



Mainstreaming **DISASTER RISK REDUCTION** in the Philippines

TEACHER / STUDENT MODULES
Science 1



Mainstreaming
DISASTER
RISK REDUCTION
in the Philippines

TEACHER / STUDENT MODULES
Science 1

FOREWORD

In response to the recurrent impacts of disasters in the country, the Department of Education initiated mainstreaming disaster risk reduction in education in 2007, together with the National Disaster Coordinating Council-Office of Civil Defense.

The initiative is one of the components of the project Mainstreaming Disaster Risk Reduction into Development Policy, Planning, and Implementation in the Education Sector Project (MDRD-EDU), which aims to inculcate resilient attitude among students, teachers, and the community where they belong. The project is envisioned as a sustained collaboration towards the realization of a global mission to reduce disaster impacts in the country through the education system.

Lesson exemplars and teacher/student modules on DRR have been developed for the secondary curriculum. Contained in the lesson exemplars are strategies and methods of teaching disaster risk reduction through modules on natural hazards in Science and in Araling Panlipunan for Grade 7 (First Year High School).

These lesson exemplars and modules are trailblazing efforts of participating agencies, which are mostly members of the NDCC and the MDRD-EDU TWG, motivated by the goal to educate our school children on the different kinds of hazards and how to respond to each of these when the need arises and to create a multiplier effect which will benefit the communities where they live.

The Department of Education would like to acknowledge the cooperation and assistance of all the agencies involved in the preparation of the lesson exemplars and teacher/student modules. We especially thank the Asian Disaster Preparedness Center (ADPC), the United Nations Development Programme (UNDP), and the European Commission Humanitarian Aid department (ECHO) for sponsoring the project and for the printing of these valuable materials.

JESLI A. LAPUS
Secretary

June 2009

INSTITUTIONALIZING DISASTER RISK REDUCTION IN THE CURRICULUM

The Philippines' geographic setting makes it vulnerable to geologic and hydrometeorological hazards. The country has more than 300 volcanoes, 22 of which are considered active or have had a record of eruption in the last 10,000 years. The country is also surrounded on both sides by active subduction zone systems, which generate large magnitude, and at times, tsunamigenic earthquakes. The archipelago is also cut by numerous active fault systems that cause seismic hazards. About 20 earthquakes are recorded per day while at least one damaging earthquake occurs per year. In terms of hydrometeorological hazards, tropical cyclones bringing strong damaging winds and heavy rains cross through the archipelago at an average of 20 per year, causing flash floods and at times landslides.

The education sector is vulnerable to the various hazards that frequently besiege the country. The destruction of school buildings and facilities, as well as educational materials, at the eventuality of disasters often results in suspension of classes, disrupting the learning process of students. On the other hand, teachers are overburdened in the aftermath of disasters as they are often volunteers and caregivers, as well as heads of evacuation committees. Furthermore, schools in the Philippines are primarily used as evacuation centers during disasters. As such, school facilities suffer damages due to a large number of evacuees. The use of school buildings, which are not designed to be emergency shelters, puts further strain on the already limited educational resources of most schools in disaster prone areas in the country.

The perennial effects of disasters on students and teachers in the country have led the Department of Education (DepEd) and the National Disaster Coordinating Council (NDCC) to undertake Mainstreaming Disaster Risk Reduction (DRR) in Education as a priority program. The program started its initial phase in January 2007. The second phase was implemented from September 2008 to December 2009 in partnership with the Asian Disaster Preparedness Center (ADPC) and the United Nations Development Programme (UNDP), with the support of the European Commission on Humanitarian Aid department (ECHO).

The technical working group (TWG), formed in 2007 includes Department of Education (DepEd), National Economic and Development Authority (NEDA), the Department of Finance (DOF), and the National Disaster Coordinating Council (NDCC). The TWG initiated the development of DRR lesson exemplars and modules for Grade 7 (First Year High School) for Science and Social Studies subjects. The modules serve as reference materials for students and teachers while the lesson exemplars serve as guides for teachers in the delivery of their lessons.

Both the lesson exemplars and the teacher/student reference materials were reviewed and enhanced by the expanded TWG members on 14-17 April 2009. The TWG members, aside from DepEd and NDCC-OCD, that

contributed to the enhancement of the modules in this document, include the following:

Department of Health (DOH)
Department of Public Works and Highways (DPWH)
Department of Science and Technology (DOST)
Philippine Institute of Volcanology and Seismology (PHIVOLCS)
Philippine Atmospheric, Geophysical, and Astronomical Services
Administration (PAGASA)
Department of Environment and Natural Resources (DENR)
Mines and Geosciences Bureau (MGB)
National Mapping and Resources Information Authority (NAMRIA)
Office of the Presidential Adviser on Global Warming and Climate
Change (OPACC)
Philippine Information Agency (PIA)
Technical Education and Skills Development Authority (TESDA)

The modules provide an understanding of a number of hazards, i.e. definition, causes, and related hazards they bring, as well as information on what to do before, during, and after a disaster. Modules included in this document are:

Heat Wave
Fire
Landslide
Earthquake
Volcanic Eruption
Tornado
Tropical Cyclone
Floods
Storm Surge
Disaster Supply Kit
Family Disaster Plan

The integration of these materials in the teaching of Science 1 aims to build the resilience of students and teachers in the face of hazards. The transfer and acquisition of knowledge between teachers and students is vital in the creation of a culture of prevention, safety, and resilience that extends to communities as students are transformed from being victims of disasters to agents of disaster risk reduction.

Contents

HEAT WAVE 1

- What is a heat wave? 1
- What causes heat waves? 1
- What are the hazards of heat waves? 2
- Is the Philippines prone to heat waves? 3
- How can we reduce heat wave-related disasters? 3

FIRE 5

- What is fire? 5
- What causes fires? 5
- What are fire-related hazards? 5
- Is the Philippines prone to fire hazards? 5
- How can we reduce fire-related disasters? 5

LANDSLIDE 9

- What is a landslide? 9
- What natural factors cause landslides? 10
- What are landslide-related hazards? 11
- Is the Philippines prone to landslides? 11
- How can we reduce landslide-related disasters? 11

EARTHQUAKE 14

- What is an earthquake? 14
- What are earthquake-related hazards? 15
- Is the Philippines prone to earthquakes? 15
- How can we reduce earthquake-related disasters? 15

VOLCANIC ERUPTION 19

- What are volcanoes and what causes them to erupt? 19
- What are volcanic hazards? 20
- Is the Philippines prone to volcanic hazards? 22
- How can we reduce disasters related to volcanic eruptions? 22

TORNADO 24

- What is a tornado? 24
- What causes tornadoes? 24
- What are tornado-related hazards? 24
- Do tornadoes occur in the Philippines? 25
- How can we reduce tornado-related disasters? 25

TROPICAL CYCLONE 28

What is a tropical cyclone? 28

What causes tropical cyclones? 28

What are the associated hazards of tropical cyclones? 28

Is the Philippines prone to tropical cyclones? 30

How can we reduce tropical tyclone related disasters? 30

FLOODS 32

What are floods? 32

What causes floods? 32

How can we reduce flood related disasters? 33

STORM SURGE 34

What is storm surge? 34

What causes storm surges? 34

Who are likely to be affected by storm surges? 35

DISASTER SUPPLY KIT 36

What Is a Disaster Supply Kit? 36

Involving Children in Disaster Preparedness 36

 Tips in Preparing a Disaster Supply Kit 36

Disaster Supply Kit 37

 Basics 37

 Evacuation Supplies 37

 Other Supplies 38

Building a Makeshift Toilet 38

Tips on Water Storage 38

Tips on Storing Food 39

First Aid Kit 40

Important Documents 40

FAMILY DISASTER PLAN 41

Four Steps to Safety 41

What to Tell Children 43

Media and Community Education Ideas 44

Evacuating your Family 44

After a Disaster 45

For People with Disabilities 47

HEAT WAVE

Figure 1



A period of abnormally and uncomfortably hot and unusually humid weather.

What is a heat wave?

Heat wave is a prolonged period of extremely hot weather. While qualifying hot weather condition as a heat wave varies from one location to another, there are some basic elements that are common to all. First, the weather is noticeably warmer than is considered normal for the time of year and the climate. Second, the unusual weather continues for a period of time sufficient to be considered a wave or a phase. Third, the weather is likely to bring about some type of increased risk to people and other living things.

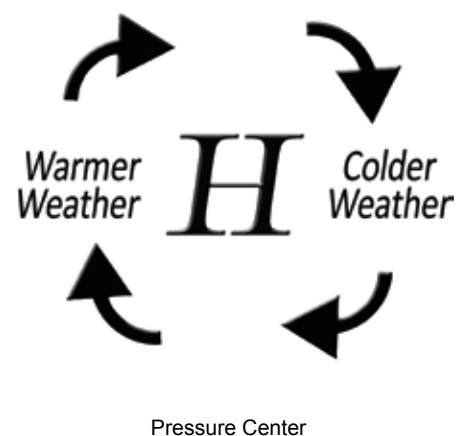
In some locations, the weather condition must persist for a minimum of three calendar days before the phenomenon is classified as a wave. In other countries, a twenty-four hour period of unusually warm weather is already considered as such.

Figure 2

What causes heat waves?

In general, the main cause of heat waves is related to the positioning of the jet stream. Jet stream refers to a current of fast moving air found in the upper levels of the atmosphere. The air found on one side of the jet stream is likely to be much warmer than on the opposite side (see illustration).

Fair weather generally accompanies a high pressure center and winds flow clockwise around a high pressure center (as illustrated in Figure 2). This means that winds on the back (western) side of the high pressure center (as illustrated in Figure 2) are generally from a southerly direction and typically bring warmer temperatures. On the front (eastern) side of a high pressure center (as illustrated in Figure 2), winds are generally from the north and this typically results in colder temperatures (ww2010.atmos.uiuc.edu).



Heat waves are formed when a mass of air becomes stationary over a region. If the high pressure in the region is characterized by low precipitation, the air and ground are heated to temperatures above the normal range. If the cloud cover remains thin and there is no sufficient precipitation (such as rain) to cool the air and ground, a heat wave is likely to develop. The frequent and widespread occurrence of heat wave is generally associated with climate change.

What are the hazards of heat waves?

Heat can have serious effects on people's health and physical well-being. The body normally cools itself by sweating. But under certain conditions, sweating may not be enough. When a person is exposed to excessive heat for a relatively long period, a person's body temperature rises rapidly. Very high body temperatures may damage the brain and other vital organs.

Several factors affect the body's ability to cool itself during extremely hot weather. When the humidity is high, sweat will not evaporate as quickly, preventing the body from releasing heat quickly. Other conditions that can limit the ability to regulate temperature include obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and alcohol use. Elderly people and infants are also more susceptible to heat-related illnesses. (www.medicinenet.com)

Below are some heat-related illnesses.

Table 1

Heat-related Illnesses	Definitions / Descriptions	Management / Preventive Measures
Hyperthermia	Known also as heat stroke, occurs during periods of sustained high temperature and humidity	Taking prescription medications that improve the body's ability to dispel heat
Heat Edema	A transient swelling of the hands, feet, and ankles resulting from an increase in water retention	No treatment is required.
Heat Rash	Maculopapular rash accompanied by acute inflammation; blocked sweat ducts which may develop to dermatitis secondary to bacterial infection	Wearing of loose-fitting clothing in the heat
Heat Cramps	Painful, often severe, involuntary spasms of the large muscle group used in strenuous exercise	Rehydration with fluids containing salt provides rapid relief.
Heat Syncope	A spontaneous loss of consciousness related to heat exposure; produces orthostatic hypotension (abnormally low blood pressure)	Rehydration therapy; avoid standing in the heat for long period of time, deep knee bending movements can help promote venous blood return.
Heat exhaustion	A condition referring to body dehydration or water loss due to heat.	Definitive therapy includes removing patients from the heat and replenishing their fluids.

The earth's ecology is also affected by heat wave and other manifestations of global warming. Below are some of its effects on the environment.

Table 2

Effects on Environment	Definitions	Preventive Measures
Forest Fire	Natural or human-caused fires that burn forest vegetation	Dissemination of information about the adverse effect of forest fires by the government.
Excessive Drought	Condition of abnormally dry weather within a geographic region where some rain might usually be expected	Construction of reservoirs to hold emergency water supplies, education to avoid over-cropping and over-grazing, and programs to limit settlement in drought-prone areas

Is the Philippines prone to heat waves?

The Philippines has not experienced heat wave. The country has marked high temperatures of 38°C - 42°C as of 2002 but it was not sustained. It lasted only for a day at the maximum. The phenomenon is characterized by high temperatures sustained for a period of time. The highest recorded atmospheric temperature in the Philippines is 42.2°C in Tuguegarao, Cagayan. It occurred on 29 April 1912 and 11 May 1969. (CLIMATOLOGICAL EXTREMES AS OF 2002, Climate Data Section, Climatology and Agrometeorology Branch, PAGASA-DOST, July 2004)

Although the Philippines has no recorded phenomenon of heat wave yet, the nation must be prepared for its eventuality. El Niño has been happening more often now. Preparedness is the key to overcome this disaster.

How can we reduce heat wave-related disasters?

Develop a heat wave preparedness plan. Many people are unaware of heat wave hazards and risks. Learn what heat hazards may occur and plan accordingly. Different areas have different risks associated with prolonged heat. Contact PAGASA for information and the Office of Civil Defense or the Philippine National Red Cross chapter for assistance.

- A. Develop a Community/School/Family Heat Wave Preparedness Plan. (See page 41.)
- B. Assemble a Disaster Supply Kit. (See page 37.)
- C. Prepare your homes.
 - Install window-type air conditioners properly. Insulate spaces around air conditioners for a tighter fit. An air conditioner with a tight fit around the windows or wall openings will make less noise and allow less hot air from the outside.
 - Insulate your houses properly. This will help you conserve electricity and reduce your house's power demands for air conditioning. Cover the joints of your doors and windows with a strip of material to keep cool air inside. This allows the inside temperature to stay cooler longer.
 - Check air-conditioning ducts for proper insulation. Insulation around ducts prevents cool air from leaking and keeps it directed through the vents.
 - Cover your windows. Hang shades, draperies, and canopies on windows to block the rays of the sun. Outdoor canopies can reduce the heat entering the house by as much as 80 percent.
 - Use fans. Although fans do not cool the air, they help sweat to evaporate, which gives a cooling effect.

D. What to do during extreme heat

- Slow down. Avoid strenuous activity. Reduce, eliminate, or reschedule strenuous activities. High-risk individuals should stay in cool places. Get plenty of rest to allow your natural “cooling system” to work. If you must do strenuous activity, do it during the coolest part of the day, usually in the morning between 4:00 A.M. to 7:00 A.M. Many heat emergencies are experienced by people exercising or working during the hottest part of the day.
- Avoid too much sun. Sunburn slows the skin’s ability to cool itself. Use a sunscreen lotion with a high sun protection factor (SPF).
- Postpone outdoor games and activities. Extreme heat can affect the health of athletes, staff, and spectators of outdoor games and activities.
- Avoid extreme temperature changes. A cool shower immediately after coming in from hot temperatures can result in hypothermia, particularly for elderly and very young people.
- Stay indoors as much as possible. If air conditioning is not available, stay on the lowest floor of the house.
- Keep heat outside and cool air inside. Close any air passage that may allow heat inside. Install temporary reflectors, such as aluminum foil or cardboards, on windows and skylights to reflect heat back outside.
- Conserve electricity. During periods of extreme heat, people tend to use a lot more power for air conditioning. Turn off other electric appliances to reduce the chances of a community-wide outage.
- Vacuum air conditioning filters weekly during periods of high use. Air condition filters can become clogged or filled with dirt, making them less efficient. Keeping them clean will allow your air conditioner to provide cooler air.
- If your home does not have air conditioning, go to a public building with air conditioning. Schools, libraries, theaters, and other community facilities provide refuge during hot days. Air conditioning provides the safest escape from extreme heat.
- Wear loose-fitting, lightweight, and light-colored clothing. Lightweight, light-colored clothing reflects heat and helps maintain normal body temperature. Cover as much skin as possible to avoid sunburn.
- Protect face and head by wearing a wide-brimmed hat. A hat will keep direct sunlight off your head and face.
- Take frequent breaks if you must work outdoors. Breaks help people tolerate heat better.
- Use buddy system when working in extreme heat. Exposure to heat can sometimes cloud judgment. Having a partner ensures that you have someone to assist you when needed.
- Drink plenty of water. Too much exposure to the sun results in dehydration. Water is the safest liquid to drink during heat emergencies.
- Avoid drinks with alcohol or caffeine in them. They can make you feel good initially, but make the heat’s effect on your body worse. This is especially true with beer, which dehydrates the body.
- Eat small meals but eat more often. Large, heavy meals are more difficult to digest and require more body heat to aid digestion, worsening overall conditions. Avoid foods that are high in protein, such as meat and nuts, which increase metabolic heat.
- Avoid using salt tablets unless directed by a physician. Salt causes the body to retain fluids. Salt affects parts of your body that help you sweat and keep you cool. Persons on salt-restrictive diets should check with a physician before increasing salt intake.

