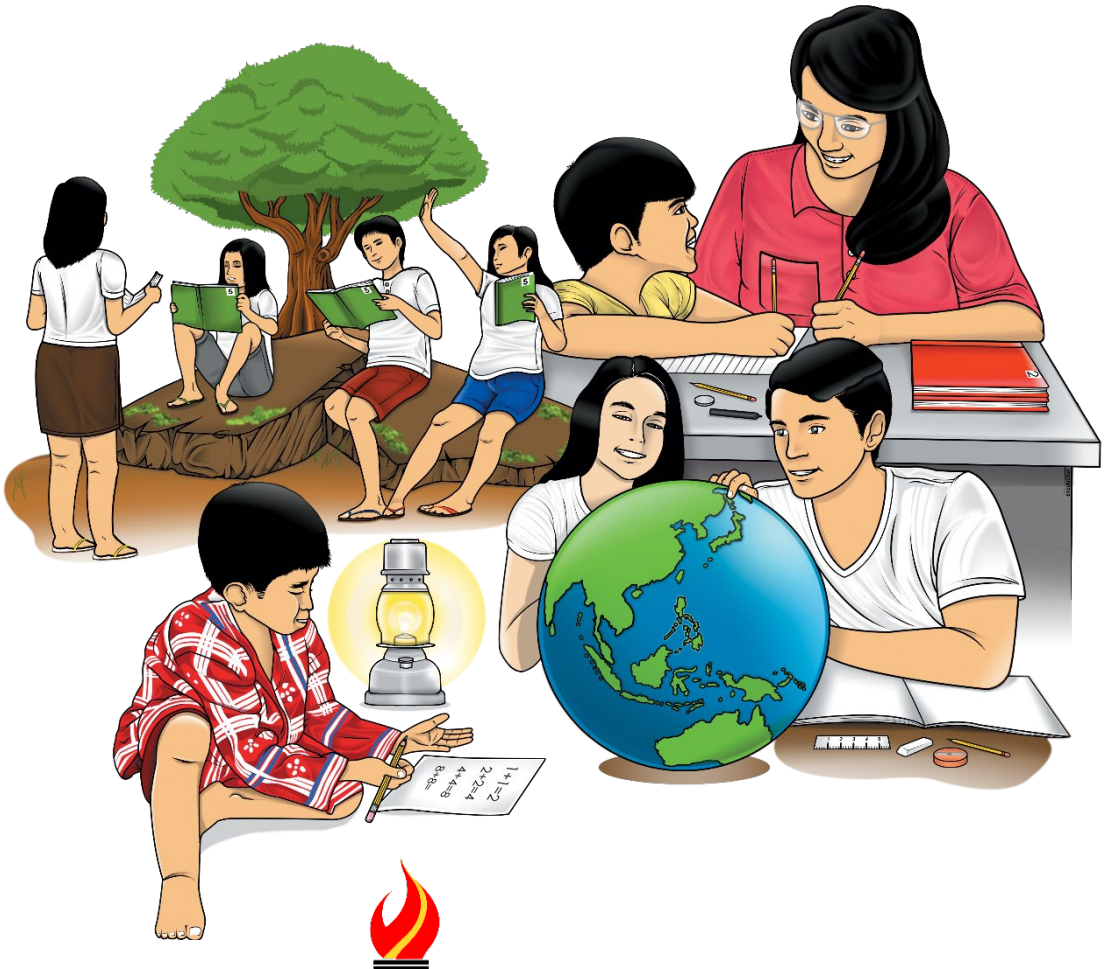
Senior High School

DepED
DEPARTMENT OF EDUCATION

Earth and Life Science

Quarter 1 – Module 15:
Geologic Processes and Hazards



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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master the geologic processes and 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. But the order in which you read them can be changed to correspond with the textbook you are now using.

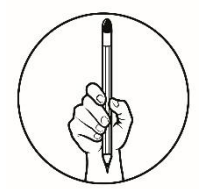
In this module, we will describe the geologic processes and hazards happening in the community. Geologic processes like earthquake, volcanic eruption, and landslides lead to different hazards. A hazard refers to a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards are extreme natural events with a certain degree of probability of having adverse consequences.

The module covers:

- Lesson 1 – Geologic Processes and Hazards

After going through this module, you are expected to:

Describe the various hazards that may happen in the event of earthquakes, volcanic eruptions, and landslides.



