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PREVENTION, PREPAREDNESS AND RESPONSE TO ENVIRONMENTAL ACCIDENTS FOR COMMUNITIES, WORKERS, AND MUNICIPALITIES.

EXPERIENCES AND PRACTICES FROM OTHER COUNTRIES

INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT

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ACRONYMS AND ABBREVIATIONS

APELL	Awareness and Preparedness for Emergencies at Local Level
ARA	Appropriate regulatory authority
COA	certificates of authorization
CPR	cardiopulmonary resuscitation
DDM	Department of Disaster Management
EMR	Environmental Management Representative
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPD	Environmental Protection Department (of Hong Kong)
ERP	Environmental emergency response procedure
GDP	gross domestic product
IZ	industrial zone
IFRC	Red Cross and Red Crescent National Societies
NTRS	NT Recycling Solutions
OECD	Organisation for Economic Co-operation and Development
PMU	Project Management Unit
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WB	World Bank
WHO	World Health Organization

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CENTRE FOR ENVIRONMENT AND
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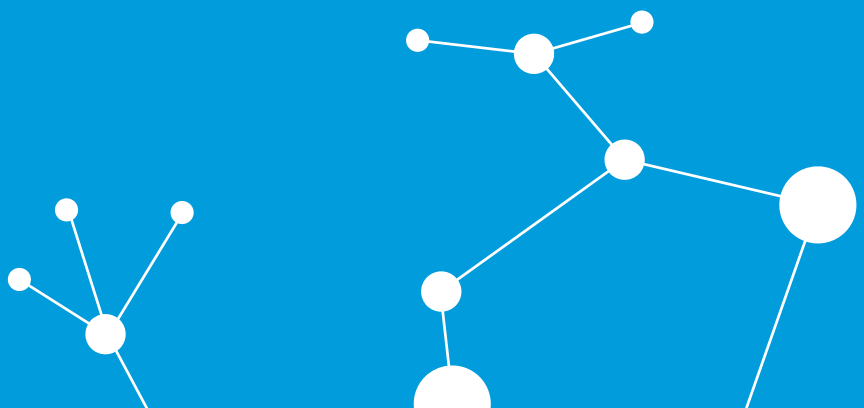
INTRODUCTION

Environmental accidents and natural disasters are increasing in number and intensity. Most of them are unpredictable, and so people have to be well prepared to protect themselves in the most secure ways. The impacts from disasters are extremely devastating and significantly affect people, the environment and business organizations. Moreover, the risk of industrial accidents should not be underestimated. Indeed, a firm can be the object of an accident that could have been avoided with the proper controls and safety measures. A lot of prevention is required in order to avoid and/or minimize the risk of industrial accident that could happen.

This report is part of Component 1 (Review and analyze international and domestic experience on environmental accidents) of the assignment, "*Capacity building in communities to respond to environmental accidents or disasters from industrial zones*". The overall objective of this report is to provide a comprehensive review of international and national experiences on prevention, preparedness and response to environmental accidents to ensure that all stakeholders are able to respond in a timely and effective manner.

This report was prepared for Vietnam's reference and use. It includes guidance for preparedness and steps to follow from emergency scenarios from other countries in the region, such as Japan, the Philippines and Indonesia. Additional experiences and lessons learned from other international organizations, such as World Health Organization (WHO), United Nations Environment Programme (UNEP) and Red Cross and Red Crescent National Societies (IFRC), etc., have been reviewed and considered while compiling this report.

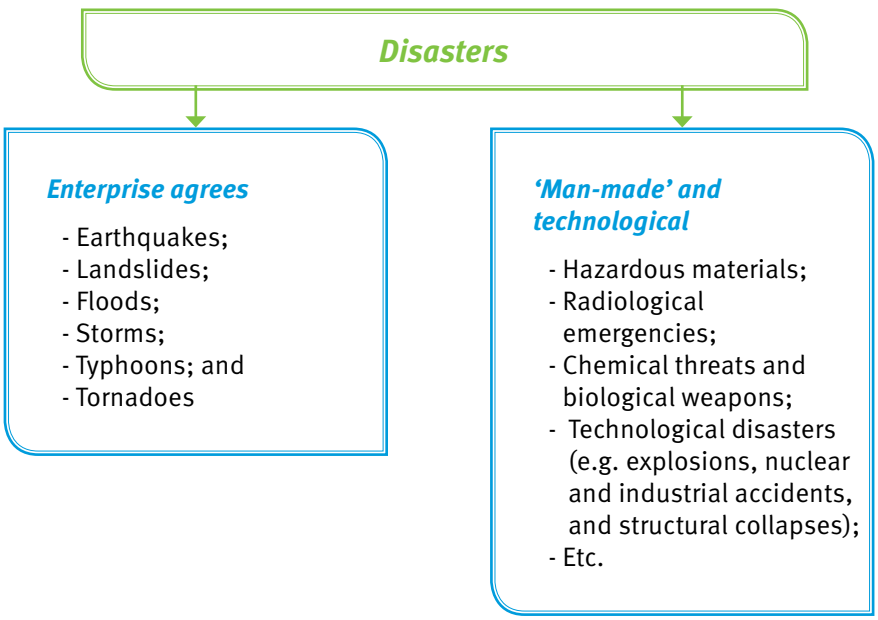


I. CLASSIFICATION OF NATURAL DISASTERS AND ENVIRONMENTAL ACCIDENTS

Climate change impacts have increased the awareness of the threat that natural disasters pose on communities already prone to extreme weather events, and to industrial zones, chemical facilities and critical infrastructure such as oil, chemical and gas tanks/storage, pipelines and nuclear plants. These environmental accidents, often caused by natural disasters, can have severe consequences for the agriculture, ecosystems, human health, economy development and industries. According to the World Bank, Vietnam loses 1-1.5 percent of GDP annually due to natural disasters, which hinders the social and economic development of the country (World Bank, 2009).

Disasters are divided into two groups: natural and environmental. Some authors consider environmental disasters an accident caused by people or technology. Figure 1 describes disaster classification, natural and 'man-made', and components of each type (Faleschini, F. *et al.*, 2017).

Figure 1. Disaster classification



Natural disasters

A natural disaster is a major event resulting from natural processes of the earth, for instance floods, hurricanes, earthquakes etc. In recent times, there has been an increased awareness of the threat that natural disasters pose to industrial zones.

Environmental accidents

Environmental accidents are major events resulting from human activity, such as oil spills, toxic rain, chemical leaks, pollution, fires and explosions and often result in severe consequences for the environment and human health.

1.1. Natural disasters

Earthquakes

Earthquakes are one of the most deadly natural disasters; generating the largest number of human casualties, and are estimated to be responsible for 35 percent of the economic loss generated by natural disasters. Earthquakes can cause environmental, infrastructural and industrial disruptions and accidents. Industrial accidents often happen when the earthquakes are a 7.0 magnitude or higher.

Challenges:

- Industrial facilities located in seismic areas with inadequate building structures;
- High population density in industrial areas; and,
- Inadequate warning systems.

Possible physical damages:

- Ground shaking, soil liquefaction and landslides;
- Collapse of industrial buildings;
- Destroyed industrial equipment;
- Earthquakes can result in the release of hazardous materials, such as chemicals. This can lead to burns from exposure to the chemicals and respiratory injury from the inhalation of dangerous gases, heavy dust produced by damaged tanks and equipment;
- Explosions and fires;
- Electrocution from power lines that has fallen down;

- Injuries and deaths caused by collapsed buildings and landslides;
- Destroyed infrastructure and disrupted power supply, water supply, transport and communication; and,
- Evacuation sites have an increased risk of infectious diseases, inability to provide adequate treatments and sanitation, etc.

Floods

Floods are one of the most frequent natural disasters to trigger industrial accidents. The frequency of major flooding events is increasing because of climate change and urbanization. There are several kinds of floods. Floods can be predicted in advance. Conversely, flash floods are sudden, extreme, and therefore difficult to foresee, which gives people less time to react.

Challenges:

- Industrial facilities in flood-prone areas with inadequate building structures;
- Inadequate warning systems and safety measures;
- High population density around industrial areas;
- Lack of public awareness ;

Possible physical damages:

- Damage to pipework, storage tanks and industrial equipment;
- Release of hazardous materials, such as chemicals;
- Disruption of the infrastructure, water supply, power supply and communication;
- The damage to the industrial storage tanks and equipment can lead to the release of hazardous materials, such as dangerous chemicals that can severely contaminate the water and the environment;
- Floods can distribute toxic or flammable materials over wide areas and thereby increasing the risk to the surroundings;
- Pollution, such as water pollution or toxic cloud pollution;
- Burns from fires or dangerous chemicals, respiratory injury from the inhalation of toxic chemicals or gases;
- Fire, explosions and collapsing buildings; and,
- Evacuation sites have an increased risk of infectious diseases, inability to provide adequate treatments and sanitation, etc.

