



What Is This Module About?

The Philippines is located within the Ring of Fire. Because of this, we are prone to volcanic eruptions, earthquakes, typhoons and floods. These calamities cause great casualties in the lives of the people. Sometimes they also cause landslides, liquefaction and tsunami, which lead to even greater loss of lives and properties.

In this module, you will learn the causes of these calamities. You will also learn ways to lessen the destruction that these calamities bring and what to do in case they happen.

This module is divided into three lessons. These are:

Lesson 1 – *Preparing for Typhoons*

Lesson 2 – *Volcanic Eruptions and Earthquakes*

Lesson 3 – *Tsunami, Landslides and Liquefaction*



What Will You Learn From This Module?

After studying this module, you should be able to:

- ◆ explain the causes of typhoons, volcanic eruptions and earthquakes;
- ◆ discuss other calamities such as tsunamis, landslides and liquefaction that may be caused by typhoons, volcanic eruptions and earthquakes; and
- ◆ demonstrate safety measures to lessen the destruction that these calamities can cause.



Let's See What You Already Know

Before you start studying this module, answer the test below to find out what you already know about this topic.

What would you do if you were in each situation? Write your answer in the spaces provided.

1. Your friend is selling his land which is on a slope of a hill. It is much cheaper than the lots in the town center. You have enough savings to buy it and build a small house on it. What would you do to make sure that it is safe to build a house on this lot?

2. You and your friends went swimming in a nearby beach. When you were having your lunch, you felt the ground shaking. What would you do?

3. You are living in a squatters' area. Like most other roofs, the roof of your house leaks and is not nailed securely. The typhoon season is only a few weeks away. What would you do?

4. The volcano located in a nearby province erupted after being dormant (inactive) for hundreds of years. The ashes that it released reached your place. What would you do?

5. You are inside a movie house when an earthquake happens. You see the people rushing toward the doors. What would you do?

Well, how was it? Compare your answers with those in the *Answer Key* on page 47.

If all your answers are correct, very good! This shows that you already know much about this topic. You may still study the module to review what you already know. Who knows, you might learn a few more things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may now go to the next page to begin Lesson 1.

Preparing for Typhoons

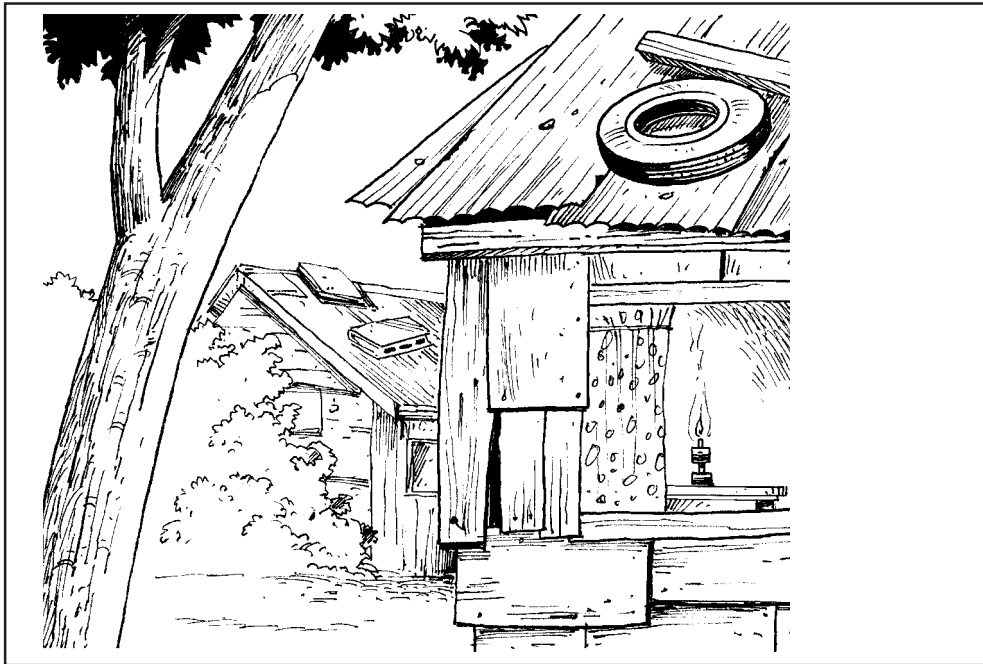
The whole archipelago, except for the island of Palawan, is visited by a number of typhoons throughout the year, especially from June to October. Typhoons are one of the most destructive natural disasters that hit the country. They are also the most frequent, causing loss of lives and properties.

In this lesson, you will learn more about typhoons and some effective measures to follow before, during and after typhoons.



Let's Study and Analyze

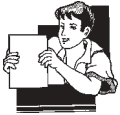
Study the picture below. Then answer the questions that follow.



1. Do you think that the people living in this house are safe in case a typhoon comes? Why or why not?

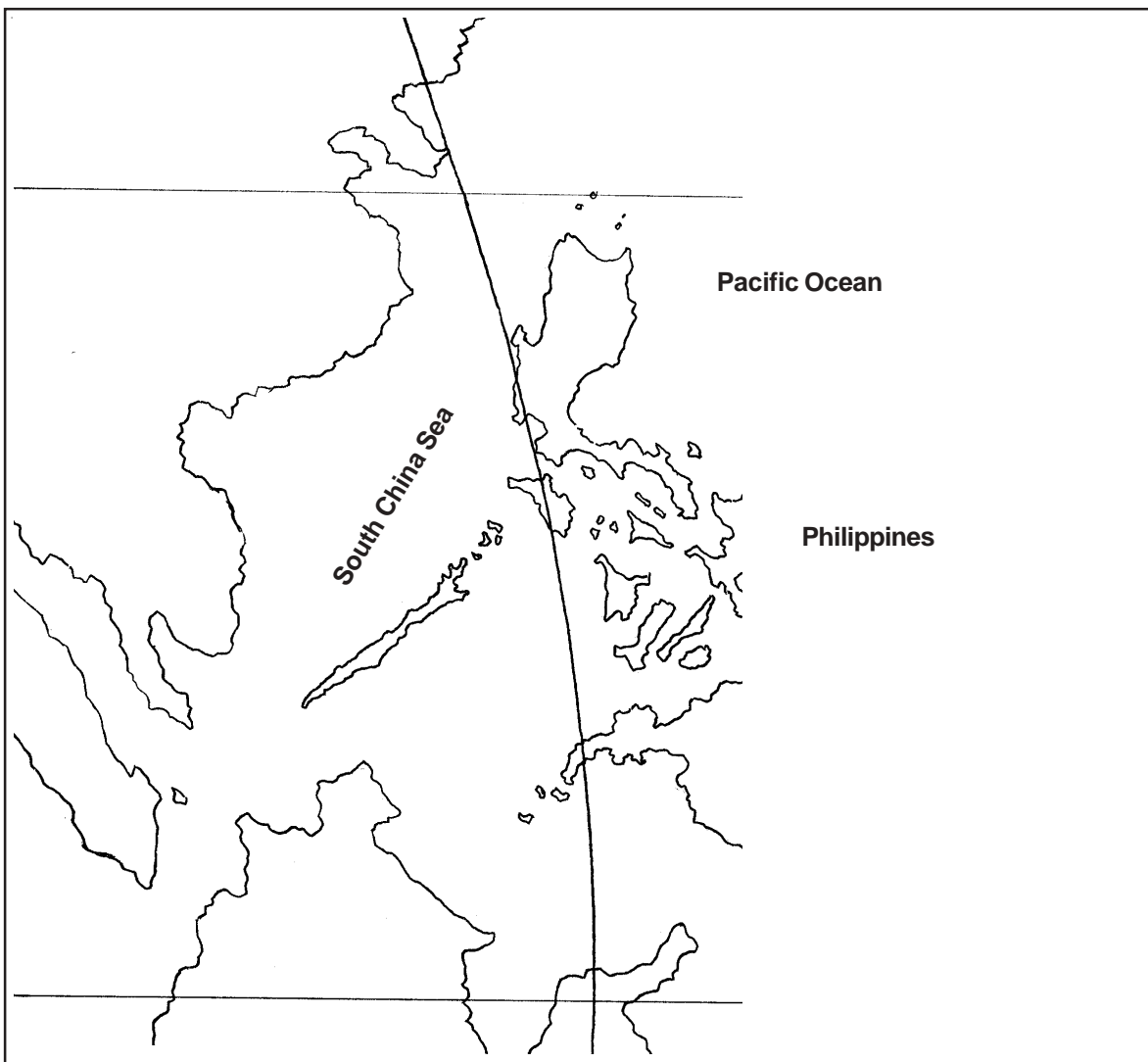
2. What do you think should the owner of this house do before a typhoon comes?

Compare your answers with those in the *Answer Key* on page 47.



Let's Learn

What comes to your mind when you hear that there is an upcoming typhoon? Do you think of strong winds? Heavy rains? Both of these accompany typhoons. A **typhoon** is a very strong storm in tropical regions like our country. The typhoons that hit the Philippines usually form in the Pacific Ocean, but sometimes they form in the South China Sea. These two bodies of water surround our country.



How do typhoons affect our lives? Typhoons cause serious damage to peoples' lives and properties.

Do you live near the sea? If so, you are at greater risk when there is a typhoon. The heavy rains and the strong winds that go with a typhoon can cause very big waves. To go fishing or sailing would be very dangerous at this time.

When the weather suddenly calms, it means that the center or the "eye" of the typhoon is passing. But the wind and rain will soon come back. As the typhoon comes closer to the land, it gradually loses its energy and soon dies out. (This is explained further in the module *Typhoons in the Philippines*, which you can study if you wish.)



Do you read the newspaper or watch the television after a very strong typhoon? Have you seen how much destruction a typhoon can cause? Since a typhoon is accompanied by heavy rains, it causes soil erosion and flood. The most badly affected are the places where there are not enough trees to hold the soil.

Do you still remember what happened in Ormoc in 1991? When Typhoon Uring hit the province, landslides and floods killed thousands of people.

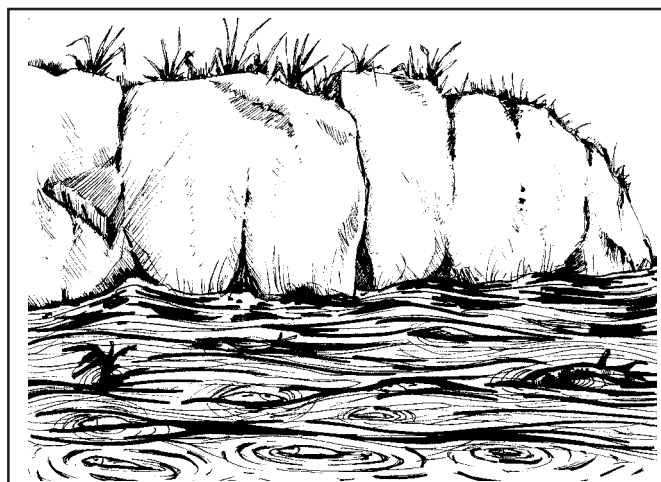


Did you ever observe how farms are after a typhoon? You can see that most crops cannot resist strong winds and heavy rains.

What happens to *palay* or rice plants when a typhoon hits before they are harvested? The roots and grains rot. Banana plants are also easily destroyed by typhoons. Provinces that rely on agriculture lose millions of pesos during typhoon seasons.



Typhoons also destroy aquatic ecosystems like seas and oceans. The strong winds break and carry away coral reefs. This decreases the number of fish in the seas because the habitats where they live are destroyed. Even the fish that are in the water are also carried away. Thus, after a typhoon, you often see dead fish floating in bodies of water.







Let's Review

Identify the small pictures and use their names to complete the sentences. You may choose your answers from the words or phrases inside the box below. (There is one word in the box which you will not need to use.)


| | | |
|--------|-------------|-------------|
| flood | coral reefs | winds |
| people | fish | Philippines |
| rains | typhoon | center |




A is a very strong storm in the tropical regions. It is accompanied


by continuous  and very strong . The typhoons that hit

the  usually form in the Pacific Ocean. Sometimes, they form in the South China Sea.

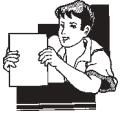
Typhoons cause serious damage to  and properties because of the high and strong winds that they bring. Agriculture also suffers greatly.

Most crops cannot resist the strong winds and . Typhoons also

destroy aquatic ecosystems. The strong winds carry the  the

away where they get broken. This decreases the number of  in the seas because their habitats or the places where they live are destroyed.

Do you think you got all the right answers? Find out by referring to the *Answer Key* on page 47.

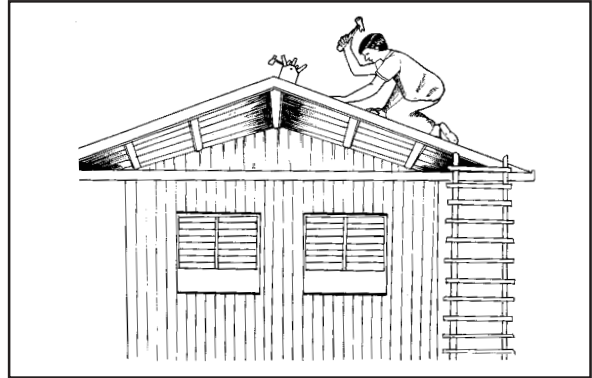


Let's Learn

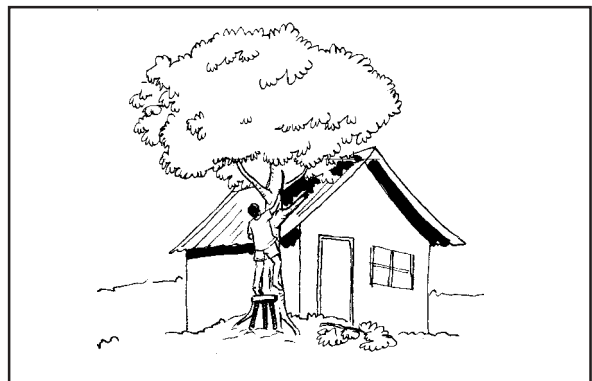
Since typhoons are like the country's regular visitors, we should all know how to deal with them. So read on and learn what you should do in case there is a typhoon.