FIRE

What is fire?

Fire is the result of the burning of materials. It releases heat, light, and other by-products like carbon monoxide and water.

What causes fires?

The majority of fatal fires (roughly 80 percent) occur at nighttime when people are asleep. Two out of every five fire incidents are started accidentally by children while majority of arson fires are caused by juveniles.



Smoking is the leading cause of residential fires in the Philippines.

What are fire-related hazards?

The leading cause of death in a fire is asphyxiation, with a 3:1 ratio over burns. Asphyxiation is the condition of being deprived of oxygen. Fire consumes the oxygen in the air, while increasing the concentration of deadly carbon monoxide and other toxic gases in the atmosphere. Inhaling carbon monoxide can cause loss of consciousness or death within minutes.

Fire generates a black, impenetrable smoke that blocks vision and stings the eyes. The smoke makes it difficult to navigate through fire. The secondary cause of death in a fire is burns. The heat from a hostile fire, which can reach to 1,100 degrees Fahrenheit is beyond what the human body can endure.

Is the Philippines prone to fire hazards?

Home fires are common in the Philippines. They rank as the primary cause of death among children under the age of 15 and are considered as the fifth leading cause of injury and unintentional death. Approximately 900 adults die in fire accidents annually.

How can we reduce fire-related disasters?

- A. Develop a Community / School / Family Disaster Preparedness Plan. (See page 41.)
- B. Assemble a Disaster Supply Kit. (See page 37.)

C. Protect your property.

- *Consider having one or more working fire extinguishers in your home.* There are three home fire extinguisher ratings: “A” rated extinguishers are for wood or paper fires only; “B” rated extinguishers are for flammable liquid and grease fires; and “C” rated extinguishers are for electrical fires. You can get fire extinguishers that have multiple ratings. An extinguisher rated A-B-C is recommended for home use. Smaller fire extinguishers are designed for one-time use and cannot be recharged.
- *Get training from the fire department or a fire extinguisher manufacturer on how to use your fire extinguisher.* Fire extinguishers from various manufacturers operate in different ways. Unless you know how to use your extinguisher, you may not be able to use it effectively. There is no time to read directions during an emergency. Only adults should handle and use extinguishers.

How to use a Fire Extinguisher

Figure 3



P - Pull the pin

A - Aim the extinguisher hose at the area of the fire.

S - Squeeze trigger while holding the extinguisher upright.

S - Sweep the extinguisher from side to side covering the area of the fire with the extinguishing agent.



- *Install extinguishers high on the wall, near an exit and away from heat sources.* Extinguishers should be easily accessible to adults trained to use them but must be kept away from children’s curious hands. Heat may make the contents less effective or cause the extinguisher to lose its charge more quickly.
- *If you try to use a fire extinguisher on a fire and the fire does not immediately die down, drop the extinguisher and get out.* Most portable extinguishers empty in eight to ten seconds. People have been found dead with fire extinguishers near them or in their arms.
- *Ensure that your fire extinguisher is properly charged.* Fire extinguishers will not work if they are not properly charged. Use the gauge or test button to check proper pressure. Follow manufacturer’s instructions for replacing or recharging fire extinguishers. If the unit is low on pressure, or if it is damaged or corroded, replace it or have it professionally serviced.
- *If smoke alarms are not already in place, install them.* Smoke alarms cut your chances of dying in a home fire nearly in half. Smoke alarms sense abnormal amounts of smoke or invisible combustion gases in the air. They can detect both smoldering and flaming fires.
- *Keep matches and lighters up high, away from children, preferably in a locked cabinet.* Children are fascinated by fire and may play with matches and lighters if they are not kept out of reach. Instruct older children to tell an adult right away if they find them or see someone playing with fire, matches, or lighters.

D. What to do before a fire

- *Draw a floor plan of your house; mark two fire escape routes.* It is easy to become disoriented when there is thick, dark, and heavy smoke. Creating a floor plan with two routes greatly helps everyone understand the safest routes during an emergency.
- *Consider escape ladders for sleeping areas on the second or third floor.* Learn how to use them, and store them near the window. If main escape routes via stairs are blocked by smoke or fire, the windows may be your only alternative. Escape ladders permit quick exits, reducing time spent in smoke-filled, toxic environments while waiting for firefighters.
- *Burglar bars and locks that block outside window entry must be easy to open from the inside.* If a key is required to open bars or locks, keep a key near each window to use for fire escape. Quick-release devices are available for security bars. If smoke or fire is blocking the main exit, you must be able to use your alternate routes quickly. Fire deaths have occurred when people were trapped by security bars and were unable to get out and firefighters were unable to get in.
- *Practice a crawl-low escape from your bedroom.* Fires produce many toxic gases. Some are heavy and will sink low to the floor; others will rise, carrying soot towards the ceiling. Crawling with your head at a level of one to two feet above the ground will temporarily provide the best air. Close doors behind you.
- *Practice evacuating blindfolded.* In a real fire situation, the amount of smoke generated by a fire will most likely affect your vision.
- *Practice getting out of your home during the night.* Fire can happen any time. Practicing your routes at night will help you move quickly should fire occur at night.
- *Practice stop, drop, and roll (Figure 4).* Know how to stop, drop, and roll in case your clothes catch on fire. Stop what you are doing, drop to the ground, cover your face, and roll back and forth until the flames are extinguished. Running will only make the fire burn faster. Practicing makes the actual response more of an appropriate



Figure 4

What to do during fire

reaction, requiring less thinking time during an actual emergency situation. Children have a tendency to confuse this message with messages about escaping from a fire, so make sure that they understand that “stop, drop, and roll” is to be used only when clothing catches on fire. Once the flames are out, cool the burned skin with water for 10 to 15 minutes and get medical attention.

E. What to do during a fire

- *If a fire starts in your home or you hear the smoke alarm, yell “Fire!” several times and go outside right away.* Smoke alarms go off because there is enough smoke and toxic gas to cause harm. Yell to let people know the emergency is real, and they

should get out. If you live in a building with elevators, use the stairs. Never try to hide from fire. Leave all your things where they are and save yourself.

- *If your escape route is filled with smoke, use your second escape route.* It is very hard to find your way through thick, heavy smoke. Using your second escape route will provide a safer alternative.
- *If you must exit through smoke, crawl low under the smoke to your exit.*
- *Close doors behind you as you escape to delay the spread of the fire.*
- *If you are escaping through a closed door, feel the door, cracks, and doorknob with the back of your hand before opening the door.* If it is cool and there is no smoke at the bottom or top, open the door slowly. If you see smoke or fire beyond the door, close it and use your second way out. If the door is warm, use your second way out. It is a natural tendency to automatically use the door, but fire may be right outside. Feeling the door will warn you of possible danger. The back of your hand is more sensitive to heat than the palm or fingers.
- *If smoke, heat, or flames block your exit routes and you cannot get outside safely, stay in the room with the door closed. Open the window for ventilation, and hang a sheet outside the window so firefighters can find you.* If there is a phone in the room, call the fire department and tell them where you are. Seal doors and vents with duct tape, towels, or sheets to keep smoke from entering the room. Wait by the window for help. The first thing firefighters will do when they arrive at a fire scene is to check for trapped persons. Hanging a sheet out will make it easier for them to find you.
- *Get out as safely and quickly as you can.* The less time you are exposed to poisonous gases, heat, or flames, the safer it is for you.
- *Once you are outside, go to your meeting place and then send one person to call the fire department.* Gathering in a specific location outside of your home will quickly let you know who are trapped inside.
- *Once you are out, stay out.* Children are often concerned about the safety of their pets so discuss this issue before a fire starts. In many cases, pets are able to get out on their own. Many people are overcome by smoke and poisonous gases while trying to rescue others, pets, or possessions. No one should go into a burning building except a trained firefighter who has proper breathing apparatus and protective clothing.
- *Firefighters are our friends, and they will help in case of a fire.* Visit a fire station to help ease children's fears. A fire suit and mask are often frightening and children may try to hide from a firefighter in full protective gear.

F. What to do after a fire

- *Give first aid where needed.* After calling for assistance, cool and cover burns. This will reduce the chances of further injury or infection. Immediately seek medical help for those who are seriously injured or who are suffering from burns.
- *Stay out of fire-damaged homes until local fire authorities say it is safe to re-enter.* Fire may have caused damage that could injure you or your family. There may be residual smoke or gases that are unsafe to breathe.
- *Look for structural damage.* Fire authorities may allow you to re-enter, but may not have completed a thorough inspection. Look for damage that will need repair.
- *Check that all wirings and utilities are safe.* Fire may cause damage inside walls and to utility lines.
- *Discard food that has been exposed to heat, smoke, or soot.* The high temperatures of fire and its by-products can make food unsafe.

LANDSLIDE

What is a landslide?

Landslide is a general term for the slow to very rapid mass movement of soil, rock, and debris earth materials downslope. It is caused by certain geological conditions and is triggered by events such as rainfall and earthquake. Certain human activities may also cause landslides.

In the Philippines, a number of landslides are reported almost every year. Among the prominent landslide events include the mud flow at Brgy. Punta in San Francisco, Southern Leyte in December 2003 which occurred following continuous heavy rains. In February 2006, another major landslide virtually wiped out the whole village of Brgy. Guinsaugon in St. Bernard, Southern Leyte.



Landslide covering the entire barangay in Brgy. Guinsaugon, St. Bernard, Southern Leyte, Feb. 2006

There are six common types of landslides / mass movements in the Philippines.

1. **creep** – a very slow downslope movement of soil or unconsolidated debris (See Figure 5.)
2. **slump** – downward movement along a curved surface of loosely consolidated earth materials (See Figure 6.)

Figure 5 CREEP LANDSLIDE

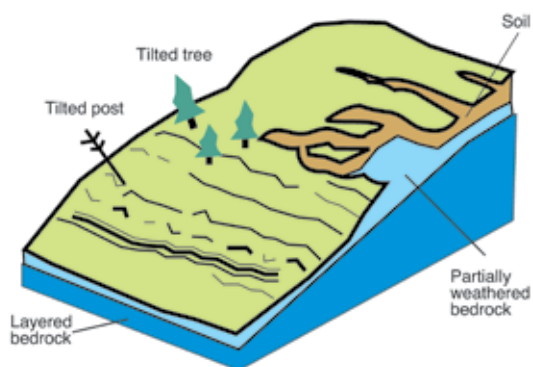
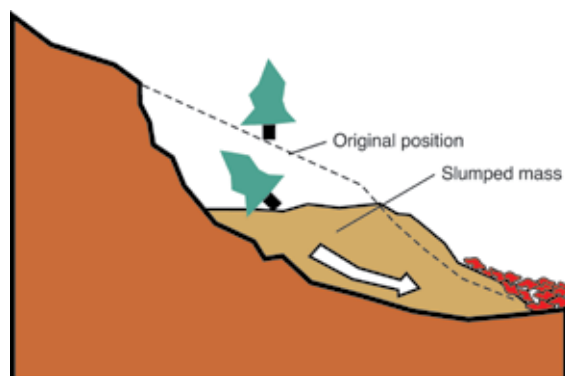


Figure 6 SLUMP LANDSLIDE



3. mud flow / debris flow – a relatively fast moving, water-saturated mass of unconsolidated materials such as soil, mud, and rock fragments (See Figure 7.)

4. rock fall – breaking off and free falling of rock from a cliff (See Figure 8.)

Figure 7 MUD/DEBRIS FLOW

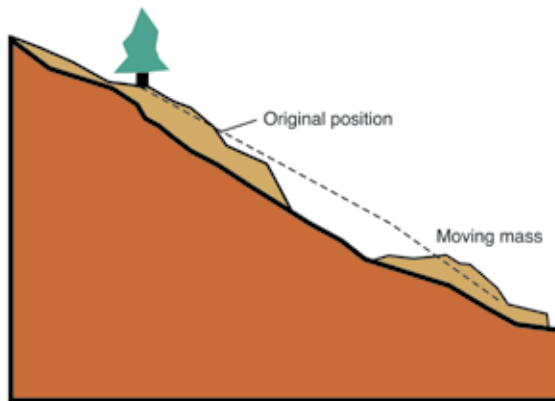
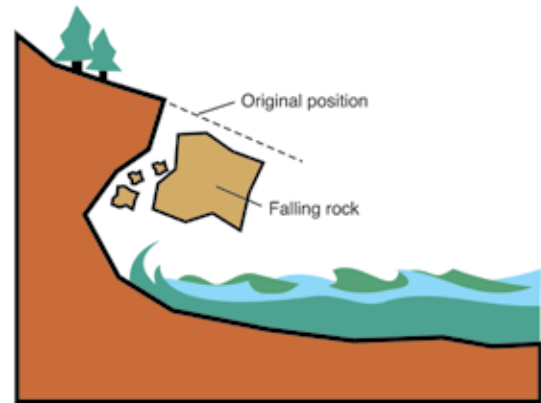


Figure 8 ROCK FALL



5. debris slide – a rapid downward movement of comparatively dry, unconsolidated earth materials (See Figure 9.)

6. complex slide – a combination of two or more types of landslides (See Figure 10.)

Figure 9 DEBRIS SLIDE

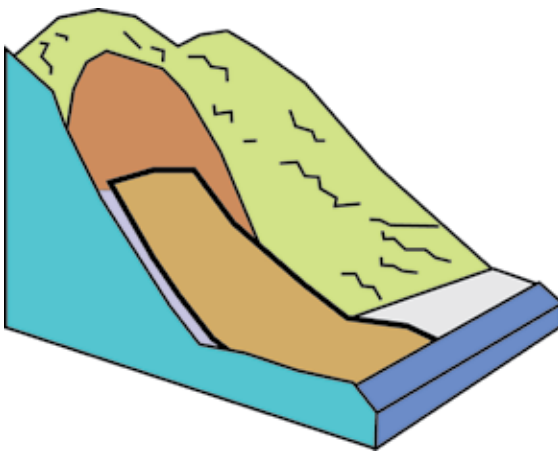


Figure 10 COMPLEX SLIDE



What natural factors cause landslides?

- Weight of the slope
- Weak soil and rock strength due to fracture and composition
- Poor soil cohesion
- Steep slopes
- Shallow rooted vegetation
- Rapid soil erosion

Most slides result from a combination of these factors. They are triggered by heavy rainfall and/or earthquake.

What are landslide-related hazards?

The annual damages to property, infrastructure, and livelihood brought about by landslides in the Philippines amount to approximately P2 billion. Globally, landslides cause billions of money in damages and millions of deaths and injuries each year.

Is the Philippines prone to landslides?

Landslides are natural hazards common in the Philippines because of its setting. Geologically, the Philippines is within an active region where earthquakes are a common occurrence. Geographically, the country lies within the path of typhoons. Both earthquakes and typhoons are triggering mechanisms for the occurrence of landslides.