Tropical storms

Hurricanes, typhoons and cyclones are intense tropical storms with winds of at least 120 km/h. These storms can be predicted in advance, but these disasters are often very extensive and destructive. Tropical storms are predicted to increase in frequency and intensity, because of climate change impacts. They can be hundreds of kilometers wide and are often accompanied by flooding, lightning and sometimes tornadoes.

Challenges:

- Inadequate building structures;
- Structures that are vulnerable to storm damage and lightning strikes;
- Inadequate warning systems and safety measures;
- High population density around industrial areas; and,
- Lack of public awareness about the risks of natural disasters, such as tropical storms.

Possible physical damages:

- Damage to buildings, power lines, pipes, etc.;
- Lightening during thunderstorms can affect electrical control systems and damage vulnerable equipment or storage tanks;
- Release of dangerous materials, such as chemicals or gases. Ruptured storage tanks can release gaseous toxic chemicals and blow over populated areas or can dissolve in rainwater and create corrosive rain;
- Pollution, water pollution, toxic clouds, corrosive rain, etc.;
- Lightning can directly strike structures and storage tanks that contain flammable materials, causing fires or explosions. Oil and gas facilities are particularly vulnerable; and,
- Disruption of infrastructure, power supply and communication.

Box 1: Example of a typhoon that caused an industrial disaster

Typhoon Haiyan hit the Philippines on 8 November 2013 with a wind of 315 km/h. It caused significant damage to cities, villages and infrastructure. It broke loose a power barge anchored south of Estancia that hit the shoreline and ruptured. Over 800,000 litres of fuel released into the 10 km coastline. People started to clean up the oil manually, but without adequate protective equipment, they were exposed to the oil. The impact on aquaculture and coastal vegetation ultimately affected the local communities who depended on fishing (AGHAM, 2014).

1.2. Environmental accidents

Environmental incidents are often caused by failure or mishaps that include fuel, oil, chemicals and other dangerous material spills, contamination of water, land or air, fires, explosions or accidents, and illegal dumping waste, etc. This can occur during the production, transportation or handling of hazardous chemical substances. This can also happen during natural disasters and can cause fires, burns, explosions, and pollution, etc.

Often authors classify environmental incidents according to the nature of incidents as described below. However, there are authors/organizations that classify environmental incidents according to the seriousness of the incidents.

Nuclear explosion/Radiation

Accidental nuclear explosions or radiation can result from natural disasters disrupting a nuclear plant, which can cause an explosion of the plant and the release of radioactive materials. This often has severe consequences for the people and environment exposed to the blast or radiation.

Possible physical damages:

- Pollution and destruction of wildlife and vegetation;
- Physical damage of the blast. It can injure humans by rupturing eardrums or lungs, and causes moderate damage to buildings, etc.
- The radiation can damage the cells of the body and cause sickness and death;
- Fire can cause death, burn and injuries; and,
- Damage electrical power equipment.

Acid rain

Acid rain is rain, snow, fog, hail or dust that has an excessive concentration of acid as a result from chemical pollution. Acid rain is caused by the burning of fossil fuels to generate electricity, vehicles and heavy equipment and manufacturing, oil refineries and other industries. The wind can blow the acid rain over long distances and across borders, which makes acid rain a global problem and not just for the people living in industrial zones.

Possible physical damages:

- The acid is absorbed by the soil and water, which causes agricultural and ecological damage to the vegetation and wildlife;
- It can cause a corrosion of steel structures, such as bridges; and,
- It affects human health and can create heart and lung problems.

Chemical pollution

Chemical pollution is the release of chemicals into nature and it disrupts the ecosystem, threatening the health of humans, wildlife and vegetation. It can pollute the air, water, food, soil etc. and lead to internal body disorders.

Possible physical damages:

- Damage to the health of humans and wildlife. It can impair immune systems, trigger asthma, affect the development of organs, etc.
- Disruption of the ecosystem threatening wildlife and vegetation.

Atmosphere pollution

Atmospheric pollution is the release of dangerous chemicals or materials into the atmosphere, which can have severe consequences. The release of gases, solids, chemicals or radiation into the atmosphere through burning natural or artificial fuels or chemicals in the industrial processes and by nuclear explosions causes atmosphere pollution.

Possible physical damages:

- The release of carbon dioxide is a major cause of climate change;
- The release of chemicals or gases can form dangerous acid rain, toxic clouds or smog; and,
- Atmospheric pollution is harmful to humans and is a major cause for cancer.

Box 2: Example of environmental accident classification according to Red Cross and Red Crescent National Societies (IFRC) (IFRC, 2011):

- ✓ **Accident release:** Occurring during the production, transportation or handling of hazardous chemical substances
- ✓ **Explosions:** Disasters will only be classified as explosions when the explosions is the actual disaster. If the explosion is the cause of another disaster, the event will be classified as the resulting disaster.
- ✓ **Chemical explosion:** Violent destruction caused by explosion of combustible material, nearly always of chemical origin.
- ✓ **Nuclear explosion/Radiation:** Accidental release of radiation occurring in civil facilities, exceeding the internationally established safety levels.
- ✓ **Mine explosion**: Accidents that occur when natural gas or coal dust reacts with the air.
- ✓ **Pollution:** Degradation of one or more aspects in the environment by noxious industrial, chemical or biological wastes, from debris or 'man-made' products and from mismanagement of natural and environmental resources.
- ✓ **Acid rain:** A washout of an excessive concentration of acidic compounds in the atmosphere, resulting from chemical pollutants such as sulphur and nitrogen compounds. When deposited these increase the acidity of the soil and water causing agricultural and ecological damage.
- ✓ **Chemical pollution:** A sudden pollution of water or air near industrial areas, leading to internal body disorders with permanent damage of the skin.
- ✓ **Atmosphere pollution:** Contamination of the atmosphere by large quantities of gases, solids and radiation produced by the burning of natural and artificial fuels, chemicals and other industrial processes and nuclear explosions.

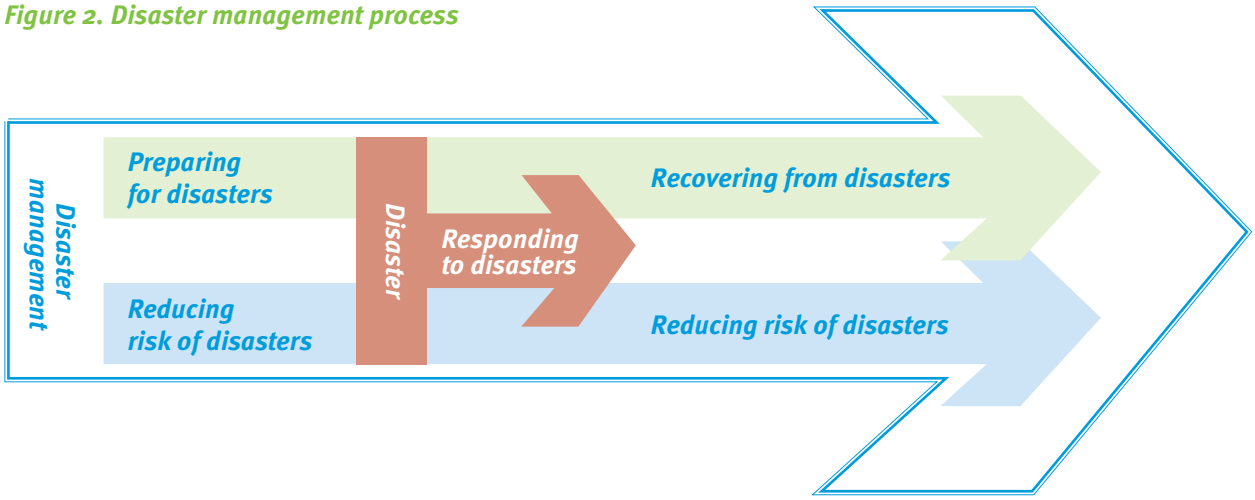
Box 3: Example of environmental incident classification according to Transport Road & Maritime Services (New South Wales, Australia) (Transport Road & Maritime Services, 2017). There are three categories of environmental incidents/events that are to be identified and managed:

- Category 1 Incidents - potentially the most serious incidents. They generally reflect breaches of environmental legislation.
- Category 2 Incidents - are generally less environmentally serious and generally have lower maximum penalties. Nevertheless, there are sound policy reasons why these incidents need to be identified and reported in order to track potential trends that may lead to Category 1 incidents if not addressed.
- Reportable Events - This category captures events that occur outside the scope of reasonable controls and mitigation.

