## Disaster Management Framework

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**Abstract** This journal focusing on the Disaster Management Framework for Major Hazard Installation in Malaysia and to deploy based solution to collect and distribute disaster preparedness information that will be used by both the authorized party and the public citizens. The literature review focused on emergency disaster management that covers the man-made disaster. Humans is one of the factor that cause man-made disaster and may result in human error. Thus, environmental impact will occurred after man-made disaster. The importance of framework disaster risk management is that it can be reduce the impact through a complete disaster management and preparedness plan. A qualitative research method was selected because it is traditionally used in social sciences and qualitative method will produce such results of when, what, why, where and who to consider when gathering info and furthermore, helps a lot to help better understanding of problem. Disaster Management Framework for disaster preparedness information that will be used by both the authorized party and the public citizens. The Disaster Management Framework provides mechanism that serves as a guideline for effective and efficient. The framework aligns key roles, responsibilities, authorities and best practices for managing disasters.

**Keywords:** Emergency Disaster Management, Oil and Gas Industrial, Major Hazard, Man-made Disaster.

### 1. Introduction

The purpose of this research is to study the Disaster Management Framework for Major Hazard Installation in Malaysia. Important of Disaster Management Framework for handling all potential emergencies associated with the emergency management. The Disaster Management Framework provides mechanism that serves as a guideline for effective and efficient. The significant topics and their current progress in relation to the current research through reviewing literatures in books, journals, reports, conference papers and the internet.

In the early planning, it should include to protect the safety & health of employee, the property and public plus focusing on back to normal operation. Mitigation measures should be done in order to reduce the effect of hazard. In order to recover back, the effectiveness of emergency preparedness must be taken in consideration when hazard occurred. An effective response action will lead to less damage, reduce the impact and disruption. Preparedness includes hazard identification activities, emergency procedures, budgeting and implementation of training and education programs for the general public (Ismail Bahari, 2006).

## 2. Literature Review

The Literature Review will cover man-made disaster, international disaster, local disaster and preliminary disaster management framework. The significant topics and their current progress in relation to the current research through reviewing literatures in books, journals, reports, conference papers and the Internet. In the UN Global Assessment Report (2013), many loss of life including injury of human, property thus impacting communities involving around natural disaster such as earthquake, tsunami and floods. Ismail Bahari (2006) mentioned that the primary objective of management and occupational safety and health is to avoid accidents. Whether it becomes a small or large accident depends on the emergency preparedness on-site.

The Disaster Management Framework provides mechanism that serves as a guideline for effective and efficient. In order for the framework to help us are by determining using key items such as responsibilities, authorities, key roles and best practises for managing such disaster. This can make choosing the best strategy for Disaster Management Framework for Major Hazard Installation in Malaysia. During the 10 years time period, about 1.4 million people were severely injured and more than 700,000 people lost their lives in tragedy. There are also about 23 million have lost their home and became homeless. In summary, there are about 1.5 billion of people affected by disaster and total value loss was more than \$1.3 trillion (Sendai Framework 2015-2030).

Goetsch, (2011) summarised that disaster is an incident that occurs unexpectedly and may or may not result in the loss of human lives, damage to properties and environment impact. Disaster is a major threat that could jeopardise the development of economic, social and physical elements of a nation. Emergency is an accident that may potentially threat the life that usually occurs suddenly and unexpectedly. It may be a result of natural and/or human causes. Emergency can be refer to two different descriptions. A minor emergency may involve a residential fire or a car collision. These events occur more regularly and usually involve a low number of casualties and minor damages. Serious emergencies refer to events that happen in the future having broader and more severe implications. That is why emergency planning is vital as it can minimise losses and top management planning.

Wentz (1999) states that planning should should be done by focusing on protecting the health and safety of employees, the public, property and the environment, and restoring normal operations back in place. If not handled appropriately, an emergency may spiral into a disaster. Disasters can be defined as an event that can cause disruption to society, their business and their country. It will involved property damage, economic losses, the loss of life, and environmental degradation. Left unchecked, disaster can affect beyond the community's ability to address, and will require an extensive resource of mobility (NADMA Malaysia).

