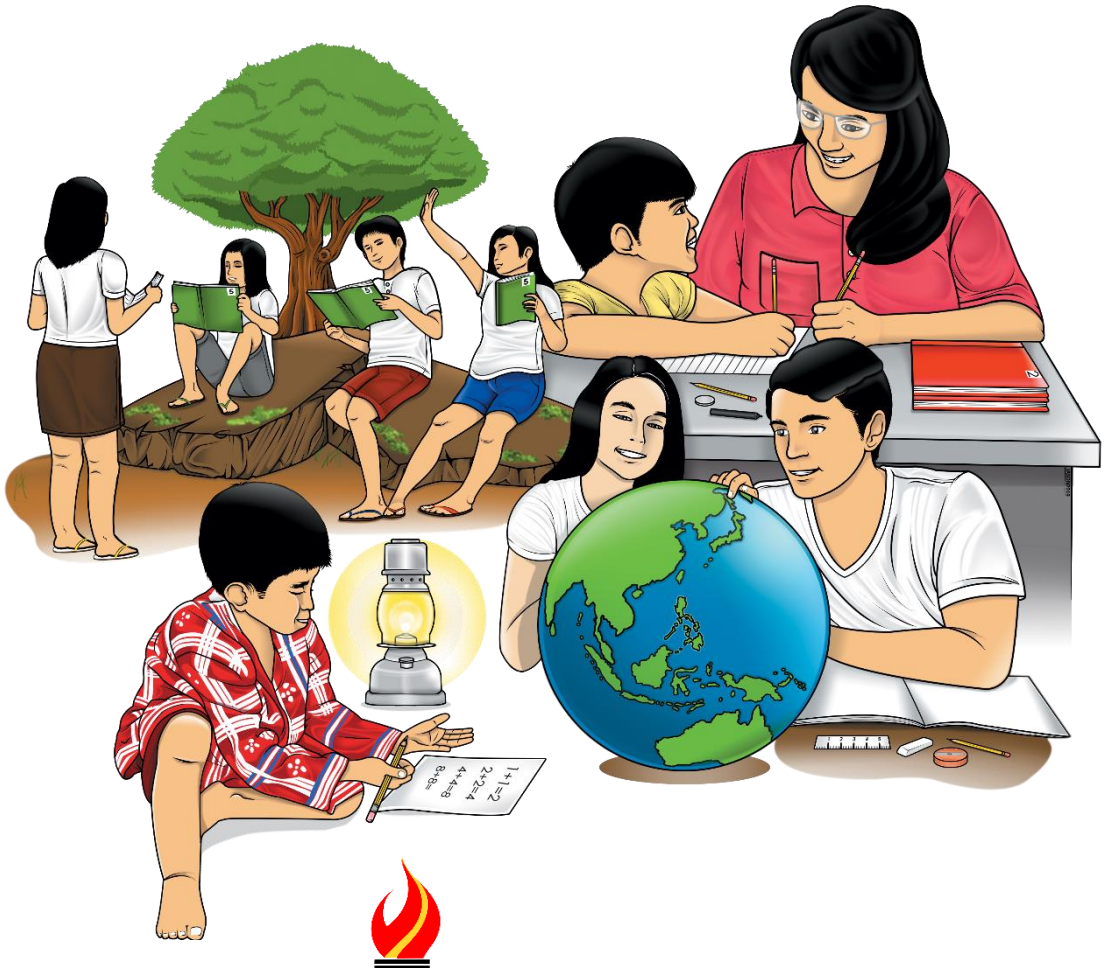
Senior High School

DepED
DEPARTMENT OF EDUCATION

Disaster Readiness and Risk Reduction

Quarter 1 – Module 15: Potential Volcano-Related Hazards



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ADM

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Quarter 1 – Module 15: Potential Volcano-Related Hazards
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Quarter 1 – Module 15: Potential Volcano-Related 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.