II. DISASTER MANAGEMENT

IFRC defines Disaster Management as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters (see Figure 2) (Figure source: IFRC, 2011):

Figure 2. Disaster management process



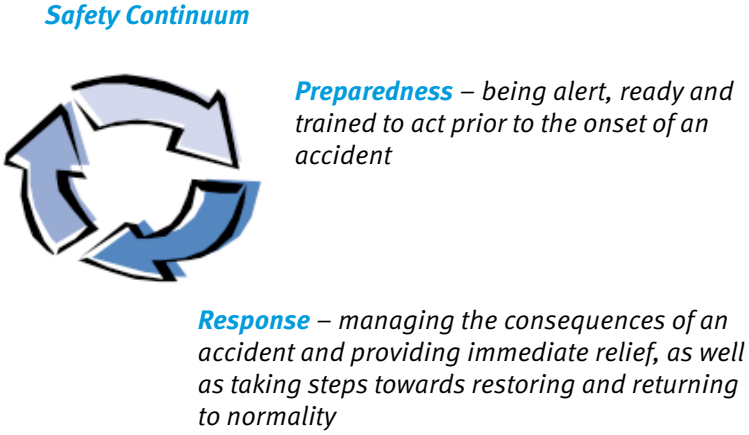
According to WHO, disaster management can be implemented through the following steps (WHO, 2002):

- **Vulnerability assessment**: This provides the basis for reducing vulnerability through work in two areas: disaster prevention/mitigation (to reduce susceptibility) and emergency preparedness (to increase resilience). Vulnerability assessment makes it possible to anticipate problems that specific groups will face in the event of a disaster and during the period of recovery. The process of vulnerability assessment involves determining the spatial proximity of population subgroups to potential hazards (an assessment of susceptibility), according to personal and socioeconomic characteristics that may influence the immediate and long-term impact of hazards on them (an assessment of resilience).
- **Prevention and mitigation**: Complete prevention of disasters is feasible only if it is possible to eliminate people's susceptibility to hazards by moving populations away from hazard zones, providing complete protection from hazards, or preventing the physical hazard altogether. Mitigation—actions aimed at reducing (but not eliminating) the impact of future hazard events—and reduction of the susceptibility of high-risk groups are then the goals.
- **Emergency preparedness**: Emergency preparedness is "*a programme of long-term development activities whose goals are to strengthen the overall capacity and capability of a country to manage efficiently all types of emergency and bring about a transition from relief through recovery, and back to sustained development.*"

- **Planning, policy and capacity building**: Planning is required at all levels, from the community level to national and international levels. Planning ensures that programmes for disaster prevention and mitigation are deployed with clear objectives, adequate resources and management arrangements, and that strategies, resources, management structures, roles and resources for emergency response and recovery are determined and understood by key actors. The complete disaster-management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, assets and infrastructure. Institutional capacity should also be increased through organizational innovation and training.
- **Emergency response**: The appropriate response will depend on the nature of the emergency or disaster and the effectiveness of mitigation measures, but is also very much conditioned by the degree of preparedness achieved. The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population.
- **Rehabilitation, reconstruction and recovery**: As the emergency becomes under control, the affected population is capable of undertaking a growing number of activities aimed at restoring their lives and the infrastructure that supports them. This may be a slow process and one in which the capacity for such efforts must be carefully nurtured and built up over a period of time, but the process should start early in the emergency phase.

The Organization for Economic Co-operation and Development (OECD) has developed a technical guideline for industry (including management and labor), public authorities, communities and other stakeholders on principles for Chemical accident Prevention, Preparedness and Response. The guidelines address these stages, and the roles and responsibilities of the different stakeholders in each stage within an entire process described as a "Safety Continuum" of "Emergency Management Cycle" (OECD, 2003).

Figure 3. Emergency Management Cycle



Reference documents show that disaster/emergency management cycle can be broken down into separate contents, or can include one or two contents per group. However, the three major pillars of the cycle remain as Prevention, Preparedness and Emergency Response. The following is a summary of experiences from different sources.

2.1. Prevention and preparedness

Prevention and preparedness are important in order to promote the populations health, a healthy environment and the productiveness of the industrial zones. Several things can be done to establish prevention measures for environmental accidents. These prevention measures seek to promote the strengthening of programs to prevent and response to environmental accidents.

Prevention is the outright avoidance of adverse impacts of hazards and related disasters and Preparedness is the lessening or limitation of the adverse impacts of hazards and relateddisasters. Mitigation measures encompass engineering techniques and hazard-resistant construction, as well as improved environmental policies and public awareness (UNEP, 2015).

2.1.1. Roles and responsibilities of the various interested stakeholders

This part addresses the roles and responsibilities of the various interested stakeholders as local authorities, community, industry and others, recognizing that prevention is the concern of a wide range of different parties, synthesized from different sources.

2.1.1.1. Local authorities and community representatives

The responsibility of the local authorities and community representatives (mass organizations, residential area leaders, etc.) is to build disaster resilient communities and introduce strategies that can reduce the impact of a disaster. This should include:

Partner up*:*

- Identify local emergency response organizations and leaders and ask them to be part of your education and planning efforts;
- Recruit members of your community to participate in your emergency preparedness team;
- Define roles and responsibilities of partners in an emergency;
- Arrange meetings of community members through the development of a Community Disaster Preparedness committee; and,
- Cooperate with the local fire department, police department, paramedics, or emergency management agency to discuss ways to prepare your community and improve its capacity to respond and recover from disaster.

Planning*:*

- Develop comprehensive planning processes between public and private sectors to address the needs of communities to maintain independence, medical care supervision, transportation, and communication;
- Develop a regional all-hazards plan to address the needs of pets and livestock for evacuation, sheltering, and medical care during a catastrophic event;

- Obtain information on potentially affected hazardous sites in order to assess the risks to health and determine the appropriate risk-management measures. This includes the development of risk profiles to determine which potential emergencies to prioritize for planning;
- Provide training to the majority of the community. Individuals are not prepared for an emergency. Experience tells us that citizens need to prepare to be self-sufficient during the initial 72 hours of a catastrophic incident;
- Develop information, education and materials for specific target groups and vulnerable parts of the population;
- Know the natural or 'man-made' hazards that could affect a community, and seek advice on how to best prepare for or mitigate these hazards.
- Develop a neighborhood evacuation plan. Contact the local emergency management office and find out ahead of time what evacuation routes are designated for your area. Distribute maps to community members and become familiar with major and alternative routes to leave your area before a disaster;
- Evaluate special needs response for vulnerable individuals or parts of the population;
- Identify members of the community who have special skills (medical, technical) or equipment that they would be willing to share in the event of an emergency; and,
- Coordinate emergency plans with the local schools. Make sure children know where to meet parents in the event that schools are evacuated or an early release occurs.

Early warning systems:

- Build surveillance and forecasting systems so that events can be detected early and their effects mitigated;
- Provide standardization of early warning systems for municipalities and institutions across the region; and,
- Educate the public about the early warning systems.

Communication:

- Ensure that responding organizations within the region have completely interpretable communication capabilities;
- Inform the community about evacuation routes, temporary shelters, and other emergency procedures; and,
- Create a list of home and work phone numbers and e-mail addresses for all community members, noting contact information and plans for children and seniors who may be home alone during emergency situations.

Preparedness:

- Provide for adequate shelter, feeding, volunteer and logistical resources to address all-hazards catastrophic event needs sufficient to sustain the region's recovery for up to 72 hours without outside resources;
- Assure coordination of medical response capabilities and provide for uniformity of public health emergency plans across the region;
- Community members should have working fire extinguishers and know how to shut off their utilities, such as gas, electricity, and water in the event of an emergency; and,
- Encourage community members to develop family preparedness plans that cover emergency contact information for family members, predetermined meeting places, home evacuation procedures, emergency pet care, safe storage of food and water, and assembling disaster supplies kits.

Education*:*

Prevention should be a knowledge that people learn at school, home, and at work. For example, in the Philippines, the Department of Education has required schools to promote family disaster preparedness for disasters (Miasco, M.B. 2017). This would raise awareness about different kinds of environmental accidents and increase their knowledge about safety measures. This education should include:

- The dangers of different types of natural and environmental accidents and vulnerable industrial zones. This is particularly important for the parts of the population who live in vulnerable areas;
- Identification of exposed pathways, contaminated water and toxic clouds, etc.;
- Warning systems that ensure public awareness of accidents, procedures and safety measures;
- Information about emergency plans, evacuation locations and different safety measures;
- When and how to contact the local authorities, and how the poison center can help them and the community in an emergency;
- Safety measures for all different types of emergencies scenarios; and,
- CPR training: Cardiopulmonary resuscitation (CPR) is the fastest and most basic of all medical training classes. Most CPR classes take less than four hours to complete.

Training*:*

- Training programs and drills for an emergency. This could be in collaboration with the industrial zones;
- First aid measures for the decontamination of a person exposed to chemicals; and,
- Regularly evaluate the drills and develop the local emergency plan.

Information*:*

- Information about different types of possible disasters and safety measures;
- Information about emergency plans, evacuation locations and different safety measures; and,
- When and how to contact the local authorities, and how the poison center can help them and the community in an emergency.

Building planning*:*

- Ensure building and institutional all-hazards plans exist to provide transparency with other regional catastrophic planning efforts;
- After a disaster, rebuild structures that are better and safer - 'build back better'; and,
- Increase the use of renewable energy and environment-friendly alternative energy sources.

