Senior High School

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Earth & Life Science

First Quarter-Module 9

Geologic Hazards

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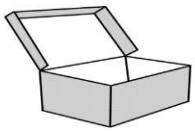
City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE



What I Need to Know

This module was designed and written with you in mind. It is here to help you understand geologic hazards. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course.

The module has one lesson which is geologic hazards.

After going through this module, you are expected to

1. **describe the various hazards that may happen in the event of earthquakes, volcanic eruptions, and landslides; (S11/12ES-if-30)**
2. **using hazard maps, identify areas prone to hazards brought about by earthquakes, volcanic eruptions, and landslides; (S11/12ES-if-31) and**
3. **identify human activities that speed up or trigger landslides; (S11/12ES-if-33)**

What I Know

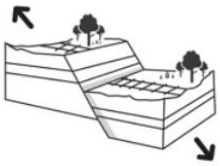
Read the question carefully and encircle the letter of the correct answer.

1. Which of the following refers to a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes?
   A. Pacific Ring of Fire
   B. Pacific Ring of Volcanoes
   C. Pacific Ring of Landslides
   D. Pacific Ring of Earthquakes

2. Which of the following is a weak to violent shaking of the ground produced by the sudden movement of rock materials below the earth's surface?
   A. Fire
   B. Landslide
   C. Earthquake
   D. Soil erosion

3. Which of the following is **TRUE** of ground shaking?
   A. It is the downslope movement of rocks, soil, and other debris.
   B. It is the disruptive up and down and sideways movement of the ground during an earthquake.
   C. It is the deformation on the ground that marks the intersection of the fault with the earth's surface.
   D. It is a phenomenon wherein sediments especially near bodies of water behave like liquid like quicksand.

4. What is shown in the figure below?



A. Landslide
B. Liquefaction
C. Ground shaking
D. Ground rupture

5. Which is **TRUE** about liquefaction?
A. downslope movement of rocks, soil, and other debris
B. series of waves caused by an earthquake under the sea
C. disruptive up and down and sideways movement of the ground
D. Sediments especially near bodies of water behave like liquid like quicksand.

6. What are some effects of landslide?
A. Flooding and coastal erosion
B. Sinking and tilting buildings
C. Erosion, burial and blockage of roads and rivers
D. Displacement on the ground due to the movement of the faults

7. What are some effects of tsunami?

I. Flooding
II. Drowning of people
III. Coastal erosion
IV. Damage to property.

A. I and II
B. III and IV
C. I, II, and III
D. I, II, III and IV

8. Which of the following refer to steam-like flows of molten rock erupted from a crater?
A. Lahars
B. Ash fall
C. Lava flows
D. Volcanic gases

9. Which of the following refer to rapidly flowing thick mixture of volcanic sediments and water?
A. Lahars
B. Ash fall
C. Lava flows
D. Volcanic gases

10. Which of the following refer to showers of airborne fine-to coarse-grained volcanic particles?
A. Lahars
B. Ash fall
C. Lava flows
D. Volcanic gases

11. Which of the following are some human activities that trigger landslide

I. Logging
II. Mining
III. Road construction
IV. Volcanic eruption

A. I and II
B. II and III
C. I, II and III
D. I, III, and IV

12. Which of the following can produce acid rain?

A. Volcanic gases
B. Lahars
C. Lava flows
D. Tsunami

13. What are some hazards from ash fall?

I. Respiratory ailments
II. Poor or low visibility
III. Dangerous for aircrafts
IV. Burning

A. I and II
B. II and III
C. I, II, and III
D. I, II, III and IV

14. What are some hazards from lahars?

I. Can destroy by direct impact
II. Bury valley and communities with debris
III. Can block tributary stream
IV. Can cause acid rain