Before the Typhoon Season

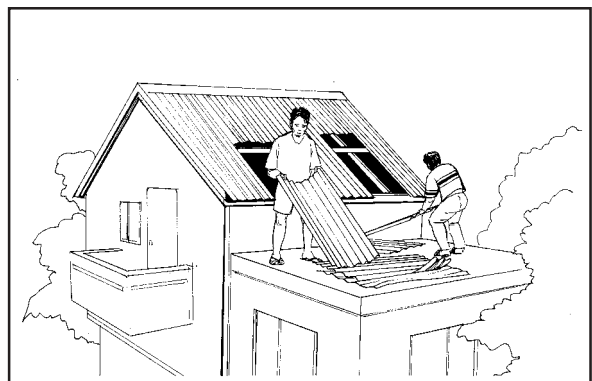
1. Check your house if it is in good condition, particularly the roof.



2. Trim tree branches well near your house.



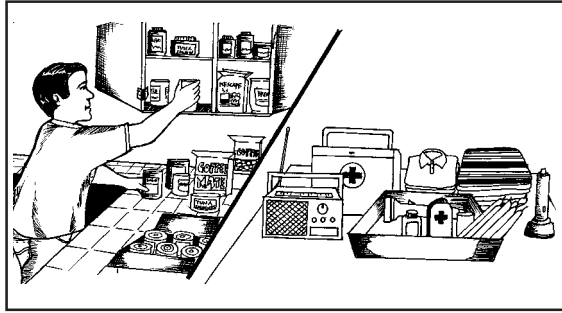
3. Fix loose iron sheets.



4. Prepare an emergency kit. Keep it ready in your home.

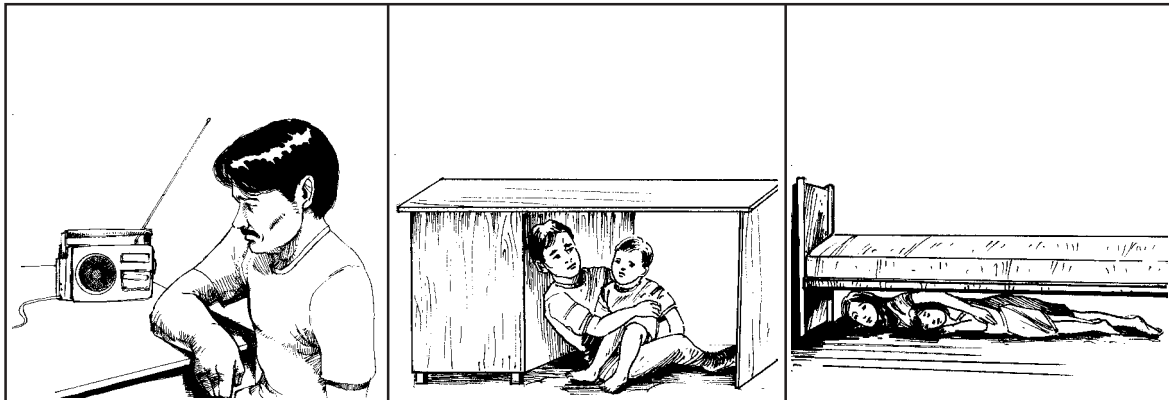
The kit should contain:

- ◆ Portable radio with extra (fresh) batteries
- ◆ Flashlight, kerosene lamp, candles and matches
- ◆ Potable (drinking) water, canned goods, can opener and extra clothes
- ◆ First aid kit and important medicines



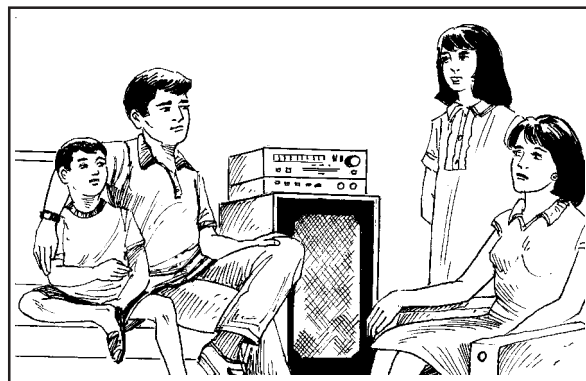
During a Typhoon

1. Don't panic. Just listen to the radio for warnings and advice.
2. Stay inside. Take shelter in the strongest part of your house.
3. If your house starts to break up, protect yourself with mattress, rugs or blankets. Get under a strong table or bed.

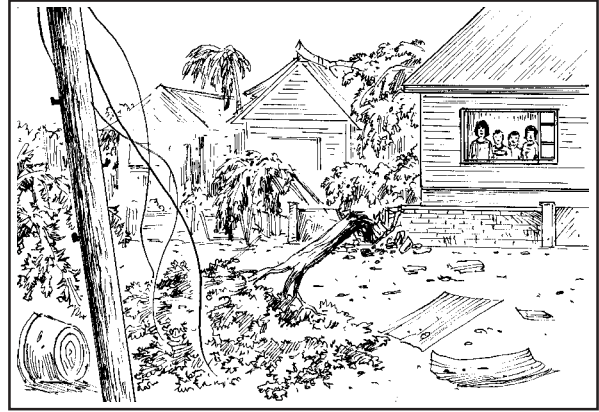


After a Typhoon

1. Listen to your radio. Don't go outside until advised officially that the typhoon has passed, or that it is already safe to go out.



2. Beware of fallen power lines, damaged buildings and trees, and flooded waterways.



Let's Review

Encircle the letter of the correct answer.

1. Before the typhoon season, you should check your house particularly the _____.
 - a. bathroom
 - b. roof
 - c. kitchen
 - d. bedroom
2. If your house starts to break up, what should you do?
 - a. Watch a television show.
 - b. Get out of the house immediately.
 - c. Call the police.
 - d. Protect yourself with mattress, rugs or blankets.
3. Which of the following things is NOT necessary to keep before the typhoon season?
 - a. flashlight and extra batteries
 - b. first aid kit and important medicines
 - c. chocolates and candies
 - d. potable water and canned goods
4. Which of the following is safe to do after a typhoon has passed?
 - a. swimming
 - b. listening to the radio
 - c. sight-seeing
 - d. fishing

5. Which of the following is NOT necessary to do before the typhoon season?
- Build a small fish pond near your house.
 - Fix loose iron sheets.
 - Prepare an emergency kit.
 - Trim tree branches.

Check if you got all the correct answers. Refer to the *Answer Key* on page 48.



Let's See What You Have Learned

- A. Match the items in Column A with those in Column B. Write the correct letters in the blanks provided.

| Column A | Column B |
|--|--------------------------|
| ___ 1. a very strong storm in a tropical region | a. areas near the sea |
| ___ 2. The weather suddenly calms down when it passes. | b. flood |
| ___ 3. caused by heavy rains and lack of trees | c. places near volcanoes |
| ___ 4. places which are at greater risk when there is a typhoon | d. "eye" of the typhoon |
| ___ 5. caused by heavy rains and very strong winds at sea | e. very big waves |
| | f. typhoon |

- B. What would you do if you were in each situation? Write your answers in the spaces provided.

1. You learned from the news that within 24 hours, a strong typhoon will hit your town. What would you do?

2. You could hear the rumbling sound of thunder and see flashes of lightning as the heavy rains continued to pour. You could also see from your window fallen trees and power lines. What would you do?

Compare your answers with those in the *Answer Key* on page 48.



Let's Remember

- ◆ A typhoon is a very strong storm in the tropical regions accompanied by continuous rains and very strong winds.
- ◆ Typhoons cause damage to people, crops, properties and aquatic ecosystems.
- ◆ The heavy rains that accompany typhoons cause flood and soil erosion.
- ◆ We cannot prevent typhoons from coming but we can take measures before, during and after a typhoon to lessen the damages that it cause.

Volcanic Eruptions and Earthquakes

Don't you admire the beauty of the near-perfect cone of Mt. Mayon? It is the most famous as well as the most active volcano in the Philippines. Surely, you also must have heard of Mt. Pinatubo, which erupted in 1991. They're just two of the country's volcanoes. Do you live near Mt. Mayon, Mt. Pinatubo or any other volcano? Do you know the dangers that volcanoes can bring? Do you know what to do in case a volcano near your place erupts?

Do you still remember the earthquake that happened on July 16, 1990? Its epicenter was in Cabanatuan City, Nueva Ecija, but it was felt all throughout the Luzon region. That earthquake damaged properties and claimed hundreds of lives.

In this lesson, you will learn more about volcanic eruptions and earthquakes. You will also learn what to do before, during and after these natural disasters occur.



Let's Study and Analyze

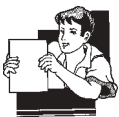
Study the following picture then answer the questions that follow.



1. Do you think that the man shown is safe where he lives? Why or why not?

2. If you were the man in the picture, what would you do? Why?

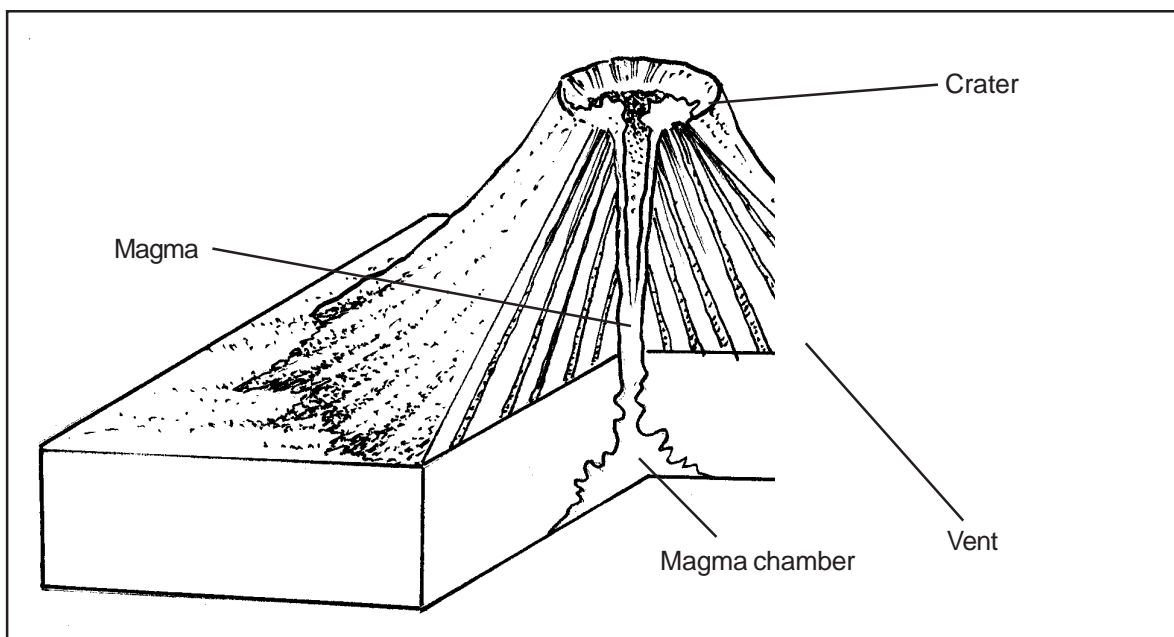
Compare your answers with those in the *Answer Key* on pages 48–49.



Let's Learn

Have you seen a volcano? It's like an ordinary mountain or hill, except that it has openings in its surface called **vents**. Through these openings, a volcano releases different materials such as magma, lahar and ash when it erupts. The hollow part at the peak of a volcano lying above the vent is the **crater**.

Do you know why volcanoes erupt? It's because the pressure on the magma chamber forces the magma up and out the volcano's vents. **Magma** is very hot, molten (melted by heat) rock formed within the earth. When magma reaches the earth's surface, it is called **lava**.