Avalanches, hurricanes and earthquakes and are among of natural disaster that may happened. A disaster may result in severe property, human casualties, and environmental damage. The man-made disaster ie the Nuclear Power Plant

Explosion in Chernobyl, Piper Alpha Platform Accident, the Kuwait Oil Fires, the fire at Kemaman Bitumen Company, the Exxon Valdez oil spill, Bright Sparklers Sungai Buluh, dioxin pollution, the Love Canal, the Union Carbide gas leak, the Three Mile Island nuclear explosion etc. After realizing most of accident are caused by human error, the industries are focusing more on human error which can lead reduce the industrial accidents. Due to all burden lie on safety supervisor, most of industrial accidents are increasing because the current safety management system to manage every workplaces during working time. Some of the natural disasters that happened all around the world are including major earthquakes, tornadoes, landslides, wind hurricanes, flash floods and volcanic eruptions. Some of example for natural disaster are tsunami in Indonesia and Japan.

Samuel *et al.* (2013) discussed that Petrochemical plants processed natural resources such as ores, crude oil, natural gas and minerals into products for a many applications. The definition of petrochemicals is 'natural gas producing chemicals, natural gas liquids, or refinery products derived from the distilled crude oil, or cracking'. Lukaszewski (2013) described that LNG storage tanks was used storing of liquefied natural gas. The tanks can be found in ground, above ground or in LNG carriers. Liquefied natural gas is one of the major fossil fuels used throughout the world and is to gain even more of the market share being the cleanest burning fossil fuel and also due to its availability.

Zohra et al. (2018) studied the reports of 137 fire accidents that happened at an offshore oil and gas facilities in the UK. The report indicates that the incident happened because of some equipment failure that stands for about 56 percent and the source from human error are about 40 percent. One of the equipment failure caused are due to some leakage from pipes and hoses. After leakage of gas for some time, an explosive cloud burst at the incident area (Hoiset, 2000). One of major catastrophe, the Bhopal incident has released about 42 tonnes of toxic Methyl Isocyanate (MIC) gas, which impacted and exposed more than 500,000 people to toxic gases and killed about 3000 people that night (Yang et al., 2015).

Chernobyl nuclear accident is a technological failure which eventually caused the nuclear meltdown of power plant and it happened due to human error. The incident has caused fatality to 167 people and about 61 workers were severely injured and survived the accident. The root cause of incident are due to lack of safety training, human error, and poor safety management systems. According to Hendershort (2013), the cause of accident is due to inadequate work permit, communication failure, poor lockout/tag out procedures and heavy mechanical work at shift turnover. In 1989, the Exxon Valdez drilled on Bligh Reef in Prince William Sound, Alaska, which a spillage incident occurred. An estimated 10.8 million gallons of crude oil spillage has impacted beaches which later on shows that buried oil has some toxic elements. Pranesh et al. (2017) studies the Deep Water Horizon incident that was caused by pipe leaking followed by sudden explosion and lead to uncontrol hydrocarbon fire. The root cause of incident was due to human errors and poor leadership abilities.

The Great East Japan Earthquake (GEJE) that occurred in March 2011 has caused major consequence disaster which are earthquake, tsunami and the meltdown of the Fukushima Daiichi nuclear plant. Due to nuclear meltdown, the

impacted area has suffered from economic damage and health risks due to residual radiation. Russia and Greece found the rapid movement of radioactive contamination and this accident similar to Chernobyl accident (Bolsunovsky et al., 2011).