A. I and II
B. II and III
C. I, II, and III
D. I, II, III and IV

15. What is **TRUE** about landslides?

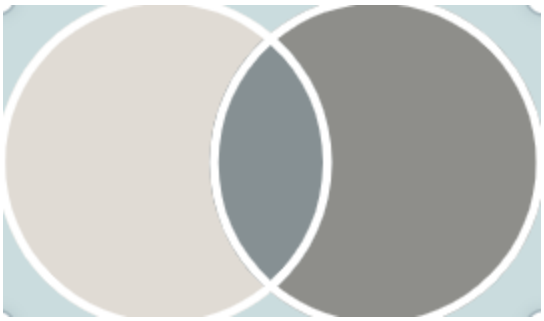
A. It follows other natural disasters.
B. It may be aggravated by human activities.
C. Both A and B
D. Neither A nor B

Lesson 1 Geologic Hazards

What's In

Activity 1.1. Hazard vs Disaster

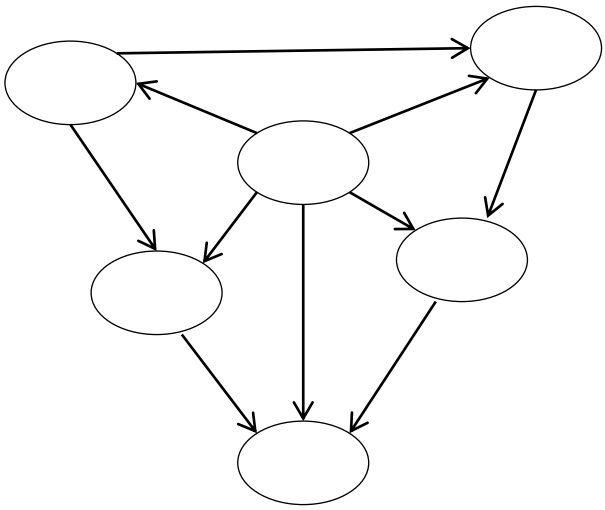
Use a Venn Diagram to compare hazard and disaster. Copy and answer on a clean sheet of paper.



What's New

Activity 1.2. Picture Analysis

Examine the picture below. Based on the picture, what do you think are some ways by which human activities affect our environment? Use the mind map below to organize your thoughts. Use another sheet oof paper if necessary.



Source: *Human Activities and the Environment. Digital Image. FrontLearners. Accessed September 4, 2020. www.frontlearners.com*

What Is It

Earthquake, Volcanic Eruption, and Landslide.

There is an average of 20 earthquakes recorded daily in the Philippines, but these are mostly weak ones, so we hardly feel their effects. You have studied in your previous Science classes that our country is part of the Pacific Ring of Fire which is characterized by active volcanoes and frequent earthquakes. The Philippines is also bounded by subducting tectonic plates called the Philippine Sea Plate and Eurasian Plate.

See the Philippines Tectonic Map below. You would notice several trenches. A trench is any long, narrow, s steep-sided depression in the ocean bottom in which occur the maximum oceanic depths. An offshore earthquake may occur on trenches such as Philippine Trench, East Luzon Trough, Manila Trench, Negros Trench, Sulu Trench and Cotabato Trench. On the other hand, inland earthquakes are generated by the movement of active faults. The longest of which is the Philippine fault.