Cross-section of a Volcano

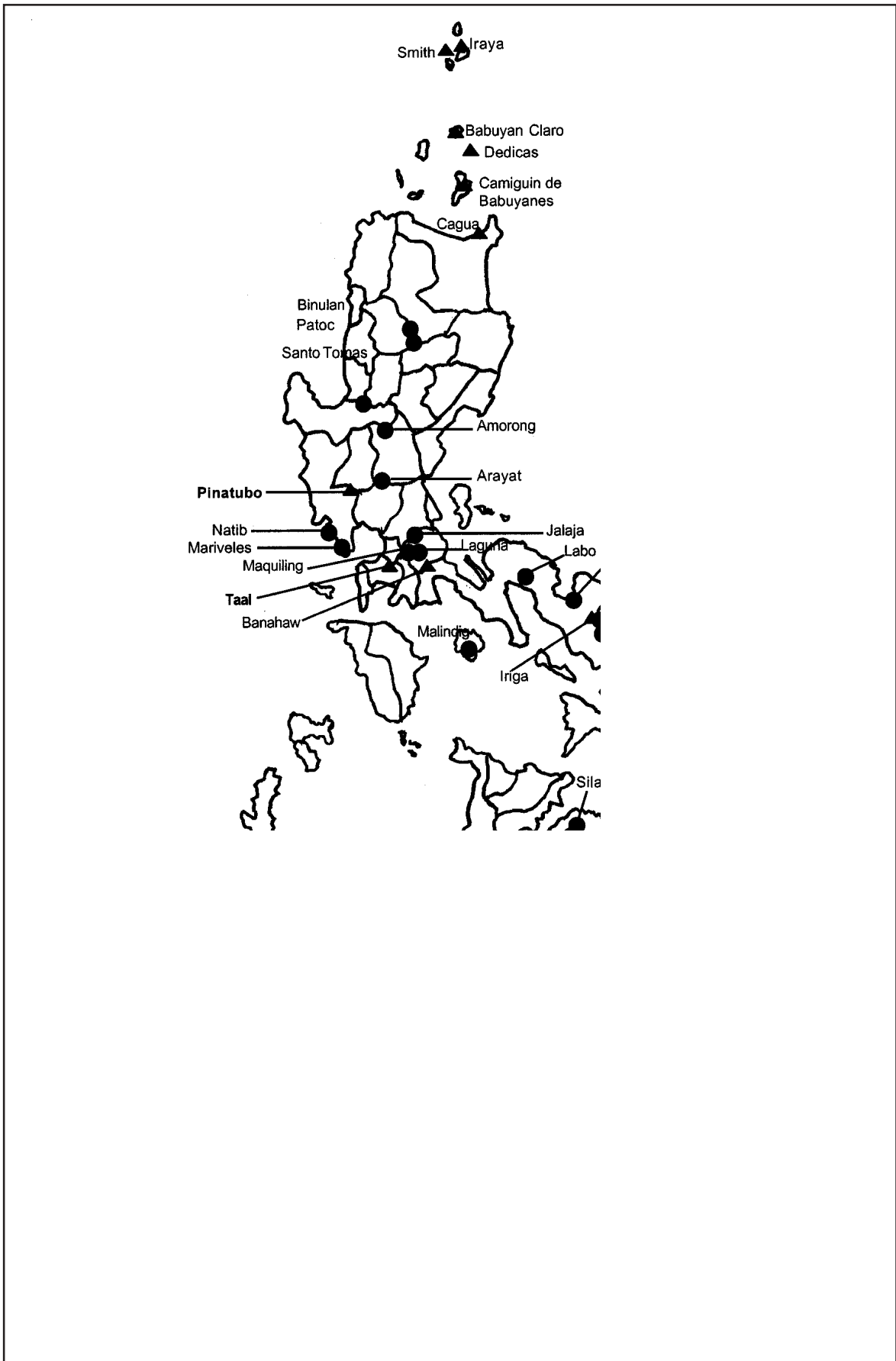
Volcanic activity is classified by how often a volcano erupts. A volcano is said to be **active** if man has recorded its eruption. An **inactive** volcano has no records of eruption and its form is beginning to change because of weathering and erosion.

Is there a volcano in your town or near it? There are about 200 volcanoes in the Philippines. Below is a list of major Philippine volcanoes and their locations. See if you can identify a volcano near your area.

| Volcano | Location |
|-----------------------|---------------------------|
| Mayon | Legaspi City, Albay |
| Taal | Talisay, Batangas |
| Kanlaon | Negros Oriental |
| Bulusan | Sorsogon |
| Ragang | Cotabato |
| Smith | Babuyan Island |
| Hibok-Hibok | Mambajao, Camiguin Island |
| Dedicas | Babuyan Island |
| Babuyan | Babuyan Island |
| Cagua | Cagayan |
| Camiguin de Babuyanes | Babuyan Island |
| Banahaw | Lucena City |
| Calayo | Valencia, Bukidnon |
| Iraya | Batanes |
| Pinatubo | Zambales |
| Iriga | Camarines Sur |
| Biliran | Biliran |
| Bud Dajo | Jolo Island |
| Matutum | Cotabato |
| Kalatungan | Bukidnon |
| Makaturing | Lanao del Sur |
| Parker | South Cotabato |

Now look at the map on the next page to know if there is an active or inactive volcano near your hometown.

Philippine Volcanoes

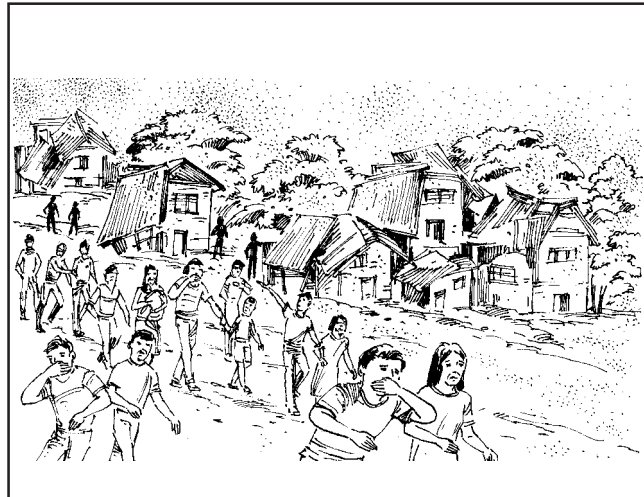


Source: http://www.reliefweb.int/mapc/asi_se/cnt/phil/phl_volc.html

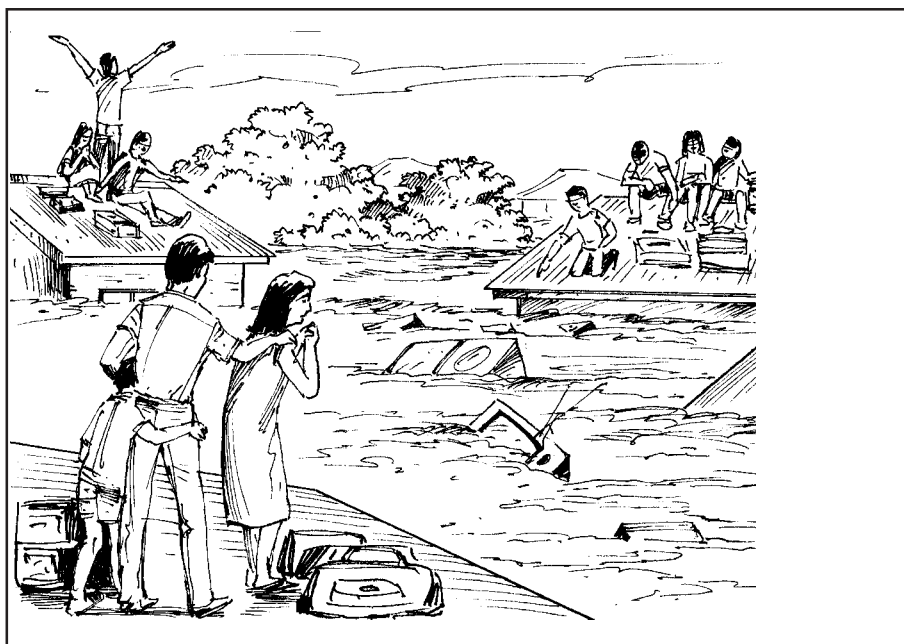
Were you able to find out if there is a volcano near your place? If you do live near an active volcano, then it is very important that you know what happens when a volcano erupts and the effects that this may have.

When a volcano erupts, it releases materials that destroy properties and put people in danger.

Do you still remember the eruption of Mt. Pinatubo in 1991? The ash that Mt. Pinatubo released even reached other Asian countries. Many people had respiratory diseases when Pinatubo erupted. Heavy ashfall caused roofs to collapse, especially those made of *nipa*, *cogon* and old iron sheets.



You probably know how lahar from Mt. Pinatubo carried trees, people, vehicles and even houses away with it. It even destroyed buildings, roads and bridges. **Lahar** is made up of volcanic particles and water. For several years in the Pinatubo area, whenever heavy rains come, lahar would flow into rivers and other bodies of water. It also blocked drainage channels and caused flooding in some areas. Rivers also became shallow due to lahar deposits. For a long period, people had to stay in evacuation centers and wait for relief goods to come. Billions of pesos were needed to build a mega (very large) dike that would trap the lahar in a “basin.”



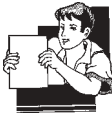


Let's Review

Arrange the jumbled letters to form words that will complete the sentences below.

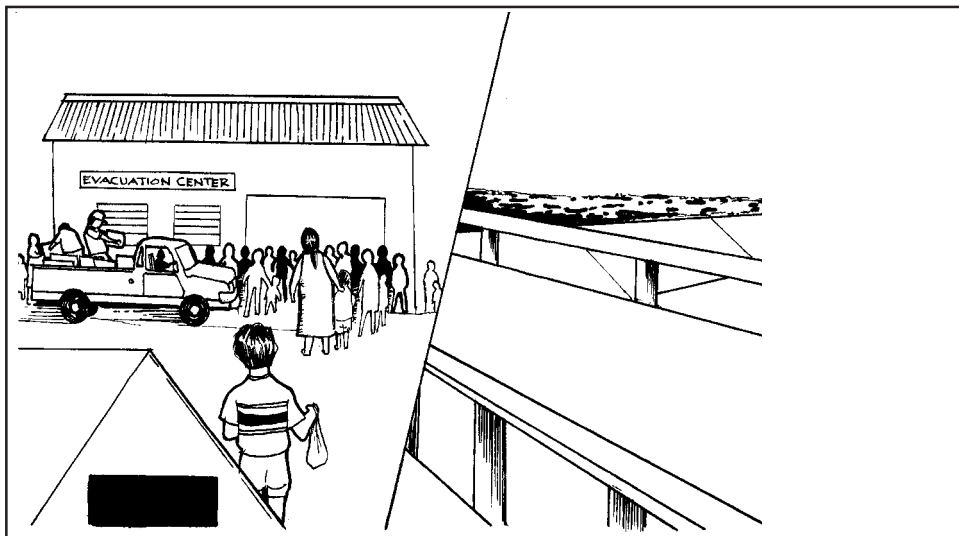
1. (a c o n o l v) A _____ is a hill or mountain with an opening from which materials are released when it erupts.
2. (v i e n c i a t) An _____ volcano has no record of eruption.
3. (w o d f m l u) Lahar or _____ is made up of volcanic particles and water.
4. (f l a a h s l) Heavy _____ can cause roofs to collapse when allowed to collect in big quantities.
5. (g a m m a) _____ is very hot, molten rock which is formed within the earth.

Compare your answers with those in the *Answer Key* on page 49.



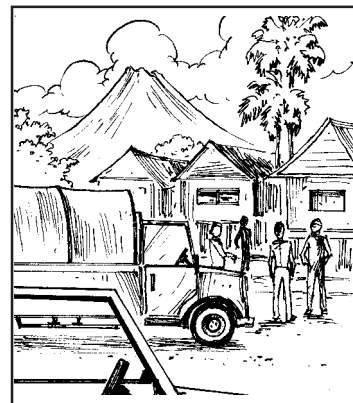
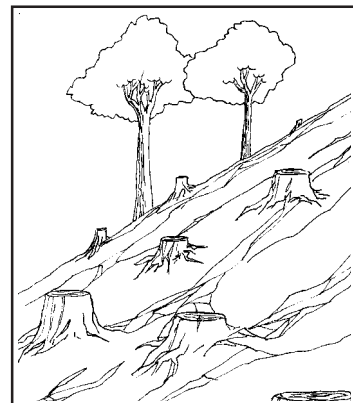
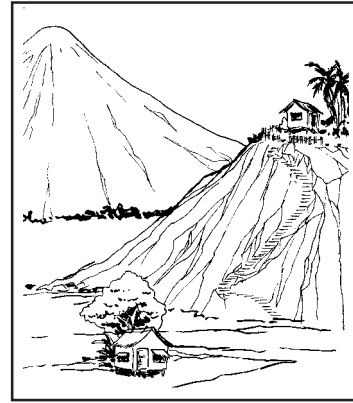
Let's Learn

A volcano may sit quietly for hundreds of years. But it doesn't mean that there is no possibility for it to erupt anytime like Mt. Pinatubo. Read on to learn what you should do in case a volcano erupts close to where you live.



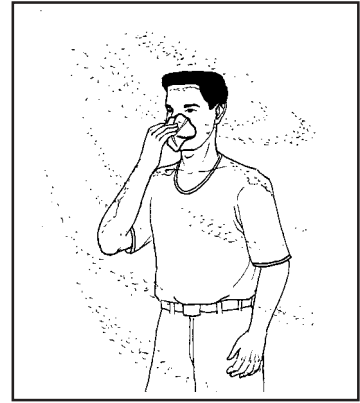
Before Volcanic Eruptions

1. If you are planning to build a house, avoid low places or areas that are prone to mudflows.
2. Because lahar flows more easily when there are no trees you should avoid cutting trees on slopes of volcanoes without replacing them.
3. If you live on or around a volcano, you should always have ready means of transportation because the volcano might erupt anytime.
4. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) prohibits settling in areas within 4–6 km around the peak of active volcanoes. Comply with this prohibition. It's for your own safety. If PHIVOLCS orders you to evacuate, do so.

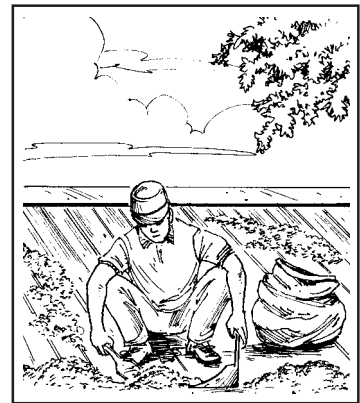


During Volcanic Eruptions

1. During an ashfall, you should cover your nose with a wet piece of cloth.

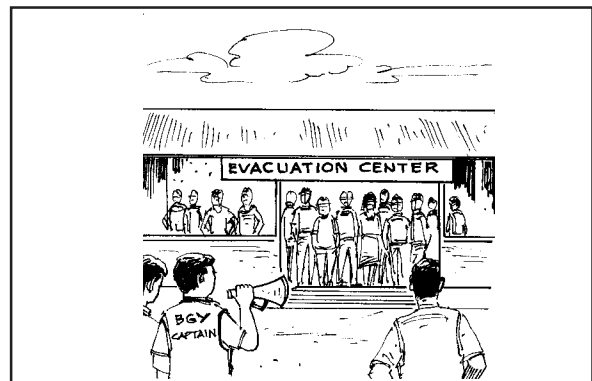


2. In between heavy ashfalls, scrape off ashes that have collected on rooftops to prevent their collapse or destruction.

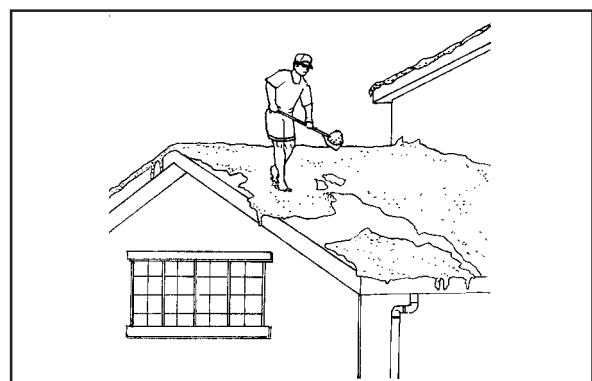


After a Volcanic Eruption

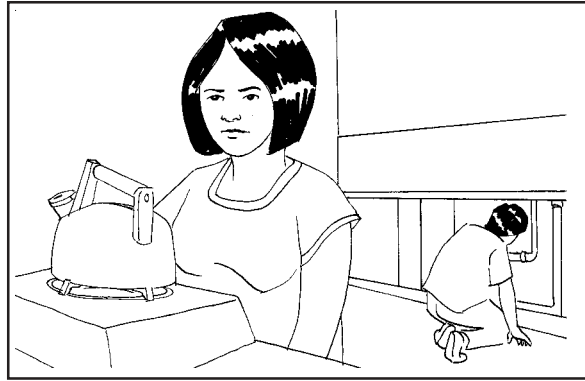
1. If you are in an evacuation center or staying with a relative in a safe place, wait for instructions before returning home.