2.1.1.2. Industrial business

Being prepared for accidents also protects businesses and the local communities. This includes:

- Have building/s inspected by a licensed professional to find out if the workplace is vulnerable to various hazards;
- An emergency plan for different types of accidents. Emergency escape procedures and route assignments, such as floor plans, workplace maps, and safe or refuge areas;
- Make sure alarms are distinctive and recognized by all employees as a signal to evacuate the work area or perform actions identified in your plan;
- Safety measures in case of an emergency;
- Routine check-ups of tanks, storage, etc.;
- Routine drills for the workers and the surrounding community in case of a chemical spill or oil leak;
- Use expert measurement and testing (e.g. water quality testing, or diagnosis of mechanical failure of a pump); Develop a risk profile to determine which potential emergencies to prioritize for planning;
- Evacuation plans for the room or building, as appropriate;
- Inventory of spill control materials and personal protective equipment; and
- Means for proper disposal of cleanup materials (in most cases, as hazardous waste) including contaminated tools and clothing.

Workers*:*

Workers who deal with chemicals, in industrial zones, etc. should be educated about procedures, the dangers of spills and potential risks. This should include:

- Adequate training in procedures when handling industrial tanks, etc.;
- Ensure that appropriate containment measures are applied;
- Education about the dangers of spills and environmental accidents;
- Information about small spills and safety measures. Instructions for containing the spilled material, including potential releases to the environment (e.g., protect floor drains);
- When and how to contact the local authorities, and how the local poison center can help them and the community in an emergency;
- First aid measures for the decontamination of a person exposed to chemicals; and,
- For adequate security, workers should complete training and the managers should be held accountable for the equipment.

Control Systems*:*

Industrial enterprises should use different control systems in order to secure safety, this could be:

- Labeling of hazard products that provide clear information about the nature of the material;
- Restricted access to contaminated sites can be enforced using barriers or warnings; and,
- Suitable packaging for transport or storage to prevent leaks.

2.1.1.3. Family

In the case of a disaster, it is necessary that families are prepared and know what to do, where to hide or evacuate.

Communication*:*

- How to contact the local emergency management office for more information on disasters and emergency plans;
- In the case where family members are separated from one another during a disaster (a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster; and,
- Ask an out-of-state relative or friend to serve as the "family contact." After a disaster, it is often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

Training*:*

- Identify safe places in the house, escape routes and evacuation routes for different types of disasters;
- Teach children how and when to call the police or fire department, and which radio station to tune to for emergency information; and,
- Teach all family members how and when to turn off gas, electricity, and water.

Preparedness*:*

- Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves;
- At home have:
- First aid kit and manual;
- Emergency food and water;
- Essential medicines;
- Flashlight and extra batteries; and,
- Portable battery-operated radio and extra batteries.
- Fasten shelves securely to walls; and,
- Repair defective electrical wiring and leaky gas connections. These are potential fire risks.

Box 4: Example of preparedness and response procedures developed by Environment Protection Department of Hong Kong

Environmental Protection Department (EPD) of Hong Kong has developed the preparedness and response procedures, which applies to industrial activities for which potential accidents and emergencies may arise (EPD, 2006). The procedures for preventing and mitigating the following emergency situations are described:

- Fires, explosions;
- Rainstorms, typhoon or other unexpected weather conditions;
- Major chemical spillage or leakage;
- Accidents because of equipment failure.

The procedure includes the following steps:

1) The Environmental Management Representative (EMR), Environmental Management System (EMS) Committee, and Function/Departmental Managers shall identify dangers, take proactive steps to prevent emergency incidents, and complete tasks in preparation for emergencies.
2) The EMR shall coordinate the preparation and maintenance of an Emergency Response Plan that contains all emergency procedures.
3) The EMR shall ensure the Function/Departmental Managers prepare an Emergency Response Plan relevant to their activities.
4) The Function/Departmental Managers shall familiarise and train their staff and Emergency Team members on the procedures described in the Emergency Response Plan.
5) The Function/Departmental Manager and involved staff shall identify the root causes and any preventive actions, report the accident by completing an Accident Report after each accident or emergency and submit the completed form to the EMR to review.
6) The Function/Departmental Manager shall ensure emergency drills and procedures are tested periodically and where practical, and maintain the emergency drill summary report for the EMR to review.
7) The EMR together with Function/Departmental Managers shall review the suitability, adequacy and effectiveness of the emergency plan after each accident or emergency and revise the emergency plan as necessary.
8) The EMR shall maintain documentation on emergency response and preparedness, and emergency incidents for at least three years.

In the case of a natural disaster, such as a flood or tropical storm that should cause an environmental accident, some mitigation measures should be taken:

- Elevate the furnace, water heater, and electric panel if the building has been damaged by floodwaters in the past;
- Construct barriers (levees, beams, or floodwalls) to stop floodwater from entering the building. Seal walls in basements with waterproofing compounds to avoid leaks from outside the building;
- If the industrial park is near a coastal area, learn about the risks of tropical storms in the area;
- Learn the signs of a potential tropical storm, such as an earthquake, a loud roar from the ocean, or unusual ocean behavior, such as a sudden rise or wall of water or sudden draining of water showing the ocean floor; and,
- Know and practice community evacuation plans and map out routes from home, work, and play. Pick shelters that are 30 meters or more above sea level, or at least one mile inland.

2.1.2. Mock disaster drills

Mock disaster drills are part of the preparedness stage. Mock disaster drills conduct real-rime drills where the emergency plan for a possible scenario is tested. The drill is a way to see how people respond under pressure and identify gaps that can make the plan stronger.

Various types of emergency response drills and exercises target specific goals. They can range from small group discussions to complex, multi-faceted exercises. Each drill or exercise presents the opportunity to improve site-specific response plans and render the potential for a more effective response. Response plan testing can begin with simple exercises intended to validate general response plan comprehension or incorporate an all-inclusive, full-scale, realistic, and multi-scenario exercise. An exercise should prepare employees and responders to minimize the impacts of an incident. Below are three of the most basic exercises:

i. **Orientations:** The purpose of an orientation is to familiarize participants with roles, responsibilities, plans, procedures, and equipment. Orientations can resolve questions of coordination and assignment of responsibilities. The inclusion of first responders and facility staff promotes the development of an effective plan.

ii. **Drills:** The goal of a drill is to practice aspects of the response plan and prepare teams and participants for more extensive exercises in the future. A drill can test a specific operation or function of the response plan. Facilities should conduct evacuations, shelter in place, and lockdown drills to demonstrate emergency response actions. Drills can be altered to incorporate various scenario situations. The procedures, individual responsibilities, and public safety coordination may be revised depending on the presented scenario or outcome of the drill.

iii. **Tabletop Exercises:** A tabletop exercise simulates an emergency in an informal, stress-free environment. The participants, usually comprised of decision-making level staff and responders, gather to discuss simulated procedures and general problems/solutions in the context of an emergency scenario. The focus is on training and familiarization with roles, procedures, and responsibilities relative to the emergency synopsis and potential injects (Technical Response Planning, 2014).

Practice is important to prepare for an emergency and one of the best ways to test emergency plans. If professionals plan the test, then participants will:

- Experience how they respond under pressure;
- Experience problems if the plan is poorly developed, executed or is misunderstood;
- Develop their responsive skills, their role and responsibilities;
- Learn to prioritize and practice problem solving;
- Partake in the improvement of the emergency plan and their individual competences; and,
- Discuss lessons learned from the experience.

Box 5: Example of national drills

In Japan, about 1.6 million people took part in the annual emergency drill in 2015, where schoolchildren took cover under their desks and the officials met in response to a mock natural disaster. During this rescue, operations and emergency medical exercises were carried out to stimulate a 7.3 magnitude earthquake. The drill is held on the anniversary of the 1923 Great Kanto Earthquake, which killed 100,000 people (The Strait Times, 2015).

The following are some experiences of mock disaster drill for the two main stakeholders: industry (in case of chemical spill) and community (in case of natural disaster).

2.1.2.1. Industrial Business: Chemical spill response drill

Before the Drill:

- Before beginning, select a specific chemical substance that will be the subject of your drill. If desired, a spill may be simulated with a small amount of water, sand, or other harmless substance;
- A minor chemical spill is one that the employee is capable of handling safely without the assistance of safety or emergency personnel. All other chemical spills are considered major; and,
- The drill will take around 1 hour.

Scenario:

It is 15 minutes to lunch, when a custodian was moving a cabinet of cleaning chemicals. The cabinet tipped over and the chemicals spilled, releasing dangerous gases into the hallway area.

- First, the Lead Facilitator will assign roles to exercise staff and brief them on the details of the exercise;
- Second, the Lead Facilitator will lead and guide the exercise by presenting information. He or she will provide messages to the exercise participants to ensure key decision-points in the exercise are reached; and,

- Third, the Lead Facilitator will observe and coach. In this role, he or she will observe the actions of exercise participants and be on the alert for potential safety issues. If the Lead Facilitator observes a safety concern, he or she may need to intervene and stop the exercise.

