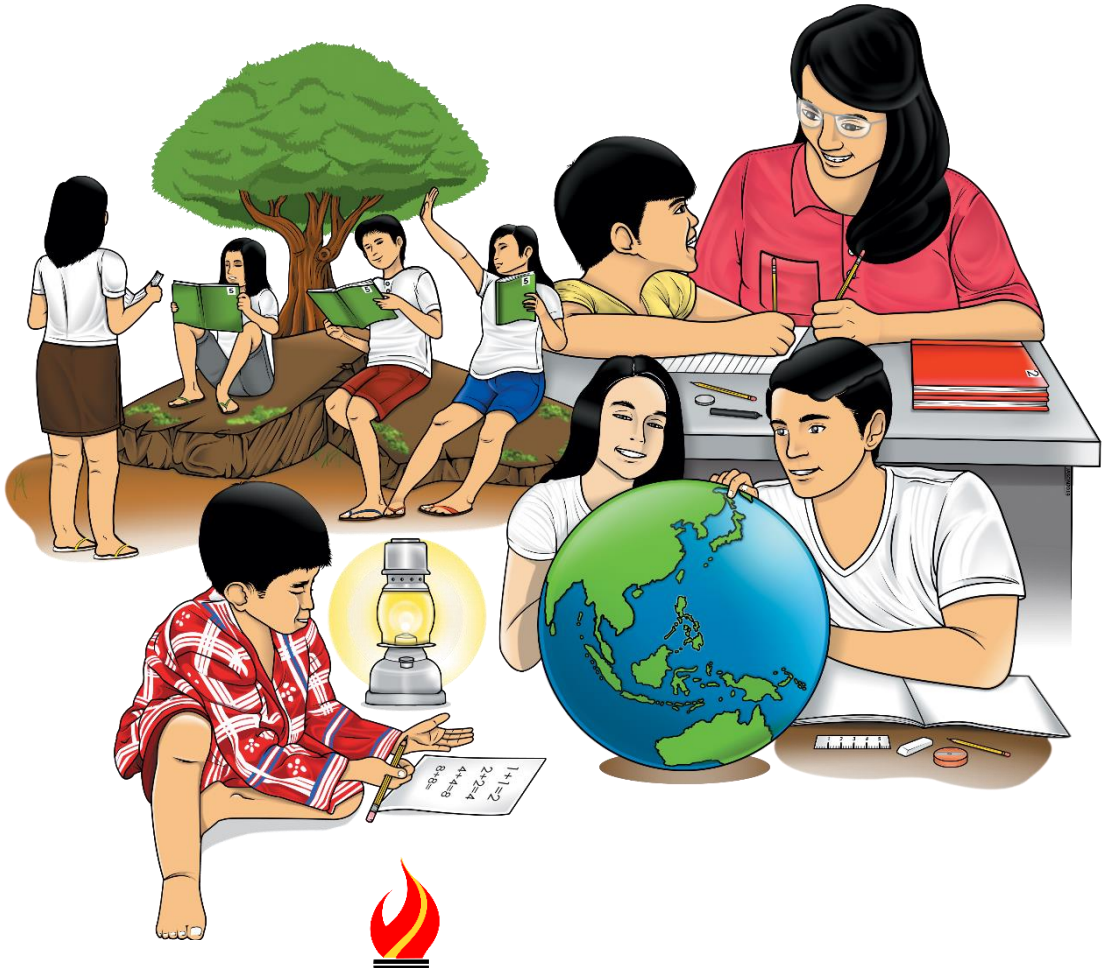
Senior High School

DepED
DEPARTMENT OF EDUCATION

Disaster Readiness and Risk Reduction

Quarter 2 – Module 4: Interpretation of Geological Maps



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ADM

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Alternative Delivery Mode
Quarter 2 – Module 4: Interpret Geological Maps
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Senior High School

Disaster Readiness and Risk Reduction

Quarter 2 – Module 4:

Interpretation of Geological Maps

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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.

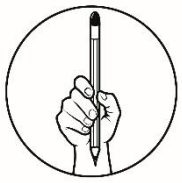
What I Need to Know

This module will discuss the definition, uses, and interpretation of geological maps. It shows a major tool of information for the upcoming disaster and mitigates or reduces of the impact of Rainfall -induced landslide and sinkhole.

The Module is intended to equip you with skills in interpreting geological maps.

After going through this module, you are expected to:

1. identify geological maps, its part and elements;
2. interpret the geological maps and its uses;
3. give an example of geological maps and
4. appreciate the importance of knowing the uses of geological maps.