**Table 1:** International Oil and Gas Accident

INCIDENT	IMPACT	CAUSE
Deep Water Horizon	Spill with lost 500 million and 11 fatality	Human Error
Bhopal	The release of methyl isocyanate (MIC) gas killed 3000 people	Gas leaking
Piper Alpha	An explosion and resulting oil and gas fires, loss of 167 lives	Human error, poor safety training and poor safety management systems
Fukushima	Earthquake, tsunami and meltdown suffered from economic damage and increased health risks	Natural Disaster
Chernobyl	Nuclear Accidents as impact the health and environmental	Technological failure, Human Error
Exxon Valdez	Oil tanker Exxon Valdez crashed into a rocky reef and spilling 10.8 million gallons of crude oil and impacted beaches	Human Error
Flixborough	Flixborough explosion and 28 killed	Uncontrolled leakage

In May, 7, 1991, fire and explosion at the firework plant has caused 23 in fatality, 103 suffering injuries and several properties around the factory was highly damaged. Human error also one of contributed factor to the disasters. After report, the explosion of chemical happened during an experiment in the factory and sparked off fires to a nearby pile of large firecrackers.

During 20th June 1992, the M.T. Choon Hong III ship was landed for the purpose of unloading xylene chemicals. Approximately around 9:00 pm, a fire and explosion occurred on board the ship. It was caused by a faulty unloading pump that were still be used for unloading works. The main caused of the explosion has led to the subsequence accident which is the unloading pumps had been out of service. In December 1997, an explosion occurred at Shell MDS (Malaysia) Sdn Bhd's 400,000-tonne middle distillate synthesis plant in Bintulu, Sarawak.

In April 2006, the caused fire at the Johor Port has destroyed three storage tanks which consists of 720,00 litres of petrol and aviation fuel. Several lighting bolts has caused another tanks caught fire. The incident then continued and caused the fire (The Star, 2006). Zulfahiz (2017).studies about the Petronal Plant Incident in Labuan. on January 2012, a chemical tanker was caught on fire and explode in Labuan while the vessel was loading methanol into their tank. The 38,000 tonne tanker was loading six tonnes of methanol when a small fire broke out during a thunderstorm. It has caused five fatalities and severe environmental impact.

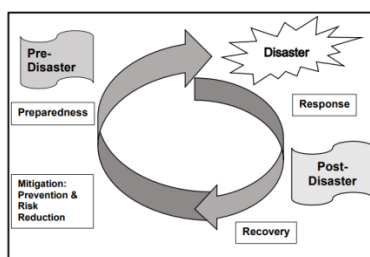
In July 2018, fire destroyed two huge crude oil tanks and spread to a third 16 hours after it started at the Kemaman Bitumen Company (KBC) that later on lead to four people injured (Malaysiakini, 2018). In April 12 2019, a fire and explosion at the complex shocked people living nearby and caused minor property damage in several villages. Emergency Response Team with 30 personnel from the Pengerang RAPID Fire and Rescue Department were deployed after receiving a report on the incident. The two victims, who worked as security guards, received outpatient treatment at the Pengerang RAPID Medical Emergency Centre. The investigations were still underway to determine the cause of the incident.

**Table 2: Malaysia Oil and Gas Accident**

INCIDENT	IMPACT	CAUSE
Kemaman Bitumen	Fire broke out at the three oil tanks containing about 20,059 litres. Four injured	Blaze
Shell MDS Bintulu	Explosion occurred of 400,000-tonne middle distillate synthesis plant.	Prolonged haze period
Bright Sparklers Sungai Buluh	Fire and explosion cause 23 killed ,103 serious injury and several properties was damage around the factory.	Human error (During product have been tested and fire sparks falling on the chemical, causing the fire and explosion)
Petronas Methanol Plant Labuan	The 38,000 tonne MISC tanker loading six tonnes of methanol when a small fire broke out during a thunderstorm. Five has been killed.	Natural Disaster (thunderstorm)
Petronas Storage Tank in Pasir Gudang	Fuel storage tanks 720,00 litres of petrol and fuel caught fire when several lashes of lightning bolts struck the area	Natural Disaster (lightning)
Tiram Kimia	Fire and explosion occurred on board the ship	Poor Management