2. Once you get home, you may start repairing the damaged portions of your property. Scrape off the ash from your roof.



3. Make sure that the water is safe to drink. Check if it is clear and has no unusual odor. Always boil water for 10-15 minutes before drinking it.



Let's Review

A volcano close to where the Galang family lives erupted. PHIVOLCS ordered them and the other families to evacuate to a nearby province. A month after the eruption, PHIVOLCS announced that they can safely return to their homes. What advice can you give them?



Compare your answer with that in the *Answer Key* on page 49.

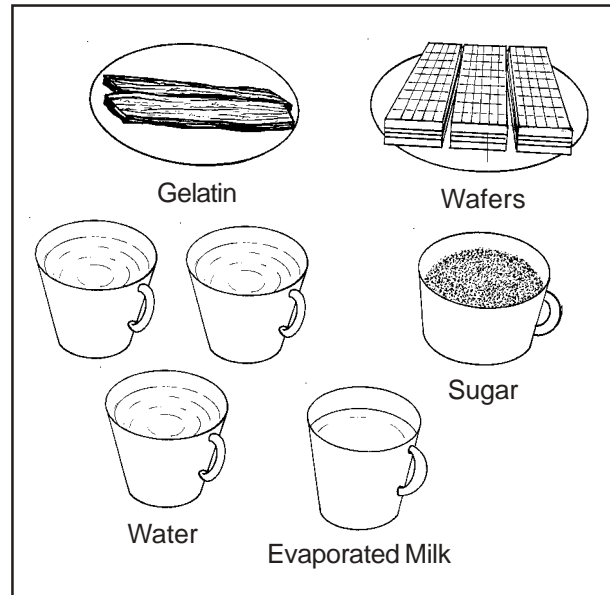


Let's Try This

Now that we have studied volcanic eruptions, we are ready to move to another topic. To give you an idea of the kind of natural disaster that we are going to discuss next, try to do this experiment. If you cannot do it, then you can simply read the ingredients and procedures on the next page, and imagine what the results would be like.

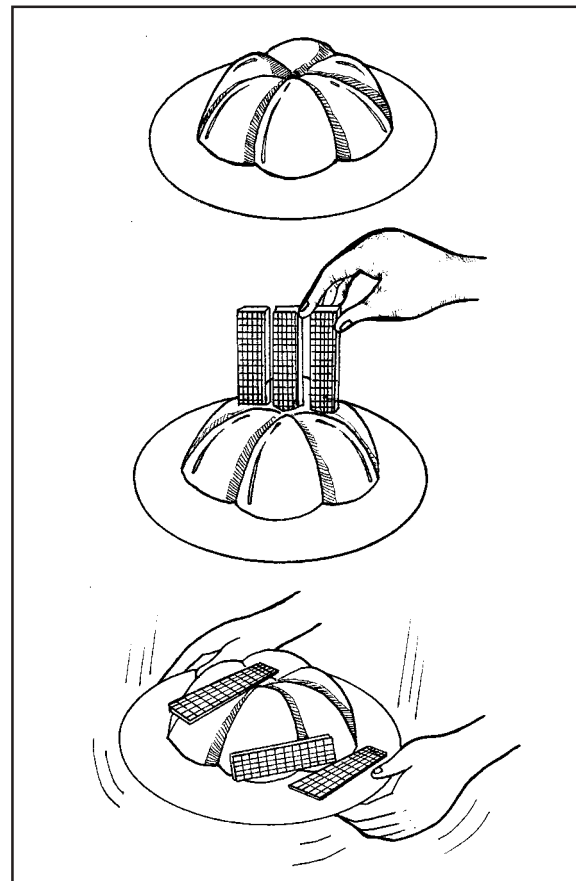
A. Ingredients:

- 1 bar of gelatin
- 3 pieces of wafers
- 3 cups of water
- 1 cup of sugar
- 1 cup of evaporated milk
(optional)



B. Directions

1. Tear the gelatin bar into tiny bits.
2. Pour gelatin bits in boiling water.
3. Add sugar and stir the mixture.
4. Remove the mixture from heat.
5. Then pour the mixture in a shallow plastic bowl. Add milk.
6. After it has cooled down, transfer the gelatin mixture onto a plate.
7. Make the wafers stand on the gelatin. Then shake the plate and observe what happen.
8. Enjoy eating your delicious gelatin and wafers.





Let's Think About This

Did you enjoy doing the previous activity? Now, answer the following questions to know if you learned something from it.

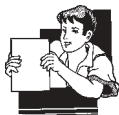
1. Can you guess what disaster is being suggested by the previous experiment? _____
2. What happened to the wafers when you shook the plate?

Compare your answers with the ones given below.

1. Earthquake
2. The wafers fell down.

When an earthquake happens, the ground shakes, just like the gelatin did in your experiment. This can cause the objects on it like houses, trees and buildings to fall down, just like the wafers did.

Do you want to learn more about earthquakes? Read on then.



Let's Learn

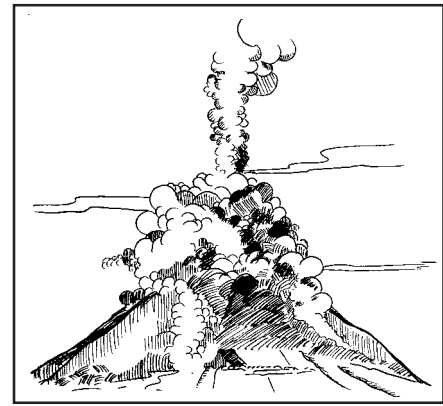
Have you ever experienced an earthquake? Do you remember how you felt at that time? Where were you? Were you afraid? What did you do? An earthquake can be a very frightening experience for anyone. Do you know what causes it?

When you feel the ground shake, you instantly know that it's an earthquake, right? Have you ever wondered why it happens? Well, an earthquake occurs when a volcano erupts violently or when the tectonic plates under the ground move. Tectonic plates are like pieces of a jigsaw puzzle that fit together. They move constantly due to the extreme heat in the inner parts of the earth.

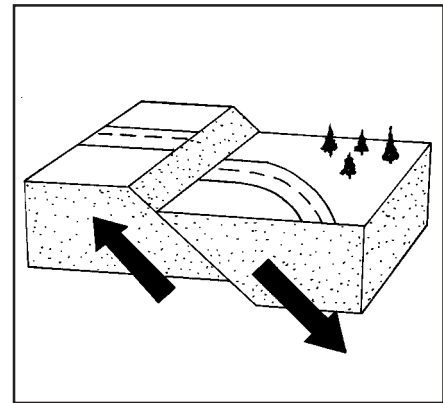
If you live near a volcano and it erupts, you will feel the ground shake. Because the earthquake is caused by a volcanic eruption, it is called a **volcanic earthquake**.

A different kind of earthquake is the **tectonic earthquake**. It is caused by the movement of the tectonic plates, and it occurs over a wider area.

Have you seen big cracks on the ground? These are called **faults**. Faults resist the forces that try to move the plates apart. When the sides of the fault slide past each other, an earthquake occurs.

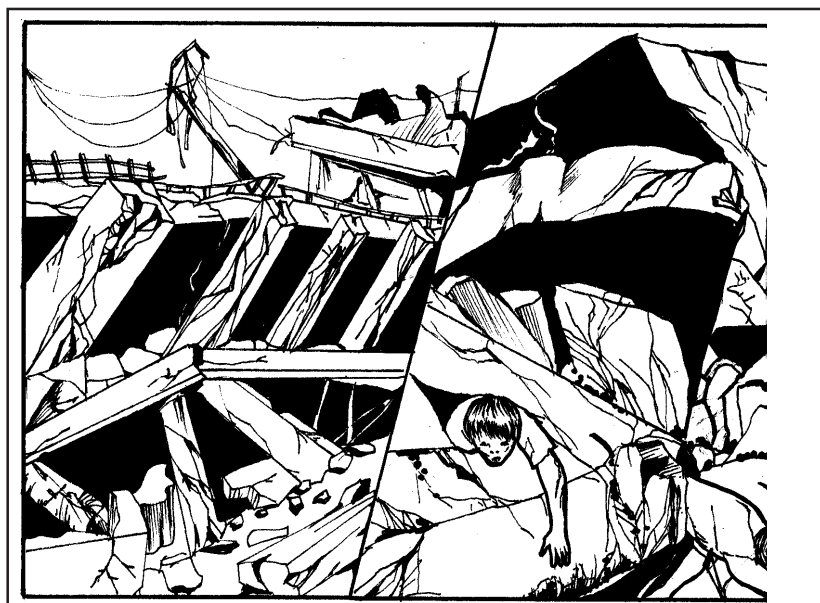


A volcanic eruption may cause an earthquake.



The movement of tectonic plates causes the sliding of faults, resulting an earthquake.

Recall the experiment you did on pages 22–23. What happened to the wafer “buildings” when you shook the plate? They all fell down, right? That’s how destructive earthquakes can get. Do you still remember the buildings that collapsed during the Northern Luzon earthquake in July 1990? How about the lives that the same earthquake claimed?



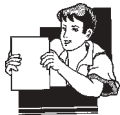


Let's Review

Complete the words that will make the sentence correct. Some letters are already given as clues.

1. An a a is caused by either volcanic eruption or the movement of plates.
2. a resist the forces that try to move the plates apart.
3. A o earthquake occurs when a volcano erupts.
4. A o earthquake occurs over a wider area.
5. Tectonic a move constantly due to the extreme heat in the inner parts of the earth.

Compare your answers with those in the *Answer Key* on page 49.

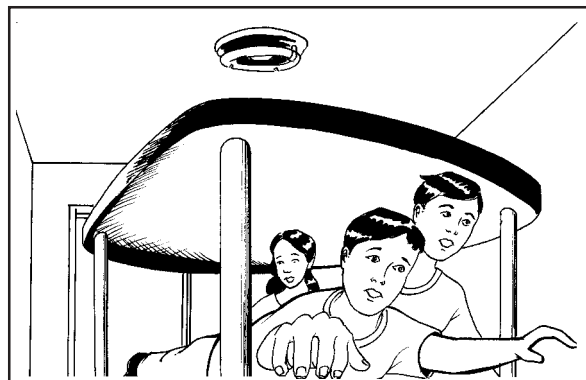


Let's Learn

Like most natural disasters, there is no way to prevent earthquakes. But the good thing is we can do something about the damage that earthquakes cause. There are measures that we can take to prevent undue damage. Learn about these below.

What to Do During an Earthquake

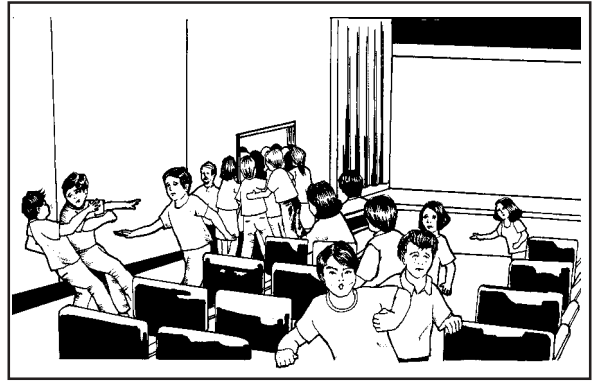
1. If you are indoors during an earthquake, take cover under a heavy table or desk. Stay away from glass windows, paintings, hangings on a wall, or anything that might fall.



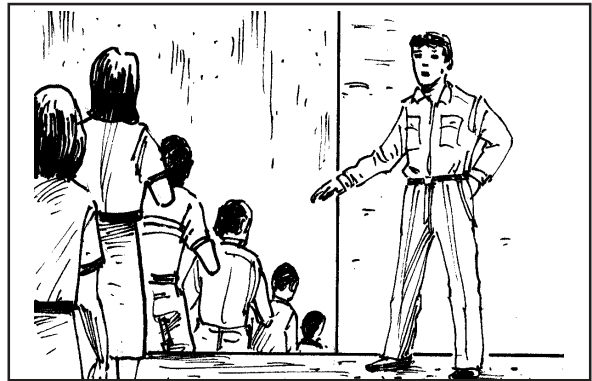
2. If you are in the kitchen, get away from the stove, refrigerator and cabinets with heavy objects. Leave the kitchen if necessary or get under a table.