What I Know

Directions: Read each statement and choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. What is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation?
    A. eutrophication
    B. geologic hazard
    C. landslide
    D. poisonous gases
2. Which of the following describes the vibration of the ground during an earthquake?
    A. ground shaking
    B. landslides
    C. liquefaction
    D. tsunami
3. What do you call the hazard where giant waves move at speeds of up to 500 miles an hour and reach heights of hundreds of feet?
    A. ground shaking
    B. landslides
    C. liquefaction
    D. tsunami
4. What is the process during earthquake shaking where sand and silt grains in wet soil are rearranged and the water in the spaces between the grains are squeezed?
    A. ground shaking
    B. landslides
    C. liquefaction
    D. tsunami
5. What refers to the sliding down of a mass of earth or rock from a mountain or cliff?
    A. ground shaking
    B. landslides
    C. liquefaction
    D. tsunami
6. What natural hazard is involved when rock underground suddenly breaks along a fault causing tectonic movement?
    A. cyclone
    B. earthquake
    C. hurricane
    D. volcanic eruption
7. What natural hazard has the effects of reshaping new land, debris avalanche, destroyed forests, and death to many animals?
    A. earthquake
    B. hurricane
    C. tsunami
    D. volcanic eruption

8. What occurs when large amount of water quickly overflows a boundary?
    A. flash flood
    B. regular flood
    C. landslide
    D. tsunami
9. What causes an earthquake?
    A. glacier
    B. landslide
    C. very large storm
    D. a movement along fault
10. Which of the following is **NOT** a natural hazard?
    A. earthquake
    B. house fire
    C. hurricane
    D. tsunami
11. A natural physical process becomes a natural hazard when the process becomes ____.
    A. scary
    B. dormant and inactive
    C. faster than usual
    D. extreme and unpredictable
12. Which statement is true of earthquakes?
    A. All of them can be prevented.
    B. Weak ones can be prevented.
    C. Some of them can be prevented.
    D. None of them can be prevented.
13. What specific region of the world is characterized by the presence of active volcanoes, tsunamis, and earthquakes?
    A. the ring of fire
    B. the Eastern Europe
    C. the North and South pole
    D. Western Europe
14. Which of the following is true of a landslide?
    A. A landslide is a mass movement of rock fragments, soil, and debris downslope.
    B. A landslide is associated with a volcanic eruption.
    C. If debris from a landslide mix with water, it will break apart and stop flowing.
    D. All of the answers are true.
15. Which of the following is/are geologic hazard/s?
    A. earthquake
    B. volcanoes
    C. waves pounding on a coast
    D. all of these are geologic hazards

Lesson 1 Geologic Processes and Hazards

What's In

Geology is the study of the Earth and its history. It involves studying the materials that make up the earth, the features and structures found on Earth, as well as the processes that act upon them. It also deals with the study of the history of all life living on the earth now.

How do geological processes occur?

Geological processes are naturally occurring events that directly or indirectly impact the geology of the Earth. Examples of geological processes include events such as plate tectonics, weathering, earthquakes, volcanic eruptions, mountain formation, deposition, erosion, droughts, flooding, and landslides. Geological processes affect every human on the Earth all of the time, but are most noticeable when they cause loss of life or property. These threatening processes are called natural disasters.

How about Geologic Hazards?

A geologic hazard is an extreme natural event in the crust of the earth that poses a threat to life and property, for example, earthquakes, volcanic eruptions, tsunamis (tidal waves), and landslides. It is a large-scale, complex natural events that happen on land. These hazards can cause immense damage, loss of property, and sometimes life. Geologic hazards can play a significant role when infrastructure is constructed in their presence. The unpredictable nature of natural geologic hazards makes identifying, evaluating, and mitigating against them a unique challenge.

Activity 1: Arrange Me

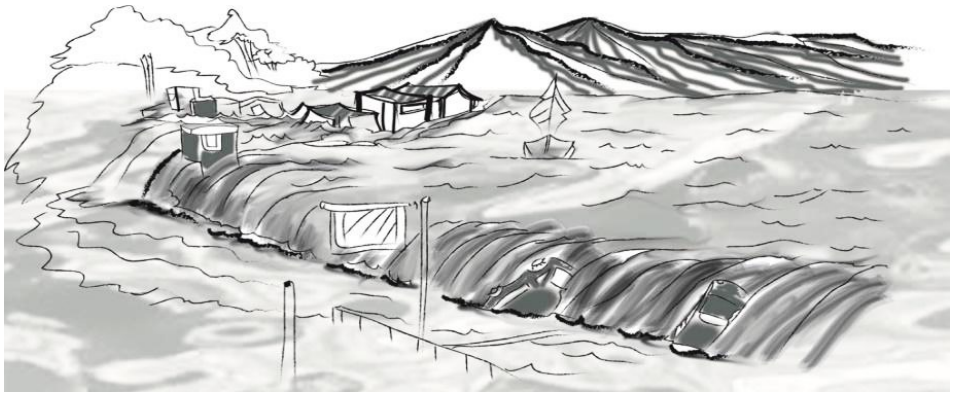
What do you see in the pictures below?