Areas susceptible to landslides are those situated in existing or old landslide areas and at the foot of steep slopes. Settlements located at or near the mouth of rivers and the base of steep road cuts are susceptible to landslides as well. Conversely, sites that are typically considered safe from landslides are those that are on relatively gentle to flat-lying areas situated some distance away from steep slopes and natural drainage systems.

How can we reduce landslide-related disasters?

Many people are unaware of landslide hazards and risks. Learn whether landslides of any type have occurred in your area by inquiring either from your local and community officials such as the Parish Social Action Centers (SAC), Barangay Officials, or the MGB-DENR (Mines and Geosciences Bureau-DENR) office near you. If your property is in a landslide-prone area, seek help or advice from a government geologist, preferably from MGB, or any private geologist knowledgeable about the area. Contact your local officials – BDCC (Barangay Disaster Coordinating Council), MDCC (Municipal Disaster Coordinating Council) or PDCC (Provincial Disaster Coordinating Council) to better understand landslide preparedness.

A. Develop a Community/School/Family Landslide Preparedness Plan. (See page 41.)

B. Assemble a Disaster Supply Kit. (See page 37.)

C. What to do before intense storms

1. Determine whether landslides have occurred in your area by contacting local officials, local geologists and geologists from DENR MGB, and other government agencies. Being familiar with the condition of your area will help you assess your risk to landslide.
2. Watch the patterns of storm-water drainage on slopes near your home, and especially the places where runoff water

INTENSE STORM



converges. This increases the flow over soil-covered slopes. Watch the hillsides around your home for any signs of land movement, such as small landslides or debris flows, or progressively tilting trees. Observing these small changes could alert you to the potential of a greater landslide threat.

3. You are in hazard areas if you can detect possible slope failure or mass movement. Following are some signs of mass movement:
 - doors or windows jam for the first time.
 - new cracks appear on plaster, tile, brick, or foundations.
 - outside walls, walks, or stairs begin pulling away from the building.
 - slowly developing, widening cracks appear on the ground or on paved areas such as streets or driveways.
 - fences, retaining walls, utility poles, or trees tilt or move.
 - water or bulging ground appears at the base of a slope.
4. To know the activities and programs of your local officials, interview the local planning engineers in your municipality. Ask them about land-use planning and zoning regulations in the area.

D. What to do during intense storms

1. Stay alert and awake. Many debris-flow fatalities occur when people are sleeping. Listen to portable, battery-powered radio or television for warnings of intense rainfall. Be aware that intense, short bursts of rain may be particularly dangerous, especially after longer periods of heavy rainfall and damp weather.
2. If you are in areas susceptible to landslides, consider leaving only if it is safe to do so. Remember that driving during an intense storm can be hazardous. If you remain at home, move to a second story if possible.
3. Listen for any unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together. A trickle of mudflow or debris flow may precede larger landslides. Moving debris flows quickly and sometimes without warning. Staying out of the path of a landslide or debris flow saves lives.
4. If you are near a stream or creek, be alert for any sudden increase in water flow. Check if water flow changes from clear to muddy. Such changes may indicate landslide activity upstream, so be prepared to move quickly. Do not delay! Save yourself, not your belongings.
 - Be especially alert when driving. Embankments are particularly susceptible to landslides. Watch the road for collapsed pavement, mud, fallen rocks, and other indications of possible debris flows.

E. What to do before a landslide

1. Monitor the signs of an impending landslide. These include:
 - leaning door jambs and windows
 - cracks in concrete floors and walls
 - open spaces between walls and stairs
 - cracks in roads which gradually increase in size
 - misalignment or snapping of buried pipes
 - bulges on the ground at foot slopes – emergence of spring or seepage
 - leaning trees, poles, and retaining walls
 - rumbling sound which increasingly becomes louder
2. Monitor the daily weather condition.
3. Know the location of your evacuation centers and escape routes.
4. Get involved with the disaster risk management programs of your Barangay Disaster Coordinating Council (BDCC).

- F. What to do if you suspect a landslide occurrence
1. Contact your local fire, police, or public works department. Local officials are the best persons to assess potential danger.
 2. Inform affected neighbors. Your neighbors may not be aware of potential hazards. Advising them of a potential threat may help save lives.
 3. Evacuate. Getting out of the path of a landslide or debris flow is your best protection. Once you and your family are safe, check if you can help neighbors who may need assistance to evacuate.
- G. What to do during a landslide
1. When caught indoors and there is no time to evacuate, stay inside and hide under a sturdy and stable object like a table.
 2. When caught outdoors, stay away from the path of the landslide and go to the nearest higher ground away from the landslide.
 3. Run towards the direction of the back of the trees or buildings when you see approaching rock and soil debris.
 4. If it seems impossible to avoid the landslide, assume a fetal position and cover your head.
- H. What to do after a landslide
1. Stay away from the landslide area. Secondary landslides and flooding can occur.
 2. Know if there are casualties or people trapped near the landslide area, and report to proper authorities. Initiate rescue operations if capable.
 3. Listen to radio or television for the latest bulletin about the landslide.
 4. Inspect power and water supply lines for damages and inform proper authorities.
 5. Consult experts on landslides for additional information and advice.

For Adults

1. Check for injured and trapped persons. Do not enter the slide area. Direct rescuers to their locations.
2. Check building foundations and surroundings for damages. Damages to foundations and surroundings help you assess the safety of the area.
3. Replant damaged ground as soon as possible. Erosion caused by loss of ground cover can lead to flash flooding.
4. Seek the advice of a geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk. A professional will be able to advise you on the best ways to prevent or reduce landslide risk, without creating further hazards.
5. Seek advice of a government agency like DENR with experts for evaluating landslides hazards or designing corrective techniques to reduce landslide risk.

EARTHQUAKE

What is an earthquake?

An earthquake is a weak to violent shaking of the ground produced by the sudden movement of rock materials. They are sometimes accompanied by natural hazards like landslides, flashfloods, fires, and tsunamis. Earthquakes occur due to natural causes such as volcanic eruption or as a result of human activities like bombing. Earthquakes usually happen in areas where they have already occurred in the past.

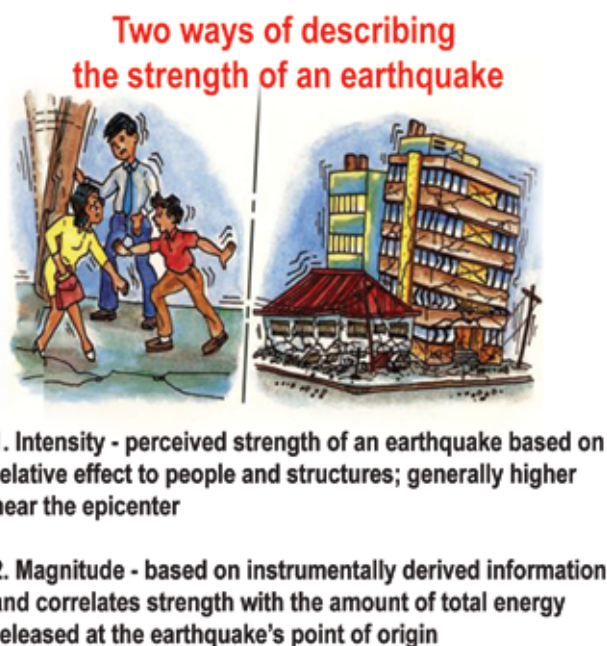
The source of an earthquake is called **focus**. It is the exact location within the earth where seismic waves are generated by sudden release of stored elastic energy. The **epicenter** is the point on the earth's surface directly above the focus.

Magnitude refers to the energy released by the earthquake at the focus. An instrument called a seismograph measures the shaking of the ground during an earthquake. It is seen as a series of wave-like patterns on a seismogram (seismograph record). The greater the shaking of the grounds, the larger the wave-like patterns in the seismogram. Scientists refer to seismograms to calculate the magnitude of an earthquake. An earthquake event has only one magnitude value. It is expressed in Arabic numbers, with 2.0-2.9 considered as "very minor" and 8.0 and up as "great."

Intensity refers to the descriptive scale of strength of an earthquake. Intensity is based on perceived effects and observed damages. It is determined by going to the affected areas, observing the damages, and recording the experiences of the people. The amount of damage is not the same for every area. It is generally higher near the epicenter. An earthquake event may have more than one intensity value, expressed in roman numerals (e.g. IV, VIII). In the Philippines, the PHIVOLCS Earthquake Intensity Scale (PEIS) is used. The PEIS denotes intensity I as "scarcely perceptible" and intensity X as "completely devastating."

Aftershocks are weaker earthquakes that follow the main shock and can cause further damage. They can occur in the first hours, days, weeks, or even months after the main shock. Be aware that some earthquakes may actually be foreshocks, and a stronger earthquake might still occur.

Figure 11





EARTHQUAKE IN THE PHILIPPINES

What are earthquake-related hazards?

Most earthquake-related injuries and casualties result from toppled walls, broken glass, fallen objects, and in cases of high intensity earthquakes, collapsed buildings. People trying to move drastically during the shaking may also incur injuries.

Extreme ground shaking from earthquakes can cause major damages. Buildings, bridges, and other infrastructures with foundations resting on unconsolidated, water-saturated landfill tend to slide during high intensity earthquakes. The same is true for structures that are erected on loose sediments such as sand and silt. Buildings that are poorly constructed and made of substandard materials may suffer more damage. Water, electric, and telecommunication services are prone to disruption as earthquakes can topple down posts and cut off wirings. When an earthquake occurs in a populated area, it can cause injuries, deaths, and extensive damage to properties.

Is the Philippines prone to earthquakes?

In the past 35 years the Philippines has been affected by 10 earthquakes with magnitudes greater than 7.0. Hence, the likelihood of these destructive earthquakes occurring again in the future is indeed very strong.

At least five earthquakes per day occur in the Philippines. Based on the distribution of earthquake epicenters, the most seismically active part of the country is its eastern section (eastern Mindanao, Samar, and Leyte) with an average of 16 perceptible earthquakes per year. This is due to active subduction processes going on along Philippine Trench. The other relatively active parts are found at the eastern side of northern Luzon and the area in the vicinity of Lubang Island and Mindoro. The presence of the East Luzon Trough, Casiguran Fault, and northern segment of the Philippine Fault Zone all make the places at and near Dingalan Bay and Casiguran Sound earthquake prone. The high frequency of earthquakes in the offshore areas of Lubang Island and northern Mindoro may be due to complicated tectonics characterized by faulting.

How can we reduce earthquake-related disasters?

Many people are unaware of the earthquake hazards and risks in their communities. Learn whether your area is at risk of earthquake hazards by contacting the Philippine Institute of Volcanology and Seismology (PHIVOLCS) or your local disaster management office. Ask for historical information on earthquake occurrences in your area. Gather material on earthquake preparedness.

- A. Develop a Community / School / Family Earthquake Preparedness Plan.
(See page 41.)
- B. Assemble a Disaster Supply Kit. (See page 37.)
- C. Protect your property.
- *Secure objects inside the house and classroom.* Bolt book shelves, china cabinets, and other tall furniture to the walls. Anchor high or top-heavy objects. Brace appliances like televisions, refrigerators, and computers. During an earthquake, these items can fall over, causing damage or injury.
 - *Install strong latches or locks on cabinets.* The contents of cabinets can fall out during an earthquake, which may cause injuries. Latches and locks will prevent cabinets from flying open and contents from falling out.
 - *Place large, heavy objects and fragile items (glass or chinaware) on lower shelves.* There will be less damage and fewer chances of injury if these items are stored properly.
 - *Store pesticides, toxic chemicals, and flammable products securely in closed cabinets with latches at the bottom shelves.* Such materials will be less likely to create harmful situations like fire and spillage when stored in lower and confined locations.
 - *Hang heavy items (such as picture frames and mirrors) firmly and away from beds, couches, and sitting areas.* Earthquakes can knock things off the walls, causing damage or injury.
 - *Support overhead light fixtures.* Overhead light fixtures are the most common items to fall and break.
 - *Strap water heaters to the wall.* The water heater may be your best source of drinkable water following an earthquake; hence, it should be safe from damages and leaks.
 - *Protect gas appliances.* After an earthquake, broken gas pipes frequently create fire hazards.
 - *Install flexible pipe fittings to avoid gas or water leaks.* Flexible fittings will be less likely to break.
 - *Repair any deep cracks in ceilings or foundations.* Get expert advice if there are signs of structural defects. Earthquakes can turn cracks into ruptures and create bigger problems.
 - *Check to see if your house is bolted to its foundation.* Houses bolted to their foundations are less likely to be severely damaged during earthquakes. Houses that are not bolted may slide off from their foundations, and may no longer be habitable.
 - *Have your house or office building evaluated by the City or Municipal Engineer.* Ask about house repair and strengthening tips for exterior features, such as porches, sliding glass doors, canopies, carports, and garage doors. Learn additional ways on how you can protect your house and reduce the risk of damage.
 - *Strictly comply with standard engineering specifications, building codes, and proper land use plans* that regulate construction of human settlements, public and private infrastructures along areas which cross or are near active faults. PHIVOLCS recommends at least five-meter buffer zones from both sides of an active fault. The National Structural Code of the Philippines (NSCP) has been enacted to protect lives and properties from structural failures brought about by earthquakes.

D. What to do during an earthquake

- If you are indoors during an earthquake, do the “drop, cover and hold” position. Get under a sturdy table, desk or bench. Cover your head and hold on to the table, desk or bench. Be aware of what is happening in your surroundings. If there is no table, desk or bench nearby, sit down against an interior wall and protect your head. An interior wall is less likely to collapse than a wall on the outside shell of the building. Select a safe place where objects will not fall on you, i.e., away from bookcases or tall, heavy furniture. **DO NOT RUN AND PANIC** while the shaking is going on. It is dangerous to run outside when an earthquake is ongoing because debris, roofing, glass fragments, and other materials may fall from buildings, which may cause injury. Wait in your safe place until the earthquake is over.
- Stay away from windows. Glass windows can shatter with force, causing injury.
- If you are in bed, hold on and protect your head with a pillow. You are less likely to be injured staying where you are. Broken glass on the floor has caused injury to those who have rolled to the floor or tried to get to doorways.
- If you are outside during an earthquake, move away from buildings, trees, street lights and power lines. Crouch down and cover your head. Many injuries occur within a few meters from the buildings as debris, roofing, glass fragments, and other materials can fall from buildings.
- If you are in a vehicle, pull over to a clear location, stop, and stay there with your seatbelt fastened until the shaking has stopped. Trees, power lines, posts, billboards, and other overhead items may collapse during earthquakes. Stopping will help reduce your risk, and a hard-topped vehicle will help protect you from flying or falling objects. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged.
- If you are in a coastal area, move to higher ground. Tsunamis are often created by undersea earthquakes.
- If you are in a mountainous area or near unstable slopes or cliffs, be alert for falling rocks and other debris that could be loosened by the earthquake. Landslides may be induced after strong earthquakes.

Figure 12

How to do the DROP, COVER, and HOLD



E. What to do after an earthquake

- Immediately leave the building and move outside to an open space **ONLY AFTER** the shaking has stopped. Check yourself for injury before checking on others. You will be able to help others more if you take care of yourself first. Do not try to move seriously injured people unless they are in immediate danger of further injury. Move carefully and watch out for things that have fallen or broken, creating dangers. Be ready for aftershocks.
- When leaving a building, use the stairs, **NOT** the elevator. The earthquake may have damaged the elevator; hence, it would be dangerous to use it in leaving the building. Also, one may be trapped inside the elevator if the electricity is suddenly cut off.