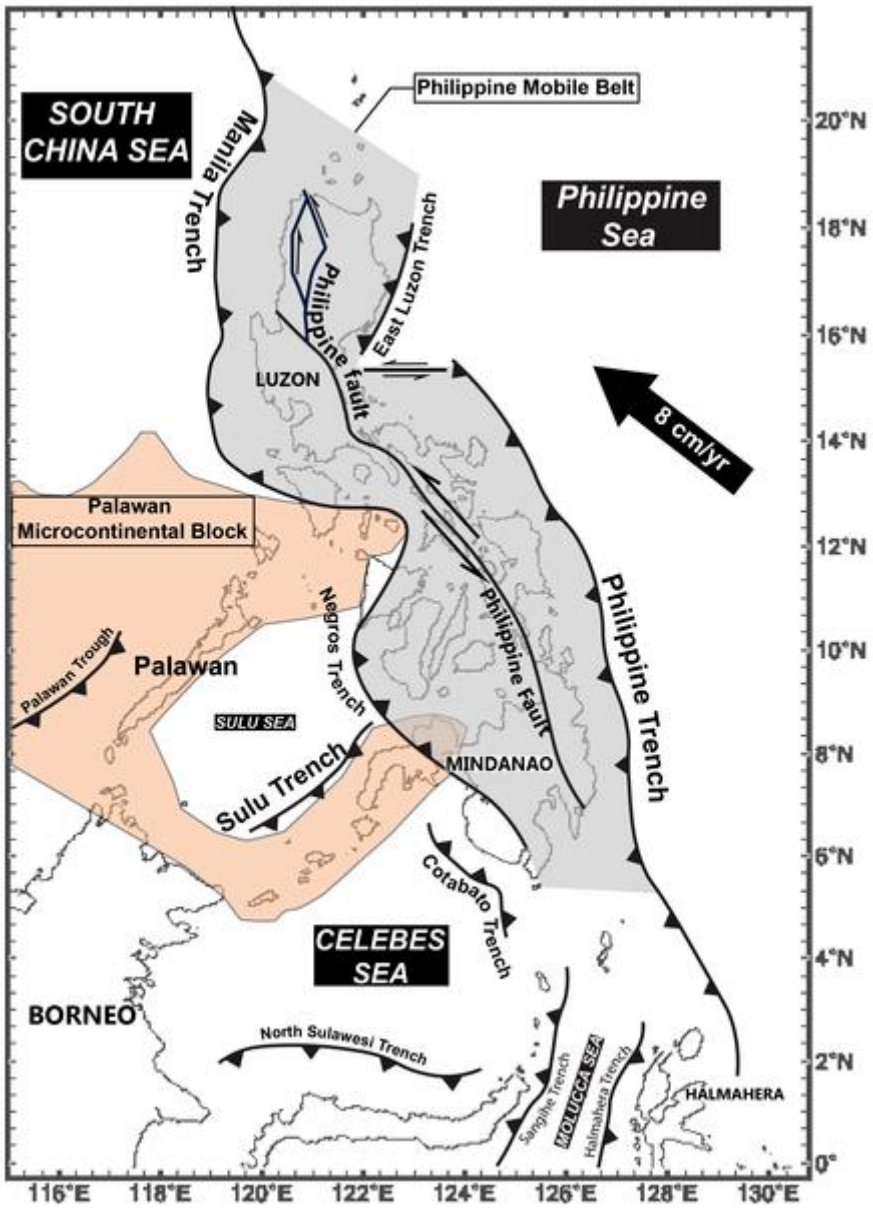


Figure 1.1. Tectonic Map of the Philippines

Source: *Tectonic Map of the Philippines. Wikimedia Commons. Accessed September 4, 2020. https://commons.wikimedia.org/wiki/File:Tectonic_map_of_Philippines.png*

The following are the hazards associated with earthquakes: ground rupture, ground shaking, liquefaction, earthquake-induced landslide and tsunami. A secondary hazard is fire. See the tables below for hazards associated with earthquakes and volcanic eruptions.

