Senior High School

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Disaster Readiness and Risk Reduction

Module 14
Volcano Hazard Map

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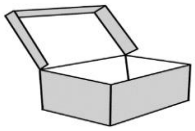
City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE



What I Need to Know

This module was designed and written with you in mind. It is here to help you master the concept on volcano hazard map. 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 includes only one lesson which is the Volcano Hazard Map.

After going through this module, you are expected to interpret different volcano hazard maps (DRR11/12-Ih-i-25).

Specifically, you should be able to

1. identify the different types of volcano hazard maps;
2. describe volcano alert signals; and
3. develop a family emergency preparedness plan to guide them on what to do before, during, and after a volcanic eruption.

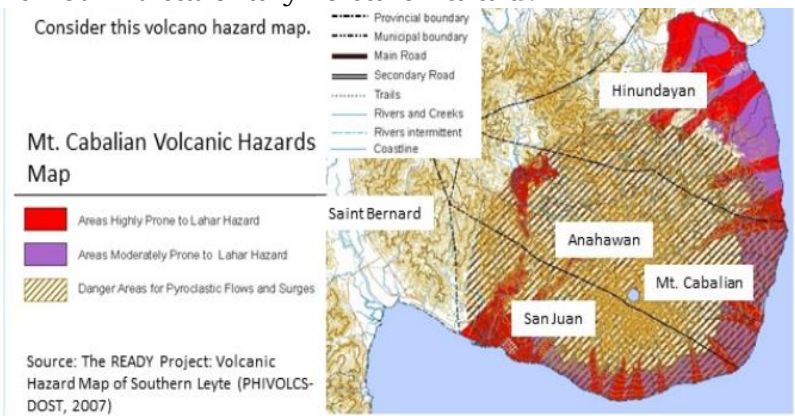
What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following types of volcano hazard map contains generalized information about the areas expected to be the most affected by pyroclastic flow, mudflow, ashfall, and other volcanic hazards?
   A. Lahar hazard map
   B. Ashfall hazard map
   C. Multiple-hazard map
   D. Lava flow hazard map

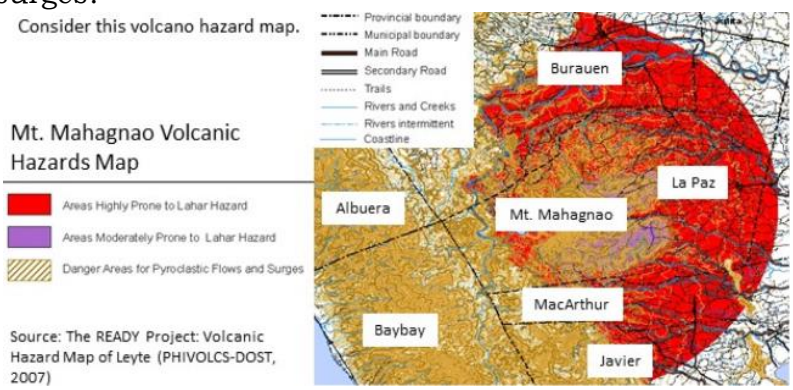
2. What do you call the area around the volcano's summit that is permanently considered by the authorities as a dangerous area due to the possibility of sudden volcanic activities?
    A. Vulnerable areas
    B. Pyroclastic flow buffer
    C. Permanent danger zone
    D. Areas prone to lava flow

3. Based on the given volcano hazard map of Mt. Cabalian below, which of the following municipality is not in treat of any volcano hazard?
    A. San Juan
    B. Anahawan
    C. Hinundayan
    D. Saint Bernard



4. Based on the given volcano hazard map of Mt. Cabalian on number 3, which of the following municipality has the greatest number of areas highly prone to lahar hazard?
    A. San Juan
    B. Anahawan
    C. Hinundayan
    D. Saint Bernard

5. Based on the given volcano hazard map of Mt. Mahagnao below, which of the following municipality has the greatest number of areas highly prone to pyroclastic flows and surges?
    A. Javier
    B. La Paz
    C. Baybay
    D. Mac Arthur



6. Which of the following is a special map that geographically shows the location, size, and destructive potential of volcanic hazards?
    A. Lahar hazard map
    B. Volcano hazard map
    C. Pyroclastic hazard map
    D. Base surge hazard map

7. Which of the following hazard map shows all the possible areas that can be affected in case of a volcanic mud flow?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Lava flow hazard map
    D. Pyroclastic flow hazard map

8. Which of the following hazard maps contain more facts about the topography of the land around the volcano, location of towns and cities, distance measurements from the crater, and even river channels?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Lava flow hazard map
    D. Pyroclastic flow hazard map

9. Which of the following is mostly based on historical accounts and previous eruption records?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Lava flow hazard map
    D. Pyroclastic flow hazard map

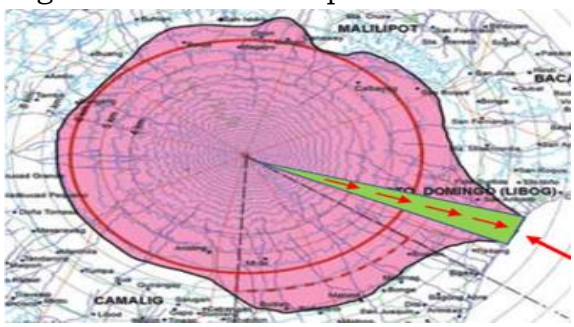
10. Which of the following is used to define the current status of each volcano?
    A. Lahar alert level
    B. Ashfall alert level
    C. Volcano alert signals
    D. Pyroclastic flow alert level

11. With the use of volcano hazard map, proper authorities can do the following **EXCEPT** one. Which one is it?
    A. Effectively plan and efficiently take actions during a calamity.
    B. Had hard time planning on evacuation routes that ensure maximum safety.
    C. Immediately assess possible location for establishing evacuation centers.
    D. Easily identify the areas that should be given priorities for immediate evacuation.

12. Which of the following is delineated and identified where no permanent habitation is recommended due to the possible impact of various hazards at any time?
    A. Volcano alert level
    B. Volcano hazard map
    C. Permanent Safe Zone (PSZ)
    D. Permanent Danger Zone (PDZ)

13. All of the following are importance of volcano hazard map **EXCEPT** one. Which one is it?
    A. It will just add confusion to the people living near volcano.
    B. Useful in determining risks of living in identified potentially hazardous areas.
    C. It can help people to become aware of specific dangers (lava flow, pyroclastic flows, ashfall, lahars, etc.) they might face in the event that a volcano reactivates.
    D. Both B and C

14. Which of the following is the correct interpretation of the hazard map below?



    A. The arrow suggests being prone to lava flow during a volcanic eruption.
    B. The arrow suggests that this is the safest area and the good place for evacuation area.
    C. The arrow suggests that a pyroclastic flow can reach the sea by flowing down that section.
    D. The arrow suggests that the areas which are classified as least prone to lahar are still in threat of devastation if the river channels overflow due to circumstances like heavy rain.

15. All are the things you can do during volcanic eruption **EXCEPT** one. Which one is it?
    A. Immediately leave the evacuation area without notice to the authorities.
    B. If indoors, close all window, doors, and dampers to keep volcanic ash from entering.
    C. Follow any evacuation orders issued by authorities and put your emergency plan into action.
    D. Listen to a local station on a portable, battery-operated radio or television for updated emergency information and instructions.

Lesson	Volcano Hazard Map

(GNS Science nd) states that typically, a number of types of hazards will result from a volcanic eruption. In addition, hazard gives different risks affecting specific place and this is the key difference between eruptions and the other principal natural hazards like earthquakes. In order to understand the places that may be affected, hazard maps are used to show specific areas that can be affected and or safe. One thing you should know is that volcanic hazard analysis is based primarily on assessments of past eruptions and by studying the geological record, observing eruptions, and monitoring background levels of activity, an understanding of the likely future hazards can be gained which is shown in the hazard maps.

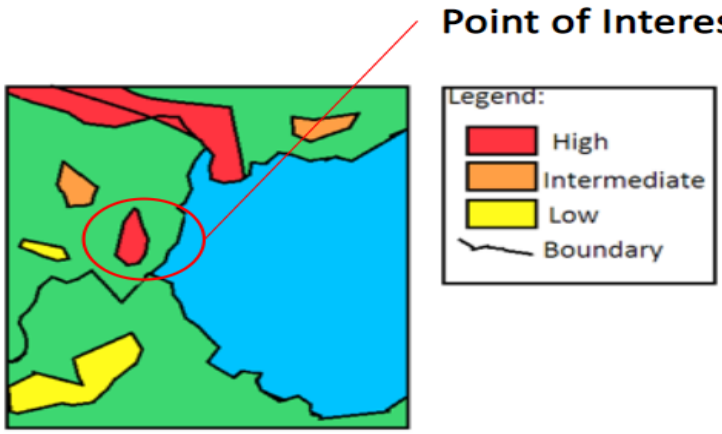
What's In

In the previous module, you learned about signs of an impending volcanic eruption such as the increase in the seismic activity with rumbling sound, crater glow, and ground deformations. You also learned that (Quizlet nd) states that volcanologists can predict eruptions if they have a thorough understanding of a volcano's eruptive history. In addition, if they can install the proper instrumentation on a volcano well in advance of an eruption, and if they can continuously monitor and adequately interpret data coming from that equipment.