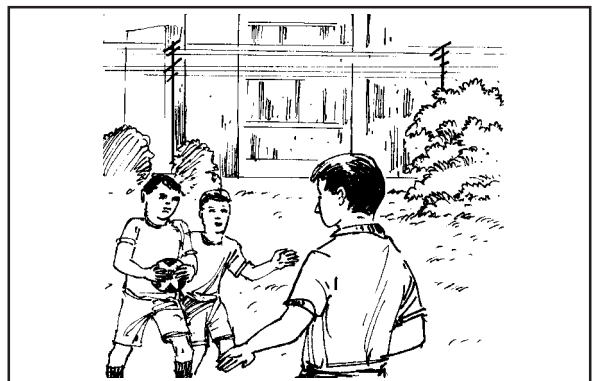
3. If you are in a crowded public place, do not rush to the door. Everyone will be doing that, and this may cause a stampede. Instead, take cover under something heavy.



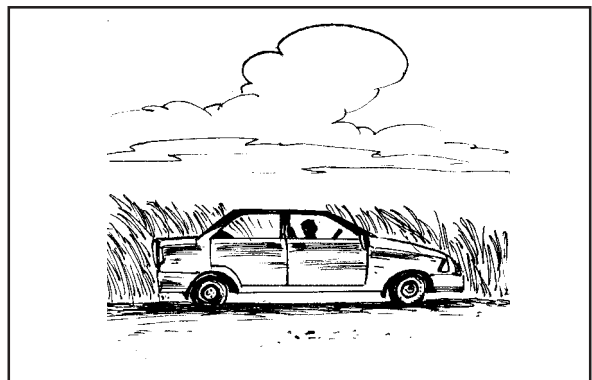
4. If you are in a tall building, do not use elevators. To get out to an open area, use the stairs instead. Or better yet, just take cover under something heavy like a table or chair.



5. If you are outdoors, move to a clear area. Avoid power lines, trees, signs, buildings, vehicles and other hazards.



6. If you are driving, pull over to the side of the road, stop, and set the parking brake. Avoid overpasses, bridges, power lines, signs and other hazards. Stay inside the vehicle until the earthquake is over.





Let's See What You Have Learned

Answer the following questions.

1. Aling Lina's son has asthma. When the volcano in a nearby province erupted, the ashfall reached their place. What should Aling Lina do?

2. After their class, Elsa, Carlo and Ronald played *patintero* on their school grounds. Suddenly, they felt that the ground was shaking. They could see the branches of trees swaying violently. What should they do?

Compare your answers with those in the *Answer Key* on page 49.



Let's Remember

- ◆ Both volcanic eruptions and earthquakes pose danger to people, properties and livelihood.
- ◆ A **volcano** is a hill or mountain which formed around an opening at the earth's surface called a **vent**.
- ◆ When there is too much pressure in the magma chamber, a volcano begins to erupt. When the magma reaches the earth's surface, it is called **lava**.
- ◆ Volcanoes can be classified as **active** or **inactive**. There are records of the eruption of active volcanoes, while there is none for the inactive ones.
- ◆ Some of the many effects of volcanic eruption are ashfall, lahar or mudflow, flood and soil erosion.
- ◆ An **earthquake** is a shaking or trembling of the earth's surface due to volcanic activity or the movement of tectonic plates.

- ◆ An earthquake is either volcanic or tectonic. A **volcanic earthquake** occurs due to volcanic eruption, while a **tectonic earthquake** is caused by the movement of tectonic plates under the ground.
- ◆ **Faults** resist the forces that move the tectonic plates. When the sides of the fault slide past each other, an earthquake occurs.
- ◆ To lessen the damage that volcanic eruptions and earthquakes might cause, there are measures that you can take before, during and after they actually happen.

Tsunami, Landslides and Liquefaction

In the previous lessons, you studied three kinds of natural disasters and measures to take when they happen. Typhoons, volcanic eruptions and earthquakes can result in other calamities and cause further destruction.

In this lesson, you will find out what calamities can arise from a certain calamity. You will also learn what you should do in case these calamities hit your place. In this lesson, it is best if you can get the accompanying cassette tape entitled *Tsunami: One Quake Brings Change*. You may get it from your Instructional Manager.

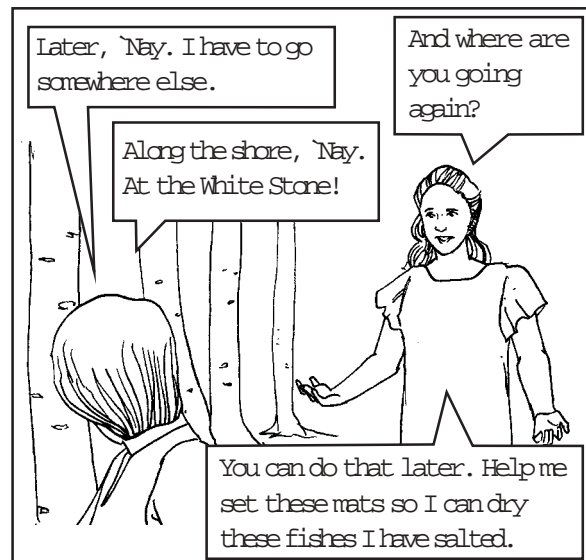


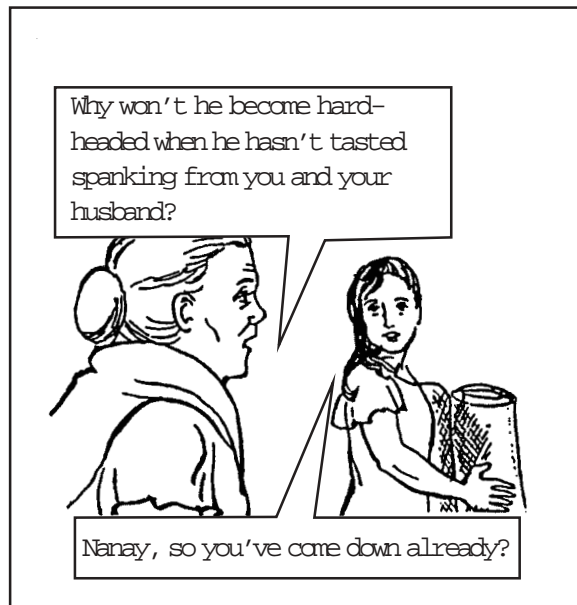
Let's Listen To This

Listen to the cassette tape accompanying this module. If the tape is not available, just read the comic strip that follows. The story is about a strong earthquake that caused a tsunami in the Moro Gulf in Mindanao.

Tsunami: One Quake Brings Change

- Characters:
- Fred – 39 years old, responsible father
 - Eloy – 12 years old, hard-headed son
 - Meding – 34 years old, Fred's wife
 - Idad – 38 years old, from the same barrio as Fred
 - Turo – 40 years old, from the same barrio as Fred, another fisherman
 - Lola – 65 years old, Meding's mother







I know, Mother. Stubborn kids become responsive through spanking. But Fred and I have a different belief. We believe that only effective sermons are needed to instill discipline in a smart child.

It's good if he's going to listen to you, Mading. I told you...

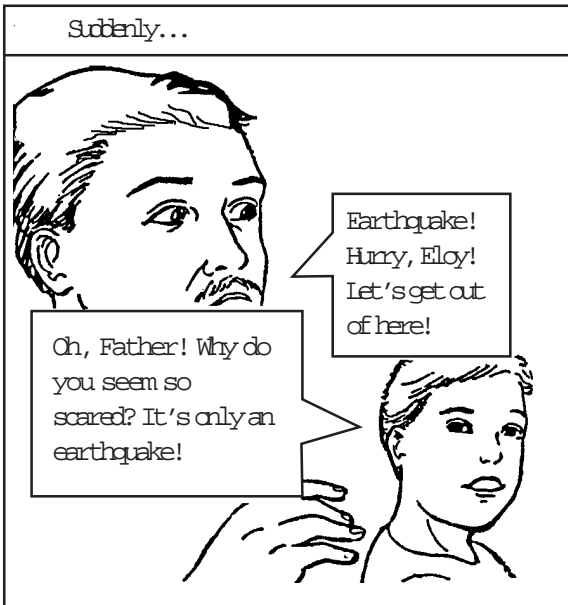


Along the shore...
The wind seems to have become stronger.

Wheeeel
Wheeeel

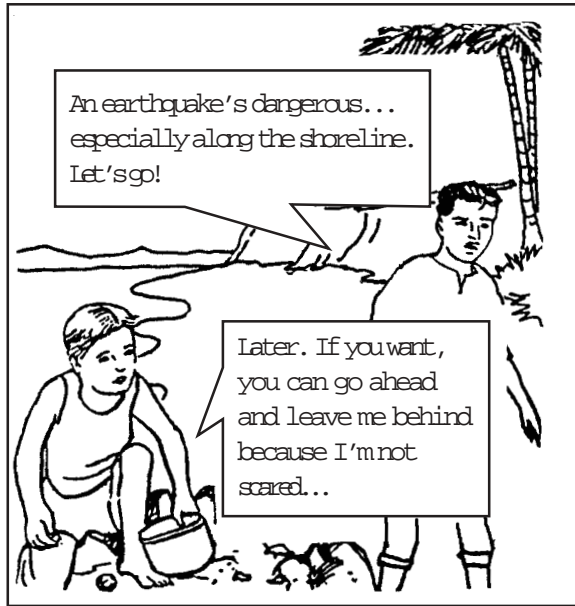
Let's go home, son...

In a while, Father. I still have to gather some...



Suddenly...
Oh, Father! Why do you seem so scared? It's only an earthquake!

Earthquake! Hurry, Eloy! Let's get out of here!



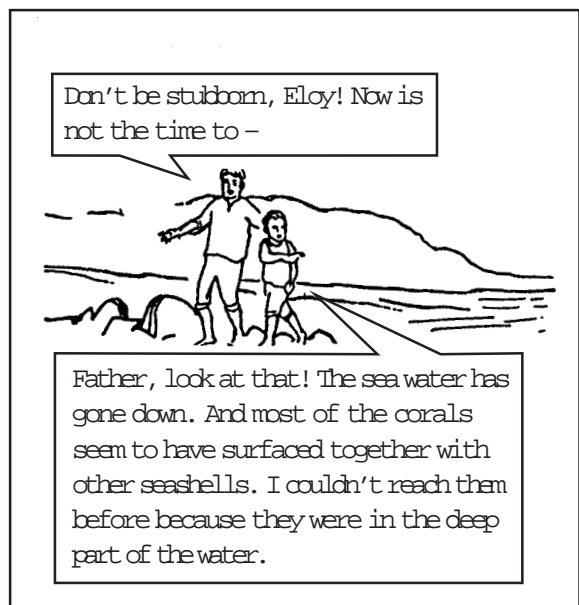
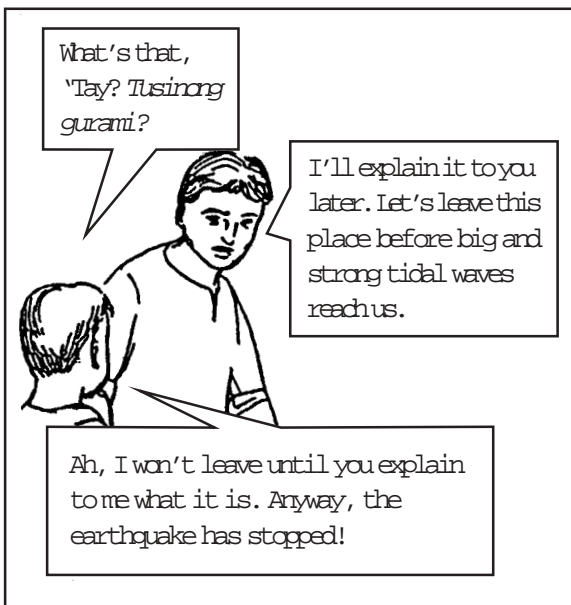
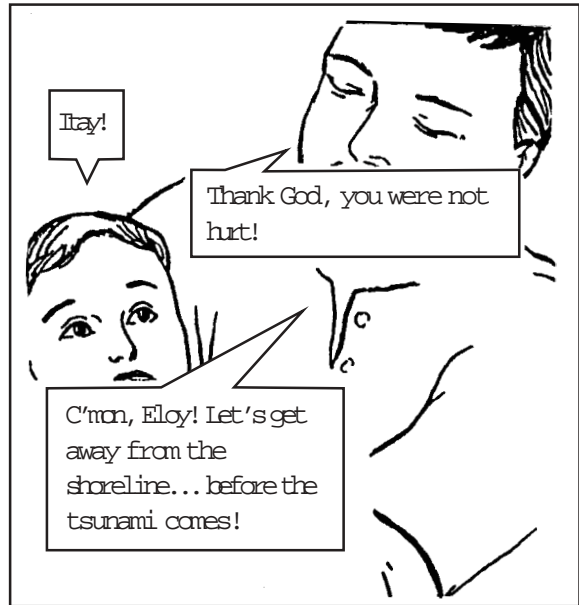
An earthquake's dangerous... especially along the shoreline. Let's go!

Later. If you want, you can go ahead and leave me behind because I'm not scared...



Ahhhhhhhhhhhh!
I'm going there, son! Don't be frightened! I'll help you up!

Ahhhhhhhhhhhh!
'Tay, help me! I can't get up!





Run, Eloy!
Faster! Run!

Oh, no!