- When entering a building, use extreme caution. Building damage may have occurred where you least expect it. Carefully watch every step you take.
- Be on the lookout for fires. Fire is a secondary earthquake hazard primarily due to broken gas pipes, damaged appliances or electrical lines, and previously contained fires or sparks being released. Be aware whether or not there is an actual fire because fire alarms and sprinklers may be activated during or immediately after an earthquake. If possible, put out small fires quickly to prevent them from spreading. Otherwise, call the local fire stations immediately.
- Listen to a portable, battery-operated radio or television for emergency advisories and news updates. If the electricity is out, the radio may be your only source of information. Local radio and local officials provide the most appropriate advice for your particular situation.
- Use the telephone only to report life-threatening emergencies. Telephone lines are frequently overwhelmed during emergency situations. They need to be open and clear for urgent calls to get through.
- Watch animals closely. Restrain dogs and place them in a fenced yard. The behavior of pets may change dramatically after an earthquake. Normally quiet and friendly cats and dogs may become aggressive or defensive.
- Help neighbors who may require special assistance. Elderly people, pregnant women, young children, and those with special needs may require additional assistance.

Adults

- Inspect your house or building for any structural damage. Get everyone out if your structure is unsafe. Aftershocks following the main shock can cause further damage to unstable structures.
- Use battery-powered emergency lamps or flashlights to inspect your house. Kerosene lanterns, torches, candles, and matches may tip over and cause fire outbreak. Avoid smoking inside damaged buildings as it may ignite spilled flammables and leaked gas.
- Clean up spilled chemicals, bleach, gasoline, or other flammable liquids immediately.
- Check for gas leaks. If you smell gas or hear a blowing or hissing noise, close the gas valve, open the window, and quickly leave the building.
- Check for electrical system damage. If you see sparks or broken wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in a pool of water to get to the fuse box or circuit breaker, call an electrician first for advice.
- Check for sewage line and water pipe damages. If you suspect that the sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes.
- Open closet and cabinet doors cautiously. Contents may have been shaken during the earthquake and could fall, creating further damage or injury.
- Get help from professional engineers to examine walls, floor, doors, staircases, and windows to make sure that the building is not in danger of collapsing. Watch out for loose plaster, drywall, and ceilings that could fall.

VOLCANIC ERUPTION

What are volcanoes and what causes them to erupt?

A volcano is a vent, or a mountain from which magma (molten or hot rocks with gaseous materials) are ejected onto the earth's surface. Unlike other mountains, which are pushed up from below, volcanoes are built by surface accumulation of their eruptive products – layers of lava, fragmented rock materials, and ashes. When temperature and pressure from gases within the molten rock become too great, an eruption occurs. Volcanic eruption is the process wherein these volcanic materials are ejected from a volcano.

Classification of volcanoes (in the Philippines)

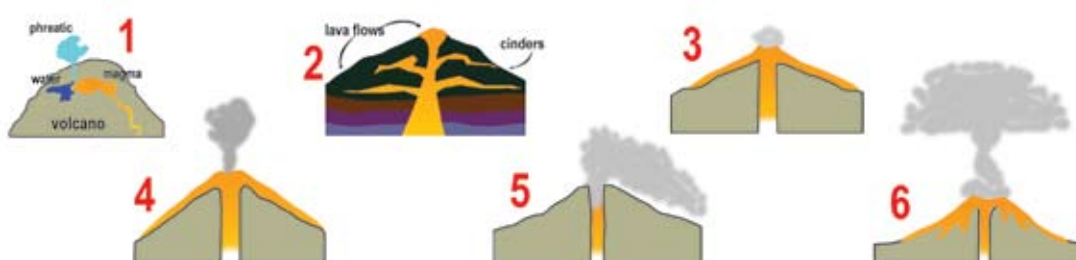
- active volcanoes – these are volcanoes that erupted within historical times (past 600 years), have oral or written historical accounts, and historical volcanic seismicity. They also erupted within the last 10,000 years, based on the age of volcanic rocks, which is determined through radiometric dating.
- potentially active volcanoes – these are volcanoes whose landforms are young-looking and have no record or proof of eruption.
- inactive volcanoes – these are volcanoes that have no record of eruption. The long period of inactivity is evident from weathering and erosion of deep and long valleys.

Types of volcanic eruptions: (See Figure 13.)

Eruptions can be relatively quiet, producing lava flows that creep across the land at a speed of 3-16 kilometers per hour. However, eruptions can also be violent and explosive, where columns of hot gases, rock fragments, and ashes are spewed hundreds to thousands of meters upward into the atmosphere, spreading ashes several kilometers downwind.

1. **Phreatic** – explosion driven by steam produced by heating and expansion of groundwater due to an underlying hot source
2. **Phreatomagmatic** – eruption resulting from simultaneous ejection of fresh magmatic materials and steam produced by the contact of groundwater with the ascending magma
3. **Strombolian** – weak to violent eruption characterized by fountain-like pouring of lava
4. **Vulcanian** – eruption resulting from sudden release of large quantities of accumulated magmatic gas which lifts fine ash and blocks from the magma
5. **Pelean** – eruption caused by the release of large quantities of gas from a near-or at-surface extremely viscous magma that hurls out ash and other pyroclastic materials
6. **Plinian** – very violent eruption characterized by voluminous explosive ejections of pumice and ash flows

Figure 13



Factors that affect the intensity of volcanic eruptions:

- magma composition
- viscosity of the magma
- gas content

Natural precursors of volcanic eruption:

- Seismicity – increase in frequency of volcanic earthquakes near and around the volcano with occasionally felt events, sometimes accompanied by rumbling sounds
- Changes in volcanic gas emissions - increase in steaming activity, sulfuric odor, and acid fumes
- Thermal changes – increase in caldera / lake / fumarole / hot spring temperature; development of new thermal areas and reactivation of old ones
- Ground deformation - detectable ground tilt and related movements, sometimes ground fissuring
- Gravity changes – changes in gravity values which may indicate movement of materials under the volcanoes
- Magnetic changes – decrease in magnetic intensity of rocks which may suggest an impending eruption; rocks lose their magnetic properties when heated
- Other changes – changes in the color and volume of steam emission, drying up of vegetation, and rock slides

What are volcanic hazards?

While volcanoes produce fertile soil, provide valuable minerals, water reservation, and geothermal resources, they also produce a wide variety of hazards that can claim lives and destroy properties.

Volcanic hazards are volcano-related phenomena that pose potential threats to man, property and the environment. There are two types of volcanic hazards: those that result directly from volcanic eruptions; and those that do not.

Hazards directly related to volcanic eruptions:

1. Lava Flows – streams of molten rock that either pour from a vent quietly or explosively like lava fountains. Lava flows destroy everything in their path. Because of their intense heat, lava flows are great fire hazards. Lava itself is not on fire; it glows because it is hot and in liquid form. The fire that appears to be with the lava is from the materials that come in contact with the hot lava. The speed at which lava moves across the ground depends on several factors, including the type of lava erupted, the steepness of the ground, and the rate of lava production at the vent.
2. Pyroclastic Flows – turbulent mass of fragmented materials (ash and rocks) mixed with hot gases that flow downslope at very high speed (30-700 kph).



- Ashfall or Tephra Fall – gravitational settling of volcanic ash and rock fragments from tall eruption columns and ash cloud of pyroclastic flows.

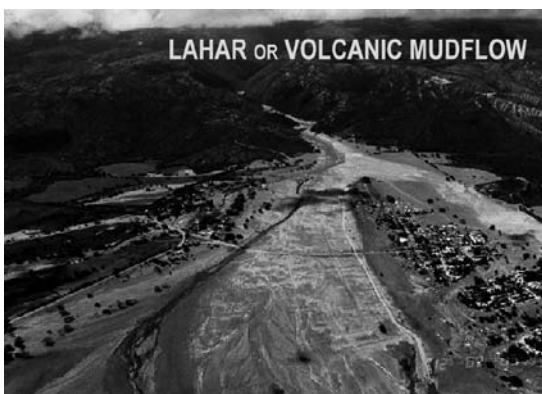
Volcanic ash consists of small bits of pulverized rock and glass less than two millimeters in diameter. It can affect people and properties up to hundreds of kilometers away from the volcano. It poses dangers to infrastructures such as collapse of roofs when ash accumulates on them. It contaminates water resources, destroys vegetation, and poses health hazards (e.g. respiratory disease) to humans and other animals when inhaled excessively. Suspended ash in the air can be a threat to jet engines and other types of aircraft.



- Volcanic gases – can cause acid rain. They can pollute the atmosphere, destroy vegetation, kill fishes and other animals. They can also cause deaths among humans when inhaled excessively.
- Fissuring – cracks on the ground due to movement of magma beneath the surface, and/or movement or adjustment along faults, accompanied by volcanic earthquakes.

Hazards indirectly related to volcanic eruptions:

- Lahar or volcanic mudflow and debris avalanche – Lahar is a rapidly flowing mixture of volcanic sediments (ash and other fragments lying on the slope of the volcano) and water.



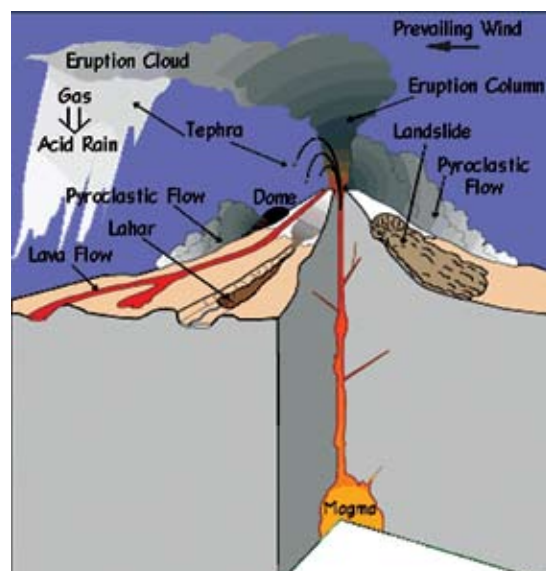
During heavy rains, the volcanic sediments are carried down the slopes by water as lahar. Lahar is considered as one of the deadliest volcanic hazards. The flow of lahar ranges from a speed of 30 kph to more than 80 kph. It can occur even when the volcano is at rest. Large-scale lahar threatens many communities near and around the volcanoes. Examples are the 1990 Mt. Pinatubo eruption and the 2006 Mayon Volcano eruption.

Figure 14

Volcanic eruption activity

On the other hand, volcanic landslide or debris avalanche is a downslope movement of volcanic flanks in large proportions. These flanks consist of different materials (e.g. mud, blocks of pyroclastic materials, trees, etc.) that are mixed together. Debris avalanche is a type of lahar.

- Tsunami – giant sea waves resulting from disturbance of the ocean floor. This is a result of underwater or near-shore volcanic eruption or earthquakes under the sea.



3. Secondary explosions – earthquakes, flash floods, and wild land fires may also accompany volcanic eruption.

Is the Philippines prone to volcanic hazards ?



The Philippines has more than 300 volcanoes, 23 of which are considered active, based on the recency of their eruptions. The six most active volcanoes are Bulusan, Hibok-Hibok, Kanlaon, Mayon, Pinatubo, and Taal. These are volcanoes that have repeatedly erupted.

Volcanoes usually give off warning signs of eruption. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) regularly monitors the six most active volcanoes. PHIVOLCS advises and alerts local officials and the public on possible volcanic activities.

How can we reduce disasters related to volcanic eruption?

Learn about the volcanic activity in your community. While volcanoes are located in specific areas, ash may be carried to larger distances during an explosive eruption. Contact your local emergency management office or PHIVOLCS for more information.

A. Develop a Community / School / Family Disaster Preparedness Plan (See page 41.)

B. Assemble a Disaster Supply Kit.

Volcanic eruption-specific supplies should include the following:

- A pair of goggles and dust mask for each member of the household, in case of ash fall
- Basic Disaster Supplies Kit
- Evacuation Supply Kit (See page 37.)



C. What to do during a volcanic eruption

- Be prepared for the different hazards that accompany volcanic eruptions and know how to respond properly to reduce risk. Follow the evacuation order issued by authorities and put your disaster plan into action.
- Although it may seem safe to stay at home and wait out an eruption, if you are within the permanent danger zone delineated by PHIVOLCS, doing so could be very

dangerous. The advice of local authorities is your best advice for staying safe and reducing risk.

- Avoid areas downwind and downstream river valley of the volcano. Downwind refers to the direction where the wind is blowing while downstream refers to the direction of the stream's current. Debris and ash are carried by wind and gravity. Avoid these areas for your safety.
- **If indoors:**
 - _ Close all windows and doors to keep volcanic ash from entering.
 - _ Put all machinery inside a garage to protect it from volcanic ash. If this is not possible, cover machinery with large tarps.
 - _ Bring animals and livestock into closed shelters to protect them from breathing volcanic ash.
- **If outdoors:**
 - _ If possible, try to seek shelter indoors.
 - _ If caught in a rock fall, roll into a ball (See Figure 15.) to protect your head and neck. A tight ball position will provide the best protection for your body. Your head and neck are more easily injured than other parts of your body.
 - _ If caught near a stream, be aware of mudflows, especially if you hear the roar of an approaching mudflow. Mudflows often accompany volcanic eruptions. Move quickly out of the path.



Figure 15

- Stay out of the area defined as permanent danger zone by PHIVOLCS. Effects of a volcanic eruption can be experienced several kilometers away from a volcano. Mudflows and flash floods, wild land fires, and even deadly pyroclastic flow can reach you even if you cannot see the volcano during an eruption.
- Avoid river valleys and low-lying areas. Trying to watch an erupting volcano up close is a deadly idea.
- Listen to a portable, battery-operated radio or television for updated emergency information and instructions. If the electrical power is not available, this may be your main source of information. Local radio and local officials provide the most appropriate advice for your particular situation.

D. What to do after a volcanic eruption

- **Help a neighbor who may require special assistance.** Infants, elderly people and those with special needs must be prioritized.
- **If possible, stay away from volcanic ash fall areas.** Volcanic ash can pose health hazards to children and people with existing respiratory conditions such as asthma, chronic bronchitis, or emphysema. Stay indoors, wear dust masks designed to protect lungs, use eyeglasses instead of contact lenses, and wear clothing that covers as much skin as possible.
- **Clear roofs of ash fall.** Ash fall can be very heavy, especially when wet, and can cause roofing and buildings to collapse. Exercise great caution when working on the roof.
- **Avoid driving in heavy ash fall.** Driving will stir up volcanic ash that can clog engines and stall vehicles. Moving parts can be damaged from abrasion, including bearings, brakes, and transmissions.

TORNADO

What is a tornado?

Tornado is a localized windstorm over land surface characterized by a visible funnel-shaped, rapidly whirling cloud extending downward from the base of a dark cumulonimbus cloud. The strongest tornadoes have rotating winds estimated to exceed 450 kph and may last for few minutes. In the Philippines, the diameter of tornadoes can range from a few meters to 100 meters. Its movement is dependent on the movement of thunderclouds.

Waterspouts are tornadoes which form over warm water. They can move towards the shoreline and cause damage to coastal areas.

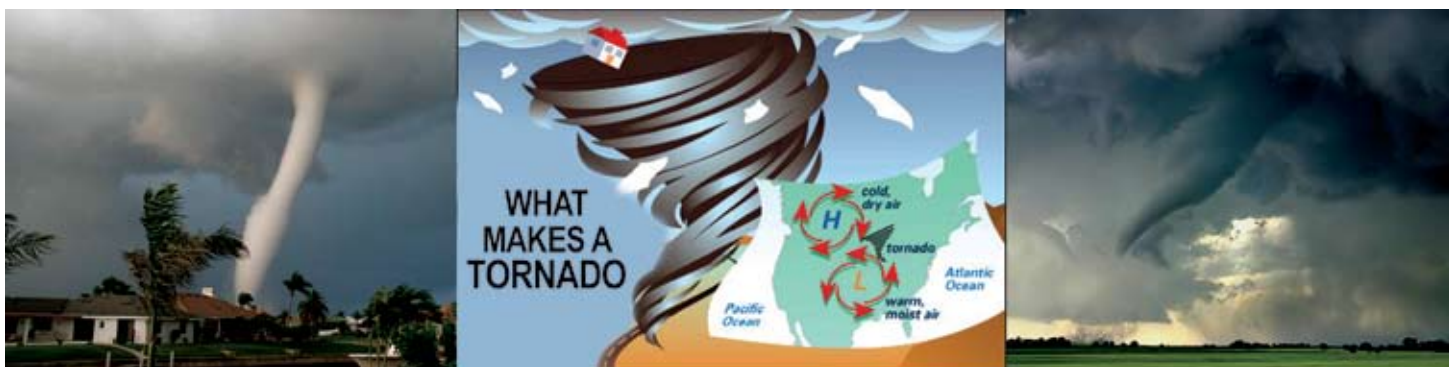
What causes tornadoes?