Before you proceed to the lesson of this module, take time to recall the information below related to this lesson.

Steps in Reading Hazard map:

1. First, locate the point of interest or POI. This is the area of interest



Source: *Accessed August 31, 2020. https://frontlearners.com/blended/pluginfile.php/6095/mod_resource/content/16/index.html .*

2. Next check the color or representation of the POI.

   In the sample hazard map above, the POI is colored red. Sometimes, if the map is not colored, different kinds of lines or shadings are used to represent an area.

3. Lastly, compare it to the legend.

   The **legend** shows or explains the color coding/representation and symbols found in the map. Generally, light colored areas have low susceptibility while dark colored areas have high susceptibility. In our example, the POI has a high susceptibility according to the legend. This means that the area we located is highly prone to floods.

Generally, in colored maps, light-colored areas have low susceptibility while dark-colored areas have high susceptibility.

What's New

Volcano Hazard Map

To understand more about this lesson, accomplish the activity below. Decode the following sets of symbols. Use the ***Cryptogram*** below to unlock sets of symbols into words. Decoded word (s) corresponds to two (2) points each.

Activity 1. Cryptogram

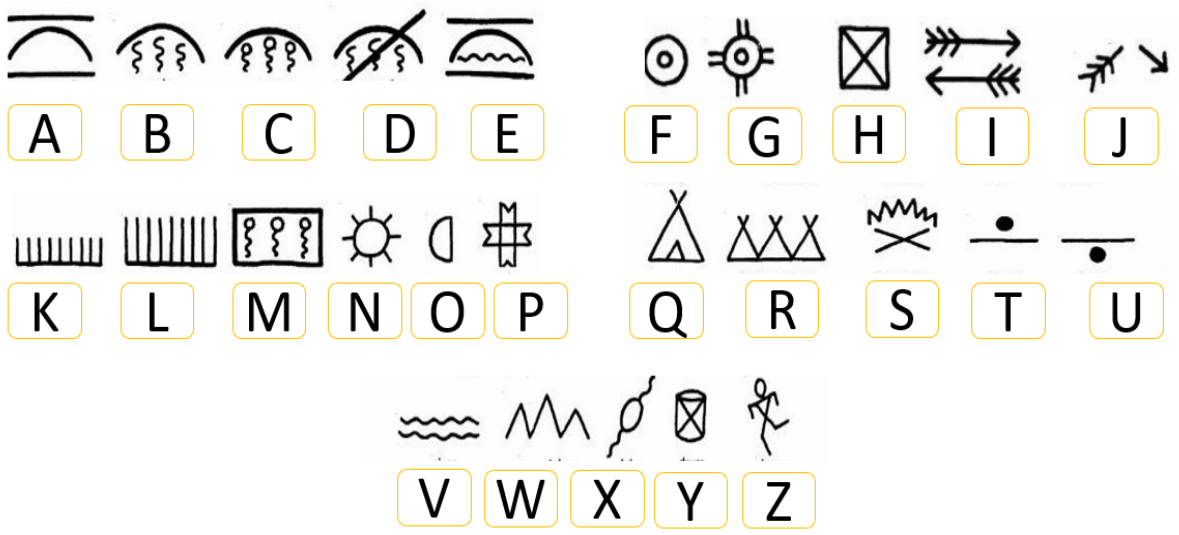
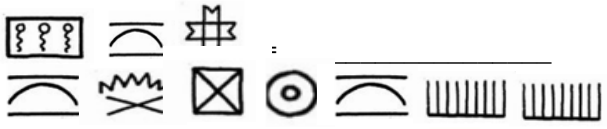


Photo Credit: https://s-media-cache-ak0.pinimg.com/736x/d7/2c/2b/d72c2ba1d1c3b9e0ac70ed35cf518cbe.jpg

1  = _____

2.  

3.  : _____

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What Is It

Volcano hazard map is a special map that geographically shows the location, size, and destructive potential of volcanic hazards. It can effectively show the possible threats to people, infrastructures, and community resources. It is very useful in assessing hazard potential in areas around the volcano. This is very helpful in establishing proper human settlement management, zoning practices, and land- use plans. It also helps the authorities in planning and designing hazard prevention countermeasures in case of volcanic crises.

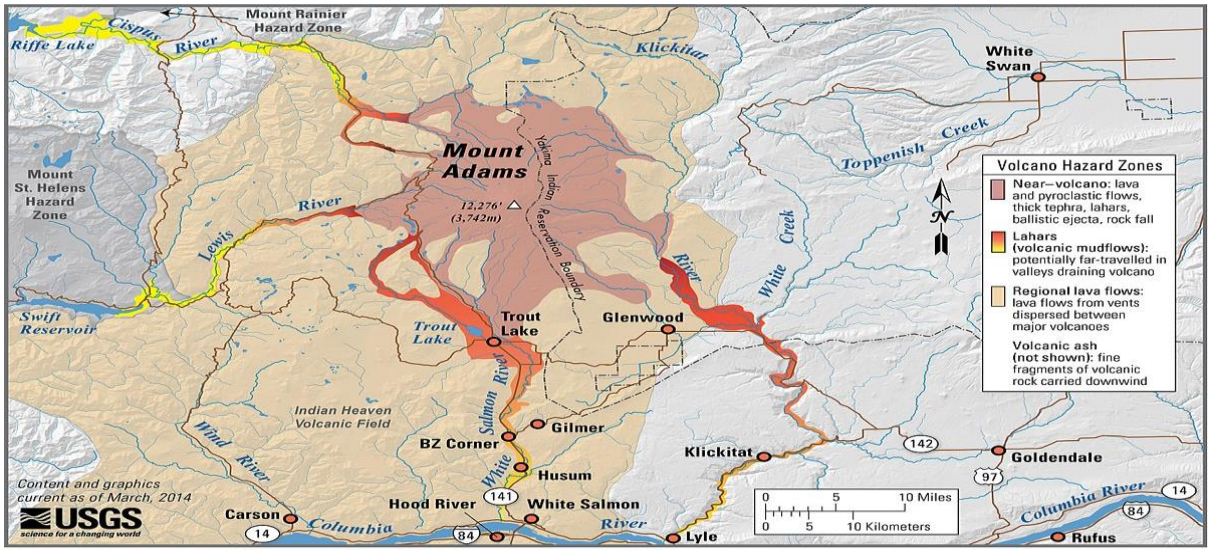


Figure 1. Mount Adams, Washington simplified hazards map showing potential impact area for ground-based hazards during a volcanic event.

Source: *Faust, Lisa. "Mount Adams Volcano Hazard Zones.jpg." 2014. Accessed August 10, 2020. https://commons.wikimedia.org/wiki/File:Mount_Adams_Volcano_Hazard_Zones.jpg.*

With the use of volcano hazard map, proper authorities can:

- Effectively plan and efficiently take actions during a calamity.
- Easily identify the areas that should be given priorities for immediate evacuation.
- Immediately assess possible location for establishing evacuation centers.
- Immediately plan evacuation routes that ensure maximum safety.

Now, let us look at the different types of volcanic hazard maps. A volcano map can show multiple hazards at the same time. This kind of volcano hazard map contains

generalized information about the areas expected to be the most affected by pyroclastic flow, mudflow, ashfall, and other volcanic hazards.