Table 1.1. Earthquake Hazards

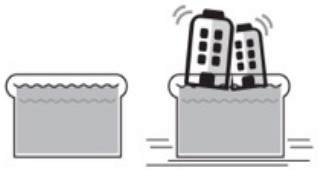
Hazards	*Description*
Ground rupture	-deformation on the ground that marks the intersection of the fault with the earth's surface. Fissures (displacement on the ground due to the movement of the faults) are some of the effects of ground rupture.  ***Source:*** *Teaching Guide for Disaster Readiness and Risk Reduction, Commission on Higher Education, 2016*
Ground shaking	- disruptive up-down and sideways movement of the ground during an earthquake. This can result to damage and collapse of structures.  *Source: Teaching Guide for Disaster Readiness and Risk Reduction, Commission on Higher Education, 2016*
Liquefaction	-a phenomenon wherein sediments especially near bodies of water behave like liquid like quicksand. Its effects can be observed in structures such as sinking and tilting buildings above it.  *Source: Teaching Guide for Disaster Readiness and Risk Reduction, Commission on Higher Education, 2016*
Landslide	-downslope movement of rocks, soil and other debris known to be a geologic hazard triggered by strong shaking. The effects of this hazards are erosion, burial and blockage of roads and rivers. In 1990, three roads in Baguio City were blocked by landslide, making rescue operations more difficult.
Tsunami	-series of waves caused by an earthquake under the sea. The effects of tsunami are flooding, coastal erosion, drowning of people, and damage to property. Examples are 2001 East Japan earthquake and 1976 Moro Gulf earthquake and tsunami.

Table 1.2. Volcanic Eruption Hazards

Lava flows	-steam-like flows of molten rock erupted from a crater or fissure. Agricultural areas affected by lava flows once solidified are rendered useless for years.
Ash fall or Tephra Fall	-showers of airborne fine-to coarse-grained volcanic particles Hazards/effects: can cause poor or low visibility, loss of agricultural land, dangerous for aircrafts as the abrasive ash can cause the engines to fail.
Lahars	-rapidly flowing thick mixture of volcanic sediments and water. Lahars can lead to increased deposition of sediments along affected rivers and result to long-term flooding problems.
Volcanic gases	-These gases can produce acid rain and are harmful to people, animals, and vegetation.

Landslide

Landslide usually follow other natural disaster like volcanic eruptions, earthquakes, wildfires, storms, and floods. Steep slopes and areas that have been hit by landslide before are places prone to landslides. They also frequently occur where people have radically changed the landscape: hills stripped of vegetation and slopes modified for roads and buildings.

Since landslide is a massive soil erosion, it is considered a natural hazard. As mentioned previously, areas near high slopes are at risk of landslide. Activities in these areas that may cause soil instability increase the risk of landslides. Some of these activities are *logging, mining, and road and other development construction.*

Logging.

People cut trees for many reasons, one of which is to create products like paper and furniture. We also cut trees for land conversion. Forest land may be converted to agricultural, residential, or commercial land. People also turn land into mining sites or new roads.

We know that trees provide anchor for the soil because the roots hold the soil compact. Removing trees will result to poor soil stability. When heavy rain falls, soil will get carried away causing landslides to occur.

Mining.

Mining also causes landslides. Recall that minerals and rocks have many uses that is why they are mined. Before establishing mine sites, trees and vegetation are cleared and burned. Aside from triggering landslides through deforestation, mining also causes the soil to become loose and unstable.

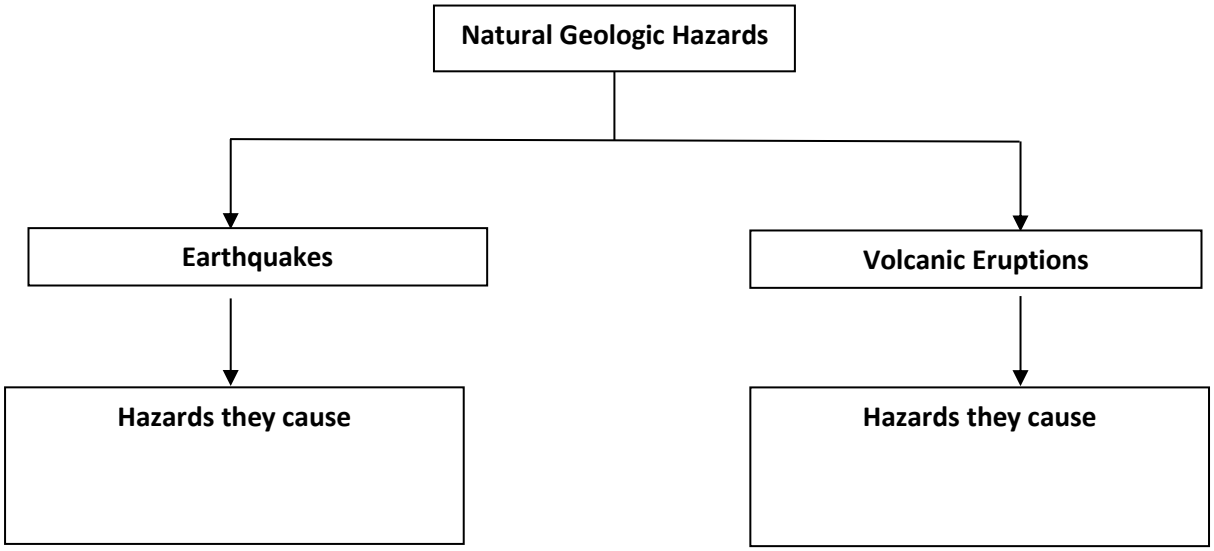
Road construction and other infrastructure