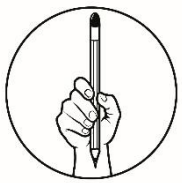
What I Need to Know

This module was designed and written with you in mind. It is here to help you master the Potential Volcano-Related 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.

The module explains various volcano-related hazards (**DRR11/12-Ih-i-2).**

After going through this module, you are expected to:

1. Explain the most common volcano-related hazards in the Philippines;
2. Appreciate the knowledge about negative impact of volcano-related hazards; and
3. Recognize the importance of having knowledge on volcano-related hazards.



What I Know

Pre-test

Directions: Part I. Read each item carefully and choose the best answer by writing the letter that corresponds to your answer.

1. Which of the following is described as a volcanic material which is directly ejected from the volcano's vent with force and trajectory?
   a. Ballistic Projectiles c. Lava Flows
   b. Pyroclastic Flows d. Ash Fall
2. It consists of fragments of pulverized rock, minerals and volcanic glass, created during volcanic eruptions and measures less than 2 mm (0.079 inches) in diameter.
   a. Ballistic Projectiles c. Lava Flows
   b. Pyroclastic Flows d. Ash Fall
3. Which of the following contains a high-density mix of hot lava blocks, pumice, ash and volcanic gas?
   a. Ballistic Projectiles c. Lava Flows
   b. Pyroclastic Flows d. Ash Fall
4. What do you call the streams of molten rock that are poured or oozed from an erupting vent of a volcano?
   a. Ballistic Projectiles c. Lava Flows
   b. Pyroclastic Flows d. Ash Fall

5. What is the term used for the rocks that are ejected into the air by an erupting volcano?
   a. Ballistic Projectiles
   b. Volcanic Gases
   c. Lava Flow
   d. Lahar
6. What is the collective term for the gases given off by an active volcano?
   a. Ballistic Projectiles
   b. Volcanic Gases
   c. Lava Flow
   d. Lahar
7. The following are all volcanic gases **EXCEPT**_____.
   a. Hydrogen sulphide
   b. Sulfur dioxide
   c. Sulfuric Acid
   d. Hydrogen
8. What human body system is greatly affected by volcanic gases?
   a. Respiratory System
   b. Digestive System
   c. Muscular System
   d. Skeletal System
9. Which of the following is/are true in lava flow?
   1. Lava flow can bury, crush, cover, and burn everything in their path.
   2. It threatens human life because it usually moves slowly.
   3. It is most characterized as quiet effusion of lava.
   4. It can trigger dangerous pyro clastic flows.
   a. 1, 2, & 3
   b. 2, 3, & 4
   c. 3, 4, & 1
   d. 1, 2, 3, & 4
10. Which of the following is/are the negative impacts of Pryroclastic flows?
    1. It leads to increased deposition of sediments along affected rivers and result to long term flooding problems in the low-lying downstream communities.
    2. It burns forest, farmlands, destroy crops and buildings.
    3. It destroys anything on its path by direct impact.
    4. It burns sites with hot rocks debris.
    a. 1, 2, & 3
    b. 2, 3, & 4
    c. 3, 4, & 1
    d. 1, 2, 3, & 4
11. Which of the following is/are negative impacts of Lahar?
    1. Can destroy by direct impact (bridges, roads, houses)
    2. Can bury valleys and communities with debris
    3. Can block tributary stream and form a lake
    4. Burn sites with hot rocks debris
    a. 1, 2, & 3
    b. 2, 3, & 4
    c. 3, 4, & 1
    d. 1, 2, 3, & 4
12. Which of the following volcanic gases when react with water in the atmosphere yields a compound called Acid rain?
    a. Carbon dioxide
    b. Hydrogen fluoride
    c. Hydrogen gas
    d. Sulfur dioxide