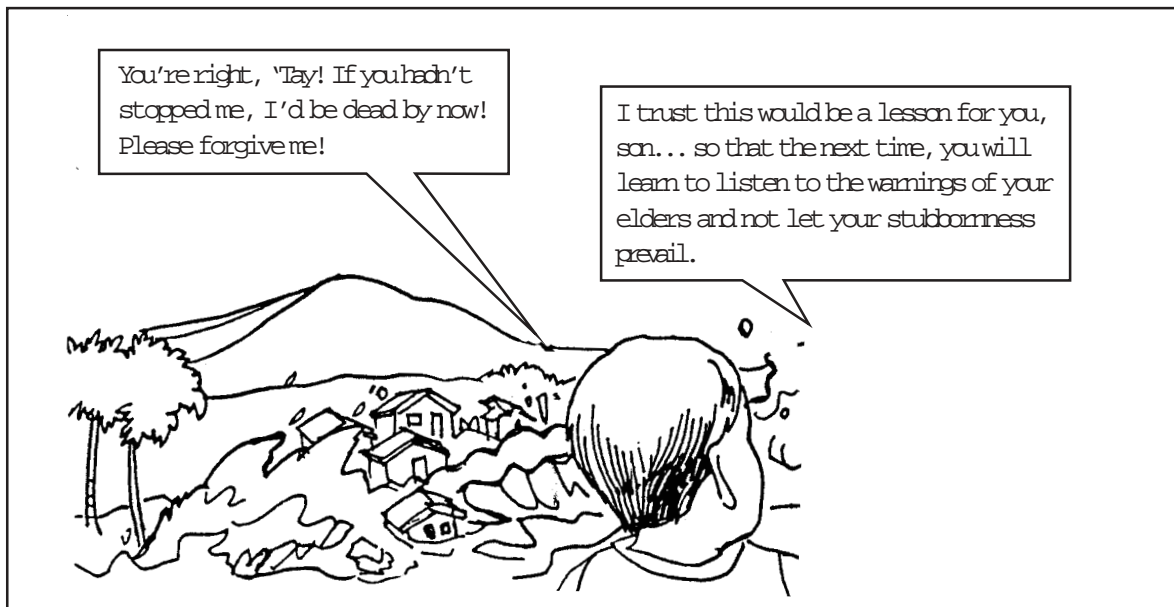
God help us!!! Eloy, to the hill!
Let's go up the hill! Quickly!



Not much later ...

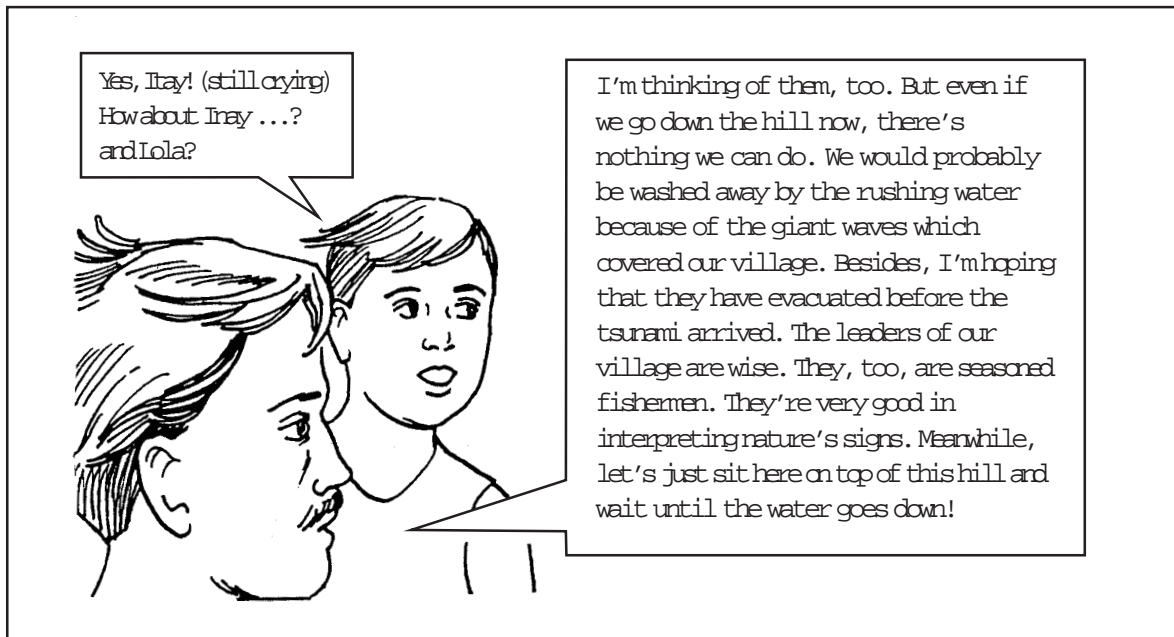
The whole village got covered by big tidal waves!

If I hadn't pulled you up, you'd probably be washed away, too, son!



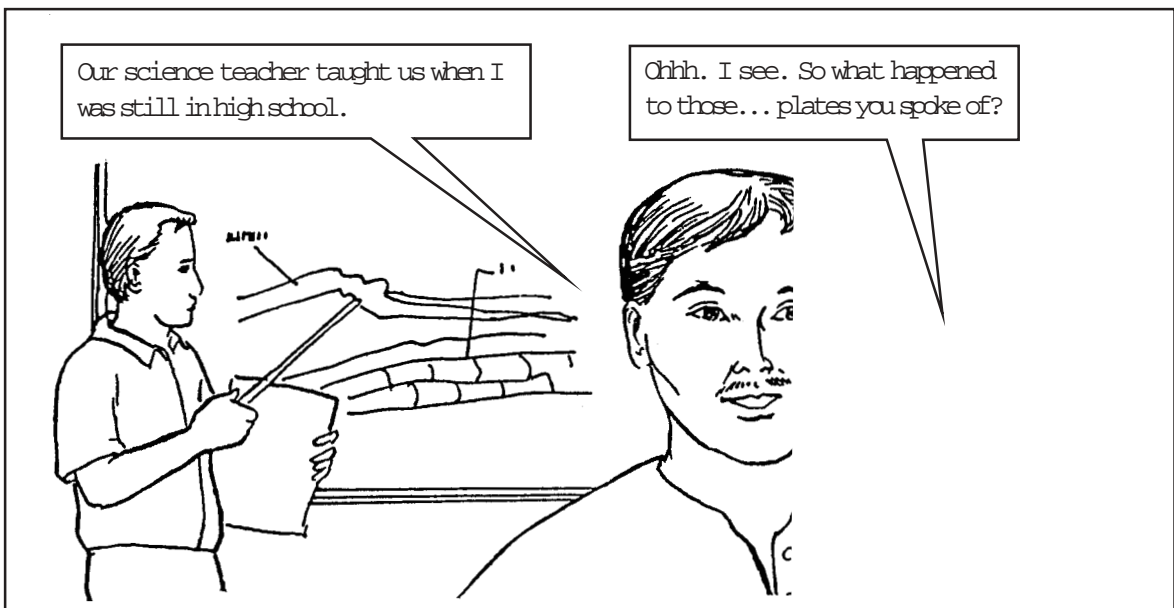
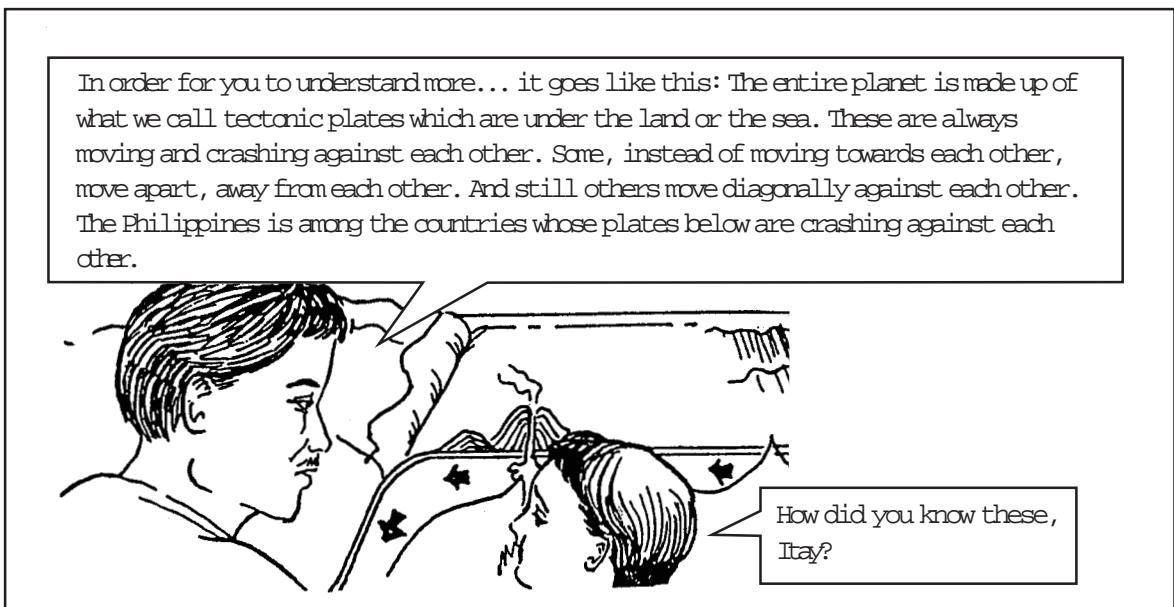
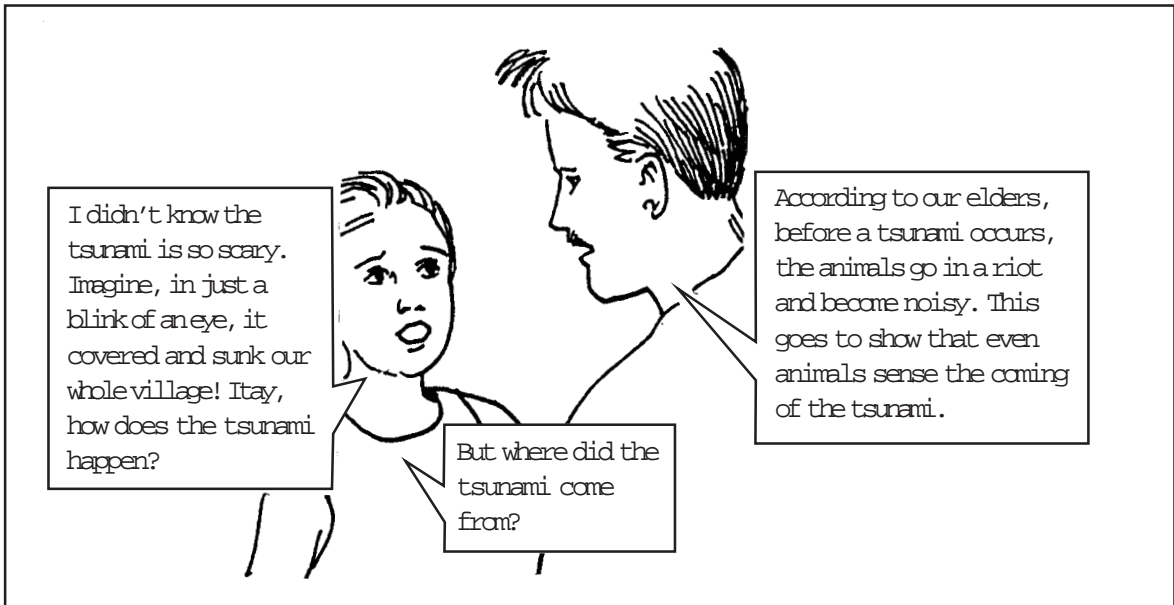
You're right, 'Tay! If you hadn't stopped me, I'd be dead by now! Please forgive me!

I trust this would be a lesson for you, son... so that the next time, you will learn to listen to the warnings of your elders and not let your stubbornness prevail.

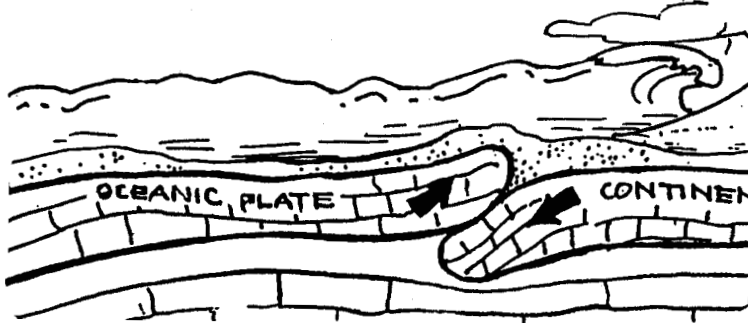


Yes, 'Tay! (still crying)
How about Inay...?
and Lola?

I'm thinking of them, too. But even if we go down the hill now, there's nothing we can do. We would probably be washed away by the rushing water because of the giant waves which covered our village. Besides, I'm hoping that they have evacuated before the tsunami arrived. The leaders of our village are wise. They, too, are seasoned fishermen. They're very good in interpreting nature's signs. Meanwhile, let's just sit here on top of this hill and wait until the water goes down!



When two plates come together, one will move under the other. That is the reason why ocean trenches appear. These are narrow and long, like canals. The movement of the plates is another reason for the eruption of volcanoes and earthquakes.



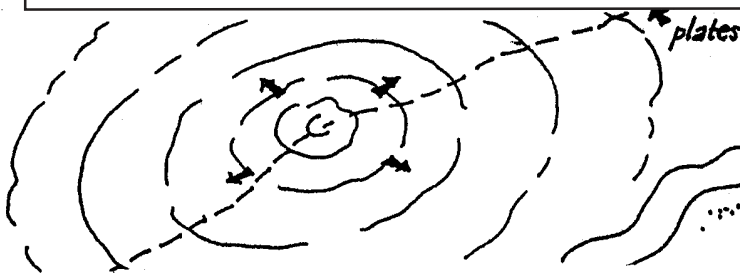
Maybe, a while ago, two plates in our place collided—that's why an earthquake happened, right, Father?