MULTIPLE HAZARD MAP

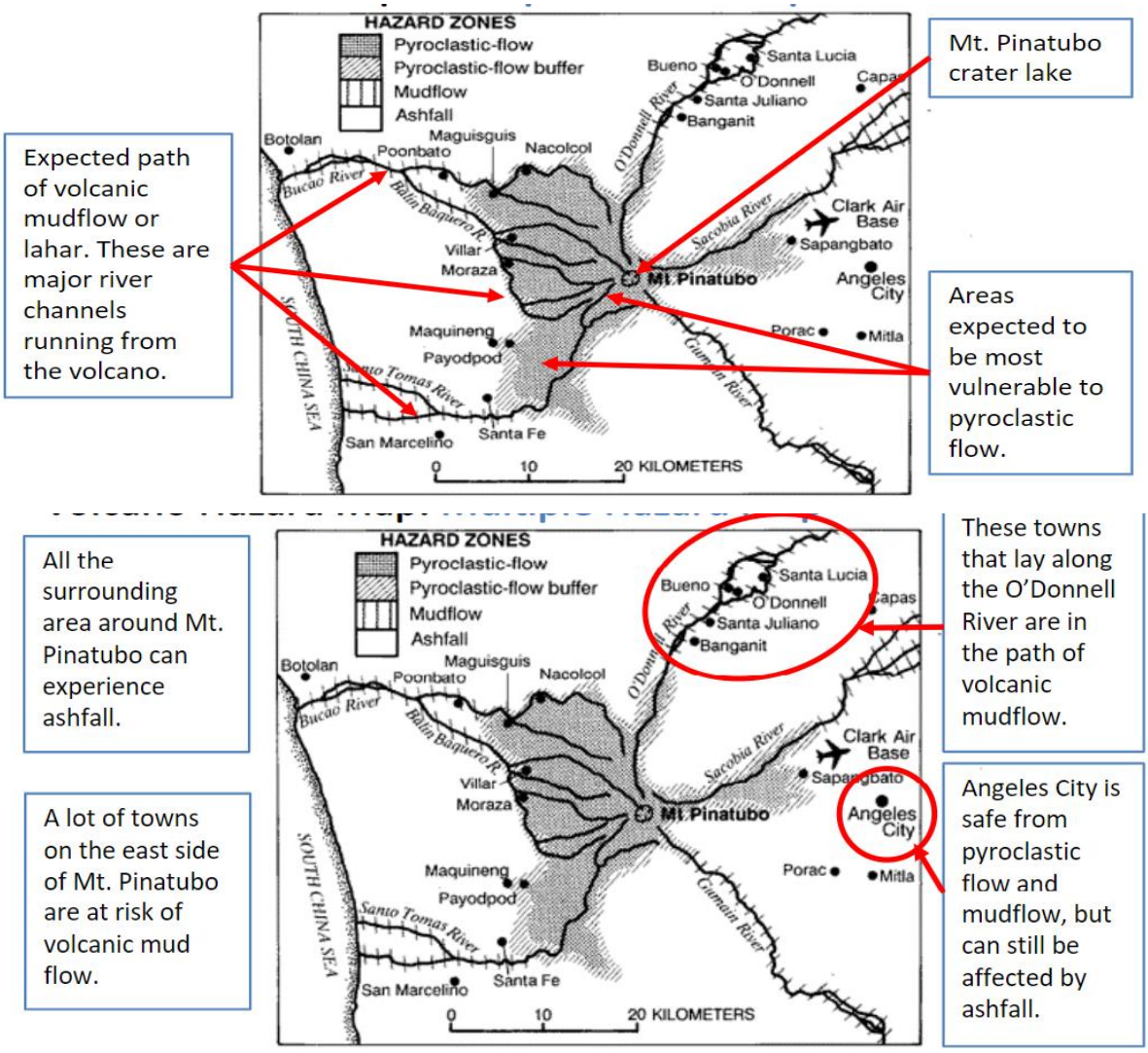


Figure 2. Volcano Hazard Map of Mt. Pinatubo

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

Primary Volcanic Hazards: Lava Flow Hazard Map

Volcano hazard map can also show a particular volcano hazard, in this case, a map that contains information about lava flow hazard. This type of volcano hazard map can be more detailed and accurate. It can contain more facts about the

topography of the land around the volcano, location of towns and cities, distance measurements from the crater, and even river channels.

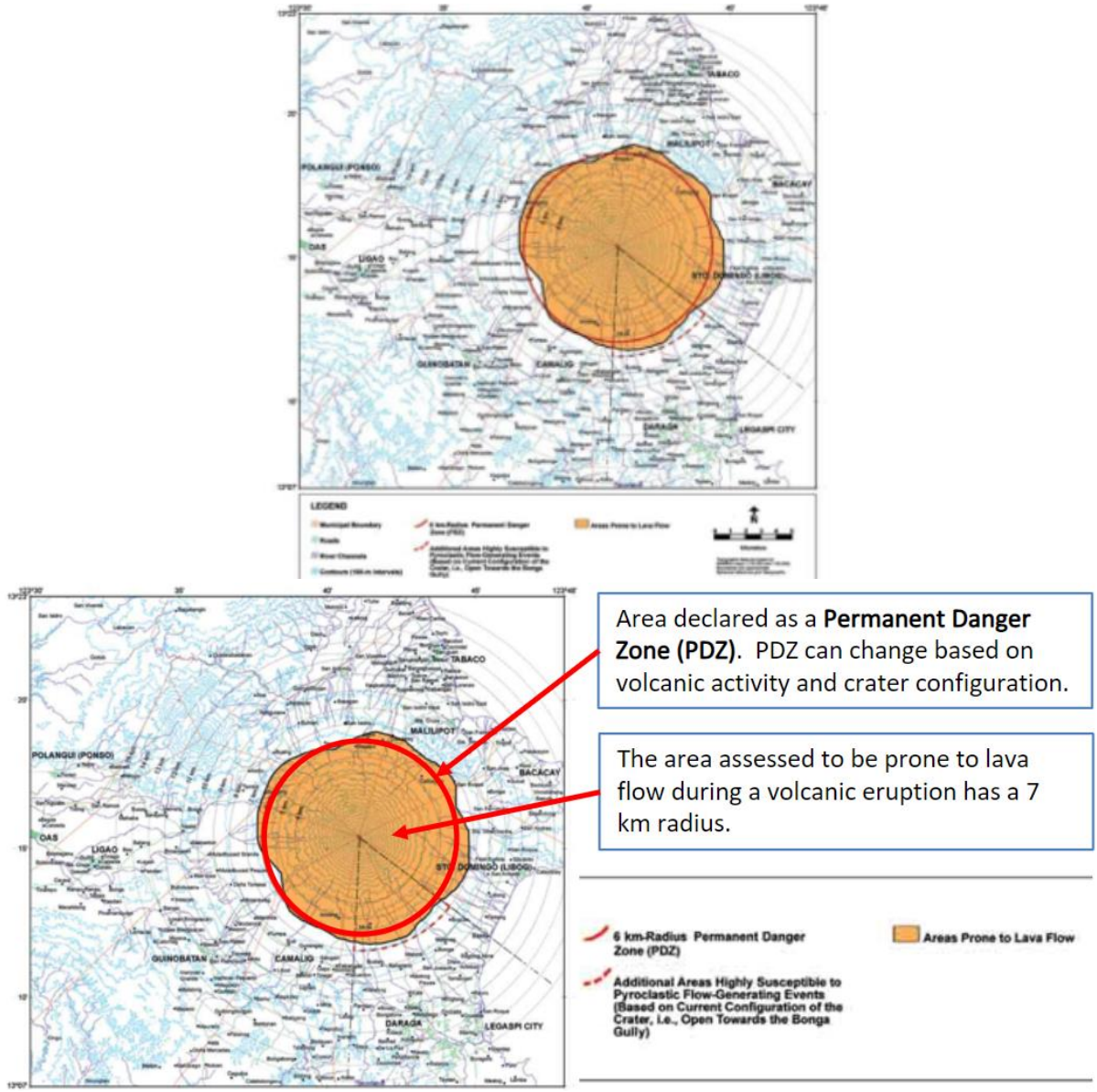
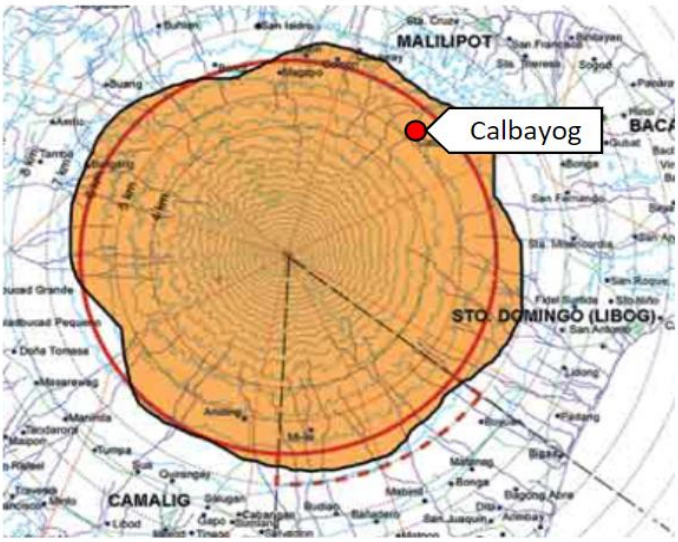


Figure 3. Mayon Volcano Lava Flow Hazard map (DOST- PHIVOLCS, 2020)
Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

These are the interpretations that can be derived from the information contained in the lava flow hazard map of Mayon Volcano.



There are no major/large town around Mayon volcano that is within the area prone to lava flow. However, there are few small towns like Calbayog, that is not just within the Permanent Danger Zone, but is also vulnerable to lava flow during an eruption. Town like Calbayog is expected to evacuate immediately in case of a volcanic crises.

Figure 4. Lava Flow Hazard Map

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

There are no major/ large town around Mayon Volcano that is within the area prone to lava flow. However, there are few small towns like Calibog, that is not just within the Permanent Danger Zone, but it is also vulnerable to lava flow during an eruption. Town like Calbayog is expected to evacuate immediately in case of volcanic crises.