13. Which of the following volcanic hazards is not identified as most hazardous to the community?
    a. Destruction of agricultural lands
    b. Long term flooding problem
    c. Respiratory tract infection
    d. Acid rain
14. Which of the following volcanic hazards is not identified as hazardous effect to human beings?
    a. Respiratory tract infection
    b. Skin irritation
    c. Eye irritation
    d. Acid rain
15. Which of the following statements is NOT TRUE about volcanic hazards?
    a. Volcanic hazards have potential threat, for seeable crisis that directly affect to human beings.
    b. Volcanic hazards are observable facts that are arising due to volcanic activity.
    c. Volcanic hazards can even directly affect the political stability of the country.
    d. Volcanic hazards have great contribution to the business aspect of the country

Lesson 1 Various Volcano-Related Hazards

Philippines is a beautiful island. We have Mayon Volcano and Taal Volcano to mention some that are fascinating and captivating. Did you know that our country has active volcanoes that may lead to hazards? If this hazard becomes active, then it will harm and endanger human lives and property. By knowing the concept of what volcano can do will give you insight on how to mitigate volcanic hazards.

Hazards are “those elements of the physical environment, harmful to man and caused by force extraneous to him” (Burton, I., Kates, R.W., and White, G.F.1978).

Volcanic hazards are volcanic activities that may harm the subsystem on Earth such as the biosphere, hydrosphere, atmospheres and even geosphere.

What's In

Activity 1: It is terrible!

Directions: Look carefully into the picture below, then think of what you can do with the situation.

Source: *2013 EARTHQUAKE VIDEO BOHOL CEBU 7.2 Magnitude compilation footage Philippines* retrieved from https://www.youtube.com/watch?v=LCJtvtUlhPk

1. What is revealed in the picture?
2. List some ways of preparation before an earthquake.
3. What you will do during earthquake?
4. What you will do after an earthquake?

Notes to the Teacher

This lesson has activities for you to work out to be sure that you as a learner will understand the topic and encourage learners to activity answer the activity.

What's New

By just looking at the pictures below, it is shown that the Taal Volcano is erupting. This natural event directly affects the environment, the community and the people.

Source: Domcar C Lagto/PACIFIC P/SIPA/Shutterstock, *Taal volcano spews ash and debris kilometres into the sky*

Source: *Ezra Acayan/Getty Images, Ash from the Taal volcano eruption darkened skies and coated towns, making the air hazardous to breathe*

Source: EZRA ACAYAN/GETTY, Residents fleeing Taal Volcano's eruption ride a flatbed truck on Monday in Lemery, Batangas province, Philippines

Source: Jojo Riñoza/BenarNews, *Washing ash from the horse as smoke spews from the Taal Volcano, in Balete town, Philippines, Jan. 13, 2020*

Answer:

Based on the picture/s above,

1. What are the hazards that can be brought by volcanic eruption?
2. How these affect humans, animals and environment?
3. Can you share your thoughts on how you could mitigate the effect of different volcanic hazards?

What is It

Volcanic hazards are observable facts that are arising due to volcanic activity such as eruption. These have potential threat, for seeable crisis that directly affect to human beings, animals, properties, infrastructure, tourism, and even political stability to mention some within a specific period of time.
Volcanic eruption is one of the dangerous event that may happen because it results to different hazards such as: Ballistic projectiles, Ash fall, Pyroclastic flows, Lava flows, Volcanic gases, Debris Avalanche or Volcanic landslide and even Tsunami.

Various Volcanic-Related hazards

1. **Ballistic projectile** are rock fragments that are ejected from volcano's mouth that are comparable to cannonballs. These reach its projectile up to 5 kilometers or 3 miles.
   Ballistic projectiles endanger life and property by (1) the force of impact of falling fragments, but this occurs only close to an eruption, (2) loss of agricultural lands if burial is greater than 10 cm depth, (3) producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants, and (4) carrying of noxious gases, acids, salts, and, close to the vent, heat (volcanology.geol.ucsb.educ).

Source: Tom Pfeiffer/flickr, *Vulcanian explosion at Anak krakatau volcano*

Negative effect: Endanger life and property

2. **Ash fall or Tephra fall** are minute volcanic particles such as pulverized rock, minerals and silicon which has fine to coarse grain. This is formed during explosive volcanic eruption when dissolve gages in magma escape violently into the atmosphere.