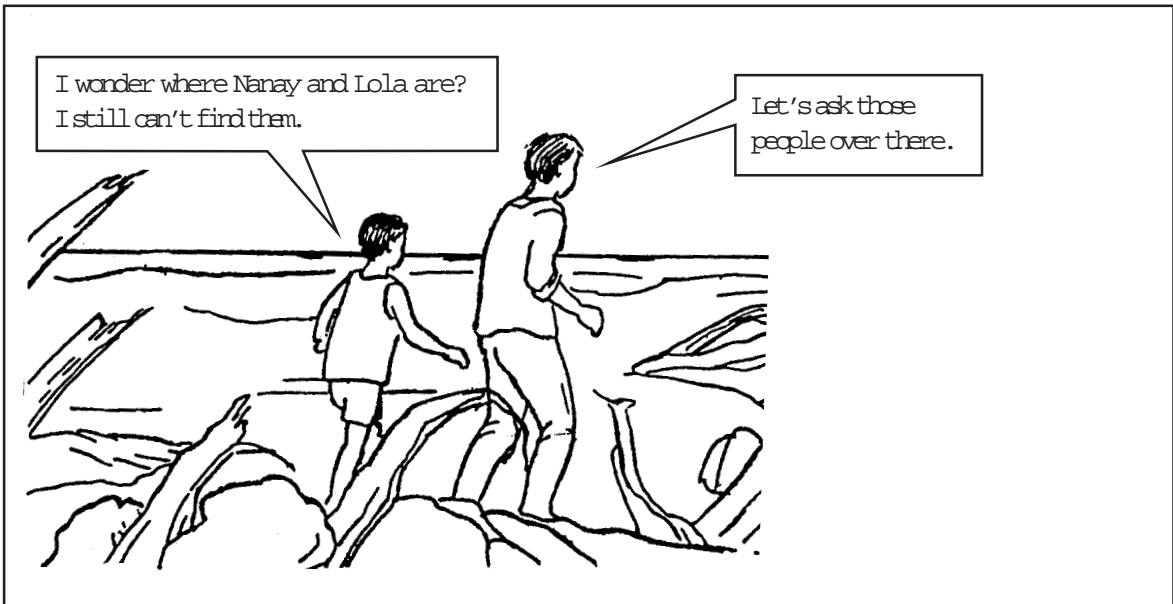
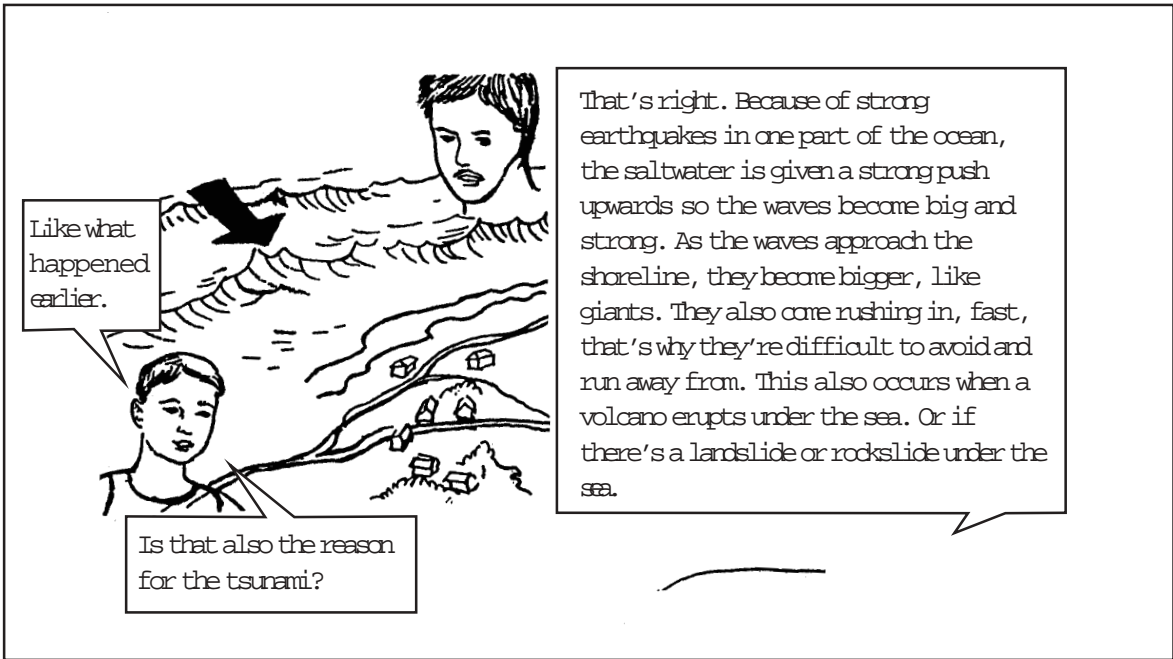
Perhaps.

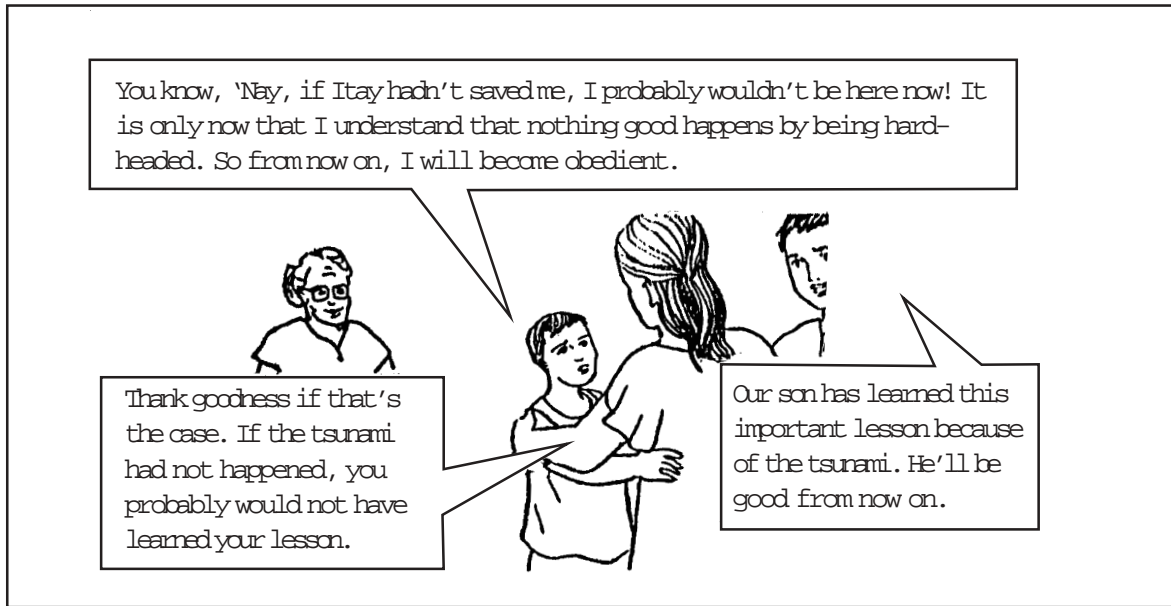


That's why tsunamis are dangerous!

A tsunami usually occurs when a strong earthquake happens under the sea, just like a while ago. Because, like I said, there are also plates under the sea. When two plates collide under and the origin of the earthquake is a bit shallow but the water is deep, surely, there will be very big waves.





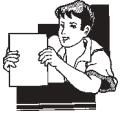


Let's Think About This

1. According to the story that you have read and/or listened to, what are the causes of tsunami?

2. What can be done to avoid being a victim of tsunami?

Compare your answers with those in the *Answer Key* on pages 49–50.



Let's Learn

Tsunami or killer waves are the most powerful waves on earth. Do you have an idea what causes such waves?

When an underwater volcano erupts or a strong earthquake occurs, a tsunami is formed. A massive landslide under the ocean might also cause it. A tsunami looks like ordinary waves in the ocean. But as it nears the shore, it becomes a powerful wall of water. It can be as tall as a building. It is no wonder that a tsunami can easily sweep away an entire village.

To avoid being a victim of a tsunami, you should evacuate immediately from the beach to a higher place after a strong earthquake. Don't wait for the waves to come. You won't live to tell your story. Don't go fishing even after the tide has gone down. Remember that a tsunami is a series of waves. Stay in a safe place until the last giant wave has passed.

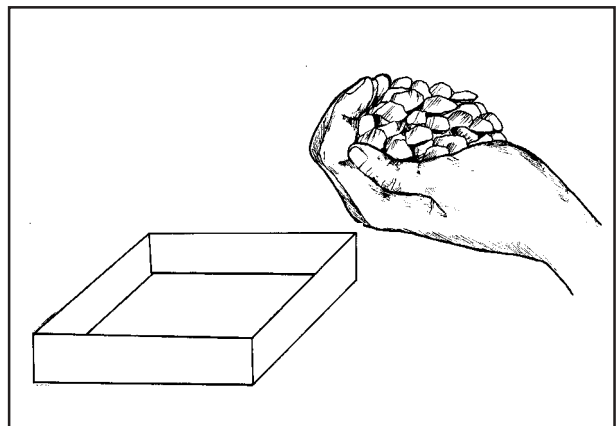


Let's Try This

We have studied tsunamis, and now we will discuss another calamity. To give you a clue on what this calamity is, try this simple activity.

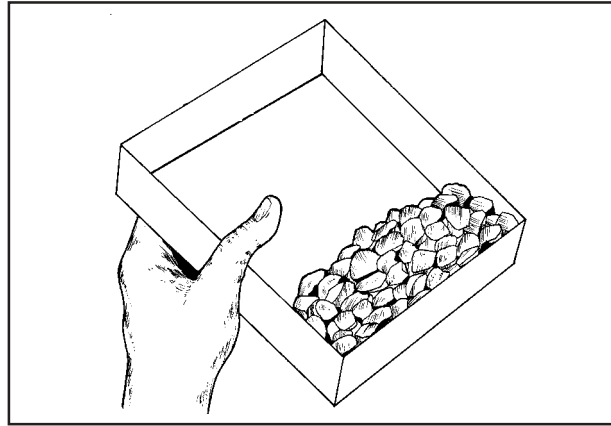
A. Materials:

- 1 empty box about 3"x5"x1" in size
- pebbles or small stones



B. Steps

1. Fill the empty box with pebbles.
2. Tilt the box slowly from side to side.
3. Observe what happens.



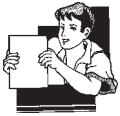
Let's Think About This

1. What happened to the pebbles when you tilted the box?

2. What do you think would happen if you put an object on the pebbles before tilting it?

3. Imagine that the pebbles in the box are the foundation of a house. What do you think would happen to the house if an earthquake occurs?

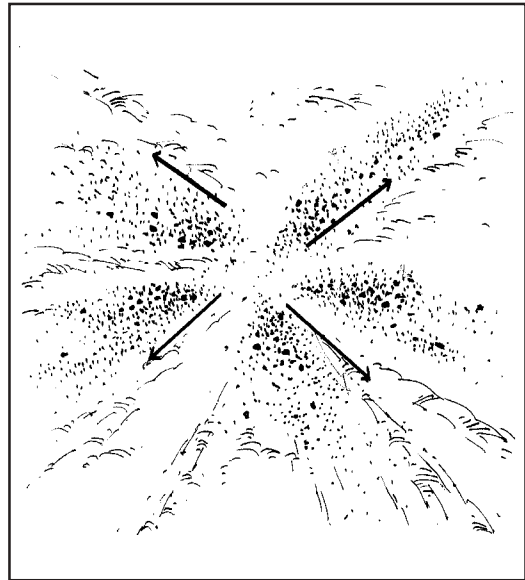
Compare your answers with those in the *Answer Key* on page 50.



Let's Learn

Do you live near the sea? Have you noticed a spot in your yard where the soil seems soft and sandy? If so, you are probably at a greater risk of being a victim of liquefaction.

When an earthquake occurs, the soil weakens. The water pressure increases, causing the soil particles to move apart. The soil then behaves more like a liquid than a solid — hence, the name **liquefaction**.



How can liquefaction affect people? When the soil weakens, it will not be a good foundation for buildings. If your house stands on liquefied soil, your house will collapse when an earthquake occurs or even before it happens.



There is another calamity that has to do with the soil. This is the landslide. Are you familiar with news of landslides happening in Baguio City, especially during the typhoon season? **Landslide** is the sudden downward movement of a mass of soil. Heavy rains may cause landslides. When there are not enough trees to hold the soil, heavy rains can easily carry the soil away.

Can you guess what the other cause of landslides is? Earthquakes cause landslides, too. When the ground is shaking, it becomes unstable. Blocks of soil slip past each other.



To know if your home is safe from liquefaction and landslides, it is wise to consult a geologist. He/She can check if the ground is a stable location, or if it would be safe to build a house there.

Let's See What You Have Learned

Answer the following questions.

1. Your family lives near the sea but your husband works abroad. A month ago, you bought a television, a refrigerator and a component system. Your children were playing at the backyard when you felt a strong earthquake. What would you do?

2. Marta and her family live on the slope of a hill. They earn a living from making charcoal and selling them in the public market during Sundays. They do not replace the trees that they cut and burn. What do you think will happen to them when the typhoon season comes?

Compare your answers with those in the *Answer Key* on page 50.



Let's Remember

- ◆ Calamities such as typhoons, volcanic eruptions and earthquakes cause other calamities like tsunami, liquefaction and landslides.
- ◆ **Tsunami** is a series of giant waves that are caused by underwater volcanic eruption, earthquake or landslide. When there is a tsunami, you should evacuate to a higher place.
- ◆ **Liquefaction** occurs when the soil behaves more like a liquid than a solid. It is because the soil particles moved away from one another due to the pressure of the water between them.
- ◆ The downward movement of a mass of soil is called a **landslide**. It happens when the soil becomes unstable due to the shaking caused by an earthquake. Sometimes it is also because heavy rains easily carry the soil away, especially if there are not enough trees to hold the soil.
- ◆ To avoid the dangers of liquefaction and landslide, consult a geologist to find out if the place you built or will build your house on is safe.

You have almost finished this module. Great job! You have been a diligent learner. Did you learn a lot from this module? Did you have fun reading it? If there are points that are not very clear to you, go back to the parts of module and study them again.

On the next page is a summary of the module's main points to help you remember them better.