What I Know

Read each item carefully and choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Geological Map defined as the following, EXCEPT

   a. Geological map is a complete compilation of information about the solid Earth we live on.
   b. Geological map is a map of the different types of rocks or structures that are on the surface of the earth.
   c. Geological Map shows locations of cities large and small and does not show topographic features like mountains.
   d. Geological Map shows geological features, rock units or geologic strata are shown by color or symbols to indicate where they are exposed at the surface.

2. Which of these is not included in Geological Map features?

   a. clay
   b. faults
   c. folds
   d. rock

3. Which of the following is not belong in Geological Parts?

   a. incapable
   b. interpretation
   c. susceptibility
   d. title

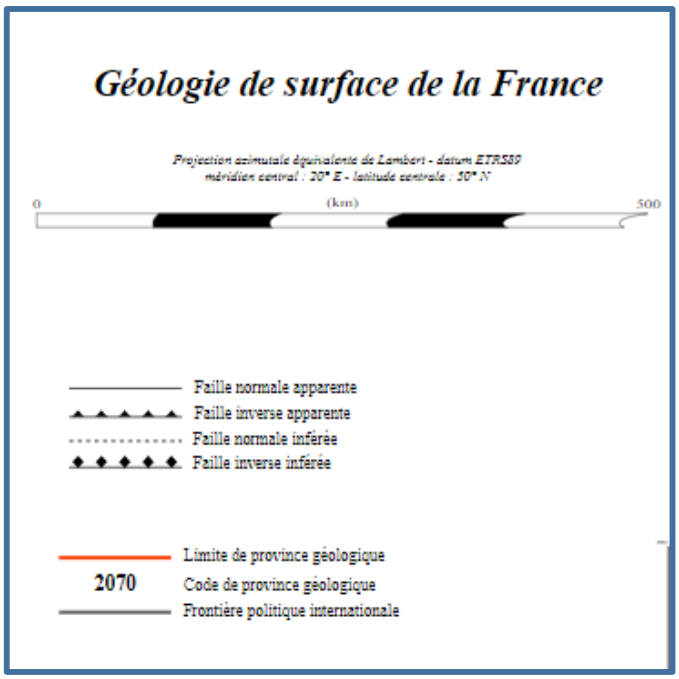
4. What do the colors on a geologic map represent?

   a. contact
   b. different colors
   c. fault
   d. folds

5. Geological Map has many parts. What part of Geological map is this?

a. direction
b. legend
c. susceptibility
d. symbols and interpretation

6. The part of Geological Map shown below is:



ic (2012). *File:France geological map-fr.svg by Europe_geological_map-en.svg*. Derivative work: nedia.org/w/index. php?curid=20457979. Licensed under CC BY-SA 3.0 https://creativecom sa/3.0/?ref=ccsearch&atype=rich.

Landslide

Very high landslide susceptibility
Areas usually with steep to very steep slopes and underlain by weak materials. Recent landslides, escarpments and tension cracks present. Human initiated effects could be an aggravating factor.

High landslide susceptibility
Areas with steep to very steep slopes and underlain by weak materials. Areas with numerous old/inactive landslides.

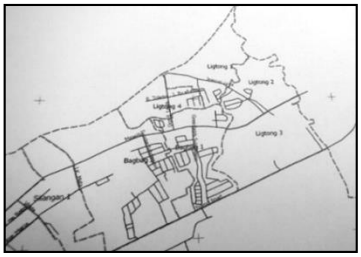
Moderate landslide susceptibility
Areas with moderate steep slopes. Soil creep and other indications of possible landslide occurrence are present.

Low landslide susceptibility
Gently sloping areas with no identified landslide

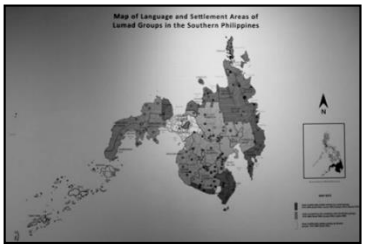
Debris flow / Possible accumulation zone
Areas that could be affected by landslide debris

a. direction
b. legend
c. Susceptibility
d. Symbols and interpretation

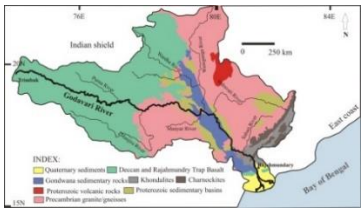
7. Which of the following is a Geological Map?

a. 