Source: Kenji Cheow, *Taal Volcano eruption from Anilao, Batangas*

Source: Money, *Proper care during ashfall*

Negative effects: Endanger life and property; kills organisms both on land and in water; causes respiratory tract problem to human beings; ruins machines in the industries and aircrafts; can damage also roofing at home, in addition to it break power and communication lines, ash, and very hot gases. They flow very fast down in volcanic slopes.

3. **Pyroclastic Flows** contain a highly-density mix of hot lava blocks, pumice, ash and volcanic gases. They move at very high speed down volcanic slopes, typical following valleys. It consists of two parts: a lower (basal) flow of coarse fragments that moves along the ground, and a turbulent cloud of ash that rises above the basal flow (Quebral 2016).

Source: Electroverse, *High-Level Eruption at Taal Volcano, Philippines*

Negative effects: Pyroclastic flows can destroy anything on its path by direct impact. It burns sites with hot rocks debris. It burns forest, farmlands, destroy crops and buildings.

4. **Lava flows** are streams of molten rocks that are poured or oozed from an erupting vent (Quebral 2016).
   Lava flows rarely threaten human life because it moves slowly. It is mostly characterized as quite effusion of lava (DRRR, TG, 2017).

Source: Sean Goebel/flickr, *Lava Flow*

Negative effects: It may instigate other types of hazards such as pyroclastic flow. It damages the properties, agricultural lands, and even human lives by burying, burning everything in their path.

5. **Volcanic gases.** Magma contains dissolve gases which provides the driving force that causes most volcanic eruptions. As magma rises towards the surface and pressure decreases, gases are released from the liquid portion of the magma (melt) and continue to travel upward and are eventually released into the atmosphere (Quebral 2016).

Source: Shutterstock, CNN Philippines

Negative effects: These gases are all potentially hazardous to all living things as well as to agriculture and property.
The Carbon dioxide that is held at low-lying areas can be detrimental to humans and animals. Sulfur dioxide is lethal also to human beings; it irritates

the eyes, skin and can cause respiratory tract infection. In addition to this, Sulfur oxide , when it reacts with water in the atmosphere, its product would be acid rain the Hydrogen sulfide in a high concentration would be toxic too.

6. **Debris Avalanche or Volcanic landslide** massive collapse of a volcano, usually triggered by an earthquake or volcanic eruption (DRRR, TG, 2017).

Source: USGS, Landslides are common on tall, steep, and weak volcano cones

Negative effects: When a huge portion of the side of a volcano collapses due to slope failure, this results to massive destruction (DRRR, TG 2017).

7. **Tsunami** – sea waves or wave trains that are generated by sudden displacement of water (could be generated during undersea eruptions or debris avalanches) (DRRR, TG 2017).

Source: *Gabriel Andrés Trujillo Escobedo, CC BY 2.0,AGU Blogosphere,* A new study shows horizontal seafloor movement creates energy for tsunamis, like the one depicted in this artist's illustration

Negative effects: An eruption that occurs near a body of water may generate tsunamis if the pyroclastic materials enter the body of water and cause it to be disturbed and displaced forming huge waves (DRRR, TG 2017).

What's More

Activity 1: The Majestic Natural Scenario, Does it Give Hazards to Us?

Instructions: As learners you should share your thought about the pictures below by means of describing its characteristics and effects to human, to the community and to the country as a whole. Write your answer on the space provided below each picture.

A.

_____

_____

_____

B.

_____

_____

_____

C.

_____
_____
_____

D.

_____
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_____

E.

_____
_____
_____

F.

_____
_____
_____

G. 

_____
_____
_____

Activity 2: Fill me out!

Instruction: Give the characteristics of each potential volcanic hazard on this table, and then answer the questions below.