What do you call these hazards?

Following each picture are rumbled letters for you to rearrange. You may arrange them now by writing the letter in the box provided.

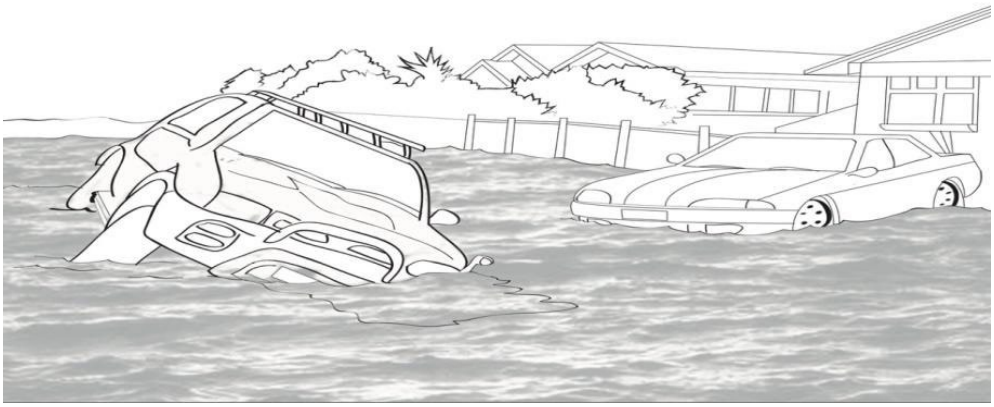
K	I	G	N	N	R	U	O	D	H	A	S	G

Image 1 shows the vibration of the ground.



A	M	T	S	N	U	I

Image 2 presents giant waves caused by volcanic eruption.



Q L E F A T I O C N I U

Image 3 happened when soil liquefies during ground shaking.

N A S L D E S I D L

Image 4 showed the movement of a mass of rock, debris, or earth down a slope.

Notes to the Teacher

This contains helpful tips and activities that will help you in guiding the learners in describing geologic processes and hazards.

What's New

Activity 2: Draw Me

Draw an erupting volcano on the box below.

Based on your drawing, can you name five (5) geologic hazards posed by an erupting volcano? Write your answer in the table below.

Hazards Posed by an Erupting Volcano
1.
2.
3.
4.
5.

What is It

Geologic processes and hazards are events which occur irregularly in time and space and cause negative impact on man and the environment. Earthquakes, volcanic eruptions, tsunamis (tidal waves), and landslides are the geologic hazards.

SIMPLIFIED CLASSIFICATION OF MAJOR GEOLOGIC HAZARDS

Geologic Event	*Hazards They Cause*
Earthquake	A. Ground shaking
	B. Surface faulting
	C. Landslides and liquefaction
	1. Rock avalanches
	2. Rapid soil flows
	3. Rock falls
	D. Tsunamis
Volcanic Eruption	A. Tephra falls and ballistic projectiles
	B. Pyroclastic phenomena
	C. Lahars (mud flows) and floods
	D. Lava flows and domes
	E. Poisonous gases

Earthquake is one of the most violent natural phenomena. According to the number of victims and destructive force, it exceeds all other natural disasters. Earthquakes also happen under the ocean and can cause tsunamis.

Earthquakes and volcanic eruptions can trigger landslides, especially in areas with water saturated soils, a common characteristic of Cascadia. Landslides may result in falling rocks and debris that collide with people, buildings, and vehicles.

There were earthquakes that happened in the Philippines which were noticeably strong such as magnitude 6.9 in October 2019 which hit southern Philippines. Another one was 6.1 magnitude that struck the Island of Luzon in April of 2019. Recently, multiple earthquakes were felt when Taal Volcano erupted early in 2020.

Have you experienced an earthquake? What did you feel?

Probably, you will feel the shaking of your body, and even the entire surroundings which causes the ground shaking.

Listed below are the hazards caused by an earthquake:

A. **Ground shaking** is one of the hazards resulting from earthquakes, volcanic eruptions, and landslides. Ground shaking is both a hazard created by earthquakes and the trigger for other hazards such as liquefaction and

landslides. Ground shaking describes the vibration of the ground during an earthquake.