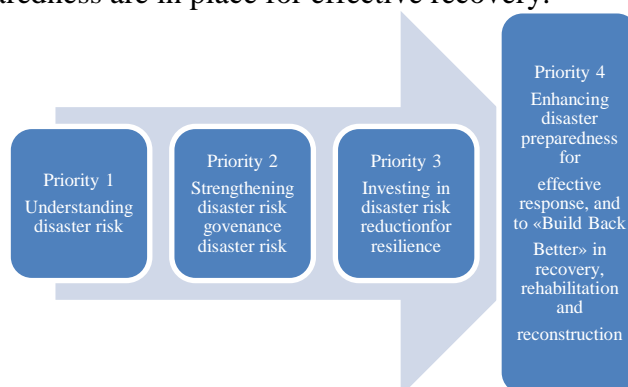
### 3. Material and Method

The NDMP (2018) framework covered all aspects of the disaster management cycle including disaster risk reduction, mitigation, preparedness, response, and recovery. The framework recognize an effective disaster management which provides a comprehensive framework consist of multiple hazards. The factor that are not being addressed are protection, rehabilitation and review.



**Figure 1** Disaster Management Cycle (NDMP 2018)

Figure 2 explains the importance of action to Sendai Framework Disaster risk management to understanding the level of disaster. The management of risk disaster at the national, regional and global levels is important to the management of disaster risk and risk reduction in all sectors. Furthermore, public and private sector need to invest in order to enhance the economic status, social welfare, health and cultural standard of human, public, countries and their assets. This includes environmental aspect as well. Previous experience taught that disaster preparedness needs to be strengthened for more effective response in the future and to ensure preparedness are in place for effective recovery.



**Figure 2** Sendai Framework for Disaster Management 2015-2030

NSC Directive No. 20 is a general plan in disaster management which involves prevention, preparedness, response and recovery. The plan explain that the importance to reduce impacts of disasters on several aspects including life, properties, and environment through the enforcement of laws, practice of disaster awareness and early education. The Emergency preparedness plan need to be reviewed and updated regularly. For prevention, warning systems and communication systems should stay alert for an effective disaster handling. Emergency response team need to mobilise search and rescue as soon as possible to disaster area immediately. Recovery plan is essential to rebuild necessary

utilities, public services, houses, medical and healthcare for victims. NADMA is responsible for the national disaster management based on before, during and post-disaster phases.

**Table 3:** Matrix Table For Disaster Framework

	<b>NDMP India</b>	<b>NSC Malaysia</b>	<b>SENDAI UN</b>
Prevention	/	/	/
Protection			
Preparation	/	/	/
Mitigation	/		/
Response	/	/	/
Recovery	/	/	/
Rehabilitation	/		/
Reconstruction	/		/
Review			

#### 4. Results and Discussion

The International Oil and Gas Accident mostly caused by human error, gas leaking, poor safety training and poor safety management systems, natural disaster, technological failure, and an uncontrolled leakage. Meanwhile for Malaysia Oil and Gas Accident, most of the incident are caused by blaze, prolonged haze period, human error, natural Disaster and poor management. Refer to Table 1, both disaster framework for NDMP India and Sendai UN covered items such as prevention, preparation, mitigation, response, recovery, rehabilitation and reconstruction. However they did not cover area such as protection and review. The best disaster framework should cover all the items in Table 1. Human error are the main factor that has caused fatality and environmental impact which effecting to the industry. However, in Malaysia, most of the accident occurred are caused by natural disaster. Example such as haze, lighting and thunderstorm.

#### 5. Conclusion

The study focused on emergency disaster management that covers the man-made and natural disasters. Humans is one of the factor that cause man-made disaster and may result in human error. Thus, environmental impact will occurred after man-made disaster. The importance of framework disaster risk management is that it can be reduce the impact through a complete disaster management and preparedness plan. Qualitative methodology is specially designed to clarify the meanings of social situations and focus upon the way different people experience and interpret. The main purpose of the quantitative study was to collect information to develop the focus group interviews.

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