Tornado is set off by severe thunderstorms called cumulonimbus mammatus. Cumulonimbus mammatus are dense, low, rugged clouds that consist of pendulous globules (mamma is the Latin word for breast) that hang from the underside of the anvil of a thunderstorm cloud.

Updraft warm moist air interacts with cold air at a higher level that moves in a downward direction (the cold air moves downward because it is denser than warm air). This interaction causes the updraft to rotate in a horizontal direction. When the speed of the downdraft increases and the air plunges to the ground, tornado occurs.

Tornadoes often occur when it is not raining. They are associated with a powerful updraft, so rain does not fall in or next to a tornado. Very large hail, however, can fall in the immediate area of the tornado. In humid environments, rain often tends to wrap around the tornado, being pulled from the main precipitation area outside of the rotating updraft. The rain can make it difficult to see the tornado.

Figure 15



What are tornado-related hazards?

Tornadoes may appear nearly transparent until dust and debris are picked up so their impact is sometimes unnoticed. Damages due to tornadoes are attributed to powerful high winds and the vacuum that is created at the center of the circulatory wind. Everything that comes in contact with it may be pulled up and thrown away.

Tornadoes are capable of causing extreme destruction, including uprooting trees and well-made structures. They can also turn seemingly harmless objects into deadly missiles.

Although violent tornadoes comprise only two percent of all tornado occurrences, they are responsible for nearly 70 percent of tornado-related fatalities.

Do tornadoes occur in the Philippines?

Tornadoes are violently rotating columns in contact with the ground which are pendant from a parent cumulonimbus cloud. Although they generally occur during spring and summer in western countries, they can occur any time of the year in any country. Tornadoes are most likely to occur in the afternoon or evening. There are no areas immune to tornadoes, as they have been reported to occur in mountains, valleys, plains, and even in swamps. Thus, regardless of the location or time of the year and day, if conditions are favorable for its formation, a tornado can occur.

Tornadoes strike in many areas of Luzon and Visayas but the highest incidence of tornado sightings and destruction has been reported in Mindanao.

How can we reduce tornado-related disasters?

Learn about tornado risk. Contact your local emergency management office and local PAGASA office,

- A. Develop a Community/School/Family Tornado Preparedness Plan.
(See page 41.)
- B. Assemble a Disaster Supplies Kit.
(See page 37.)
- C. Protect your property.
 - Keep trees and shrubbery trimmed. Make trees more wind resistant by removing diseased or damaged limbs, then strategically remove branches so that wind can blow through. Strong winds frequently break weak limbs and hurl them at great speed, causing damage or injury when they hit.
 - Remove any debris or loose items in your yard. Branches and firewood may become missiles in strong winds.
 - Consider installing permanent shutters to cover windows. Shutters can be closed quickly and provide the safest protection for windows.
 - Strengthen garage doors. Garage doors are often damaged or destroyed by flying debris, allowing strong winds to enter. As winds apply pressure to the walls, the roof can be lifted off, and the rest of the house can easily follow.
- D. What to do before a tornado:
 - Keep phone numbers of local emergency services offices and the nearest hospitals handy.
 - If you are in a tornado prone area, consider having a tornado safe place. Pick a safe place in your house where family members can gather during a tornado. The safest place is underground, or as low to the ground as possible, away from all windows. If you have a basement, make it your safe place. If you do not have a basement, consider an interior hallway or room on the lowest floor. Thick walls

provide additional protection. Less than two percent of all tornadoes are powerful enough to completely destroy a sturdy building. Make sure there are no windows or glass doors in your safe place. Keep this place uncluttered. Remove tall furniture as they could tip over. Children need to know that a tornado safe place is not the same as a fire meeting place.

- Consider having your tornado safe place reinforced. Additional reinforcement will add more protection from the damaging effects of tornado winds.
- Conduct periodic tornado drills. Practice everyone in the family on going to your designated area in response to a tornado threat. Practicing your plan makes the appropriate response more of a reaction, requiring less thinking time during an actual emergency situation.
- Check with your work place and your children's schools and day care centers to learn tornado emergency plans. Every building has different safe places. It is important to know where they are and how to get there in an emergency.
- Discuss with your family what to do when a tornado occurs. Everyone should know what to do in case all family members are not together. Discussing the hazards ahead of time helps reduce fear and lets everyone know how to respond during a tornado.
- If planning a trip or extended period of time outdoors, listen to the latest forecasts and take necessary precautions. Knowing the weather condition helps you prepare. Having a raincoat, umbrella, and disaster supply kit available will make it easier to deal with severe weather conditions. Watch for thunderstorms as tornado, originate from thunderstorm clouds.
- Be sensitive to changing weather conditions. Tornadoes accompany severe thunderstorms, and weather conditions can change rapidly. Large hail, blowing debris, or the sound of an approaching tornado may alert you. Many people say approaching tornadoes sound like a freight train.

E. What to do during a tornado

- If you hear or see a tornado coming, get to your safe place immediately.
- If you are in a different area far from your safe place, keep calm and take cover right away. Tornadoes can move quickly, blowing objects at very high speed, even if they are at a distance. Protect yourself from flying debris by taking cover immediately. Get under something sturdy, such as a heavy table, hold on, and stay there until the danger has passed.
- Use your arm and hand to protect your head and neck from falling or flying objects. Your head and neck are more easily injured than other parts of your body. Protect them as much as you can.
- If you are outside in a car, immediately go to the basement of a nearby sturdy building. Sturdy buildings are the safest place to be. Tornado winds can blow large objects, including cars, hundreds of feet away. Tornadoes can change direction quickly and can lift up a car or truck and toss it through the air. Never try to out-drive a tornado.
- If there is no building nearby, lie flat in a low spot. Use your arms and hands to protect your head. Tornadoes cause a lot of debris to be blown at very high speeds, and you can be hurt by this debris if it hits you. Dangerous flying debris can be blown under highway overpasses and bridges, or weaker overpasses and bridges could be destroyed. You will be safer lying flat in a low-lying area where wind and debris will blow above you. Tornadoes come from severe thunderstorms, which can produce a lot of rain. If you see quickly rising water or flood water coming towards you, move to another spot.

F. What to do after a tornado

Children

- Notify your parents or any other members of the family.
- Inspect your body for injury or any harm.
- Secure your belongings and if permitted, go straight home.
- Be sure to walk through safe areas.

Adults

- Continue listening to local radio or television stations for updated information and instructions. Access may be limited to some parts of the community, or roads may be blocked.
- Help a neighbor who may require special assistance. Infants, elderly people, and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- Help injured or trapped persons. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Watch out for fallen power lines or broken gas lines and report them to the utility company immediately. Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury.
- Avoid disaster areas. Your presence might hamper rescue and other emergency operations and put you at further risk from the residual effects of tornadoes.
- Stay out of damaged buildings. Tornadoes can cause great damage, creating further hazards. If you are away from home, return only when authorities say it is safe.
- When entering damaged buildings, use extreme caution. Moving through debris presents further hazards. Carefully watch every step you take. Wear sturdy shoes. The most common injury following a disaster is cut feet.
- Use battery-powered lanterns or flashlights when examining buildings. Battery-powered lighting is the safest and easiest, preventing fire hazards for the user, buildings and their occupants.
- Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.
- Look for fire hazards. There may be broken or leaking gas lines, or damaged electrical systems. Clean up spilled medicines, bleaches, gasoline, or other flammable liquids immediately. Fire is the most frequent hazard following other disasters.
- Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and quickly leave the building. Turn off the gas using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in a pool of water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- Watch for loose plaster, drywall, and ceilings that could fall.
- Use the telephone only for emergency calls. Telephone lines are frequently overwhelmed in disaster situations. They need to be clear for emergency calls to get through.

Tropical Cyclone

What is a tropical cyclone?

Tropical cyclones are one of the most destructive weather disturbances. They are accompanied by strong winds which spiral around a low pressure center called the “eye” of the storm. The tropical cyclones that affect the Philippines, usually form in the Pacific Ocean between the Philippines and the Marianas–Caroline Islands, above 5°N latitude. They move generally in a west-northwest direction with wind speed ranging from 45 kilometers per hour (kph) to about 300 kph. They intensify as they approach the Philippine area of responsibility (PAR). The winds of a tropical cyclone blow around this low pressure center in a counterclockwise direction in the northern hemisphere, with increasing magnitude as it approaches the eye. Strong tropical cyclones are called typhoons or “bagyo” in the Philippines. A yearly average of 20 tropical cyclones enters the Philippine Area of Responsibility (PAR). Winds do the most damage to buildings and settlements, but most casualties result from flooding, which is associated with the excessive rains.

The typhoon season in the Philippines begins in the month of May and lasts until January. Tropical cyclones may form as early as March and April but these are relatively few. Most typhoons form during the months of July, August, and September.

Tropical cyclones are classified according to their *strength*, and they are determined by the speed of *the maximum sustained winds* near the center. The tropical cyclones are categorized into:

- Tropical Depression – 35 to 63 kph
- Tropical Storm – 64 to 117 kph
- Typhoon – more than 117 kph

What causes tropical cyclones?

A tropical cyclone develops from a pre-existing weather disturbance such as an easterly wave or a Intertropical Convergence Zone (ITZC). Its genesis must be supported by sufficient interaction among various necessary environmental conditions. A tropical cyclone begins as a small thunderstorm over warm, tropical oceans. It can only form when the ocean water is greater than 26°C and when the wind changes in the vertical in the basic wind flow is small. If the water is warm enough, several storms may cluster together and swirl around as one. Tropical cyclones develop above 5° latitude and above, because of the high humidity, light winds, and warm sea surface temperatures present in those areas. The air at upper levels must have high relative humidity to favor growth of tall clouds which eventually serve as a conduit in spewing excess heat to the top of the tropical cyclone system. And there must be an outward flow above the surface disturbance to blow away the excess heat. Once the tropical cyclone is formed, the tall clouds or deep convection, together with the anticyclonic flow or outflow at the top, serves like an exhaust manifold of an internal combustion engine to keep the system growing.

What are the associated hazards of tropical cyclones?

Tropical cyclones visit the Philippines yearly and exact heavy toll on human lives and destroy a lot of property. During a typhoon, strong winds blow and heavy rains fall. If the typhoon stays for more than two days, the heavy rainfall can result in floods.

1. Heavy Rains/Floods

The distribution and intensity of heavy rain associated with a tropical cyclone varies greatly. Very heavy rain is associated with eyewall clouds and spiral rainbands. Frequently, very heavy rain occurs many hundreds of kilometers away from the center, due to the interaction of the system with moist air masses outside the immediate cyclone circulation. This interaction explains why a certain area experiences very heavy rainfall although it is very far from the typhoon.

At times, however, a southwest flow of wind is also induced by the presence of a huge typhoon over the Taiwan-Okinawa area. When this is observed, the weather characteristic of the southwest monsoon prevails in the Philippines. A good example of this monsoon rain happens during the approach of a tropical cyclone when the southwest monsoon is prevailing.

Continuous heavy rainfall can produce severe flooding and may cause damage to agriculture, infrastructures, and community lifelines. The ground water may be contaminated by floodwaters and may lead to the outbreak and spread of diseases. Disease-carrying mosquitoes and other animals can aggravate these conditions.

2. Strong Winds

The most obvious characteristic of a tropical cyclone is its strong winds. Maximum wind speeds in a tropical cyclone may even reach beyond 250 kph in extreme cases (more than 3x the average speed of vehicles). Structural damage is one of its most disastrous effects. In the rural areas where most houses are made of light materials, the strong winds destroy a lot of houses.

3. Storm Surges

Storm surge is the name given to the big waves and abnormally high ocean tides which rise above the regular tide during tropical cyclone occurrence. It rapidly increases in coastal water level when the storm is nearing landfall. This is due to the piling up of sea water by the strong persistent onshore winds and the reduced atmospheric pressure in the area as a cyclone approaches a shallow coastline. The total water level associated with the storm surge is due to the combined effects of the sub-normal pressure and strong wind and circulation of the typhoon super-imposed on the normal tide during landfall of the cyclone. It is disastrous when the astronomical tide is at its peak level, or if it coincides with the occurrence of high tide. This effect explains the prevalent flooding observed in coastal areas along the path of the typhoon.

Storm surge can engulf low-lying coastal communities and also bring destruction to natural and human-made structures.

4. Landslides/Mudflows

Continuous heavy rains over hilly or mountainous areas, especially denuded ones, soak and loosen the soil on slopes of mountains. This loosening of soil usually results in landslides or mudflows. Landslides can bury people alive and destroy their property. Heavy rains may also induce mudflow down volcano slopes. Mudflows, like landslides, are hazards to people's lives and property.

Is the Philippines prone to tropical cyclones?

The physical setting in the tropics and the geographical location of the Philippines make it very susceptible to tropical cyclones and their associated hazards. An average of 20 tropical cyclones occur in the country per year; five to seven of these can be rather destructive, as they result in other hazards such as strong winds, excessive rainfall, and tornado. Excessive rainfall may result in landslides and floods/flash floods. There are now manifestations of climate change in the country such as the changes in the patterns and amount of rainfall, increasing temperature, and sea level rise. Many areas in the Philippines that did not use to have flash floods and landslides are now experiencing such disasters.

Tropical cyclone is a natural phenomenon that has become a part of the way of life of the people in the Philippines. The loss of life, human suffering, damage to property, as well as environmental damage, wipe away years of development efforts and full recovery sometimes takes years. Its disastrous effects affect the lives, livelihood, property and the national economy. And the real damage brought by these hazards is complicated by the vulnerability of the people who are located in harm's way.

How can we reduce tropical cyclone related disasters?

- A. Develop a Community/School/Family Tropical Cyclone Preparedness Plan (See page 41.)
- B. Assemble a Disaster Supply Kit (See page 37.)
- C. Prepare before the onset of the tropical cyclone season.

Prior to the onset of the tropical cyclone season, there are various measures that individuals can undertake. These measures aim to effect proper mitigation of the hazards associated with tropical cyclones.

- Remind family members to observe the necessary precautionary measures.
- Check the roof for possible leaks and loose galvanized iron sheets that can be blown away by strong winds. Check other parts that need repairs to strengthen the structure.
- Check all objects that may be blown away.
- Cut small branches of trees near the house.
- Store enough food and drinking water to last three to four days
- Stock adequate supply of rice and canned goods at home.
- Prepare flashlights, batteries, matches, kerosene lamps, and charcoal in anticipation of power failure.
- Listen to the radio or read newspapers about tropical cyclones.
- Do not be caught unprepared.

- D. What to do during the tropical cyclone season

At the earliest report of an approaching tropical cyclone, the community which is directly threatened by a tropical cyclone should be on the alert. Further, tropical cyclone development reports should be closely monitored through whatever communication facility is available, like radio, television, telephone, radio transceivers, SMS, internet, etc.

The following courses of action are recommended when a typhoon threatens a community.

1. If Public Storm Signal No. 1 is over the locality:

Signal No. 1 is used to alert the people that there is a tropical cyclone. The disaster preparedness plan is activated to alert status.

- Keep your radio on and listen to the latest warnings about the weather disturbance.
- Check the capacity of the house to withstand strong winds and strengthen the house if necessary.
- If the situation gets worse, Signal No. 1 may be changed to Signal No. 2 or 3. Rely only on official PAGASA bulletins. Keep in touch with your local PAGASA Station for further information and advice.