Residential lots and buildings built in sloping areas increase the chance of having landslides. These construction activities involve cutting of trees and removal of soil from hillsides. Dam construction also leads to landslide. The weight of water depresses the rock strata under the lake.

What's More

Activity 1.3. Earthquake and Volcanic Eruption Hazards

Fill in the graphic organizer below with concepts that you have learned from this lesson. Write your answers on a separate sheet of paper.



What I Have Learned

Activity 1.4. Lesson Summary

Summarize what you have learned by filling in the gaps. Copy and answer on a clean sheet of paper.

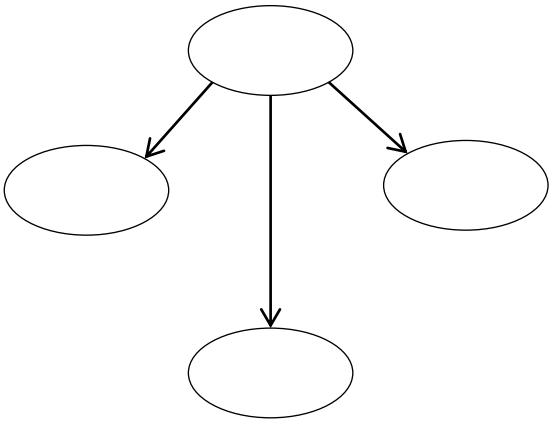
Earthquakes, volcanic eruptions, and landslides are hazardous because _____.

Some activities that increase the occurrence of landslides are _____. _____, and _____ in sloping areas.

What I Can Do

Activity 1.5. Ways to Lessen the Occurrence of Landslides

Now that you know how human activities trigger landslides, what can people do to help lessen the occurrence of landslide? Think of three ways. Use the mind map below to organize your thoughts. Use another sheet of paper if neccessary.



Posttest

Read the question carefully and encircle the letter of the correct answer.

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   B. It may be aggravated by human activities.
   C. Both A and B
   D. Neither A nor B

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4. Which of the following can produce acid rain?
   A. Volcanic gases
   B. Lahars
   C. Lava flows
   D. Tsunami

5. Which of the following are some human activities that trigger landslide?
   I. Logging
   II. Mining
   III. Road construction
   IV. Volcanic eruption
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B. Series of waves caused by an earthquake under the sea
C. Disruptive up and down and sideways movement of the ground
D. Sediments especially near bodies of water behave like liquid like quicksand.

12. What is shown in the figure below?

A. Landslide
B. Liquefaction
C. Ground shaking
D. Ground rupture

13. Which of the following is **TRUE** about ground shaking?

A. It is the downslope movement of rocks, soil, and other debris.
B. It is the disruptive up and down and sideways movement of the ground during an earthquake.
C. It is the deformation on the ground that marks the intersection of the fault with the earth's surface.
D. It is a phenomenon wherein sediments especially near bodies of water behave like liquid like quicksand.