Potential Volcanic Hazard	Characteristics
1. Ballistic Projectiles	
2. Ash Fall	
3. Pyroclastic Flows	
4. Lava Flow	
5. Volcanic Gases	
6. Debris Avalance or Volcanic landslide	
7. Tsunami	

1. Why are potential volcanic Hazards harmful?

_____
_____
_____

2. Give specific threat of volcanic hazards to human's health?

_____
_____
_____

Activity 3: Small But Horrible

Instruction: Read the article and answer the questions below.

By January 26, 2020, PHIVOLCS observed an inconsistent, but decreasing volcanic activity in Taal, prompting the agency to downgrade its warning to Alert Level 3.[6] It was until February 14, 2020, when PHIVOLCS finally decided to downgrade the volcano's warning to Alert Level 2, due to consistent decreased volcanic activity.[7][8]

President Rodrigo Duterte, who was in Davao City during the eruption, ordered Executive Secretary Salvador Medialdea to suspend classes and government work in Calabarzon, Central Luzon and Metro Manila. President Duterte flew to Manila on the morning of January 13 and continued with his scheduled activities there.[48] Duterte visited evacuees in Batangas City on January 14, 2020 and pledged to provide financial assistance worth ₱130 million ($2.6 million) to the affected residents.[49] He approved the recommendation of Defense Secretary Delfin Lorenzana to prohibit individuals from visiting or inhabiting the Taal island, declaring it a "no man's land".[50] While addressing evacuees in Batangas City, President Duterte also pushed for the construction of additional evacuation centers to be built "simultaneously" in disaster-prone areas during his administration.[51] Concurrently, Vice President Leni Robredo visited the municipalities of Santa Teresita and San Jose, and the city of Santo Tomas in Batangas, where she helped distribute food packs and face masks to the affected residents.[52] Robredo stressed the lack of medicines, toilets, toiletries and sleeping mats being provided to them, other than food and water. She also requested local officials to prepare an inventory of the damage.[53]

The Department of Agriculture (DA) reported that the damage to crops caused by the eruption are estimated to be ₱3.06 billion ($60.1 million), covering 2,722 hectares (27.22 km^2) that includes 1,967 animals. Fisheries in the Taal Lake, consisting of about 6,000 fish cages to capture a total of 15,033 metric tons of fish, suffered losses of ₱1.6 billion ($31.4 million). *Kapeng barako* and *Coffea liberica* crops, major products of Batangas and Cavite, have damages worth at least ₱360.5 million ($7.08 million) for 8,240 metric tons and 748 hectares (1,850 acres) of land. Pineapple plantations in the Cavite towns of Amadeo, Silang and General Trias lost 21,079 metric tons of pineapple worth ₱527.25 million ($10.4 million).

Rice crops in 308 hectares (760 acres) of fields across Calabarzon were lost, amounting to ₱5.6 million ($109,985), while 5,329 metric tons of corn placed losses at ₱88.9 million ($1.7 million). The Philippine Crop Insurance Corporation reassured around 1,200 farmers and fishermen in Batangas that they are insured of a three-year zero-interest survival and recovery loan worth ₱25,000 ($494.13) each, to be provided by the Mount Carmel Rural Bank.[92]

The DA plans to distribute materials and mechanisms for crop and livestock intervention worth ₱160 million ($3.1 million), which includes 5,000 coffea mother plants and 1,000 cocoa bean seedlings from the Bureau of Plant Industry, to 17 local government units in Batangas.[93] The Philippine Carabao Center and National Dairy Authority delivered 1 tonne (15,000,000 gr) of corn silages and 1.5 tonnes (23,000,000 gr) of rice straws, a total of 2.5 tonnes (39,000,000 gr) of dietary fiber, to Batangas.[94][94]

The Department of Health advised the public to remain indoors and minimize outdoor activities.[100] They also advised the public to refrain from purchasing and consuming freshwater fish from the Taal Lake, such as tilapia and *Sardinella tawilis*, as these may have been affected by the sulfur from the eruption.[101] Agriculture Secretary William Dar clarified that fruits and vegetables filled with ash, including the *Coffea liberica* fruits that are homegrown in Batangas and Cavite, are safely consumable upon cleansing.[102]

https://en.wikipedia.org

1. Based on this article, were the delivery of education and daily life activities of the people in the neighboring towns and cities affected? Why?