Primary Volcanic Hazards: Pyroclastic Flow Hazard Map

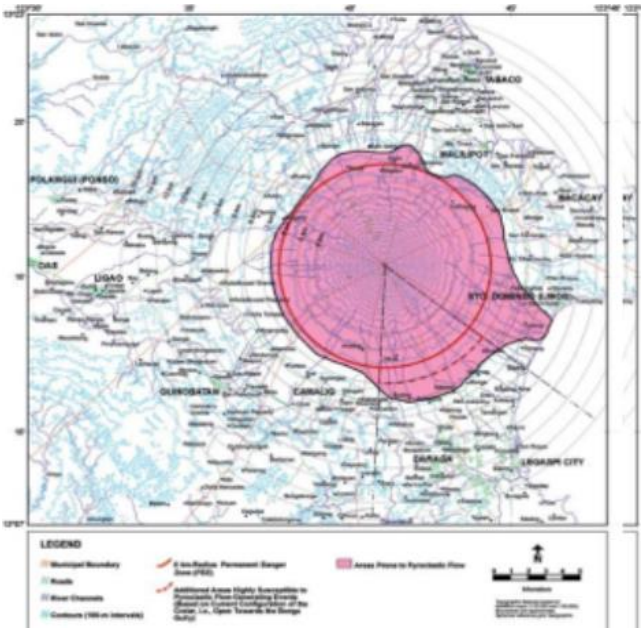


Figure 5. Areas Prone to Pyroclastic Flow

Source: Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html.
Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)

This map shows the areas that are prone to pyroclastic flow. Note that the covered land is larger than the area expected to be vulnerable to lava flow.

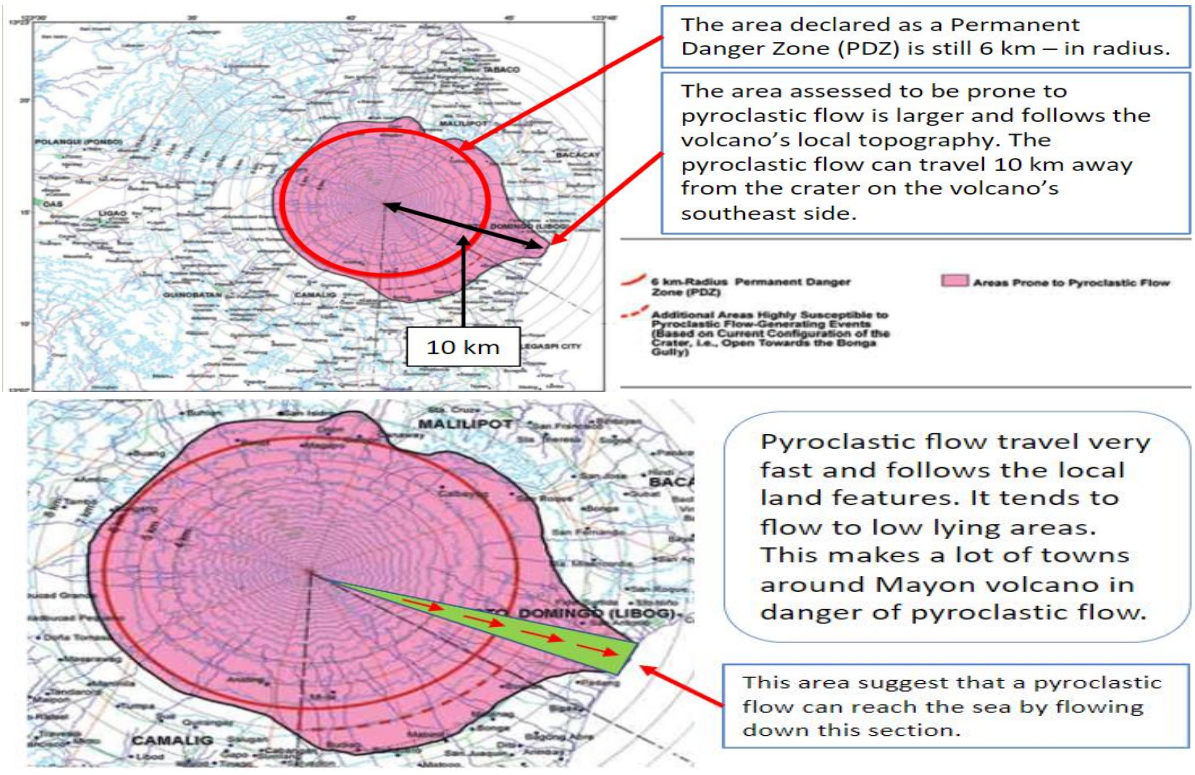


Figure 6. Pyroclastic flow hazard map interpretation
Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

These are the interpretation that can be derived from the information contained in the pyroclastic flow hazard map of Mayon Volcano. Note that pyroclastic flow travel very fast and follows the local features. It tends to flow to low- lying areas. This makes a lot of towns around Mayon Volcano in danger of pyroclastic flow.

Primary Volcanic Hazards: Lahar Hazard Map

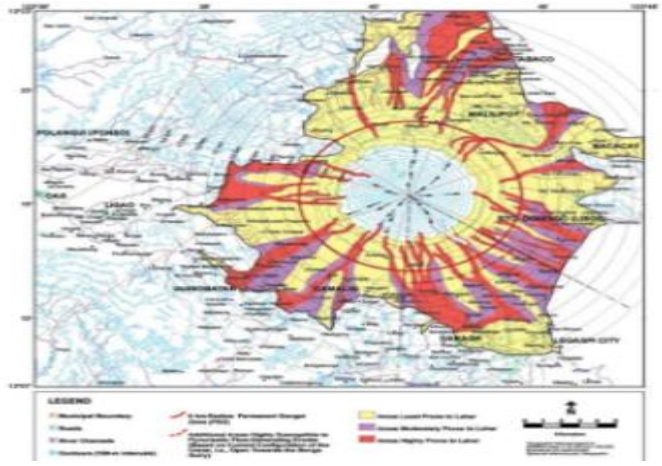


Figure 7. Lahar hazard map
Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

Lahar Hazard map shows all the possible areas that can be affected in case of a volcanic mud flow or lahar. Note that the land covered in this map larger than those in lava flow and pyroclastic flow hazard map. In this map, we can say that lahar can affect a very large region around Mayon Volcano. The areas affected are classified into three categories: areas slightly prone to lahar, areas moderately prone to lahar, and areas highly prone to lahar.

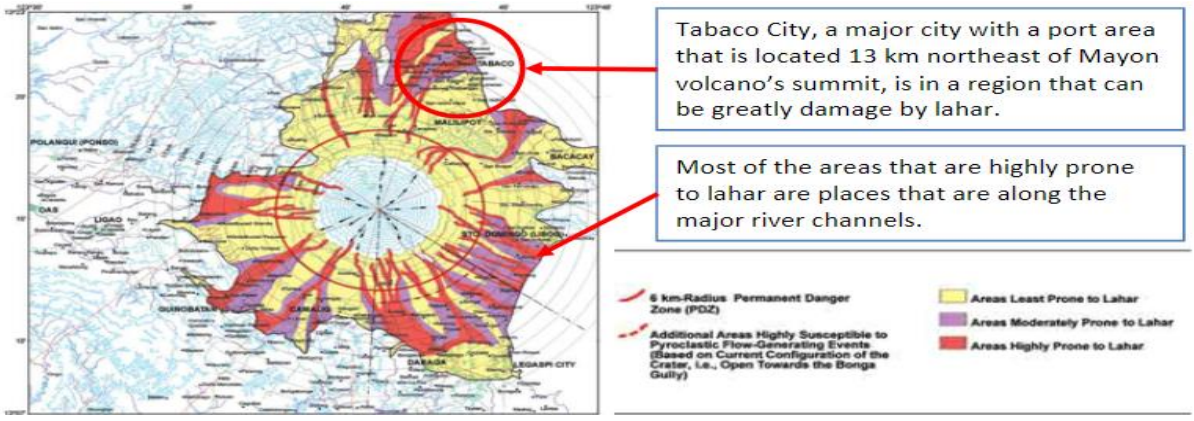


Figure 8. Areas that are highly prone to lahar

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

These are the interpretation that can be derived from the information contained in the lahar hazards map of Mayon Volcano.