Minor Chemical Spill Procedures:

1. Identify the chemical;
2. Alert people in immediate area of the spill;
3. Put on appropriate personal protective equipment for the chemical;
4. If the material is flammable, shut off electric equipment, pilots, furnace, and air conditioner if possible without walking in the material and if it will not cause a spark;
5. Ventilation instructions;
6. Isolate the spill by using absorbent material (e.g., make a dam around the spill). Neutralize the spill, or collect the spilled substance using absorbent materials. Place used absorbent materials inside an approved container;
7. Call the local poison center for labeling and disposal information; and,
8. As soon as possible, provide information to each departmental office within the facility if the spill has a potential to affect persons outside the room where the spill occurred. Provide enough information so that building occupants are informed about what has happened and whether they need to take any action to protect themselves.

Major Chemical Spill procedures

1. Identify the chemical;
2. Actual spill procedure: Call for help and attend to injured or contaminated persons and remove them from exposure, if you can do so safely;
3. Alert people to evacuate the building/area;
4. If the material is flammable, shut off electric equipment, pilots, furnace, and air conditioner if possible without walking in the material and if it will not cause a spark;
5. Have a person knowledgeable of the incident assist emergency personnel; and,
6. As soon as possible, provide information to each departmental office within the facility if the spill has a potential to affect persons outside the room where the spill occurred. Provide enough information so that building occupants are informed about what has happened and whether they need to take any action to protect themselves.

Discuss in groups after the drill:

How did it go?

- Talk about positives and negatives in the response emergency plan;
- What went well? Why did it go well?
- What did not go so well? Why did it not go well?
- Discuss how the teamwork was.
- Which challenges did you experience?

Other challenges

- Identify any barriers that interfere with alerting people who would be affected by the spill;
- Specify any difficulties in selecting and using spill control materials (absorbents, etc.)
- Discuss any obstacles to ventilating the area of the spill;
- Identify any problems related to emergency phone numbers, eyewash stations, emergency showers, and first-aid kits; and,
- List any difficulties in selecting and using appropriate personal protective equipment.

Lessons learned:

- Develop the emergency response plan; and,
- List any goals for improvement.

Box 6: Example of community and staff drills

In India, Tata Chemicals performed on-site and off-site chemical disaster drills for its staff and the surrounding community. On-site, internal safety was tested, while off-site, the emergency plan for the community tested the preparedness and gaps in their relation with the administration. Frequent drills are now a part of their rule of conduct (Padmanabhan, 2008).

2.1.2.2. Community: Natural disaster drill - Evacuation

Before the drill:

- Create a local team to carry out the planning of the drill;
- Find participants who will be part of the drill; and,
- Identify key partners and invite their representatives to participate in the drill.

Scenario:

A Tsunami has hit the community. It followed an earthquake, and flash floods are coming quickly. You have to evacuate or move to higher ground.

Evacuation procedure:

1. Respond to earthquake: Drop down, take cover and wait for the shaking to stop.
2. Immediate relief: Help those affected by the earthquake, if it is safe to do so; identify groups that are likely to have difficulty evacuating without some form of assistance, such as visitors, young children, and people with disabilities that have reduced mobility.
3. Evacuate: Start to walk the evacuation route, identify hazards or obstacles along the route and be aware of secondary hazards, such as fallen objects, flooding, etc. Discuss what to be aware of, such as electrocution from power lines that have fallen down.
4. Evacuation site: Discuss challenges at the evacuation site, space, food, and secondary needs. Evacuation sites have an increased risk of infectious diseases, inability to provide adequate treatments, and sanitation, etc. Discuss challenges to get to the evacuation site. How many reached the evacuation site? Who went to higher ground and who did not reach higher ground?

Discuss in groups after the drill:

- What worked well, versus problems or potential problems?
- Potential effects of aftershocks on evacuation;
- How long it actually took everyone to reach high ground;
- Issues related to evacuation of those with medical needs/medications;

- Discuss weakness of the route, such as clusters, the possibility of collapsing bridges or roads;
- Discuss issues related to evacuation of those with service animals and pets; and,
- What were the biggest challenges? How did people overcome those challenges? What can others learn from these experiences?

Evaluate the drill:

- Update emergency preparedness and response plans;
- Improve evacuation systems and way finding strategies; and,
- Review the draft after-action report (if available) and assessment of feedback of evaluators, participants and organizers.

2.2. Emergency Response

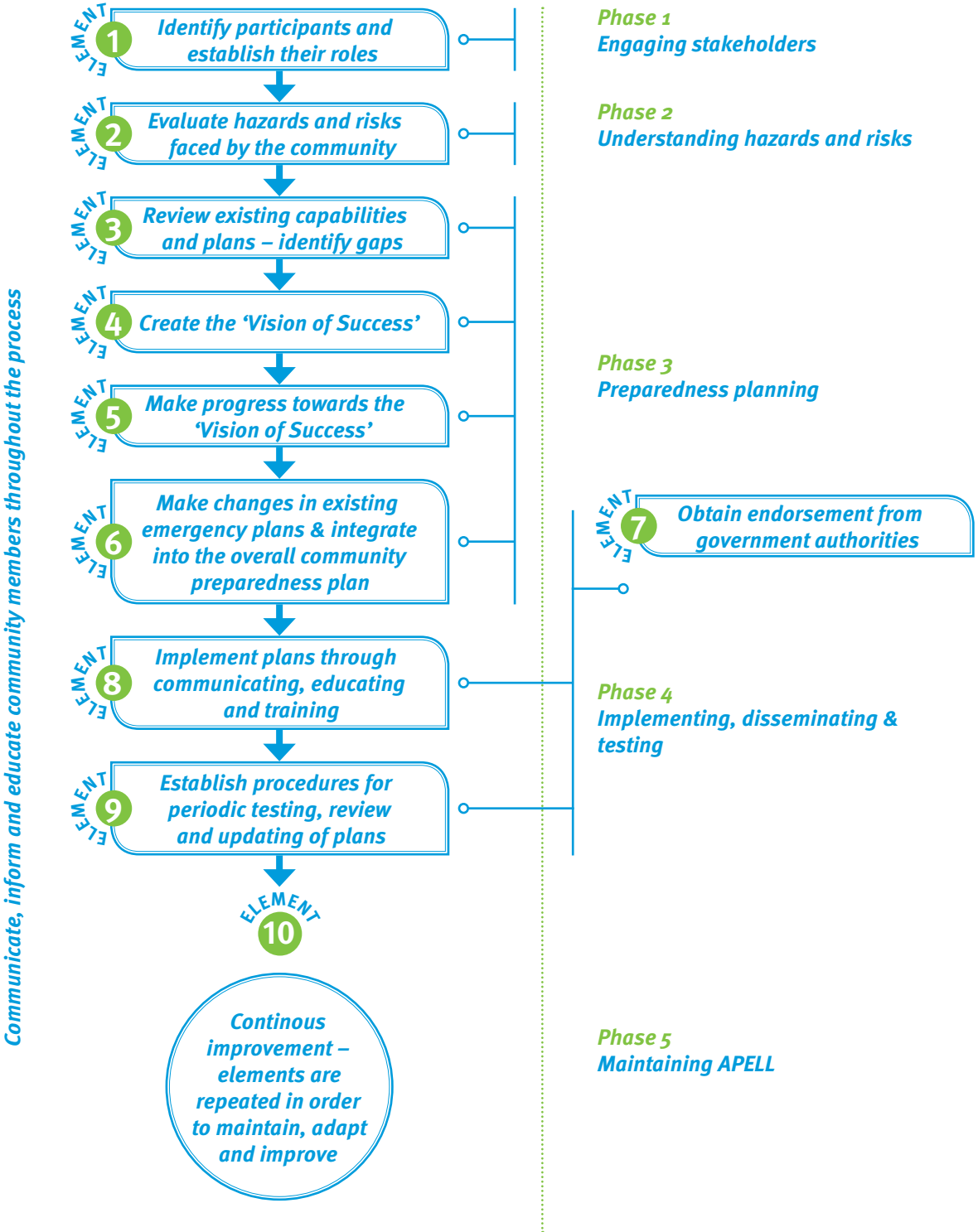
2.2.1. Emergency Response Procedure

One of the first activities of the emergency response stage is to develop an Emergency Response Procedure/Plan. The next section will introduce some experiences on the Emergency Response Procedure of some organizations in the world, including Vietnam.

NT Recycling Solutions (NTRS) has developed an Emergency Response Procedure for hazardous spill/incident that details the requirements for managing and cleaning up of spills i.e. chemical, fuel or waste oil spills/leaks that may occur (NTRS, 2015). The procedure includes parts: i) Purpose and scope, ii) Process, iii) Spill management, iv) Notification and further management, and v) Spill clean-up.