14. Which of the following is a weak to violent shaking of the ground produced by the sudden movement of rock materials below the earth's surface?

A. Fire
B. Landslide
C. Earthquake
D. Soil erosion

15. Which of the following refers to a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes?

A. Pacific Ring of Fire
B. Pacific Ring of Volcanoes
C. Pacific Ring of Landslides
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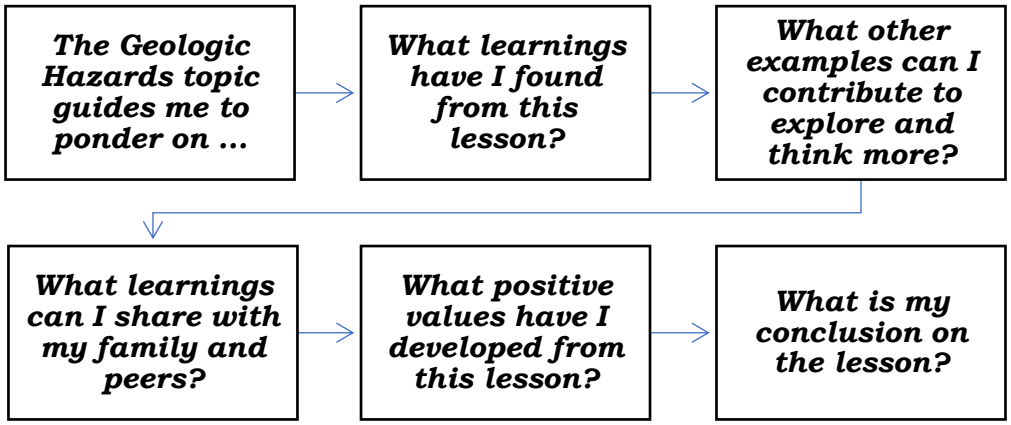
Additional Activities

Write your reflection on Geologic Hazards by answering the questions inside the box. Express your critical and creative thinking skills in your answers. Have fun and enjoy!



Answer Key

What's In Activity 1.1

Both hazard and disaster are dangerous. Hazards pose the possibility of damage. A disaster happens when a community is unable to cope with the impacts of these hazards.

What's New Activity 1.2

Human activities like cutting trees can trigger landslides. Human activities like planting trees can also protect our environment.

What's More Activity 1.3

Earthquake Hazards-ground rupture, ground shaking, liquefaction, landslide, tsunami Volcanic Eruption Hazards-lava flows, ashfall, lahar, volcanic gases

What I Have Learned Activity 1.4

Earthquakes, volcanic eruptions, and landslides are hazardous because they are spontaneous.
Earthquake Hazards-ground rupture, ground shaking, liquefaction, landslide, tsunami Volcanic Eruption Hazards-lava flows, ashfall, lahar, volcanic gases
The effects of landslides are erosion, burial and blockage of roads and rivers.
Some activities that increase the occurrence of landslides are logging, mining, and road construction in sloping areas.

What I Can Do. Activity 1.5

proper land use
planning
planting/replanting
activities
following environmental laws
education and awareness

References

(1) "Earth Rocks! | CCSF." CCSF CCSF. Accessed September 2, 2020. https://www.ccsf.edu/academics/schools/stem/earth-sciences-department/earth-rocks.

(2) Teaching Guide for Senior High School Disaster Readiness and Risk Reduction. Commission on Higher Education, 2016

(3) Welcome to STARBOOKS Online!. Accessed September 2, 2020. https://www.starbooks.ph/k12/12/7.

(4) YouTube. n.d. https://www.youtube.com/watch?v=Py9k7dacoKo.

(5) YouTube. n.d. https://www.youtube.com/watch?v=krJLnXpemtQ.

(6) YouTube. n.d. https://www.youtube.com/watch?v=mknStAMia0Qv=DEtRC35ln94.

(7) YouTube. n.d. https://www.youtube.com/watch?v=sX-lgQuXZp4.

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