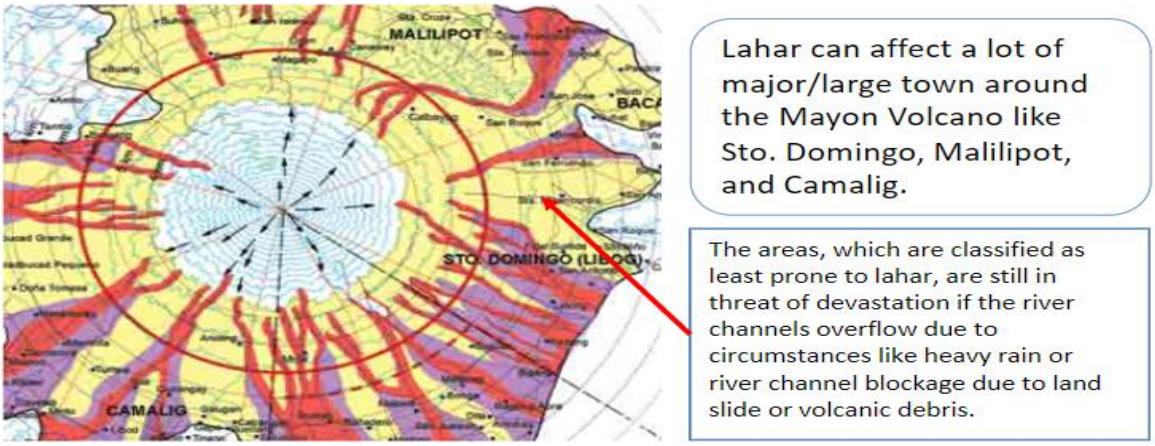


Figure 9. Least prone to lahar

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

These are the interpretations that can be derived from the information contained in the lahar hazards map of Mayon Volcano. Lahar can affect a lot of major/large town around the Mayon Volcano like Sto. Domingo, Malilipot, and Camalig.

Primary Volcanic Hazards: Ashfall Hazard Map

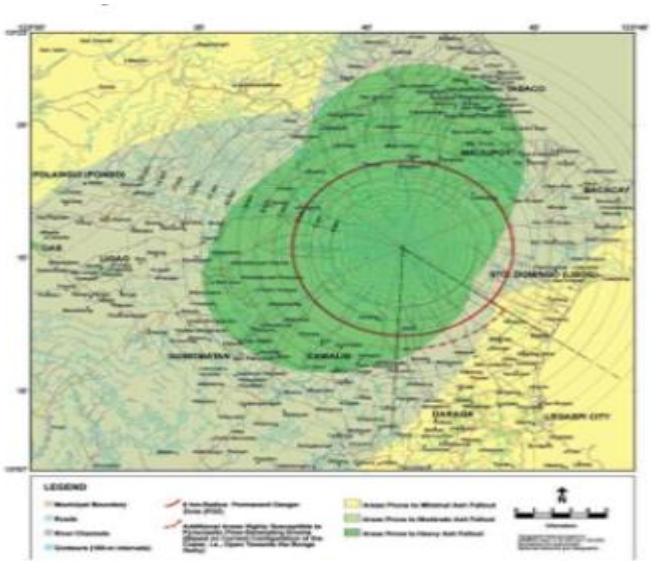
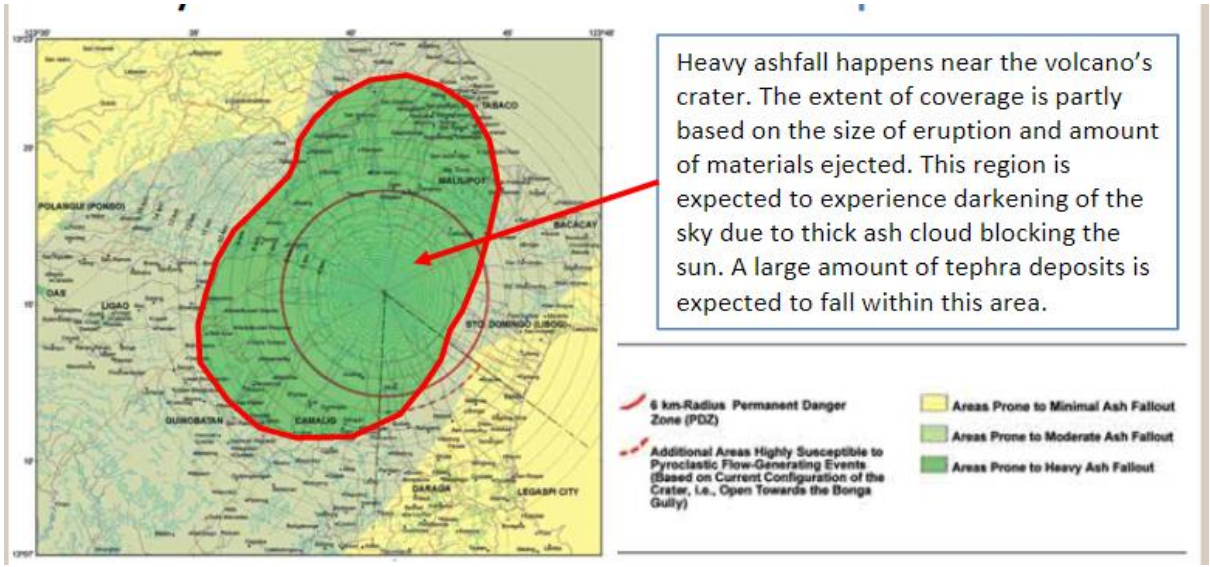


Figure 10. Ashfall hazard map

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

Ashfall hazard map shows the areas prone to ash fall. This type of volcano hazard map is mostly based on historical accounts and previous eruption records. This is because prediction an ashfall's exact magnitude, direction and coverage is very difficult to do due to numerous unpredictable factors. The areas affected are classified into three (3): areas prone to minimal ash fallout, areas prone to moderate ash fallout and areas prone to heavy ash fallout.



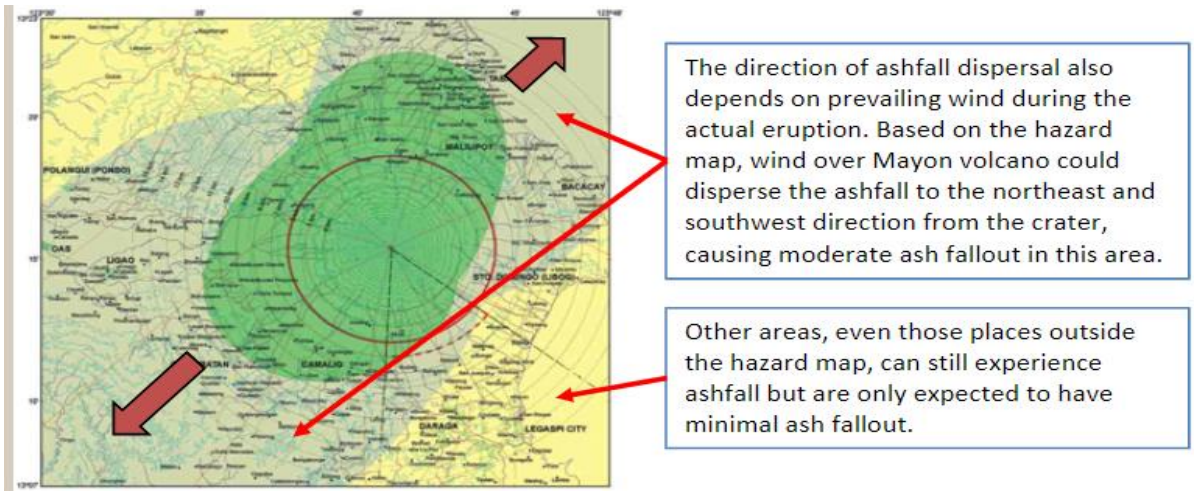


Figure 11. Ashfall hazard map interpretation

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

This is an interpretation that can be derived from the information contained in the ashfall hazards map of Mayon Volcano.

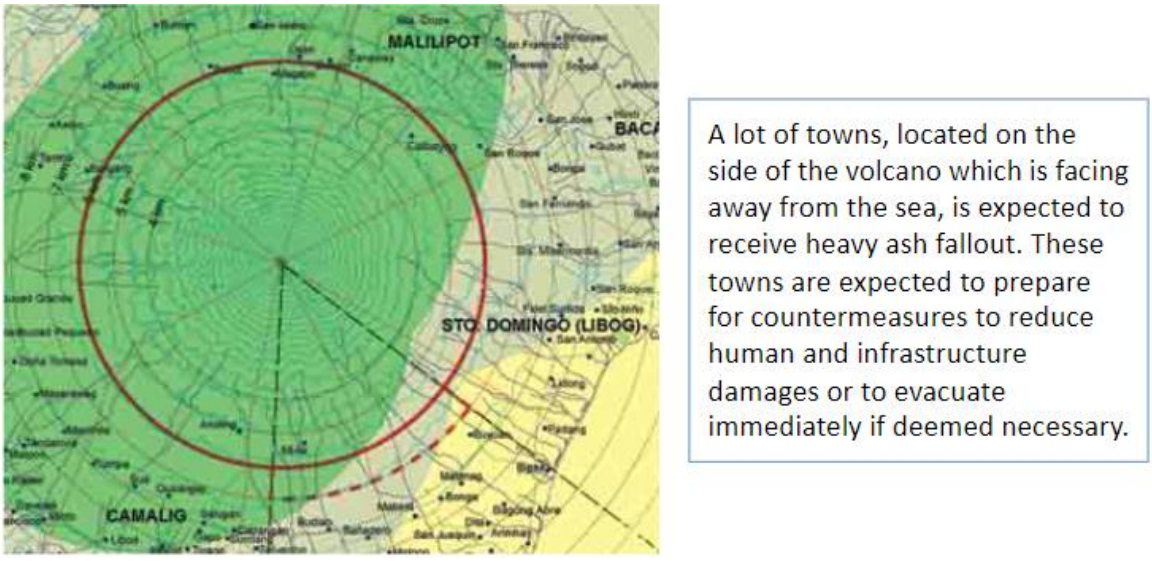
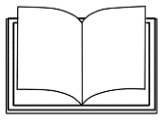


Figure 12. Expected to received heavy ash fallout

Source: *Accessed August 10, 2020. https://frontlearners.com/blended/pluginfile.php/6581/mod_resource/content/6/index.html. Mayon Volcano Lava Flow Hazard Map (DOST-PHIVOLC. 2020)*

These are the interpretations that can be derived from the information contained in the ashfall hazard map of Mayon Volcano. A lot of towns located on the side of the volcano, which is facing away from the sea, is expected to receive heavy ash fallout. These towns are expected to prepare for countermeasures to reduce human and infrastructure damages or to evacuate immediately if deemed necessary.