   _____
   _____
   _____

2. What are the direct effects of Taal Volcano eruption to agriculture?

   _____
   _____
   _____

3. What are the Do's and Don'ts that we need to practice if ever Taal Volcano erupts again?

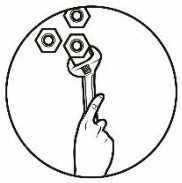
   _____
   _____
   _____

What I Have Learned

Activity 4: Tell Me

Instruction: Complete the statements below.

An example of the natural phenomenon that happened in the Philippines in which I have learned is (1.) _____. (2.) _____ are observable facts that are arising due to volcanic activity such as eruption. These have potential threats, for seeable crisis that directly affect (3.) _____, (4.) _____, (5.) _____, (6.) _____, (7.) _____, and even political stability to mention some within a specific period of time. (8.) _____is one of the dangerous events that may happen because it results to different hazards such as: Ballistic projectiles, (9.) _____, Pyroclastic flows, Lava flows, Volcanic gases, Debris Avalanche or Volcanic landslide and even (10.) _____.



What I Can Do

Activity 5: The Piece of Art.

Instruction: Make a collage of potential volcano-related hazards in a 1/4 illustration board.

Suggested rubric in scoring the collage of the students

5	4	3	2	1
90-100% completeness of content demonstrating illustrative strong development of ideas	80-89% completeness of content with adequate explanation of ideas	70-79% completeness of content with inadequate explanation of ideas	60-69% completeness of content with minimal explanation of ideas	59% and below completeness and irrelevant explanation of content

Assessment

Post Test

Direction: Part I. Read each item carefully and choose the best answer by shading the letter that corresponds to your answer.

1. Which of the following human body systems is greatly affected by volcanic gases?
    a. Respiratory System
    b. Digestive System
    c. Muscular System
    d. Skeletal System

2. Which of the following is the collective term for the gases given off by an active volcano?
    a. Ballistic Projectiles
    b. Volcanic Gases
    c. Lava flow
    d. Lahar

3. What is the term used for the rocks that are ejected into the air by an erupting volcano?
    a. Ballistic Projectiles
    b. Volcanic Gases
    c. Lava Flow
    d. Lahar

4. The following are all volcanic gases **EXCEPT**_____.
    a. Hydrogen sulphide
    b. Sulfur dioxide
    c. Sulfuric Acid
    d. Hydrogen

5. What volcanic hazard is described as a volcanic material which is directly ejected from the volcano's vent with force and trajectory?
    a. Ballistic Projectiles
    b. Pyroclastic Flows
    c. Lava Flows
    d. Ash Fall

6. What do you call the streams of molten rock that are poured or oozed from an erupting vent of a volcano?
    a. Ballistic Projectiles
    b. Pyroclastic Flows
    c. Lava Flows
    d. Ash Fall

7. It consists of fragments of pulverized rock, minerals and volcanic glass, created during volcanic eruptions and measures less than 2 mm (0.079 inches) in diameter.
    a. Ballistic Projectiles
    b. Pyroclastic Flows
    c. Lava Flows
    d. Ash Fall

8. Which of the following contains a high-density mix of hot lava blocks, pumice, ash and volcanic gas?
    a. Ballistic Projectiles
    b. Pyroclastic Flows
    c. Lava Flows
    d. Ash Fall

9. Which of the following is/are true about lava flow?
    1. Lava flow can bury, crush, cover, and burn everything in their path.
    2. It threatens human life because it usually moves slowly.
    3. It is mostly characterized as quite effusion of lava.
    4. It can trigger dangerous pyro clastic flows.