Let's Sum Up

This module tells us that:

- ◆ **Typhoon** is a violent storm in the tropical region which is accompanied by heavy rains and strong winds.
- ◆ Typhoons cause damage to people, crops, properties and even aquatic ecosystems.
- ◆ Both **volcanic eruptions** and **earthquakes** put people, properties and the livelihood of people in danger.
- ◆ A **volcano** is a hill or mountain which formed around an opening at the earth's surface called a **vent**.
- ◆ An **earthquake** is a shaking or trembling at the earth's surface due to volcanic activity or movement of tectonic plates.
- ◆ Calamities such as typhoons, volcanic eruptions and earthquakes cause other calamities like tsunami, liquefaction and landslides.
- ◆ **Tsunami** is a series of giant waves that are caused by underwater volcanic eruption, earthquake or landslide.
- ◆ **Liquefaction** occurs when the soil behaves more like a liquid than a solid.
- ◆ The downward movement of a mass of soil is called a **landslide**.
- ◆ We cannot prevent calamities from happening but there are measures we can take before, during and after they happen.



What Have You Learned?

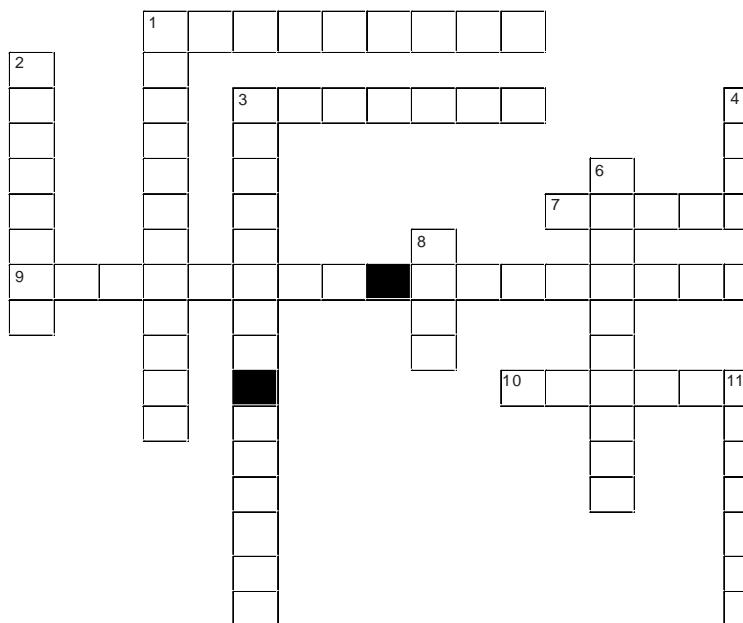
- A. Identify what is being described. Then, write it in its correct place in the crossword puzzle below.

Across

- 1 Downward movement of a mass of soil
- 3 A violent storm in the tropical regions
- 4 Also called mudflow
- 7 Very hot molten rock
- 9 This happens when a volcano erupts and releases volcanic materials (2 words)
- 10 A series of giant waves

Down

- 1 This happens when the soil behaves more like a liquid than a solid
- 2 A kind of volcano which has no records of eruption
- 3 Large parts under the earth's surface that move constantly because of the extreme heat in the inner parts of the earth (2 words)
- 4 Name given to magma when it reaches the surface of the earth
- 5 Product of a volcanic eruption that causes respiratory diseases
- 6 Shaking or trembling at the surface of the earth
- 8 An opening where volcanic materials pass through
- 11 Combination of volcanic particles and water



B. Are you prepared for calamities? What would you do if you were in each of the following situations?

1. You were in the kitchen preparing lunch for your family when suddenly, you felt the ground shaking. What would you do?

2. You have saved enough money to build a new house. What would you do to make sure that the lot on which you will build your house is safe?

3. You were on the beach when you felt an earthquake. You know that at any moment a tsunami might come. What would you do?

4. There is an active volcano in your hometown. What would you do when PHIVOLCS warns you that the volcano might erupt soon?

5. You heard on the radio that a typhoon is coming. What would you do?

Compare your answer with those in the *Answer Key* on pages 50–51.



Answer Key

A. Let's See What You Already Know (pages 2–3)

1. I would consult a geologist first. He/She would test the soil to know if it would be safe to build a house there. He/She would then advise me if it would be wise to buy that land.
2. We would run to a higher ground because the earthquake might cause tsunami.
3. Because heavy rains and strong winds accompany a typhoon, I would repair our roof. I would patch any holes so that they won't leak anymore. I would also nail the roof firmly because the winds might blow it off.
4. I would cover my nose with a wet piece of cloth so that I wouldn't get a respiratory disease from the volcanic ash.
5. I would take cover under the chairs rather than rush to the doors.

B. Lesson 1

Let's Study and Analyze (pages 4–5)

The following are only sample answers. Your own answers may be a bit different though also acceptable.

1. I don't think that the people living in that house are safe when a typhoon comes. There is danger that the strong wind might blow off the roof. Also, there is danger that the branches of the tree or the tree itself might fall on the house.
2. The people living in this house should repair their roof and trim the tree branches before the typhoon season comes.

Let's Review (page 8)

A **typhoon** is a very strong storm in the tropical regions. It is accompanied by continuous **rains** and very strong **winds**. The typhoons that hit the **Philippines** usually form in the Pacific Ocean. Sometimes, they form in the South China Sea.

Typhoons cause serious damage to **people** and properties because of the high and strong winds that they bring. Agriculture also suffers greatly. Most crops cannot resist the strong winds and **flood**. Typhoons also destroy aquatic ecosystems. The strong winds carry the **coral reefs** away where they get broken. This decreases the number of **fish** in the seas because their habitats or the places where they live are destroyed.

Let's Review (pages 11–12)

1. **(b)** If your roof is not nailed well, the strong winds would most likely blow it off.
2. **(d)** You should not get out of the house immediately because it would be more dangerous outside. Instead, you should protect yourself with mattress, rugs or blankets.
3. **(c)** You don't need chocolates and candies to survive a typhoon.
4. **(b)** It is still unsafe to go swimming, sight-seeing or fishing because bodies of water are still not calm.
5. **(a)** It is unnecessary to build a small fishpond near your house before the typhoon season.

Let's See What You Have Learned (pages 12–13)

- A.
1. f
 2. d
 3. b
 4. a
 5. e
- B. These are sample answers only. Your own answers may be a bit different. You can show them to your Instructional Manager for additional feedback.
1. I would prepare an emergency kit which would include a portable radio, extra batteries, flashlight, candles, matches, first aid kit and important medicines. I would also store potable water and canned goods.
 2. I would stay inside the house because it would be dangerous to go outside. Falling trees or power lines might hit me.

C. Lesson 2

Let's Study and Analyze (pages 14–15)

The following are sample answers only. You may give different answers which may also be correct.

1. I don't think that the man is safe. He lives just below a volcano that might erupt any moment. In case that happens, he would not be able to evacuate immediately because he has no ready means of transportation.

2. If I were to choose, I would live in a safer place. If I were the man, I would leave the place if there was a warning that the volcano might erupt. However, if I had to stay in the same place, I would stop cutting trees near my yard to minimize mudflows. I would also save money to buy a tricycle or a jeepney so I could readily evacuate in case there was a threat of an eruption.

Let's Review (page 19)

1. volcano
2. inactive
3. mudflow
4. ashfall
5. magma

Let's Review (page 22)

They should return to their home and repair whatever was damaged during the eruption. They should scrape the ash off their roof to avoid its collapse. They should also check if their water is safe to drink.

Let's Review (page 26)

1. earthquake
2. faults
3. volcanic
4. tectonic
5. plates

Let's See What You Have Learned (page 28)

Below are sample answers.

1. Aling Lina should always remind her son to cover his nose. His asthma might get worse because of the presence of volcanic ashes in their place.
2. Elsa, Carlo and Ronald should stay on the open ground, away from trees, buildings and electric posts.

D. Lesson 3

Let's Think About This (page 38)

1. Tsunami is caused by either earthquake, landslide or volcanic eruption under the sea.

- One should evacuate from the beach to a higher ground after a strong earthquake. Fishing should be avoided even after the tide has gone down. Tsunami is a series of giant waves, so it is better to stay in a safe place until the last giant wave has passed.

Let's Think About This (page 40)

Your answers should be similar to the ones below. But they may still vary based on your observations.

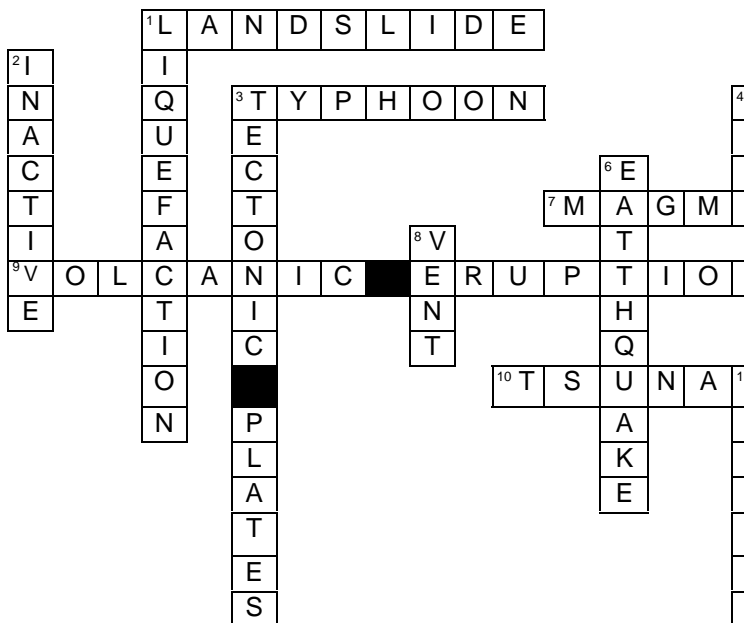
- The pebbles rolled and gathered on one side of the box.
- The object would sway uncontrollably because of the movement of the pebbles. It might fall down, and even be crushed under the pebbles.
- The house would collapse or fall down. It would be destroyed.

Let's See What You Have Learned (page 42)

- My children and I would run to a higher ground even if we could not bring any of our appliances. We can still replace those. But what's important is for us to survive the tsunami.
- They might be victims of landslide. The heavy rains can easily carry away the soil because there are no trees to prevent the landslide.

E. What Have You Learned? (pages 45–46)

A.



B.

1. I would get away from the stove, refrigerator and from the cabinets with heavy objects. Then, together with my family, I would take cover under something heavy like a table.
2. I would consult a geologist to know if it is safe to build a house on the land that I bought.
3. I would hurry to a higher place.
4. I would wait for further advice and warning. I would always be prepared for evacuation.
5. I would check our roof and trim tree branches well near our house. I would also keep our yard free from scrap iron sheets. I would prepare an emergency kit which includes a portable radio, flashlight, batteries, candles and important medicines. I would also stock potable water and canned goods.



Glossary

- Accompany** Go with; exists at the same time as something
- Active volcano** A volcano whose eruption/s has/have been documented or recorded
- Aquatic ecosystems** Communities of living and nonliving things interacting with each other near or in bodies of water
- Archipelago** A group or chain of islands separated from each other by narrow bodies of water
- Ashfall** Clouds of a powdery dust that is released by an erupting volcano
- Calamity** A disaster causing great loss or damage
- Casualties** People or things injured, lost or destroyed as a result of some event like a natural disaster
- Coastal areas** Zones of land that border the sea
- Continuous** Goes on without stopping
- Coral reef** A bank of coral or rock-like formations in the sea
- Deforesting** Cutting down forest trees without replacing them
- Deteriorating** Growing worse
- Dike** A wall built to prevent flooding
- Dormant** Not active, but having the ability to be active at a later time
- Drainage channel** A path along which liquid wastes flow
- Earthquake** The shaking or trembling of the earth's surface caused by volcanic activity or the movement of tectonic plates
- Epicenter** The area on the earth's surface directly above the origin of an earthquake
- Equator** An imaginary line that divides the earth's surface into two equal parts, the north and the south
- Eruption** The way liquids, solids and gases are thrown out on the earth's surface by volcanic activity. This can range from explosive outbursts to quiet, noiseless lava outflow
- Fault** A break or crack in the earth's surface
- Geologist** A person who is an expert in the origins, structure, and composition of the earth, especially its rocks
- Habitat** The natural surroundings in which an animal or plant lives
- Hesitate** To delay in acting or making a decision

Inactive volcano A volcano which has no record of eruption and is beginning to change its form due to weathering and soil erosion

Landslide Sudden downward movement of a mass of soil

Lahar Mudflow

Lava Magma that has reached the surface of the earth

Lightning A bright flash of light in the sky

Liquefaction The loss or decrease of the soil's strength causing it to behave more like a liquid than a solid

Magma Very hot, molten rock deep within the earth which is expelled during a volcanic eruption

Mattress A large flat, fabric-covered pad made of foam used for sleeping on

Mudflow A combination of volcanic particles and water

Potable water Fit for drinking

Precautionary measure An action taken to avoid risk or danger

Prohibits Prevents; bans; disallows

Prone Has the tendency

Respiratory diseases Diseases that affect the lungs and respiratory tract

Ring of Fire The belt of volcanoes that surround the Pacific Ocean. This belt contains about 2/3 of the world's volcanoes

Slippery So smooth or wet as to cause or allow slipping

Slope A slanting surface

Soil erosion Loosening and transportation from one place to another of soil materials by water, wind and living organisms including human activity

Stampede A large group of people or animals all moving suddenly in the same direction and at the same time. It is possible to get badly hurt in a stampede

Storm An outbreak of violent weather, with severe winds and heavy rains often accompanied by thunder and lightning

Tectonic earthquake An earthquake caused by the movement of tectonic plates

Tectonic plates Huge parts under the earth's surface that are constantly moving due to the extreme heat in the inner parts of the earth

Thunder A deep rumbling or loud cracking sound heard after a lightning

Tropical regions The parts of the earth that lie between 23.5° north and 23.5° south of the equator

Tsunami A series of giant waves caused by underwater volcanic eruption, earthquake or landslide

Vent An opening at the earth's surface through which volcanic materials are released

Volcanic earthquake An earthquake caused by volcanic eruption

Volcano A hill or mountain which formed around an opening at the earth's surface called a vent

Weathering Changing in color, texture or shape caused by exposure to sun, wind and rain



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