As a summary, take note that volcano hazard map geographically shows the location, size, and the destructive potentials of volcanic hazards. It can also show multiple volcanic hazards at the same time or only one particular volcanic hazard. Proper interpretation of volcano hazard maps can help authorities plan and design proper human settlement management, zoning practices, land-use plans, and hazard prevention countermeasures.



What's More

Activity 2

Read and analyze the following information and answer the questions below. Write your answer on a separate sheet of paper.

(Quizlet nd) states that in the Philippines, we use a system of Volcano Alert Signals to define the current status of each volcano. (Coursehero nd) added that alert levels range from 0 to 5 and used to guide any appropriate response from the Local Government Units (LGUs). You can also access this link for more information about volcano alert signals https://www.phivolcs.dost.gov.ph/index.php/volcano-hazard/volcano-alert-level.

(Masong nd) states that for each alert level, there should be a corresponding action coming from authorities. She added that Mayon Volcano Alert Levels if Alert Level 1 is declared, people are advised to not venture into the 6-kilometer radius Permanent Danger Zone.

(Ben nd) states that the Permanent Danger Zone (PDZ) for volcanoes is delineated and identified where no permanent habitation is recommended due to the possible impact of various hazards at any time. He also added that for Mayon Volcano, the area covered within a 6-kilometer radius from the summit is delineated as the PDZ. When Alert Level is raised from 0 to 1, it is recommended that people should not go within this area. This is already part of the precautionary action done by the Province of Albay when Alert 1 is declared. Geologists gain a better understanding of likely future hazards by studying the behavior of volcano, observing eruptions, and monitoring background levels of activity which can be seen using hazard maps.

(Ben nd) stated in his presentation that hazard maps are generated for various uses and are most useful in determining risks of living in identified potentially hazardous areas. He also added that hazard maps can also help people to become aware of specific dangers (lava flow, pyroclastic flows, ashfall, lahars, etc) they might face in the event that a volcano reactivates.

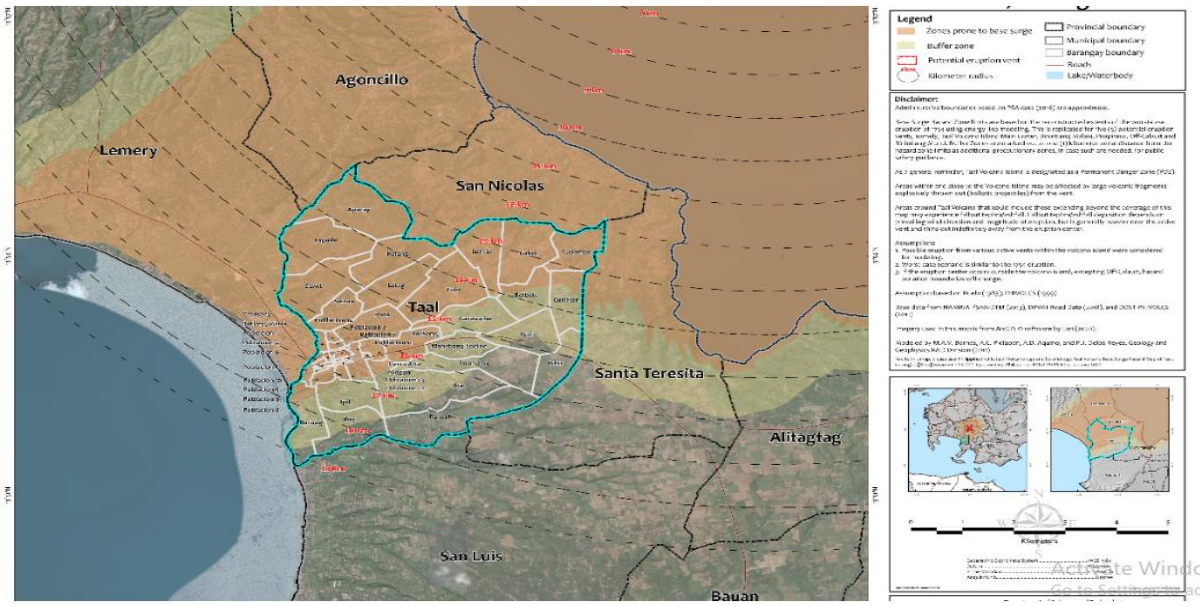
Analyze the given pyroclastic flow hazard map of Taal, Batangas, and answer the questions below. You can also access the link below to have a clearer photo of the map.
https://gisweb.phivolcs.dost.gov.ph/gisweb/earthquake-volcano-related-hazard-gis-information

NOTE: (For those students who have internet connection) You can follow the steps on how to download map with this link
https://www.phivolcs.dost.gov.ph/index.php/gisweb-hazard-maps

*Click this link to download the maps.
*To use the hazard information on Google Earth, follow the instructions below:

(Make sure that Google Earth is installed in your device. Else, download Google Earth from https://www.google.com/earth/download/gep/agree.html, install and run the app.)

1. 1.After clicking the link for map download, click the region where your area or property is located.
2. Choose between "Region" or "Province".
3. Click the hazards you intend to know. Click the kmz files, which will be downloaded automatically.
4. Go back to the directory where "3 NSO boundary" is found. Click "3 NSO boundary".
5. Download all relevant kmz files included in the folder for provincial, municipal and barangay boundaries,
6. Double Click the kmz files (hazards and administrative boundaries) you just downloaded. These will all be loaded to Google Earth.
7. Read the legend in the map for explanation of hazards in the area.
8. To make the layers transparent, look for the slider bar at the left portion in the Google Earth interface. Click the "square" icon. Scroll the bar to adjust transparency.



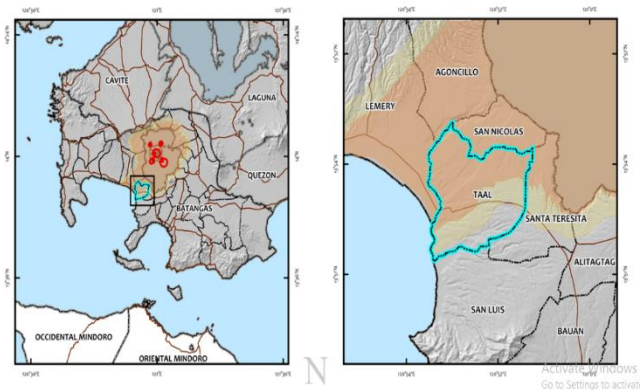
Source: *Accessed September 1, 2020. https://gisweb.phivolcs.dost.gov.ph/gisweb/earthquake-volcano-related-hazard-gis-information.*

Large scale version of the picture

Taal Volcano
Base Surge Hazard Map
Taal, Batangas

Legend

- Zones prone to base surge
- Buffer zone
- Potential eruption vent
- 1 km Kilometer radius
- Provincial boundary
- Municipal boundary
- Barangay boundary
- Roads
- Lake/Waterbody



Disclaimer:
Administrative boundaries based on PSA data (2016) are approximate.

Base Surge Hazard Zone limits are based on the reconstructed extents of the worst-case eruption of 1754 using energy-line modeling. This is replicated for five (5) potential eruption vents, namely, Taal Volcano Island Main Crater, Binintiang Malaki, Pirapiraso, Off-Calauit and Binintiang Munti. Buffer Zones are marked out at one (1) kilometer aerial distance from the hazard zone limits as additional precautionary zones, in case such are needed, for public safety guidance.

As a general reminder, Taal Volcano Island is designated as a Permanent Danger Zone (PDZ).

Areas within and close to the Volcano Island may be affected by large volcanic fragments explosively thrown out (ballistic projectiles) from the vent.