In the late 1980s, following various industrial accidents that occurred around the world resulting in adverse impacts on the environment and loss of life, the UNEP suggested a series of measures to help governments and communities, particularly in developing countries, minimize the occurrence and harmful effects of technological hazards and environmental emergencies. Often impacts can be reduced if the immediate local level response is effective. UNEP developed, with the support and involvement of a range of countries' competent national emergency management policy authorities and in cooperation with industry, a Handbook on Awareness and Preparedness for Emergencies at Local Level (APELL) - A Process for responding to technological accidents (1st ed., 1988). The second edition of that Handbook was published in 2015, on A process for improving community awareness and preparedness for technological hazards and environmental emergencies (UNEP, 2015). This process is illustrated in the Figure 4.

Figure 4. Appell process



Santos, an Australian energy pioneer has developed an emergency plan that includes the followed content (Santos GLNG):

1. Introduction
2. Roles and responsibilities
3. Legal and other requirements
4. Emergency Environmental Incidents in the Santos GLNG upstream area
5. Emergency preparedness framework
6. Emergency response actions
7. Evaluation and review

In Vietnam, the article 78 of the Law on Occupational Safety and Health requires all businesses to have Emergency response plans including the followed contents (Vietnam National Assembly, 2015):

1. Based on the risks of occupational accidents and diseases at the workplace and the legal framework, employers must develop emergency response plans at the workplace.
2. Emergency response plans must comprise major contents as follows:
    a. Plans on evacuating workers from dangerous areas;
    b. Emergency and first-aid measures for victims;
    c. Measures to prevent and overcome consequences caused by incidents;
    d. Response facilities; and,
    e. Response forces at site; plans to collaborate with external forces; and drill plans.

The Centre for Environment Safety Response (Vietnam) has prepared and published a template of Emergency response plan that should include the followed content (Center for responding to Environmental Safety incidents, 2017):

1. Describe and classify emergencies;
2. Procedures to rescue the situation;
3. Internal and external resources for emergency response;
4. Contact addresses, notifications and emergency reports;
5. Emergency training and practice; and,
6. Work restoration plan.

2.2.2.Roles and responsibilities of the various interested stakeholders

Disasters or emergencies can occur quickly and with very little warning. They may cause a number of casualties and disruption. In case of an emergency, those involved or affected by the accident should:

2.2.2.1. Industrial business

Chemical, oil or other toxic spills

In the event of a chemical, oil or gas leak, the individuals who caused or discovered the spill are responsible for warning others and if trained and equipped to clean it up.

1 - Isolate the contamination

- Immediately alert area occupants and supervisor, and evacuate the area, if necessary;
- Isolate the area. Close laboratory doors and windows;
- Turn off ventilation;
- Protect floor drains or other means for environmental release. Spill socks and absorbents may be placed around drains, as needed.

2 - Contaminated individuals

Attend to any people who may be contaminated. Contaminated clothing must be removed immediately and the skin flushed with water for no less than fifteen minutes. Clothing must be laundered before reusing.

3 - Clean up

- Choose appropriate personal protective equipment (e.g., goggles, face shield, impervious gloves, lab coat, apron or coveralls, and boots);
- Control the spill: Use recommended spill cleanup methods and materials, and the need for personal protective equipment (e.g., respiratory protective equipment, gloves, protective clothing, etc.);
- Once the spilled materials have been absorbed, use a brush and scoop to place materials in an appropriate container;
- Control sources of ignition and ventilate the area; and,
- Decontaminate the surface where the spill occurred using a mild detergent and water, when appropriate.

Natural disasters

In the event of a natural disaster, it is necessary to secure businesses and protect tanks and equipment from damage, as well as workers.

1 - Secure area

- Secure the building. Cover windows and close doors;

- Cover and move equipment/furniture to a secure area;
- Always protect your data with backup files. If dependent on data processing, consider keeping backups at an alternative site (an “off-site” location);
- Make provisions for alternative communications and power;
- Make plans to resume work with limited resources (water/power); and,
- Store emergency supplies at the office.

2 - Protect employees

- Employee safety comes first!
- Prepare, distribute and exercise a Business Continuity Plan.
- Consider providing shelter to employees and their families, and helping them with supplies after a disaster event;
- Establish a meeting point for employees in the event of a building or office evacuation;
- Establish a call-down procedure for warning and post-storm communications;
- Provide photo IDs to staff; and,
- Prepare a list of vendors to provide disaster recovery services.

2.2.2.2. Communities

The general procedures for those involved are the same for natural disasters and environmental accidents. If someone is on site of an environmental accident, move away from fire, smoke, and the smell of gas.

General response procedures:

1-Identify the hazard and assets

Following an environmental accident, it is important to identify the hazard and its dangers. Is it dangerous to inhale? Is it going to explode? Are pathways blocked with polluted water or rain? This assessment should include:

- What is the hazard?
- What safety measures are needed? (to take cover, to remove yourself, to cover mouth);
- What is the need in this situation? (to save lives, protect health or to stabilize the situation);
- Identify necessary resources (a place to take cover, a cloth, etc.)
- What is the nature or scale of the emergency? Is there a need for external assistance? Make a decision on whether local capacity is adequate or assistance is needed; and,
- Are there any disaster warnings or emergency instructions? Identify possible information about the situation, notifications from response people, etc.

2- Assets an emergency plan

- If people are safe at the facility:

  - Go inside and find the safest room;
  - Secure family members and bring to the safest room;
  - Bring pets inside;
  - Close all windows and doors (including, doors to rooms, such as the laundry room, etc.);
  - Turn off ventilation systems (conditioners, etc.)
  - Bring the emergency kit to safe room;
  - Fill bathtubs and large containers with water to have a water supply;
  - Turn on the radio in order to get vital information about the emergency;
  - Do not call emergency contacts unless in case of an emergency; and,
  - When everything is clear, open all windows and doors in order to ventilate the facility.

- If people are not safe at the facility and evacuation is necessary, or ordered by the authorities:

  - Secure themselves and family members;
  - Turn on the radio and listen for emergency alert situations, evacuation routes or other information;
  - If there is time, close doors and windows at the facility, turn off ventilation systems, gas, electricity and water;
  - Follow the evacuation plan as instructed in the emergency plan or on the radio;
  - Take the emergency kit;
  - Take records and emergency information for children, and bring special equipment or medication, if people have such;
  - Leave a note on the door with information of where the family is and lock the door;
  - Do not call emergency contacts (for example in Vietnam: 115) unless in case of an emergency; and,
  - Go calmly, but firmly to the evacuation facilities.

Flood emergency response

In any case:

- Go to higher ground, this can be a second floor;
- Be aware of streams, drainage channels or other places that can flood suddenly;
- Close your doors and windows; and,

- Turn off the main switch and disconnect electrical appliances. Do not touch the electrical equipment if you are wet or standing in water.

If people have to evacuate or receive instructions to evacuate:

- Be careful. Do not walk in moving water. Even 15 cm can make people fall down. If they have to go through, try to find water that is still. Use a stick to check the firmness of the ground.
- Do not drive in flooded areas. If you come to a road that is flooded, do not drive through. Turn around and find another way.

Afterwards:

- Avoid floodwater. The water may be contaminated by oil, gas or sewage. It can also be electrically charged from fallen power lines;
- Avoid moving water;
- Be aware, roads may have weakened from the flood and can collapse under the weight of a car;
- Stay away from fallen power lines;
- Stay away from buildings surrounded by floodwater. Be careful of buildings in general, they can have hidden damage and collapse.