2. If Storm Signal No. 2 or No. 3 is over the locality:

- The people are advised to listen to the latest Severe Weather Bulletin issued by PAGASA every six hours. In the meantime, business may be carried out as usual except when flood occurs
- Rely only on the official PAGASA warnings and bulletins.
- Special attention should be given to the latest position, direction, and speed of movement of the typhoon for it may intensify and move towards the locality.
- Secure property before the signal is upgraded
- Store extra food, especially those which can be eaten without cooking or with little preparation. Remember that electric power may be shut off or cooking facilities may not be available.
- If emergency cooking facilities are necessary, be sure that they are in order.
- Store water because water service or supply may be cut off.
- Be sure a flashlight is in working condition and keep it handy.
- The general public, especially people traveling by sea and air, are cautioned to avoid unnecessary risks.
- Stay away from low-lying coastal areas, river banks, and other places which may be swept by storm surges.
- When applicable, be sure that the window on the leeward side (the side opposite the side facing the wind) of the house is opened to avoid sudden unequal pressure. Board up windows or put storm shutters in place and securely fasten them.
- Secure everything that may be blown away or turned loose. Flying objects become dangerous during typhoons.
- If the "eye" of the tropical cyclone passes directly over the place, there is a lull lasting for a few minutes to an hour. Stay in a safe place. Very strong winds will blow again in the opposite direction.
- People are advised to stay in strong buildings.

E. What to do after a typhoon

Right after a disaster has struck a community, or even at the height of the disaster, the emergency response mechanism is put into place. Various activities are undertaken to alleviate the sufferings of the populace:

- Distribute food and water in areas which are isolated due to extensive flooding.
- Do not cross swollen rivers where the current is strong.
- Avoid mountain slopes with big rocks and loose soil.
- Search, rescue, and evacuate victims.
- Give medical assistance to victims.
- Restore public utilities.
- Rehabilitate destroyed houses, crops, and government infrastructure.

Reference:

PAGASA/DOST Primers

Valenzuela, R. (1989). *Handbook on Natural Hazards*, Philippine Atmospheric, Geophysical and Astronomical Services Administration,

Dept. of Science and Technology

Teacher's Manual on Natural Hazards (1994). PAGASA/DOST

Floods

What are floods?

A flood is a rise, usually brief, in the water level in a stream to a peak from which the water level recedes at a slower rate (UNESCO-WMO, 1974).

Floods are due to water overflowing from streams and other bodies of water, as well as by the accumulation of rain water by drainage. Floods can cause severe damage to lives and property.

What causes floods?

Floods are due to the complex combination of weather, climatic, and human activities. Most floods occur as a result of moderate to large-scale rainfall events.

1. Natural Causes

- Intense and prolonged rainfall
Weather disturbances such as low pressure areas, tropical cyclones, intertropical convergence zone (ITCZ), monsoons, and cold fronts lead to flooding.
- Storm surge
A storm surge can raise the level of the ocean by several feet and can inundate the adjacent low-lying coastal communities.
- High tide
If the high tide coincides with high streamflows, it can aggravate flooding near the coasts.

2. Human Activities

Floods due to human activities may alter the natural ground cover of a river basin and may increase the size and frequency of floods.

- Increased urbanization and coastal development
Paving and concreting roads increases the impermeable surfaces and weakens their ability to absorb flood waters; hence, they may result in flash flooding.
- Informal settlers
Encroachment of the waterways by informal settlers can obstruct the normal flow of flood waters.
- Indiscriminate dumping of garbage also causes clogging of waterways.
- Deforestation reduces the infiltration capacity and speeds flood flows.
- Blasting causes landslides down hills and mountains and may result in unintentional damming of rivers and streams.

- Failure of levees and dams can create the worst flood events when they release large quantities of water.

How can we reduce flood related disasters?

A. Develop a Community/School/Family Flood Preparedness Plan (See page 41.)

B. Assemble a Disaster Supply Kit (See page 37.)

C. Prepare before probable floods

- Know how often and to what extent your area has been flooded.
- Know the flood warning system in your community and be sure your family knows it.
- Keep informed of daily weather conditions.
- Designate an evacuation area for the family and livestock and assign family members specific instructions and responsibilities according to an evacuation plan.
- Keep a stock of food which requires little cooking and refrigeration for electric power may be interrupted.
- Keep a transistorized radio and flashlight with spare batteries, emergency cooking equipment, candles, matches and first aid kit handy in case of emergency.
- Securely anchor weak dwellings and items.

D. Observe during floods

- Avoid areas subject to sudden flooding.
- Do not cross rivers or flowing streams where water is above the knee.
- Avoid water-covered roads and bridges.
- Avoid unnecessary exposure to the elements.
- Do not go swimming or boating in swollen rivers.
- Eat only well-cooked food; protect leftovers against contamination.
- Drink only clean water, or preferably, boiled water.

E. What to do after the flood

- Re-enter dwellings with caution; use flashlights, lanterns or torches. Flammables may be inside.
- Be alert for fire hazards, like broken electric wires.
- Do not eat food and drink water until they have been checked for flood water contamination.
- Report broken utility lines (electricity, water, gas, and telephone) to appropriate agencies/authorities.
- Do not turn on the main switch or use appliances and other equipment until they have been checked by a competent electrician.
- Consult health authorities for immunization requirements.
- Do not go "sight-seeing" in disaster areas. Your presence might hamper rescue and other emergency operations.

Reference:

PAGASA/DOST Primers

Valenzuela, R. (1989). *Handbook on Natural Hazards*, Philippine Atmospheric, Geophysical and Astronomical Services Administration,

Dept. of Science and Technology

Teacher's Manual on Natural Hazards (1994). PAGASA/DOST

Storm Surge

What is storm surge?

Storm surge is the abnormal rise in sea level at the coast resulting in very big waves progressing towards the coast during the passage of an intense tropical cyclone, as it landfalls or reaches land. The surge may be spawned by a tropical cyclone, although tropical storms may also generate storm surges. The highest water level or peak of the storm surge usually coincides with the time of passage of a typhoon across a coastline.

One of the major causes of damage from a tropical cyclone is the storm surge generated during the passage of the disturbance.

- The stronger the tropical cyclone and the shallower the coast, the higher the surge will be. Storm surges can sweep the coastline inland to as deep as a few kilometers.
- Usually, the peak storm surge is experienced near the point of landfall of a typhoon or a storm.
- The rise in sea level can cause flooding and damage in low-lying coastal areas and villages, particularly when the approach of the storm coincides with the occurrence of high tide.

Sometimes the terms “tidal wave” and tsunami (Japanese: tsu, “harbor”, and nami, “sea”) are used incorrectly to mean storm surge. The term “tidal wave” refers to the astronomical tide, the result of the gravitational attraction of the moon and the sun on the oceans; while tsunamis are due to earthquakes taking place in the oceans.

What causes storm surges?

- **Wind/Pressure Effect**

The stronger the winds of the tropical cyclone and the lower the atmospheric pressure, the higher the storm surge.

- **Rainfall Effect**

Heavy rains associated with an intense tropical cyclone add to the total sea level near the coast.

- **The Tidal Effect**

If the surge coincides with the occurrence of high tide, water level is higher than when it occurs during low tide.

- **Shape of the coastline and slope of the sea bed**

The shallower the slope, the higher the surge towards the coastal communities.

Who are likely to be affected by storm surges?

The Philippines is largely a storm surge-prone area due to its long, vast expanse of coastline and many landfalling tropical cyclones. Many incidences of loss of lives and damage to property from storm surges that struck many parts of the Philippine coast has been reported. For instance, Typhoon Undang in November 1984 caused enormous damage to dwellings along the coastal areas in Basey, Samar. The typhoon that passed through Aparri, Cagayan, and Leyte in 1908 generated a storm surge that completely leveled the whole coastal village of Tarol and resulted in 22 dead and 100 missing. Nine-meter high storm surges were observed along the coastal areas of Sogod Bay in Southern Leyte during a typhoon in October 1912.

What can we do in the face of a storm surge?

The storm surge warning is incorporated in the Domestic Bulletins and reads like this: “RESIDENTS ALONG LOW-LYING COASTAL AREAS ARE ADVISED TO SEEK HIGHER GROUND AND TO TAKE THE NECESSARY PRECAUTIONS AGAINST FLOODING DUE TO BIG WAVES FROM THE SEA.” “BIG WAVES” means the storm surge itself plus the waves normally associated with typhoons or storms.

Individuals

- Make plans for evacuating the members of your family and yourself to higher ground before a storm surge takes place.
- Stay off the beach when a weather disturbance is approaching or happening in your coastal community.
- Refrain from building houses within 500 meters from flat or gently sloping coastlines.
- Listen to PAGASA Public Forecast/Warnings aired regularly.
- During weather disturbances, rely on your own initiative rather than wait for government action. You have responsibility for your own survival.

Community

- Formulate evacuation plans and procedures and review all aspects of the disaster preparedness plan.
- Conduct periodic drills and exercises to familiarize every member of the community with actual situations.
- Identify danger zones and disseminate such zoning information to all the members of the community.
- Construct sea-walls, earthen dikes, wave breakers, and the like to provide safety barriers against storm surges.
- If concrete sea walls cannot be constructed, put up natural storm surge breakers, like sturdy trees, along the coast, which is vulnerable to storm surges.
- Formulate and enforce land-use management regulations by removing existing houses and other structures exposed to risks from storm surges.
- Ensure systematic safekeeping of valuables, efficient transport system, rescue operation procedures, and relief and rehabilitation activities.
- Evacuate as soon as possible to higher ground away from beaches when a storm or typhoon approaches your coastal community.

Disaster Supply Kit

When a disaster strikes, concerned agencies respond immediately. They proceed to the disaster site at once and do an assessment to determine the extent of the damage and identify what the affected population would essentially need. For hard-to-reach areas (far-flung barangays or those that cannot be reached right away due to impassable roads or unavailability of any means of transportation), assistance may not come on time or as expected. Basic services, such as electricity, gas, and communication may be cut off, while supply of water, food, and clothing may not be available or sufficient.



Affected families may need to evacuate urgently to prevent further damage and would not have enough time to prepare the supplies they will need. So each family has to be prepared before a disaster strikes. A disaster kit is therefore a must for every home and school.

What Is a Disaster Supply Kit?



A disaster supply kit can be a box, a bag, or a container for storage of the basic needs and supplies like bottled water, canned food, flashlight, batteries, knife, blanket, clothing, and other supplies in ample quantities that can be used during or after a disaster. The kit can be kept at home, within easy reach, in case you need it. Learn more about Disaster Supply Kit from your Local Disaster Coordinating Council or the Local Philippine National Red Cross.

Involving Children in Disaster Preparedness

Ask children to help you remember to keep your kits in working order by changing the food and water every six months and replacing batteries as necessary. Children can make calendars or posters with the appropriate dates marked on them. Ask children to think of items that they would like to include in their own Disaster Supply Kit, such as books or appropriate non-perishable food items.

Tips in Preparing a Disaster Supply Kit

- The Disaster Supply Kit should be situated where every household member would have easy access to it. Make sure to inform everybody of its location.

- Keep a small disaster supply kit in the trunk of your car. If stranded or unable to return home, having some items will help you to be more comfortable until help arrives.
- Keep items in airtight plastic bags. This will help protect them from damage or spoiling.
- Update your kit at least once a year depending on your family's needs.
- Replace stored food and water frequently to ensure their freshness.
- Ask your physician or pharmacist about storing medicine. It may be difficult to obtain prescription medications during a disaster because stores may be closed or supplies may be limited.
- Use an easy-to-carry container for the supplies you would most likely need for an evacuation. Label it clearly. Possible containers include:
 - a large, covered trash container.
 - a camping backpack.
 - a duffel bag.
 - a cargo container that will fit on the roof of your vehicle.

Disaster Supply Kit (See Figure 16.)

Basics

- flashlight and extra batteries
- first aid kit and first aid manual
- medicine
- bottled water
- canned food
- matches in a waterproof container
- map of the area and phone numbers of places you could go to
- a whistle

If you have additional space, consider adding some of the items in the list of evacuation supplies.



Figure 16

Evacuation Supplies

- three gallons of water per person
- three-day supply of non-perishable food
- kitchen accessories: manual can opener; mess kits or paper cups, plates, and plastic/disposable utensils; utility knife; a can of cooking fuel if food must be cooked; chlorine to treat drinking water; sugar, salt, pepper; aluminum foil, and plastic resealable bags
- one complete change of clothing and footwear for each family member. Include sturdy shoes or rubber boots and raincoats.
- blankets or sleeping bag for each family member
- mosquito net
- sanitation and hygiene items: toilet paper, soap, liquid detergent; feminine supplies; personal items such as shampoo, toothpaste, toothbrushes, comb and brush, plastic garbage bags (heavy-duty) and ties (for personal sanitation uses); medium-sized plastic bucket with tight lid; disinfectant
- a portable, battery-powered radio and extra batteries
- needs of very young and older family members, such as infants and elderly or disabled persons

- milk formula, diapers, bottles, powdered milk and medications for babies
- money

Other Supplies

In addition to your Disaster Supply Kit Basics and Evacuation Supplies, having the following items will help your family endure home confinement, which often happens after disasters.

- wrench to turn off household gas and water. Keep it near the shut-off valve.
- a week's supply of food and water
- additional blankets and sleeping bags
- portable radio to provide warnings and forecasts for all types of hazards--both natural (such as earthquakes and volcanic activity) and technological (such as chemical releases or oil spills).

Building a Makeshift Toilet



Line a bucket with a garbage bag and make a toilet seat out of two boards placed parallel to each other across the bucket. After each use, pour a disinfectant such as bleach (one part liquid chlorine bleach to 10 parts water) into the garbage bag. This will help avoid infection and stop the spread of disease. Cover the bucket tightly when it is not in use.

Bury garbage and human waste to avoid the spread of diseases by rats and insects. Dig a pit of two three feet deep and at least 50 feet downhill or away from any well, spring, or water supply.

Tips on Water Storage

Having an ample supply of clean water is a top priority in an emergency.

- *Store water in plastic containers, such as soft drink plastic bottles.* Seal containers tightly, label them and store in a cool, dark place. Replace water every six months. Avoid using containers that will decompose or break, such as milk cartons or glass bottles.
- *Keep at least a three-day supply of water, or a minimum of three gallons per person.* It is strongly recommended to have more if possible. Use one-half gallon per day for drinking, and one-half gallon for cooking and sanitation. A normally active person needs to drink at least two quarts of water each day. Hot environments and intense physical activity can double that amount. Children, nursing mothers, and ill people will need more. Store your three-day supply in a handy place. You need to have water packed and ready in case there is no time to fill water bottles when disaster strikes.

Water needs to be treated only if it is of questionable purity.

- *Boiling is the safest method of treating water.* Strain water through a clean cloth to remove bulk impurities. Bring water to a boil for about one full minute, keeping in mind that some water will evaporate. Let the water cool before drinking. Boiled water will taste better if you put oxygen back into it by pouring the water back and forth between two clean containers. This will also improve the taste of stored water.
- *You can use household liquid bleach to kill microorganisms.* Use only regular household liquid bleach that contains 5.25 percent sodium hypochlorite. Do not use scented bleaches, color-safe bleaches, or bleaches with added cleaners. Add 16 drops of bleach per gallon of water, stir, and let stand for 30 minutes. If water does not have a

slight bleach odor, repeat the dosage and let it stand for another 15 minutes. If it still does not smell of chlorine, discard it and find another source of water. Other chemicals, such as iodine or water treatment products sold in camping or surplus stores that do not contain 5.25 percent hypochlorite as the only active ingredient are not recommended and should not be used.