Judgefloro. (2018). *File:1881Rosario Roads Cavite Landmarks Barangays 08.jpg*. Photograph. https://search.creativecommons.org/photos/b26e082b-ff00-4370-ac06-885ca84a1b44. Marked with CC0 1.0. https://creativecommons.org/publicdomain/zero/1.0/deed.en?ref=ccsearch&atype=rich.

b. 

Todd, Gary. (2016). *"Map of Language & Settlement Areas of Lumad Groups in Southern Philippines.* Photograph. https://search.creativecommons.org/photos/9ee229e3-0fff-465e-8ba4-9326ae29cad5. Marked with CC0 1.0. https://creativecommons.org/ publicdomain/zero/1.0/deed.en?ref =ccsearch&atype=rich.

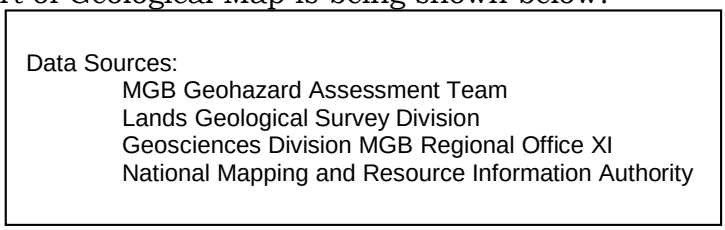
c. 

Kulgoyesh19. (2017). *File:Generalized Geological Map of Godavari Drainage Basin.jpg*. Digital Image. https://commons.wikimedia.org/w/index.php?curid=62349537. Licensed under CC BY-SA 4.0. https://creativecommons.org/licenses/by-sa/4.0/?ref=ccsearch&atype=rich

d. 

https://media.wired.com/photos/59269cd37034dc5f91bec0f1/191:100/w_1280,c_limit/GoogleMapTA.jpg

8. What part of Geological Map is being shown below?



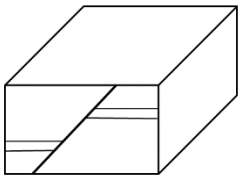
a. direction
b. legend
c. Sources
d. Susceptibility

9. Which is NOT true about Geological Map?

a. Geological map portrays the distribution of rocks, deposits, or other geologic features in a specified area.
b. Many different types of lines and symbols are found on geologic maps.
c. Geological maps are uniquely suited to solving problems involving Earth resources, hazards, and environments.
d. All of these

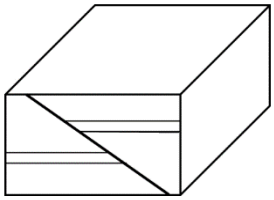
10. What fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



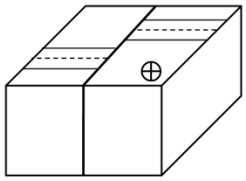
11. What fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



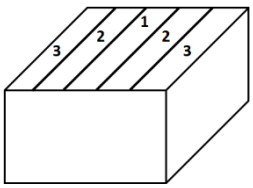
12. What fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



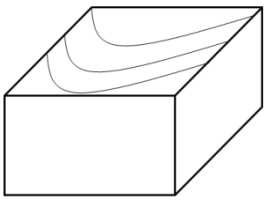
13. What fault movement is being shown below?

a. anticline
b. reverse fault
c. strike slip fault
d. plunging syncline



14. What fault movement is being shown below?

a. anticline
b. reverse fault
c. strike slip fault
d. plunging syncline



15. Which of these is a symbol in Geological Map?

a. dotted contact lines
b. hick lines and thin lines
c. first capitalized letter in a geologic unit
d. All of these choices are precise and correct.

Lesson 4 Interpretation of Geological Maps

What's In

See picture below and answer the following questions.

HueMan1 (2018). Ph locator laguna calamba.svg. Illustration. https://commons.wikimedia.org/w/index.php?curid=74387459. Licensed under CC BY-SA 4.0. https://creativecommons.org/licenses/by-sa/4.0/?ref=ccsearch&atype=rich

Directions: Answer the following questions. Write your answers on a separate sheet of paper.