Tropical storms (hurricane, tsunami, typhoons, etc.) emergency response

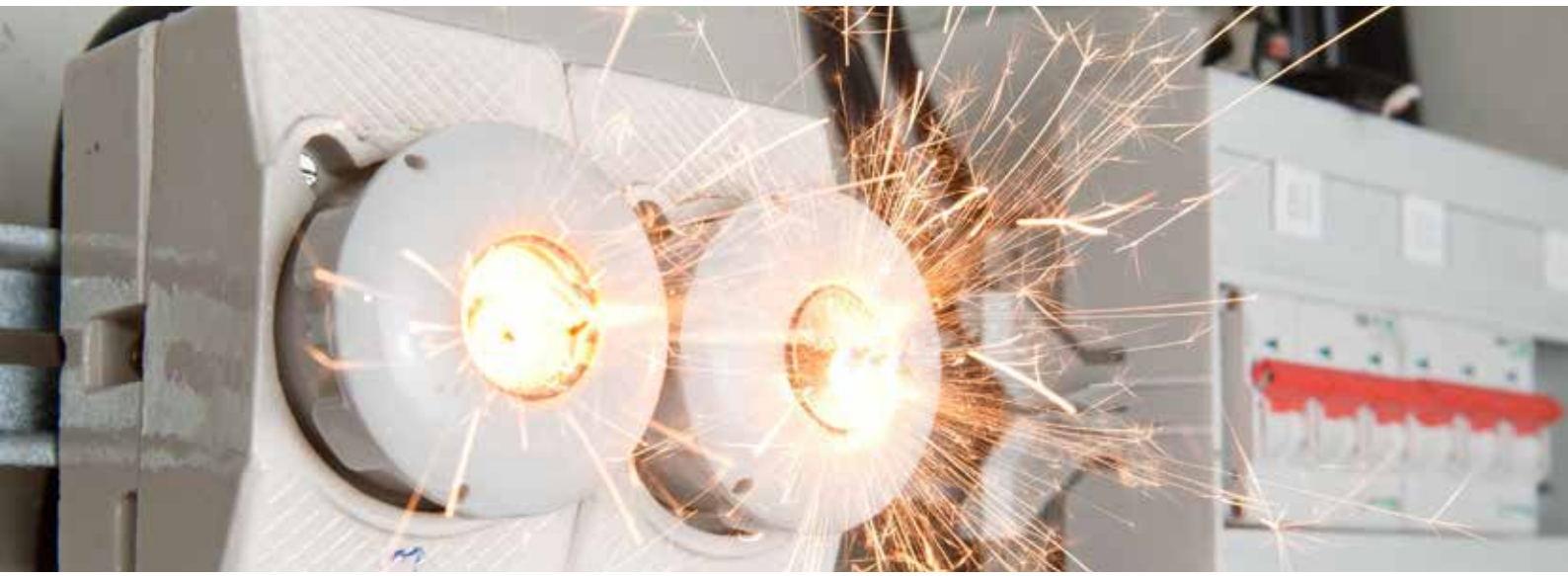
- Get to the highest ground and as far inland as you can. Every foot inland or upward may make a difference. People should be able to reach the highest ground possible on foot within 15 minutes;
- DO NOT wait for evacuations orders, as soon as residents see any natural signs of a tropical storm, they should evacuate to higher ground; and,
- Be aware of secondary hazards, such as collapsing buildings, weak infrastructure, landslides, flooding, etc.

Afterwards:

- Listen to local alerts and authorities for information on areas to avoid and shelter locations;
- Avoid wading in floodwater, which can contain dangerous debris. Water may be deeper than it appears;
- Be aware of the risk of electrocution. Underground or downed power lines can electrically charge water. People should not touch electrical equipment if it is wet or if they are standing in water; and,
- Stay away from damaged buildings, roads, and bridges.

Poisonous material emergency response

- Find a save space and close doors and windows;
- Seal openings and air intakes with wet towels;



- Turn off ventilation and air conditioners;
- Move away from windows to the center of the house or basement; and,
- Check phone or radio for further information.

If residents are caught in or near a contaminated area:

- Move away immediately in a direction upwind of the source; and,
- Find shelter as quickly as possible.

Afterwards:

- Listen to local alerts and authorities for information on areas to avoid and shelter locations;
- When the danger is over, ventilate the building by opening windows and doors; and,
- Avoid water. Oil, gas or chemicals may contaminate the water.

2.2.2.3. Local authorities

Disaster response is a multi-sectorial endeavor. The disaster management consists of different resources, such as the local community, fire fighters, poison center, healthcare center, non-government organizations, people' organizations and voluntary groups. International cooperation is also helpful, such as weather and tropical storms forecasting, warning systems, technology as a source of information and disaster management. It is necessary that:

- Early warning systems and monitoring are established;
- There is an increased level of awareness and capability in the community to the impacts of disasters;

- The local community is equipped with the necessary skills and capability to handle the impact of disasters;
- Comprehensive national and local emergency plans and response polices, plans and systems are in order and available;
- A strong partnership and coordination among all key players; and,
- Well-established and tested disaster response operations, search operations, rescue and evacuation operations.

Challenges:

Sometimes, different agencies will overlap and to some extent compete about the disaster management after the immediate relief is secured. The local structures tend to be marginalized by international organizations. This undermines the disaster management instead of developing the capacity of the local organizations to carry out the disaster management.

Natural Disasters

Emergency procedures:

- Identification and assessments
    - Information on the incident: what type of emergency, where is it, when did it happen?
    - How extended is the emergency: How many people are injured or affected by the disaster?
    - What is the situation? Has the disaster caused landslides, floods, etc.?
    - Which resources are needed in order to control the situation? Is the site secure, does it has sheltering or is evacuation needed?
    - Assess the emergency resources. Is further assistance needed, such as fire fighters, hospitals, etc.? and,
    - Inform the public, if needed.
- Effective relief:
    - Coordinate an emergency plan that focuses on,
        i. Reducing the threat to human lives; and,
        ii. Protect against further environmental damage.
    - Help those affected by the natural disaster to recover from the immediate effects, such as needs of food, clothing, shelter and medical care;
    - Evacuate, if needed; and,
    - Coordinate the different resources: Fire department, responders, etc.

- Secondary hazards:
  - Control secondary hazards, such as fire, fallen buildings, etc.;
  - Restore infrastructure, water supply, and electricity, etc.;
  - Clean up the site when the ideate danger is over; and,
  - Continue communication with the public about contaminated areas, need for evacuation, safety procedures, etc.
- Evacuation and healthcare:
  - Provide facilities for people to get healthcare; and,
  - Facilitate effective coordination, such as emergency vehicles.
- Evaluation:
  - Get an overview of the situation and short/long term consequences for the public health and the environment;
  - Evaluate the situation and emergency response;
  - Incorporate important lessons learned from the experience into the emergency plans;
  - Improve the planning, coordination, response, recovery, etc.; and,
  - Develop training programs, request resources needed, information or other.

Environmental accidents

In case of an environmental accident, there should be emergency response procedures both locally and nationally depending on the extent of the emergency. The procedure should include the followed items:

1. Identification and relevant information

The response should identify the hazard and assess the needs for local or national help centers and safety measures.

- Information on the incident: what type of emergency, where is it, when did it happen?
- Identify the hazard: what type of contamination occurred? Chemical, gas or infection?
- How extended is the emergency: How many people are contaminated, injured or exposed? What are their symptoms, and how serious is it? What is needed, antidotes or first aid?
- Seek information from specialists about health effects, technical details and safety measures;
- What is the situation? Which resources are needed in order to control the situation? Is the site secure? Does it have shelter or is evacuation needed?
- Assess the emergency resources, is further assistance needed, such as fire fighters, and poison center? and,
- Inform the public, if needed.

2. Health risks assessment

- Review health effects or contamination/exposure in cooperation with experts;
- Identify the affected areas and populations (exposed, victims, etc.);
- Consider collecting data from the exposed people, animals or the environment; and,
- Start to make a register of exposed and symptomatic individuals.

3. Emergency plan

- Coordinate an emergency plan that focus on:

  i.Reducing the threat to human lives;

  ii.Protect against further environmental damage;

- Coordinate the different resources: Fire department, poison center, and responders, etc.;
- **First,** the biological, chemical or radiation hazards need to be contained.
- Control the situation, contain the contaminated areas and set up barriers and warnings; and,
- **Then** bring victims to a treatment center and hospitals, etc.

4. Secondary hazards

- Control secondary hazards, such as fire, fallen buildings, etc.;
- Restore infrastructure, water supply, and electricity, etc.;
- Clean up the site when the ideate danger is over; and,
- Continue communication with the public about contaminated areas, need for evacuation, and safety procedures, etc.

5. Evacuation and healthcare

- Provide facilities for people to get healthcare;
- Protect evacuation sites from contamination;
- Facilitate effective coordination, such as emergency vehicles; and,
- Follow up on the people effected by the contamination.

6. Evaluation

- Get an overview of the situation and short/long term consequences for the public health and the environment;
- Evaluate the situation and emergency response;
- Incorporate important lessons learned from the experience into the emergency plans;

- Improve the planning, coordination, response, recovery, etc.; and,
- Develop training programs, request resources needed, information or other.

Box 7: Summary - Differences in emergency procedures for natural disasters and environmental accidents

Natural disasters	**Environmental**
Immediate help	Containment of contamination/ pollution
Evacuation	Warnings and barriers
Control secondary hazards	Bring victims to healthcare center
Facilitate healthcare center	Evacuation

2.3. Protocols for notifications to the authorities: bodies and compensation

Under this section, the report introduces the Protocol for notifications to the authorities of the Environmental Protection Agency (EPA) of New South Wales and EPA of Ireland.

EPA of New South Wales prescribes Duty to notify pollution incidents and Protocol for industry notification of pollution incidents (EPA, 2010).

Why notify?

Leaks, spills and other pollution incidents can harm the environment. Each of the following response agencies needs to be informed of pollution incidents quickly, so action can be coordinated to prevent or limit harm to the environment and human health generally.

What must be notified?

Pollution incidents causing or threatening material harm to the environment must be notified.

Licensed premises

If the EPA licenses the activity causing the incident, the license conditions may include incident notification requirements.