- *To obtain distilled or purified water, boil water and then collect the vapor that condenses back to water.* The condensed vapor will not include salt or other solid impurities.
- To distill, fill a pot halfway with water. Tie a cup to the handle on the pot's lid so that the cup will hang right side up when the lid is upside down (make sure the cup is not touching the water), Boil the water for 20 minutes. The water that drips from the lid into the cup is distilled.
- *Melt ice cubes* or use water from undamaged hot water tanks, toilet tanks (not the bowl), and water pipes if you need additional water
- *If you need to find water outside of your house, you can use rainwater; water from streams, rivers, ponds and lakes, and natural springs.* If you question its purity, be sure to treat the water first. Avoid water with floating material, odor, or dark color. You can use salt water but distill it first. **DO NOT DRINK FLOOD WATER.**

Tips on Storing Food

Even though it is unlikely that an emergency would cut off your food supply for two weeks, you should consider preparing a supply that will last that long. The easiest way to develop a two-week stockpile is to increase the amount of basic food you normally keep on your shelves. Familiar food can lift morale and give a feeling of security in time of stress. Include canned foods that will not require cooking, water, or special preparation. If you must heat food, pack a can of cooking fuel.

Take into account your family's unique needs and tastes. Try to include food that is high in calories, protein, carbohydrates, vitamins, and minerals. If your water supply is limited, try to avoid food that is high in fat and protein. Do not stock salty food, as these will make you thirsty. If possible, store salt-free crackers, whole grain cereals, and canned food with high liquid content.

A. Recommended food

- ready-to-eat canned meat, fruits, and vegetables
- canned juice, milk, and soup (if powdered, store extra water)
- high-energy food, such as peanut butter, jelly, crackers, granola bars, and trail mix
- comfort food, such as hard candy, sweetened cereals, candy bars, and cookies
- instant coffee and tea bags
- food for infants, elderly persons, or persons on special diets, if necessary



B. Considerations when packing

- dried food. They can be nutritious and satisfying, but they contain a lot of salt, which makes you thirsty.
- freeze-dried food. They are tasty and lightweight, but they will need water for reconstitution.

- instant meals. Cups of noodles or cups of soup are a good addition, although they need water for reconstitution.
- snack-sized canned goods. They generally have pull-top lids or twist-open keys.
- pre-packaged beverages. Those in foil packets and foil-lined boxes are suitable because they are tightly sealed and will keep for a long time.

C. Food options to avoid

- bottled foods. They are generally too heavy and bulky, and easily broken.
- meal-sized canned food. They are usually bulky and heavy.
- whole grains, beans, pasta. Preparation could be complicated under the circumstances of a disaster.
- commercially dehydrated food. They can require a great deal of water for reconstitution and extra effort in preparation.



First Aid Kit

first aid manual
sterile adhesive bandages in assorted sizes
assorted sizes of safety pins
cleansing agent/soap
latex gloves (2 pairs)
2-inch sterile gauze pads (4-6)
4-inch sterile gauze pads (4-6)
triangular bandages (3)
non-prescription drugs
2-inch sterile roller bandages (3 rolls)
3-inch sterile roller bandages (3 rolls)

moistened towelettes
antiseptic
thermometer
tongue depressor blades (2)
tube of petroleum jelly or other lubricant
needle
scissors
tweezers

Include the following non-prescription drugs:

- aspirin or other pain reliever
- anti-diarrhea medication
- antacid (for upset stomach)
- laxative
- vitamins
- syrup of ipecac (use to induce vomiting if advised by the poison control center)
- activated charcoal (use if advised by the poison control center)
- other necessary prescription and non-prescription drugs.
- special needs for infants, elderly persons, or anyone with serious allergies



Important Documents

Keep important family documents such as certificates (birth, marriage, death), land titles, bank accounts, insurance policies, and other records. Make sure you have the original documents in a safe deposit box and copies of them in a waterproof, fire-resistant portable container.

FAMILY DISASTER PLAN

Four Steps to Safety

There are four basic steps to develop a family disaster plan:

1. **Learn the type of natural disasters your community is prone to.** Contact your community disaster council or Philippine National Red Cross chapter. Ask the following questions and take down notes:
 - What types of disasters are most likely to occur in our community?
 - How can we prepare for the disasters?
 - Does our community have an early warning system?
 - What do our community's early warning signals sound like and what should we do when we hear them?
 - How can we help the elderly and disabled persons? What might be some special needs to consider?
 - What about animal care after disaster?

Learn also about disaster plans at your work place, your children's school or day care center, and other places where members of your family spend time. You should be prepared wherever you may be. Find out the steps you can take to prevent or avoid disasters.

2. **Create a Family Disaster Plan.** Once you are aware of the possible hazards in your area, gather all the members of your family and discuss how you would prepare. Make a checklist of steps you can take as you discuss this information with your family.
 - Meet with your family and discuss why you need to prepare for disasters. Explain the dangers of fire, severe weather, and earthquakes to children. Plan to share responsibilities and work together as a team. Keep it simple enough so people can remember the important details. A disaster is an extremely stressful situation that can create confusion. The best emergency plans are those with very few details.
 - Discuss the types of disasters that are most likely to happen. Explain what to do in each case. Everyone should know what to do in case all family members are not together. Discussing disasters ahead of time will help reduce fear and anxiety and will help everyone know how to respond.
 - Plan emergency escape exits. Draw a floor plan of your house and identify two emergency exits. Make sure the children understand the drawing. Emphasize a meeting place outside your house in case of an emergency:
 - Where to meet near your house
 - Where to meet in case of evacuation
 - Be familiar with escape routes. Depending on the type of disaster, it may be necessary to evacuate your house. Plan several escape routes in case roads are blocked or closed. Remember to follow the advice of local officials during evacuation situations. They will direct you to the safest route; some roads may be blocked or put you in further danger.
 - Develop a communication plan. Every disaster would have its own peculiarities and most often your family may not be together when disaster strikes. Children may be in school, parents may be at work, grandparents may be home. It is most important

that members should have a way of communicating with one another. Think of how each member can contact another in different situations.

- Make sure every member of the family will have a directory of important numbers, such as those of relatives or friends whom they can call and communicate with. Make it handy for everyone so it can be kept inside a wallet or purse.
- Discuss what to do if authorities ask you to evacuate. Make arrangements for a place to stay in, with a friend or relative who lives out of town and/or learn about shelter locations.

3. **Complete your checklists.** Take the steps outlined in the checklists you made when you created your Family Disaster Plan. Remember to include the following items in your checklists.

- Post emergency telephone numbers (fire, police, ambulance, etc.). You may not have time in an emergency to look up critical numbers.
- It is advisable to keep a small amount of cash at home in a safe place you can quickly access in case of an evacuation.
- Teach all responsible family members how and when to turn off the water, gas, and electricity at the main switches or valves. Keep necessary tools near gas and water shut-off valves. Turn off utilities only if you suspect a leak or damaged lines, or if you are instructed to do so by authorities. If you turn the gas off, you will need a professional to turn it back on. Paint shut-off valves with white or fluorescent paint to increase visibility. Attach a shut-off valve wrench or other special tool in a conspicuous place close to the gas and water shut-off valves.
- Install smoke alarms in your home. Smoke alarms sense abnormal amounts of smoke or invisible combustion gases in the air. They can detect both smoldering and flaming fires. Many areas now require hard-wired smoke alarms in new houses.
- Get training from the fire department or fire extinguisher manufacturer on how to use your fire extinguisher (A-B-C type). Show family members where extinguishers are kept. Different extinguishers operate in different ways. Unless responsible family members know how to use your particular model, they may not be able to use it effectively. There is no time to read directions during an emergency. Only adults should handle and use extinguishers.
- Conduct a house hazard hunt. During a disaster, ordinary objects in your house can cause injury or damage. Anything that can move, fall, break, or cause a fire is a house hazard. For example, during an earthquake or a tornado, a hot water heater or a bookshelf could turn over. Pictures hanging over a couch could fall and hurt someone.
- Look for electrical, chemical, and fire hazards. Contact your local fire department to learn about house fire hazards. Inspect your house at least once a year and fix potential hazards.
- Stock emergency supplies and assemble a Disaster Supplies Kit. (See the “Disaster Supplies Kit” section.) Keep enough supplies in your house to meet your needs for at least three days. Assemble a Disaster Supplies Kit with items you may need in case of an evacuation. Store these supplies in sturdy, clearly labeled, easy-to-carry containers, such as backpacks or duffel bags.
- Keep a smaller Disaster Supplies Kit in the trunk of your car. If you become stranded or are not able to return home, having these items will help you be more comfortable.
- Keep a portable, battery-operated radio and extra batteries. Maintaining communications is a step that can mean the difference between life and death.

Make sure that all family members know where the portable, battery-operated radio is located, and always keep a supply of extra batteries.

- Take a Red Cross first aid and CPR class. Have your family learn basic safety measures, such as CPR and first aid. These are critical skills, and learning can be a fun activity for older children.
 - Plan home escape routes. Determine the best escape routes from your house in preparation for a fire or other emergency that would require you to leave the house quickly. Find two ways out of each room.
 - Find the safe places in your house for each type of disaster. Different disasters often require different types of safe places. While basements are appropriate for tornadoes, they could be deadly in a major chemical emergency.
 - Make two photocopies of vital documents and keep the originals in a safe deposit box. Keep one copy in a safe place in the house, and give the second copy to an out-of-town friend or relative. Vital documents such as birth and marriage certificates, tax records, credit card numbers, financial records, and wills and trusts can be lost during disasters.
4. **Practice and maintain your plan.** Practicing your plan will help you instinctively make the appropriate response during an actual emergency. You will need to review your plan periodically and you may need to change some parts.
- Quiz your kids every six months so they remember what to do, meeting places, phone numbers, and safety rules.
 - Conduct fire and emergency evacuation drills at least twice a year. Drive through your evacuation routes so each one will know the way. Select alternate routes in case the main evacuation route is blocked during an actual disaster. Mark your evacuation routes on a map; and keep the map in your Disaster Supplies Kit. Remember to follow the advice of local officials during evacuation situations. They will direct you to the safest route, away from roads that may be blocked or put you in further danger.
 - Replace stored food and water every six months to ensure freshness.
 - Use the test button to test your smoke alarms once a month. This button tests all electronic functions and is safer than testing with a controlled fire (matches, lighters, or cigarettes). If necessary, replace batteries immediately. Make sure children know what your smoke alarm sounds like.
 - Replace your smoke alarms every ten years. Smoke alarms become less sensitive over time. Seek the recommendation of the Bureau of Fire Protection when replacing a smoke alarm.
 - Check your fire extinguisher to ensure it is properly charged. Fire extinguishers will not work properly if they are not properly charged. Use the gauge or test button to check proper pressure. Follow manufacturer's instructions for replacing or recharging fire extinguishers. If the unit is low on pressure, damaged, or corroded, replace it or have it professionally serviced.

What To Tell Children

- *Explain the concept of hazard to your children.* Tell them that a *hazard* is something that happens and could hurt people, cause damage, or cut off utilities such as water, telephones, or electricity.

- *Give examples of several disasters that could happen in your community.*
- *Help children recognize the warning signs of hazards.* Discussing the hazard ahead of time reduces fear and anxiety and lets everyone know how to respond.
- *Teach children to contact the family in case they are separated due to emergency period.* Check the telephone directory for local emergency telephone numbers. At home, post emergency telephone numbers close to all phones and explain when to call each number. Even very young children can be taught how and when to call for emergency assistance. If a child cannot read, make an emergency telephone number chart with pictures that may help the child identify the correct number to call.
- *Explain that when people know what to do and practice in advance, everyone is better able to handle emergencies.* That is why you need to create a Family Disaster Plan.
- *Tell children that in a disaster there are many people who can help them.* Talk about ways that an emergency manager, Red Cross volunteer, police officer, firefighter, teacher, neighbor, doctor, or utility worker might help during and after a disaster.
- *Teach children how to contact family members or relatives in case they are separated from the family in an emergency.* Help them memorize the telephone number, or write it down on a card that they can keep with them.

Media and Community Education Ideas

- *Meet with your neighbors* to plan how the neighborhood could work together after a disaster until help arrives. Working with neighbors can save lives and property. If you are a member of a neighborhood organization, such as a homeowners' association or crime watch group, introduce disaster preparedness as a new activity. Check with your local disaster coordinating councils to find out if they offer disaster preparedness trainings. Your neighborhood can also help organize (with the assistance of your local community leaders) and participate in community drills and exercises for fire, tsunami, earthquake, and other events.
- *Know your neighbors' special skills* (for example, medical, technical) and consider how you could help neighbors who have special needs, such as disabled and elderly persons.
- *Identify elderly and disabled people in the neighborhood.* Ask them how you can help if a disaster occurs (transportation, securing the house, getting medications).
- *Make plans for child care* in case parents cannot get home.

Evacuating your Family

- *Evacuate immediately if told to do so.* Authorities do not ask people to leave unless they truly feel lives may be in danger. Follow their advice.

- *Listen to local radio or television.* Follow the instructions, broadcasted or announced on local radio or television, of local emergency officials. Local officials will provide you with the most appropriate advice for your particular situation.
- *Wear protective clothing and sturdy shoes.* Disaster areas contain many hazards. The most common injury after disasters is cut feet.
- *Bring your Disaster Supply Kit.*
- *Lock your house.* Secure your house as you normally would when leaving for extended periods.
- *Use travel routes specified by local authorities.* Do not use shortcuts because certain areas may be impassable or dangerous.

If you are sure you still have time before you evacuate, and if local officials have not advised an immediate evacuation, take steps to protect your house and belongings:

- *Put your Disaster Supply Kit basics and Evacuation Supplies Kit in your vehicle or by the door if you may be leaving on foot.* In some disaster situations, such as tsunamis, it is better to leave on foot.
- *Notify your family members where you are going and when you expect to get there.* Relatives and friends will be concerned about your safety. Letting someone know your travel plans will help relieve the fear and anxiety of those who care.
- *Bring things indoors.* Lawn furniture, trash cans, children's toys, garden equipment, clotheslines, hanging plants, and other objects that may be blown around or swept away should be brought indoors.
- *Look for potential hazards.* Look for coconuts, unripened fruit, and other objects in trees around your property that could blow or break off and fly around in strong winds. Cut them off and store them indoors until the storm is over. Garbage collection services will not have time before the storm to pick anything up.
- *Turn off electricity at the main fuse or breaker, turn off gas tanks and water at the main valve.*
- *If strong winds are expected, cover the outside of all the windows of your house.* Use shutters that provide significant protection from windblown debris, or pre-fit plywood coverings over all windows.
- *If flooding is expected, consider using sand bags to keep water away from your house.* It takes two people about one hour to fill and place 100 sandbags, giving you a wall one foot high and 20 feet long. Make sure you have enough sand, burlap, or plastic bags, shovels, strong helpers, and time to place them properly.
- *Bring all pets into the house and confine them to one room, if you can. If necessary, make arrangements for your pets.* Pets may try to run if they feel threatened. Keeping them inside and in one room will allow you to find them quickly if you need to leave.

After a Disaster

- *Remain calm and patient.* Staying calm and rational will help you move safely and avoid delays or accidents caused by irrational behavior. Many people will be trying to accomplish the same things you are doing for their family's safety. Patience will help everyone get through a difficult situation more easily.

- *Listen to local radio or television for news and instructions.* Local authorities will provide the most appropriate advice for your particular situation.
- *Check for injuries. Give first aid and get help for seriously injured people.* Taking care of yourself first will allow you to help others until emergency responders arrive.
- *Help your neighbors who may require special assistance--infants, elderly people, and people with disabilities--and the people who care for them or for large families who may need additional help in an emergency situation.*
- *Wear protective clothing and sturdy shoes.*
- *Check for damage in your house.* Disasters can cause extensive damages, sometimes in places you least expect. Look carefully for any potential hazards.
- *Use battery-powered lanterns or flashlights when examining buildings.* Battery-powered lighting is the safest. It does not present a fire hazard for the user, buildings or their occupants.
- *Avoid using candles.* Candles can easily cause fire. More than three times as many people have died in residential fires caused by using candles after a disaster than from the direct impact of the disaster itself.
- *Look for fire hazards.* There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Fire is the most frequent hazard following floods.
- *Check for gas leaks.* If you smell gas or hear a blowing or hissing noise, close the gas valve, open the windows, quickly leave the building, and call the gas company.
- *Look for electrical system damage.* If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in a pool of water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- *Check for sewage and water line damages.* If you suspect sewage lines are damaged, avoid using the toilet and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes.
- *Clean up spills immediately.* These include medicine, bleach, gasoline, and other flammable liquids.
- *Watch for loose plaster and ceilings that could fall.*
- *Let your family members know you have returned home and then do not use the telephone again unless it is a life-threatening emergency.* Telephone lines are frequently overwhelmed in disaster situations. They need to be clear for emergency calls to get through.