B. **Surface faulting** is displacement that reaches the earth's surface during slip along a fault. It commonly occurs with shallow earthquakes; those with an epicenter less than 20 km. Surface faulting also may accompany aseismic creep or natural or man-induced subsidence.
C. A **landslide** is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses five modes of slope movement: falls, topples, slides, spreads, and flows.
D. **Liquefaction** describes the way in which soil liquefies during ground shaking. Liquefaction can undermine the foundations and supports of buildings, bridges, pipelines, and roads, causing them to sink into the ground, collapse, or dissolve.
E. **Tsunamis** are giant waves caused by earthquakes or volcanic eruptions under the sea. It can injure or kill many people and cause significant damage to buildings and other structures. The speed of tsunami waves depends on ocean depth rather than the distance from the source of the wave. Tsunami waves may travel as fast as jet planes over deep waters, only slowing down when reaching shallow waters.

What are volcanoes?

A **volcano** on Earth is a vent or fissure in the planet's crust through which lava, ash, rock, and gases erupt. Volcanoes can be exciting and fascinating but are also very dangerous. Any kind of volcano can create harmful or deadly phenomena, whether during an eruption or a period of dormancy. Volcanoes are natural systems and always have some element of unpredictability.

What about volcanic eruption?

A **volcanic eruption** occurs when magma is released from a volcano. Volcanic eruptions are major natural hazards on Earth. Volcanic eruptions can have a devastating effect on people and the environment.

These are the hazards caused by volcanic eruption:

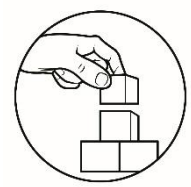
A. **Tephra** consists of pyroclastic fragments of any size and origin. It is a synonym for "pyroclastic material." Tephra ranges in size from ash (<2 mm) to lapilli (2-64 mm) to blocks and bombs (>64 mm).
B. A **pyroclastic flow** is a dense, fast-moving flow of solidified lava pieces, volcanic ash, and hot gases. Pyroclastic flows form in various ways. A common cause is when the column of lava, ash, and gases expelled from a volcano during an eruption loses its upward momentum and falls back to the ground. Another cause is when volcanic material expelled during an eruption

immediately begins moving down the sides of the volcano. Pyroclastic flows can also form when a lava dome or lava flow becomes too steep and collapses.

C. **Lahar** is an Indonesian term that describes a hot or cold mixture of water and rock fragments that flows down the slopes of a volcano and typically enters a river valley. Lahars are extremely dangerous especially to those living in valley areas near a volcano. Lahars can bury and destroy manmade structures including roads and bridges.
D. A **flood** is an overflow of water that submerges land that is usually dry. Floods can look very different because flooding covers anything from a few inches of water to several feet.
E. **Lava domes** are formed by viscous magma being erupted effusively onto the surface and then piling up around the vent. Like lava flows, they typically do not have enough gas or pressure to erupt explosively, although they may sometimes be preceded or followed by explosive activity. The shape and size of lava domes varies greatly, but they are typically steep-sided and thick.
F. **Poisonous gases**, the gases that are released during a volcanic eruption, come from deep within the Earth. The largest portion of gases released into the atmosphere is water vapor.

The Philippines has suffered from an inexhaustible number of deadly typhoons, earthquakes, volcanic eruptions and other natural disasters. This is due to its location along the Ring of Fire, or typhoon belt – a large Pacific Ocean region where many of Earth's volcanic eruptions and earthquakes occur.

Taal Volcano, on the island of Luzon in the Philippines, is the country's second most active volcano. It boomed to life on January 12,2020, Sunday afternoon, spilling volcanic ash. Taal Volcano sent a massive plume of ash and steam spewing miles into the sky and pushed red-hot lava out of its crater, prompting the evacuation of thousands of people and the closure of Manila's airport. Hundreds of earthquakes were noted while the volcano was erupting. Flashes of lightning lit up the plume, lending the scene an otherworldly appearance.



What's More

Activity 3. Check Me Out

1. In the table below, put a check on the hazards that you have experienced in your locality. Then, explain why these hazards happened to our country.

Ground shaking	*Liquefaction*	*Landslides*	*Tsunami*

2. Why is the Philippines prone to geologic hazard? Write your answer on the space below.

Activity 4: List Me In

Identify and list down the hazards using published resources and personal observation. Write your answer in the table below.

Published Resources	***Personal Observation***
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

What I Have Learned

Activity 5: Places of Possible Hazards

5.1 The table below showed places where potential hazards may occur. Write the possible hazards for the given places.

IN THE CLASSROOM AND CORRIDORS: 1. 2. 3. 4. 5.	ON THE TERRITORY SURROUNDING THE SCHOOL 1. 2. 3. 4. 5.
IN THE SCHOOL BUILDING 1. 2. 3. 4. 5.	IN THE SETTLEMENT 1. 2. 3. 4. 5.