Areas around Taal Volcano that could include those extending beyond the coverage of this map may experience fallout tephra/ashfall. Fallout tephra/ashfall deposition depends on prevailing wind direction and magnitude of eruption, but is generally heavier near the active vent and thins out indefinitely away from the eruption center.

Assumptions
1. Possible eruption from various active vents within the volcano island were considered for modeling.
2. Worst-case scenario is similar to the 1754 eruption.
3. If the eruption center occurs outside the volcano island, excepting Off-Calauit, hazard zonation boundaries will change.

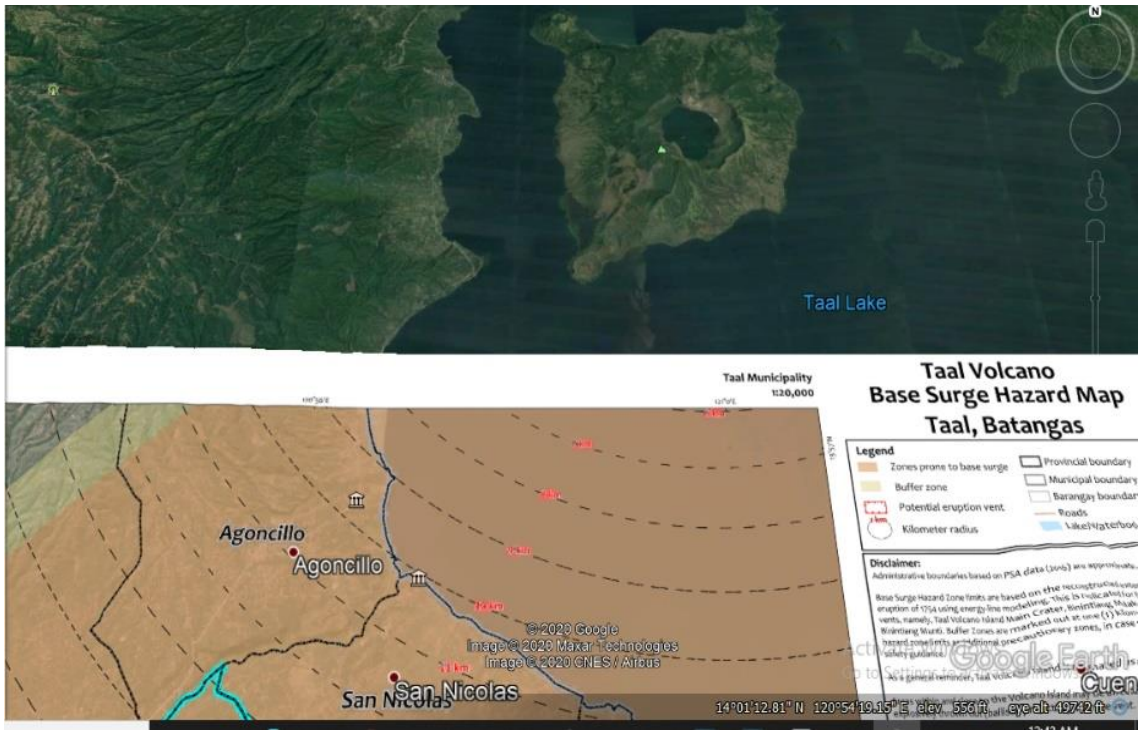
Assumption based on Ruelo (1983); PHIVOLCS (1999)

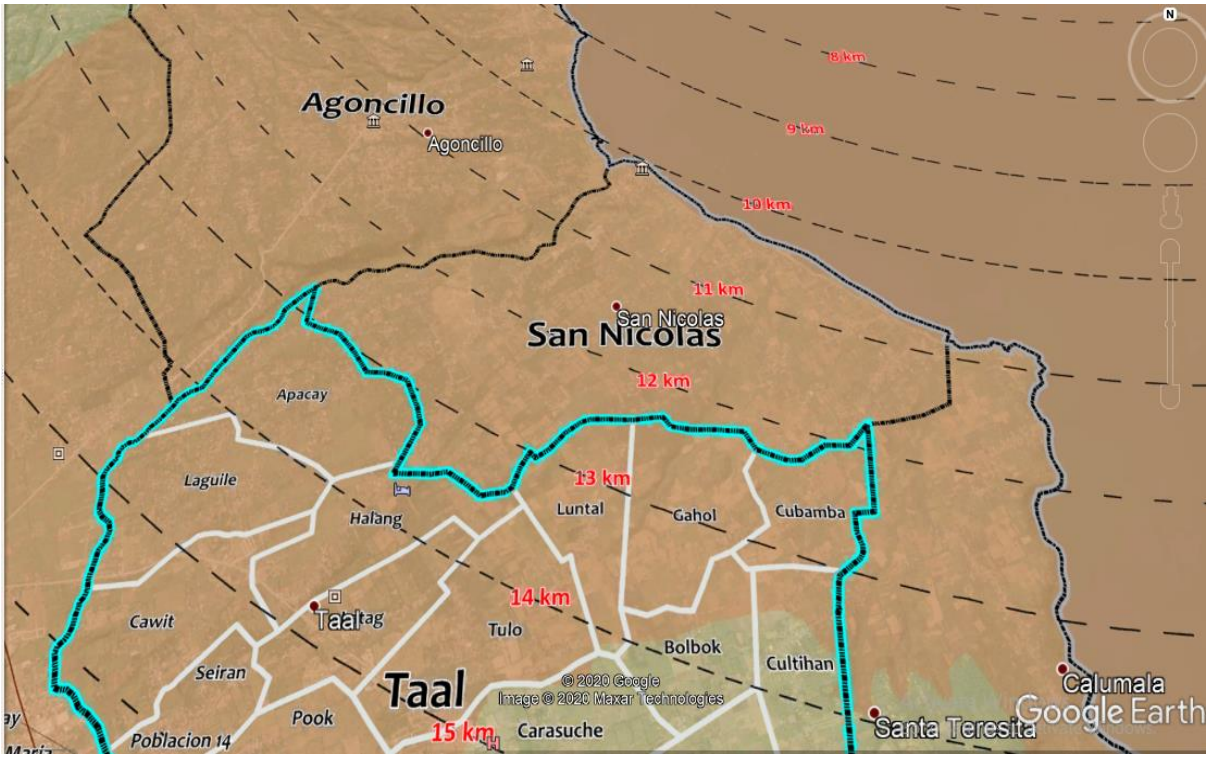
Base data from NAMRIA IfSAR-DTM (2013), DPWH Road Data (2018), and DOST-PHIVOLCS (2011)

Imagery used in this map is from ArcGIS © software by Esri (2020).

Modeled by M.A.V. Bornas, A.C. Pidlaoan, A.D. Aquino, and P.J. Delos Reyes, Geology and Geophysics R&D Division (2011)

To cite this map, please use: Philippine Institute of Volcanology and Seismology. Taal Volcano Base Surge Hazard Map of Taal, Batangas. [Map] Version 1. 1:20,000. Quezon City, Philippines: DOST-PHIVOLCS, January 2020.





For the given Taal Volcano Base Surge Hazard Map, identify the municipalities/ barangays that are likely to be affected by the surge. Base your answer on the given map above.

Location in kilometer (km)	Possible affected municipalities/barangays
11	
between 11 & 12	
between 12 &13	
13	
Between 13 & 14	
14	

NOTE: To the teacher, you can also allow the students to do the activity on CHED Teaching Guide for Senior High School DISASTER READINESS AND RISK REDUCTION Commission on Higher Education pages 96 -97.

What I Have Learned

Activity 3

Fill in the blanks with the correct answer to check what you have learned in this lesson.

1. _____ is a special map that geographically shows the location, size, and destructive potential of volcanic hazards.
2. (Quizlet nd) states that in the Philippines, we use a system of _____to define the status of each volcano.
3. Some of the volcano hazard map includes _____, _____, _____, and _____.

What I Can Do

Activity 4

Since you know already about the volcano hazard map, let us check if you can transfer your new knowledge or skills into real life situations or concerns. Knowing how to interpret the hazard map, develop a family emergency preparedness plan to guide them on what to do before, during, and after a volcanic eruption. You are free to do whatever style you want in this activity. You can make infographics or tabular style of family emergency preparedness plan.

SCORING RUBRIC

NOTE: This rubric will be used in checking your essay.