    a. 1, 2, & 3
    b. 2, 3, & 4
    c. 3, 4, & 1
    d. 1, 2, 3, & 4

10. Which of the following is/are the negative impacts of Pyroclastic flows?
    1. It can lead to increased deposition of sediments along affected rivers and result to long term flooding problems in the low-lying downstream communities
    2. It burns forest, farmlands, destroy crops and buildings.
    3. It destroys anything on its path by direct impact.
    4. It burns sites with hot rocks debris.

    a. 1, 2, & 3
    b. 2, 3, & 4
    c. 3, 4, & 1
    d. 1, 2, 3, & 4

11. Which of the following is/are negative impacts of Lahar?
    1. It can destroy bridges, roads, and houses by direct impact.
    2. It can bury valleys and communities with debris.
    3. It can block tributary stream and form a lake.
    4. It can burn sites with hot rocks debris.

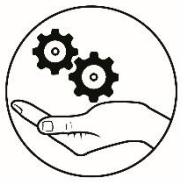
    a. 1, 2, & 3
    b. 2, 3, & 4
    c. 3, 4, & 1
    d. 1, 2, 3, & 4

12. Which of the following volcanic gases when react with water in the atmosphere yields a compound called Acid rain?
    a. Carbon dioxide
    b. Hydrogen fluoride
    c. Hydrogen gas
    d. Sulfur dioxide

13. Which of the following volcanic hazards is not identified as most hazardous to the community?
    a. Destruction of agricultural lands
    b. Long term flooding problem
    c. Respiratory tract infection
    d. Acid rain

14. Which of the following volcanic hazards is not identified as hazardous effect to human beings?
    a. Respiratory tract infection
    b. Skin irritation
    c. Eye irritation
    d. Acid rain

15. Which of the following statements is NOT about volcanic hazards?
    a. Volcanic hazards have potential threat, for seeable crisis that directly affect to human beings.
    b. Volcanic hazards are observable facts that are arising due to volcanic activity.
    c. Volcanic hazards can even directly affect the political stability of the country.
    d. Volcanic hazards have great contribution to the business aspect of the country.



Additional Activities

Enrichment Activity

Watch the video about the eruption of Taal Volcano in 2020 or Mt. Pinatubo in 1990 and write your reaction about the danger it caused to its neighboring towns and cities. Write your answer on a short typewriting pad.

_____
_____
_____
_____
_____
_____

Answer Key

What's more!

Activity 2 Possible Explanation

- **Picture A:** *Possible explanation.* Ballistic Projectiles are volcanic materials which are directly ejected from the volcano's vent with force and trajectory. These objects endanger life and property due to the force of impact of falling fragments, but this occurs only close to an eruption vent.
- **Picture B:** *Possible explanation.* Ash Fall–A "Hard Rain" of Abrasive Particles.Volcanic ash consists of tiny jagged particles of rock and natural glass blasted into the air by a volcano. Source:https://pubs.usgs.gov/fs/fs027-00/
- **Picture C:** *Possible Explanation.* Pyroclastic flows contain a high-density mix of hot lava blocks, pumice, ash and volcanic gas. They move at very high speed down volcanic slopes, typically following valleys
  Source: https://volcanoes.usgs.gov/vhp/pyroclastic_flows.html
- **Picture D:** *Possible Explanation:* Lava flows are masses of molten rock that pour into the Earth's surface during an effusive eruption
- **Picture E:** *Possible Explanation:* Volcanic gases are gases given off by active (or, at times, by dormant) volcanoes. These include gases trapped in cavities (vesicles) in volcanic rocks, dissolved or dissociated gases in magma and lava, or gases emanating directly from lava or indirectly through ground water heated by volcanic eruption.
- **Picture F:** *Possible Explanation:* Lahar is a wet mass of volcanic fragments flowing rapidly downhill. Usually contain ash, breccia, and boulders mixed with rainwater or with river or lake water displaced by the lava flow associated with the volcano
- **Picture G:** *Possible Explanation:* Tsunami are big sea waves or waves trains that are generated by sudden displacement of water (could be generated during under sea eruption or debris avalance).

  source:Deped Disaster Readiness and Reduction TG, 2017

Post Test

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

Pre-test

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

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