Emergency response

If a pollution incident occurs, all necessary action should be taken to minimize the size and any adverse effects of the release. If the incident presents an immediate threat to human health or property, Fire and Rescue NSW, the NSW Police and the NSW Ambulance Service should be contacted first for emergency assistance - phone 000. The other response agencies must still be contacted afterward to satisfy notification obligations.

Contaminated land

Persons whose activities have contaminated land and owners of land who become aware, or ought reasonably to be aware, that the land has been contaminated must notify the EPA, as soon as practicable after becoming aware of the contamination and if the contamination meets certain criteria. A person has a duty to notify if that person ought reasonably to have been aware of the contamination.

Who must notify?

The following people have a duty to notify a pollution incident occurring in the course of an activity that causes or threatens material harm to the environment.

- The person carrying on the activity;
- An employee or agent carrying on the activity;
- The employer carrying out the activity; and,
- The occupier of the premises where the incident occurs.

Notifications must be given immediately after the person becomes aware of the incident. Only persons engaged in the activity resulting in the pollution incident, and occupiers of the land where the incident occurs, have a duty to report the incident.

Who do people tell (relevant authorities)?

Pollution incidents posing material harm to the environment should be notified to each 'relevant authority' as the followed:

- the appropriate regulatory authority (ARA);
- the Environment Protection Authority (EPA) if they are not the ARA;
- the Ministry of Health;
- SafeWork NSW (formerly WorkCover);
- the local authority, e.g. the local council, if this is not the ARA; and,
- Fire and Rescue NSW.

What information should provide?

In general, sufficient detail of the incident must be reported to enable appropriate follow-up action. Any required information that is unknown at the time the incident is reported, must be notified immediately once it becomes known.

Incriminating information

A person must notify even though the notification might incriminate the person. However, the notification is not admissible in evidence against the person for an offence. This qualification does not relate to any evidence obtained following or in result of the notification.

Checklist

Could a spill or leak associated with actual activity harm the environment? If so,

- Are the people carrying out the activity, including casual or shift workers, or contractors, aware of their duty to notify?
- Do they know whom to notify?
- Is the need for notification signposted or otherwise incorporated into operation and emergency procedures?

Complying with these notification requirements does not remove the need to comply with any other obligations for incident notification, for example, those that apply under other environment protection legislation or legislation administered by Safework NSW.

In the Guidance to Licensees/certificates of authorization (COA) holders on the Notification, Management and Communication of Environmental Incidents (EPA, 2010), EPA of Ireland advises that a licensee/COA holder prepare and maintain an environmental emergency response procedure (ERP). The ERP should be activated where

necessary in responding to incidents. As part of the ERP, the Environmental Manager is required to ensure that at a minimum the following action is taken:

- Contact the Emergency Response Agencies and the Environmental Protection Agency to communicate the incident details;
- Be available to take calls regarding the incident;
- Keep apprised of the on-going situation in order to determine the appropriate level of response from staff;
- Provide and support the technical response to the incident;
- Ensure that suitable safety precautions are in place regarding any on-site response;
- Provide and support the monitoring and analytical response;
- Advise on notifications to the public and other agencies;
- Advise on remedial action necessary including preventative action (i.e. potable water supplies); and,
- Ensure compliance with the incident notification conditions of the license.

Compensation

Following a disaster, victims can be compensated for the damage. Compensation programs focus on individual compensation and community rebuilding. It includes:

- Identification of the dead;
- Final arrangements for the dead;
- Management of the missing persons; and,
- Management of the bereaved families.

The British Columbia State of Canada has introduced legal provisions regarding post-disaster compensation (Emergency Program Act- Compensation and disaster financial assistance regulation) (Government of Canada, 1995), including the following:

Part 1 — Compensation

Part 2 — Disaster Financial Assistance

Division 1 — Interpretation

Division 2 — Acceptance of Claim

Division 3 — Limits on Payment of Assistance on Accepted Claims

Division 4 — Process for Payment of Assistance

Part 3 — Disaster Financial Assistance for Local Government Body

Division 1 — Interpretation

Division 2 — Acceptance of Claim

Division 3 — Limits on Payment of Assistance on Accepted Claims

Division 4 — Process for Payment of Assistance

The Department of Disaster Management (DDM) of the Government of Virgin Islands has set up the Disaster/ Emergency Fund to assist citizens and residents who were greatly affected by any major emergency/disaster and are unable to recover rapidly. Following a thorough review of all claim documents submitted by the affected party, in addition to the investigation report prepared by the DDM, the Disaster/Emergency Fund Committee will make a decision in regards to compensation. If approved, funds will be disbursed for essential items ONLY. Relief assistance may take the following forms: Food relief; shelter or emergency accommodation grant; material or equipment for livelihood, such as in fisheries and agriculture; medical assistance; and financial grants (Government of the Virgin Islands). The process includes four steps:

Step 1: Customer completes and submits the Emergency Relief & Assistance Form to the DDM.

Step 2: The claimant or a suitable representative would be required to attend the site-visit conducted by the DDM.

Step 3: The claim is prepared and then submitted to the Disaster Fund Committee for consideration.

Step 4: Claimants are notified directly by the Disaster Fund Committee of whether or not their claims have been accepted and the decision of the Committee.

Box 8: Example of lengthy litigation

After the Exxon Valdez oil spill in Alaska in 1989, the affected communities waited nearly two decades for their compensation for the damage caused by the spill (Murphy, K. 2008).

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Annex: Questions for your evacuation plan

Below are prepared questions to help you build a plan of evacuation, and to test your community's awareness of the risks and procedures:

Industrial business

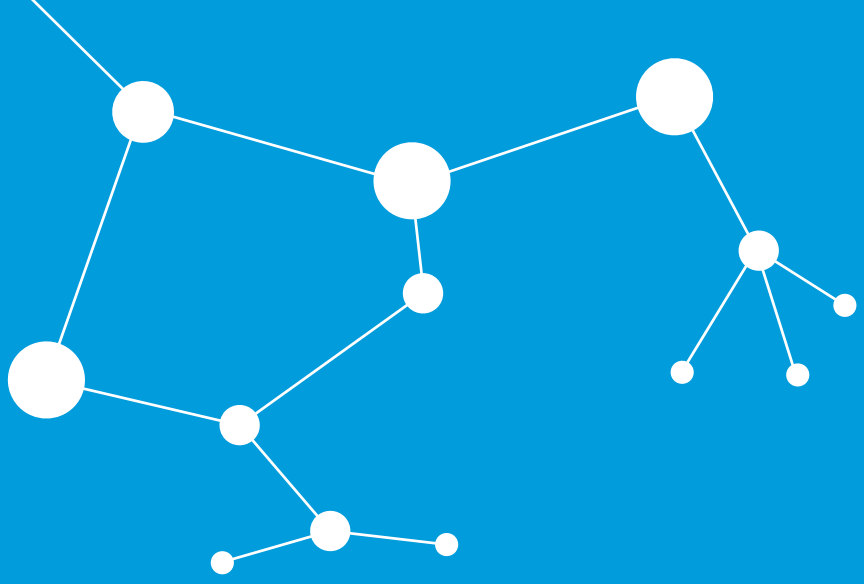
1. Describe the types of hazards most likely to affect your community;
2. Identify possible hazards with most severe impact;
3. Describe a disaster's effects in a community;
4. Identify a disaster's potential public health consequences;
5. Describe lines of authority and organizational relationships and show how all actions will be coordinated;
6. Explain how to prepare and respond to a natural disaster of your choice step-by-step;
7. Which challenges could you meet? How will you overcome them?
8. What route (and several alternatives) will you use to evacuate? Do you have transportation?
9. Explain how to prepare and respond to an environmental disaster of your choice step-by-step;
10. Which challenges could you meet? How will you overcome them?
11. Discuss your answers in a group.

Community

1. Identify the roles and responsibilities for community preparedness;
2. Describe the types of hazards most likely to affect your community;
3. Identify possible hazards with most severe impact;
4. Identify susceptible locations in the community for specific hazards: people, buildings, and infrastructure;
5. Describe potential disaster impacts on people, health, and infrastructure;
6. Describe lines of authority and organizational relationships and show how all actions will be coordinated;
7. Explain how to prepare and respond to an environmental disaster of your choice step-by-step;
8. Which challenges could you meet? How will you overcome them?
9. Discuss your answers in a group.

Public

1. Describe different categories of disasters;
2. Give examples of natural disasters;
3. Give examples of environmental accidents;
4. Describe a disaster's effects in a community;
5. Identify a disaster's potential public health consequences;
6. Which disasters are most likely to happen in your community?
7. What are the local alerts and warning systems?
8. What are the local evacuation routes?
9. Where do you get critical information during an emergency?
10. Explain how to prepare and respond for a natural disaster of your choice step-by-step;
11. Which challenges could you meet? How will you overcome them?
12. Where will you meet family members? You should have a location outside the house and another location outside the neighborhood;
13. What route (and several alternatives) will you use to evacuate? Do you have transportation?
14. Discuss your answers in a group.



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