Criterion	Excellent (4 pts)	Good (3 pts)	Approaching Standard (2 pts)	Needs Improvement (1pt)
Ideas and Content	What you are writing about is clear and well- expressed, including specific examples to demonstrate what you learned. Well done	What you are writing is clear. You answered the question. Some support may be lacking, or your sentences may be a bit awkward. Overall a decent job.	You put thought into this, but there is no real evidence of learning. More specific information is needed, or you need to follow the directions more closely.	There is no clear or specific explanation in answer to the question.
Use of terms	Your answer included all the terms from the lesson that applied to the question asked. All terms are fully defined and used in the proper context.	Your answer included several terms from the lesson, demonstrating adequate understanding of the material.	Only one term from the lesson is used in the answer. Try for a few more, next time.	No terms from the lesson are used.
Sentence fluency	Sentences are complete and they are read out loud. Your writing flows.	Sentences are complete and able to be understood.	Some sentences are complete and easy to understand. Others require some work.	Sentences are incomplete or too long. It makes reading them difficult.
Conventions	No punctuation or structural mistakes. No spelling errors. Your writing shows full awareness of the rules of English use.	Use of punctuation marks and capitals as well as spelling is mostly correct. Few errors exist in your answer.	Mistakes using end marks or capitals as well as spelling mistakes make writing hard to read.	Few end marks or capital letters. Answers contain numerous spelling or structural errors.

Source: Reazon System, Inc. 2020. Accessed August 9, 2020. https://www.rcampus.com/rubricshowc.cfm?code=U66W43&sp=yes&

Assessment

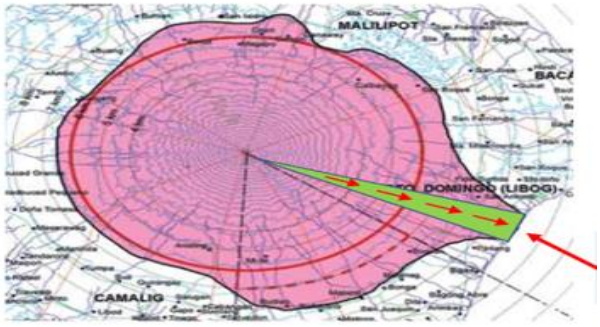
Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. All are the things you can do during volcanic eruption **EXCEPT** one. Which one is it?
    A. Immediately leave the evacuation area without notice to the authorities.
    B. If indoors, close all window, doors, and dampers to keep volcanic ash from entering.
    C. Follow any evacuation orders issued by authorities and put your emergency plan into action.
    D. Listen to a local station on a portable, battery-operated radio or television for updated emergency information and instructions.

2. With the use of volcano hazard map, proper authorities can do the following **EXCEPT** one. Which one is it?
    A. Effectively plan and efficiently take actions during a calamity
    B. Had hard time planning on evacuation routes that ensure maximum safety
    C. Immediately assess possible location for establishing evacuation centers
    D. Easily identify the areas that should be given priorities for immediate evacuation

3. What do you call the area around the volcano's summit that is permanently considered by the authorities as a dangerous area due to the possibility of sudden volcanic activities?
    A. Vulnerable areas
    B. Pyroclastic flow buffer
    C. Permanent danger zone
    D. Areas prone to lava flow

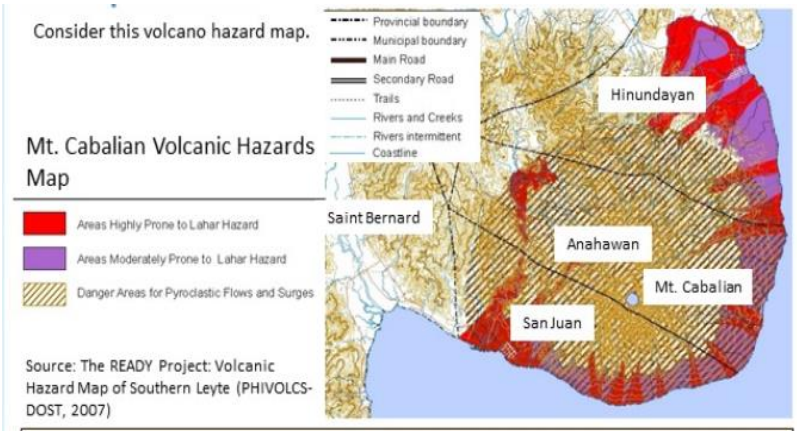
4. Which of the following is the correct interpretation of the hazard map below?



   A. The arrow suggests being prone to lava flow during a volcanic eruption.
   B. The arrow suggests that this is the safest area and the good place for evacuation area.
   C. The arrow suggests that a pyroclastic flow can reach the sea by flowing down that section.
   D. The arrow suggests that the areas which are classified as least prone to lahar are still in threat of devastation if the river channels overflow due to circumstances like heavy rain.

5. Which of the following hazard maps contain more facts about the topography of the land around the volcano, location of towns and cities, distance measurements from the crater, and even river channels.?
   A. Lahar hazard map
   B. Ashfall hazard map
   C. Lava flow hazard map
   D. Pyroclastic flow hazard map

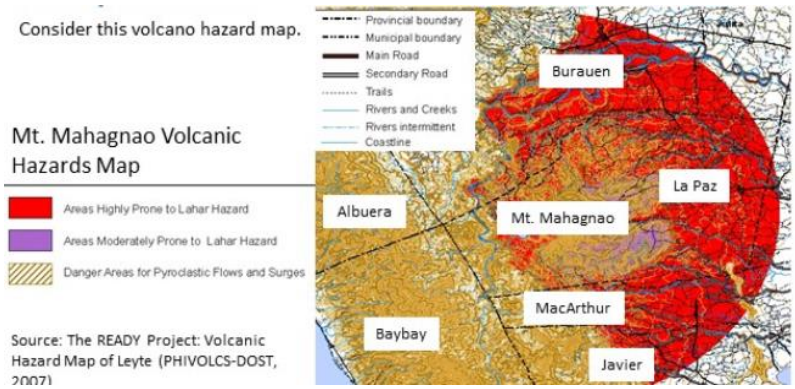
6. Based on the given volcano hazard map of Mt. Cabalian below, which of the following municipality is not in treat of any volcano hazard?
   A. San Juan
   B. Anahawan
   C. Hinundayan
   D. Saint Bernard



7. Based on the given volcano hazard map of Mt. Cabalian on number 6, which of the following municipality has the greatest number of areas highly prone to lahar hazard?
    A. San Juan
    B. Anahawan
    C. Hinundayan
    D. Saint Bernard

8. Based on the given volcano hazard map of Mt. Mahagnao below, which of the following municipality has the greatest number of areas highly prone to pyroclastic flows and surges?

    A. Javier
    B. La Paz
    C. Baybay
    D. Mac Arthur



9. Which of the following is a special map that geographically shows the location, size, and destructive potential of volcanic hazards?
    A. Lahar hazard map
    B. Volcano hazard map
    C. Pyroclastic hazard map
    D. Base surge hazard map

10. Which of the following hazard map shows all the possible areas that can be affected in case of a volcanic mud flow?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Lava flow hazard map
    D. Pyroclastic flow hazard map

11. Which of the following types of volcano hazard map contains generalized information about the areas expected to be the most affected by pyroclastic flow, mudflow, ashfall, and other volcanic hazards?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Multiple-hazard map
    D. Lava flow hazard map

12. Which of the following is mostly based on historical accounts and previous eruption records?
    A. Lahar hazard map
    B. Ashfall hazard map
    C. Lava flow hazard map
    D. Pyroclastic flow hazard map

13. Which of the following is used to define the current status of each volcano?
    A. Lahar alert level
    B. Ashfall alert level
    C. Volcano alert signals
    D. Pyroclastic flow alert level

14. Which of the following is delineated and identified where no permanent habitation is recommended due to the possible impact of various hazards at any time?
    A. Volcano alert level
    B. Volcano hazard map
    C. Permanent Safe Zone (PSZ)
    D. Permanent Danger Zone (PDZ)

15. All of the following are importance of volcano hazard map **EXCEPT** one. Which one is it?
    A. It will just add confusion to the people living near volcano.
    B. Useful in determining risks of living in identified potentially hazardous areas.
    C. It can help people to become aware of specific dangers (lava flow, pyroclastic flows, ashfall, lahars, etc.) they might face in the event that a volcano reactivates.
    D. Both B and C

Additional Activities

Write reflection on your learning on volcano hazard map by answering the questions inside the box. Have fun and enjoy!

Volcano Hazard Map

Guides me to reflect on_____
_____
_____

What learnings have I found from this lesson?

_____
_____
_____

What other examples can I contribute

_____
_____
_____

What learning can I share with my family and peers?

_____
_____
_____

What good character have I developed from this lesson?

_____
_____
_____

What is my conclusion on the lesson?

_____
_____
_____

SCORING RUBRIC:

NOTE: This rubric will be used in checking your answers in additional activities.

Criterion	Excellent (4 pts)	Good (3 pts)	Approaching standard (2 pts)	Needs Improvement (1pt)
Ideas and Content	What you are writing about is clear and well- expressed, including specific examples to demonstrate what you learned. Well done	What you are writing is clear. You answered the question. Some support may be lacking, or your sentences may be a bit awkward. Overall a decent job.	You put thought into this, but there is no real evidence of learning. More specific information is needed, or you need to follow the directions more closely.	There is no clear or specific explanation in answer to the question.
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Source: Reazon System, Inc. 2020. Accessed August 9, 2020. https://www.rcampus.com/rubricshowc.cfm?code=U66W43&sp=yes&

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