- *Make sure you have an adequate water supply in case service is cut off.* Water is often contaminated after major disasters. An undamaged water heater may be your best source of drinking water.
- *Stay away from downed power lines and report them immediately.* Turning damaged utilities off will prevent further injury or damage. If possible, set out a flare and stay on the scene to warn others until authorities arrive.

For People with Disabilities

Persons with disabilities, or those who may have mobility problems such as elderly persons, should prepare like anyone else. The following steps may be considered:

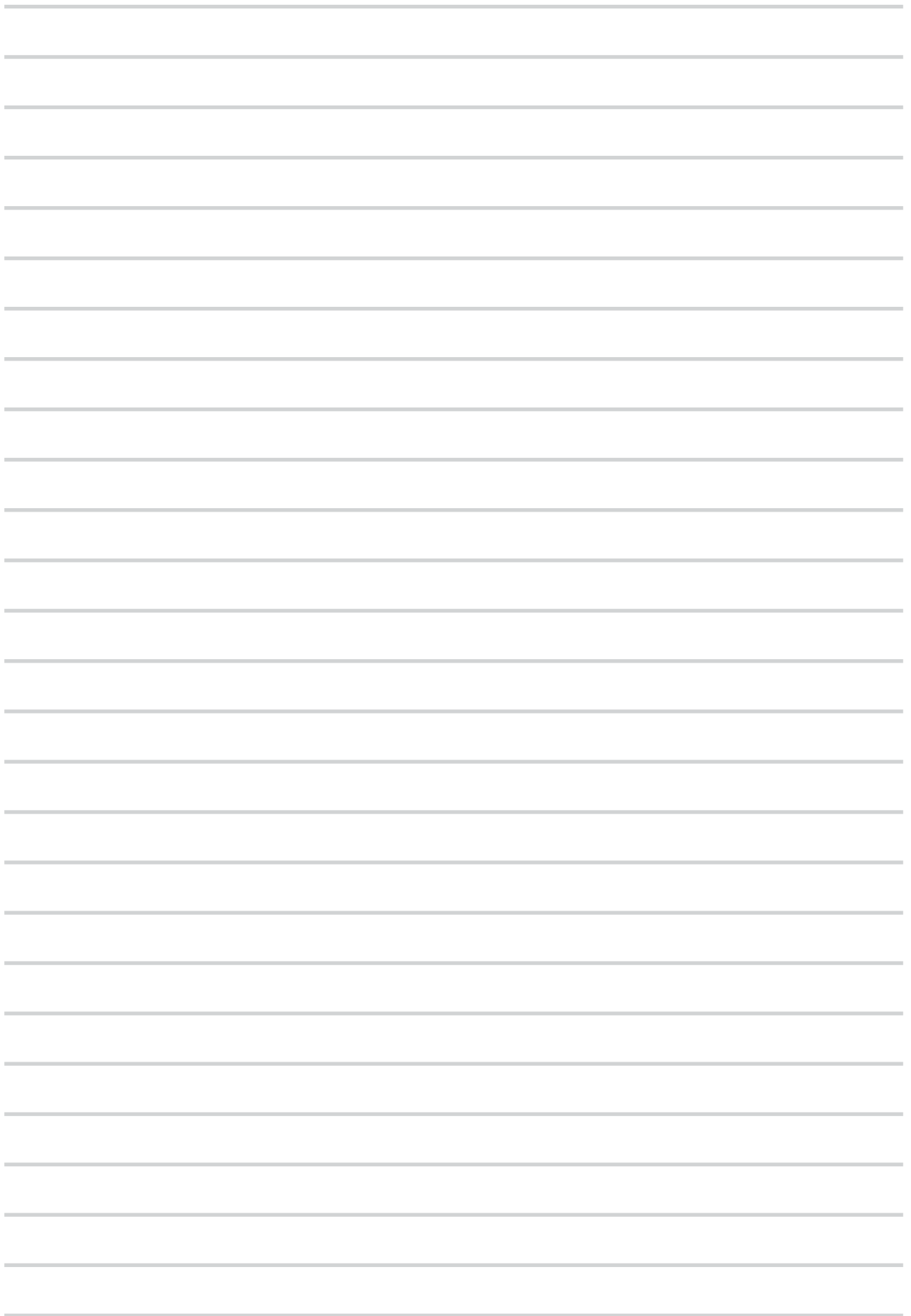
- Create a network of relatives, friends, or co-workers to assist in an emergency. If you think you may need assistance in a disaster, discuss your disability with relatives, friends, or co-workers and ask for their help. For example, if you need help moving or require special arrangements to receive emergency messages, make plans with friends. Make sure they know where you keep your disaster supplies. Give a key to a neighbor or friend who may be able to assist you in a disaster.
- Contact your local emergency management office now. Many local emergency management offices maintain registers of people with disabilities and their needs so they can be located and assisted quickly in a disaster.
- Wear medical alert tags or bracelets to identify your disability in case of an emergency. These may save your life if you are in need of medical attention and unable to communicate.
- Know the location and availability of more than one facility if you are dependent on a dialysis machine or other life-sustaining equipment or treatment. There may be several people requiring equipment, or facilities may have been affected by the disaster.

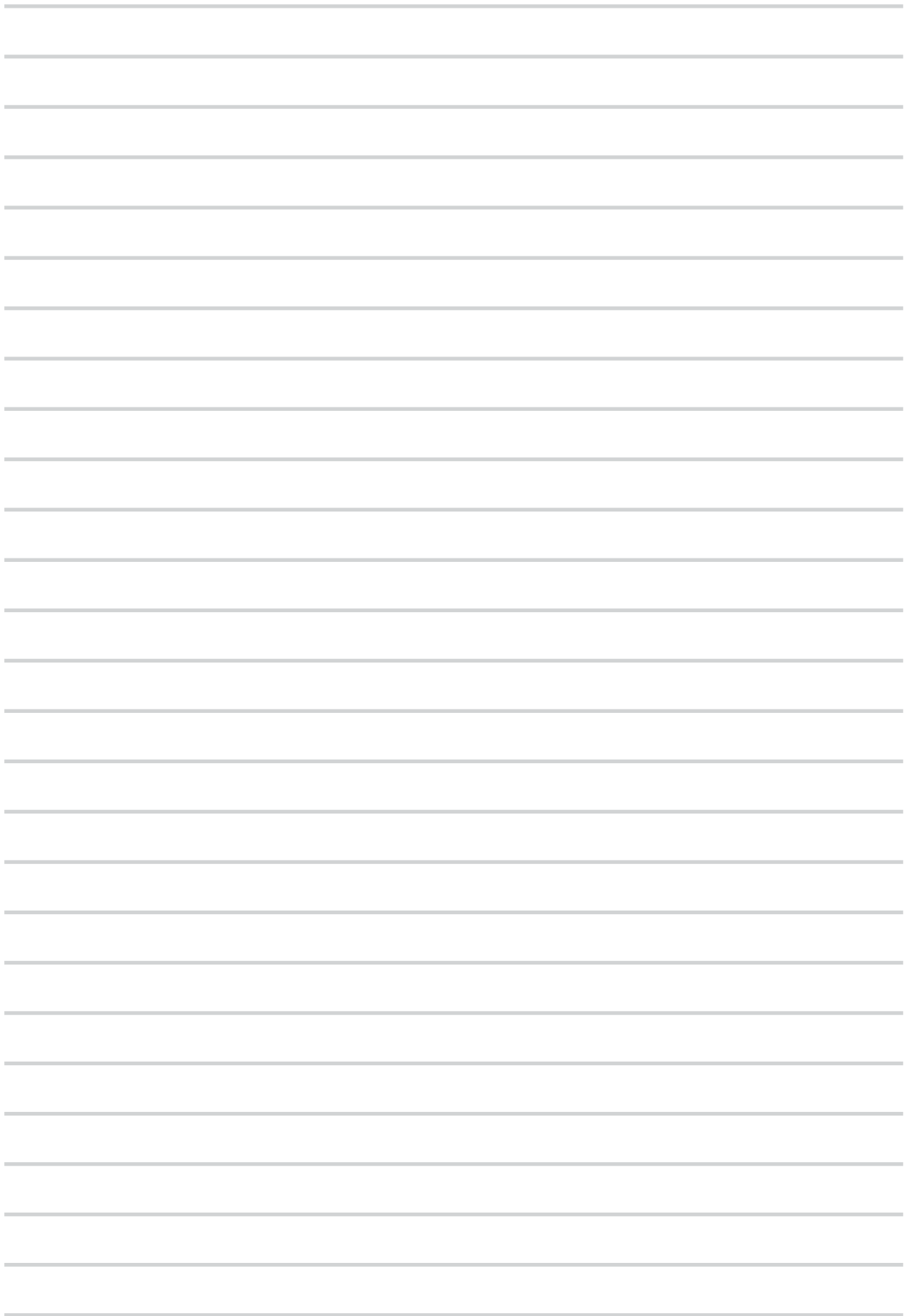
If you have a severe speech, language, or hearing disability

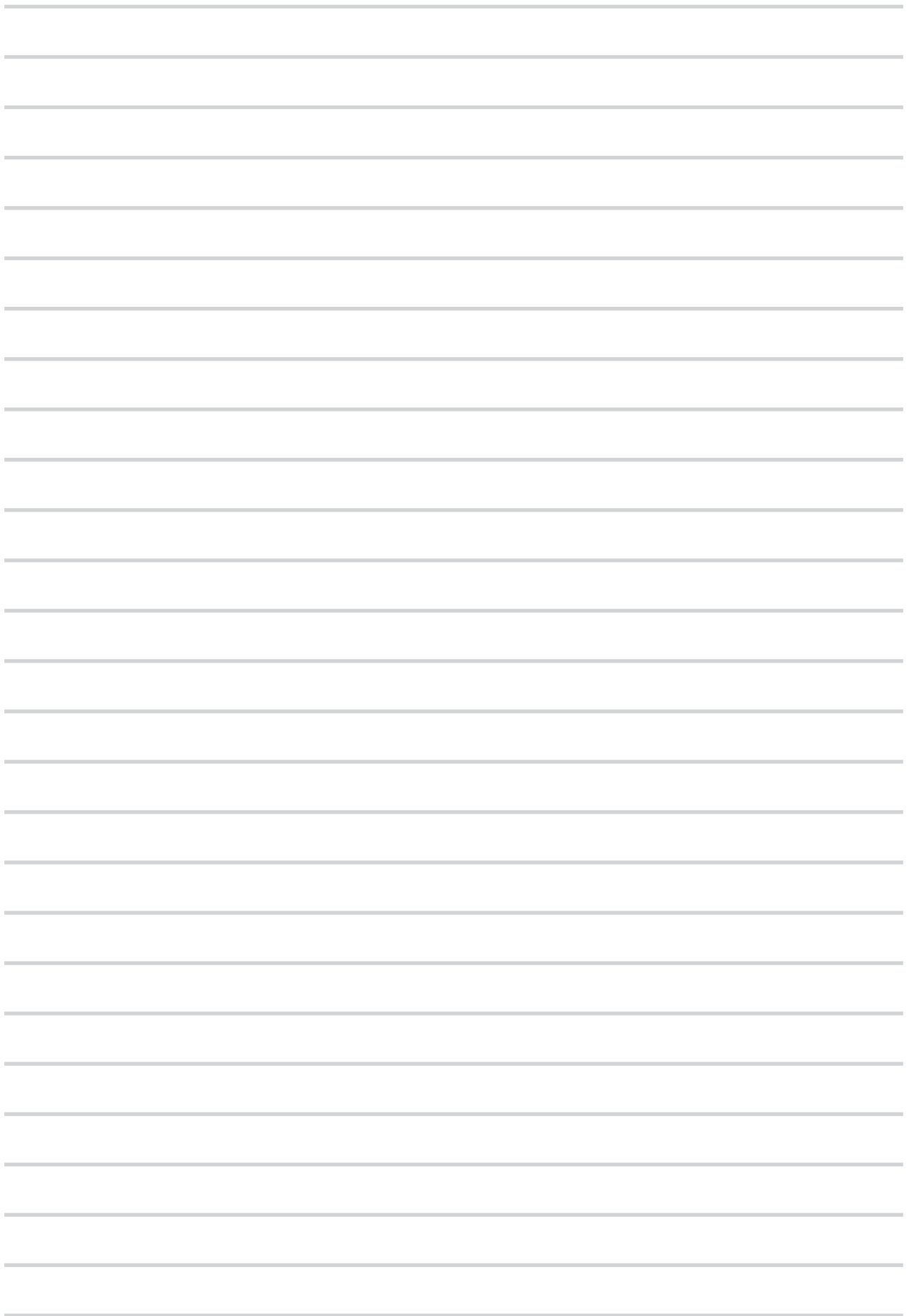
- Store writing pad and pencils to communicate with others.
- Keep a flashlight handy to signal your whereabouts to other people and for illumination to aid in communication.
- Remind friends that you cannot completely hear warnings or emergency instructions. Ask them to be your source of emergency information as it comes over the radio.
- If you have a hearing ear dog, be aware that the dog may become confused or disoriented in an emergency.

If you are blind or visually impaired

- If you need a wheelchair, show friends how to operate your wheelchair so they can move you if necessary. Make sure friends know the size of your wheelchair in case it has to be transported, and where to get a battery if needed.
- Listen to the advice of local officials. People with disabilities have the same choices as other community residents about whether to evacuate their houses and where to go when an emergency threatens. Decide whether it is better to leave the area, stay with a friend, or go to a public shelter. Each of these decisions requires planning and preparation.







Illustrations and images in this document have been taken from the following sources:

guardian.co.uk
asiaclean.tech.wordpress.com
www.infiniteknown.net
boston.com
www.solcomhouse.com
www.peternjenga.com
adpc.net
ciudadista.wordpress.com
wpthemedesigner.com
scrapetu.com
affordablehousinginstitute.org
philtags.com
democraticunderground.com
www.azonano.com/news
netsc.noaa.gov
growing-algae.com
journalism.berkely.edu
kkreetwatch.org
nrc.cnrc.gc.ca
arsteclinica.com
www.napocor.gov.ph
disc.sci.gstc.nasa.gov
temasekpoly.wordpress.com
philippines.usaid.gov/ee_clean_productive_ene
commercialappeal.com
www.peternjenga.com
<http://thailandgure.com/culturepollution>
article.wn.com/.../
article.wn.com

images.businessweek.com
clipart.com
www.scienceacross.org
www.climate-science.gov
<http://upload.wikimedia.org>
<http://www.marxist.com>
www.fivedove.com
skywatdi_media.com
www.daijiworld.com
<http://archives.starbulletin.com>
<http://www.carbonblueprints.org>
<http://pbsintotech.com>
<http://geology.com/>
www.mapsotworld.com/hurricane/
filipinolifeinpictures.blogspot.com
shahidul.wordpress.com
bousai.metro.tokyo.jp
totsesach.com
asc1996.netfirms.com
washington.edu
<http://www.swisseduc.ch>
<http://pubs.usgs.gov>
wfto.com
<http://uulcan.wr.usgs.gov>
volcanoes.usgs.gov
www.campenspoint.com
<http://www.astrophotophils.com>
<http://mmem.spschools.org>
sunnysulftolle.edu



The teacher / student modules in this document were developed by the DepEd with the assistance of the Technical Working Group (TWG) of the MDRD-EDU II in partnership with the National Disaster Coordinating Council-Office of Civil Defense, the Asian Disaster Preparedness Center, and the United Nations Development Programme with support from the European Commission Humanitarian Aid department (ECHO).