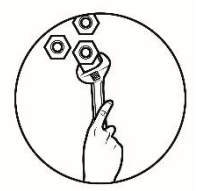
Guide Questions:

1. What will you do if you are: a.) in the classroom or corridor, b) in the territory surrounding the school, c.) in the school building and d.) in the settlement when an earthquake happens?
2. Which places are the most dangerous?
3. Whose instructions should you follow? What should you do if you are alone?
4. It might happen that your family members are not nearby. Who should you call to receive help after an earthquake? Do you know the telephone numbers?

Refer to scoring rubrics for short answer question.

Activity 5.2 My Geologic Hazards Experience

Write at least four (4) hazards you have experienced in your locality. Then make a slogan on how these hazards affect the people as well as the environment.



What I Can Do

Hazards may pose danger to our lives. Let us be prepared and protect ourselves. As students, how are you going to protect your lives in times of hazards? In the table below, write a step-by-step procedure of preparing and protecting yourselves in times of geologic hazards.

Step by Step Procedure of Preparing and Protecting Ourselves in Times of Geologic Hazards
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Assessment

Directions: Read each statement and choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which of the following may result in falling rocks and debris that collide with people, buildings, and vehicles?
   A. earthquake
   B. land slide
   C. tsunami
   D. typhoons

2. Which of the following is NOT a volcanic hazard?
   A. flooding
   B. lahars
   C. lava
   D. pyroclastic flows
3. Which of the following is an example of a hazard associated with earthquake?
   A. eutrophication
   B. ground shaking
   C. flooding
   D. pyroclastic density currents
4. What is the main reason why the Philippines has suffered from numerous geologic processes and calamities?
   A. its economic status
   B. its location (Ring of fire)
   C. Philippines is 3rd a world country
   D. something to do with human population
5. Which of the following hazards undermine the foundations and supports of buildings, bridges, pipelines, and roads, causing them to sink into the ground, collapse, or dissolve?
   A. eutrophication
   B. ground shaking
   C. liquefaction
   D. pyroclastic density currents
6. Which of the following is **NOT** a natural hazard?
   A. earthquake
   B. house fire
   C. hurricane
   D. tsunami
7. Which of the following is/are geologic hazard/s?
   A. earthquake
   B. volcanoes
   C. waves pounding on a coast
   D. all of these are geologic hazards

8. What natural hazard is involved when rock underground suddenly breaks along a fault causing tectonic movement?
    A. cyclone
    B. earthquake
    C. hurricane
    D. volcanic eruption
9. What causes an earthquake?
    A. a movement along fault
    B. glacier
    C. landslide
    D. very large storm
10. What do you call this hazard which involves the giant waves which can move at speeds of up to 500 miles an hour and reach heights of hundreds of feet?
    A. ground shaking
    B. landslides
    C. liquefaction
    D. tsunami
11. Which of the following describes the vibration of the ground during an earthquake?
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    A. scary
    B. dormant and inactive
    C. faster than usual
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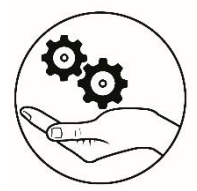

Additional Activities

List down the several geologic hazards that happened in our country and explain how these affect the people and the environment.

Rubrics for short answer

CRITERIA	3 Above Expectation	2 Meets Expectation	1 Below Expectation
Analysis	Response provide an in-depth analysis of the questions given. Shows an understanding of the lesson content. Examples were given to explain the concept presented.	Response provides an analysis of the questions given. Shows a little understanding of the lesson content. Examples were not given to explain the concept presented.	Response does not provide an analysis of the questions given. Shows no understanding of the lesson content. Examples were not given to explain the concept presented
Clarity	The thoughts were clearly expressed. The organization of words in a sentence was clearly exemplified.	The thoughts were slightly clear. The organization of words in a sentence was not exemplified clearly.	The thoughts were unclear. There is no organization of words in a sentence.
Writing Skills	Clear writing, complete sentence, no errors in grammar and spelling	Clear writing, complete sentence with minimal errors in grammar and spelling	Unclear writing, incomplete sentence, ample errors in grammar and spelling

Answer Key

What I Know

1. B
2. A
3. D
4. C
5. B
6. B
7. D
8. A
9. D
10. B
11. D
12. D
13. A
14. D
15. D

What's In

GROUND SHAKING
TSUNAMI
LIQUEFACTION
LANDSLIDE

What Can I Do

Answer may vary

Assessment

1. B
2. A
3. B
4. B
5. C
6. B
7. D
8. B
9. A
10. D
11. A
12. D
13. D
14. C
15. B

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