1. What have you observed about the picture?

_____

_____

2. Have you experienced using Google Map? When?

_____

_____

3. What are the benefits of using Google Map for you and your family? Give at least 2 answers.

_____

_____

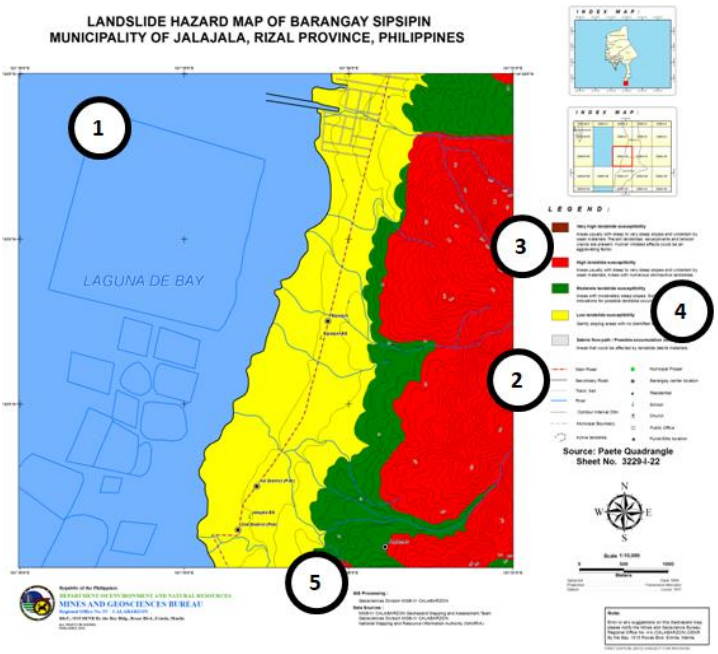
Notes to the Teacher

This Lesson comprises of various activities. Ensure all students understand the lesson clearly and encourage them to answer each activity vigorously.

What's New

ACTIVITY 1: NAME ME!

Directions: Identify the following parts of Geological Map. Write your answers on a separate sheet of paper.



Republic of the Philippines, Department of Environment and Natural Resources, Mines and Geosciences Bureau. *Landslide Hazard Map of Barangay Sipsipin, Municipality of Jalajala, Rizal Province, Philippines.* Map. http://region4a.mgb.gov.ph/geohazard-maps/. Marked as free domain. Accessed 30 August 2020.

1. _____
2. _____
3. _____
4. _____
5. _____

What is It

What is a Geological Map?

This type of map shows how geological features, rock units or geologic strata are shown by colors or symbols to indicate where they are exposed at the surface.

Geological Maps Features:

1. Faults
2. Tilts
3. Folds
4. Rock layers

Parts of Geological Map:

1. Legend
2. Interpretation
3. Title
4. Susceptibility
5. Sources

Symbols in Geological Maps

1. Thick lines and thin lines
2. First capitalized letter in geologic unit
3. Colors
4. Dotted contact line

Symbolizing Geology

Contours and topography are just the first parts of a geologic map. The map also puts rock types, geologic structures, and more onto the printed page through colors, patterns, and symbols.

Here is a small sample of a real geologic map. You can see the basic things —shorelines, roads, towns, buildings, and borders—in gray. The contours are there too, in brown, plus the symbols for various water features in blue. All of these are on the map's base. The geologic part consists of the black lines, symbols, labels, and areas of color. The lines and the symbols condense a great deal of information that geologists have gathered through years of fieldwork.

Geologic Age and Formation Symbols

Cenozoic	Cz	Carboniferous	C
Quaternary	Q	Pennsylvanian	IP
Tertiary	T	Mississippian	M
Neogene	N	Devonian	D
Paleogene	Pe	Silurian	S
Mesozoic	Mz	Ordovician	O
Cretaceous	K	Cambrian	€
Jurassic	J	Precambrian	p€
Triassic	Tr	Proterozoic	P
Paleozoic	Pz	Archean	A
Permian	P		

The letter symbols signify the name and age of the rock units in an area. The first letter refers to the geologic age, as shown above. The other letters refer to the formation name or the rock type. The geologic map of Rhode Island is a good example of how the symbols are used.

A few of the age symbols are unusual; for instance, so many age terms begin with P that special symbols are needed to keep them clear. The same is true for C, and indeed the Cretaceous Period is symbolized with the letter K, from the German word Kreidezeit. This is why the meteor impact that marks the end of the Cretaceous and beginning of the Tertiary is commonly called the "K-T event."

The other letters in a formation symbol usually refer to the rock type. A unit consisting of Cretaceous shale might be marked "Ksh." A unit with mixed rock types might be marked with an abbreviation of its name, so the Rutabaga Formation might be "Kr." The second letter might also be an age term, particularly in the Cenozoic, so that a unit of Oligocene sandstone would be labeled "Tos."

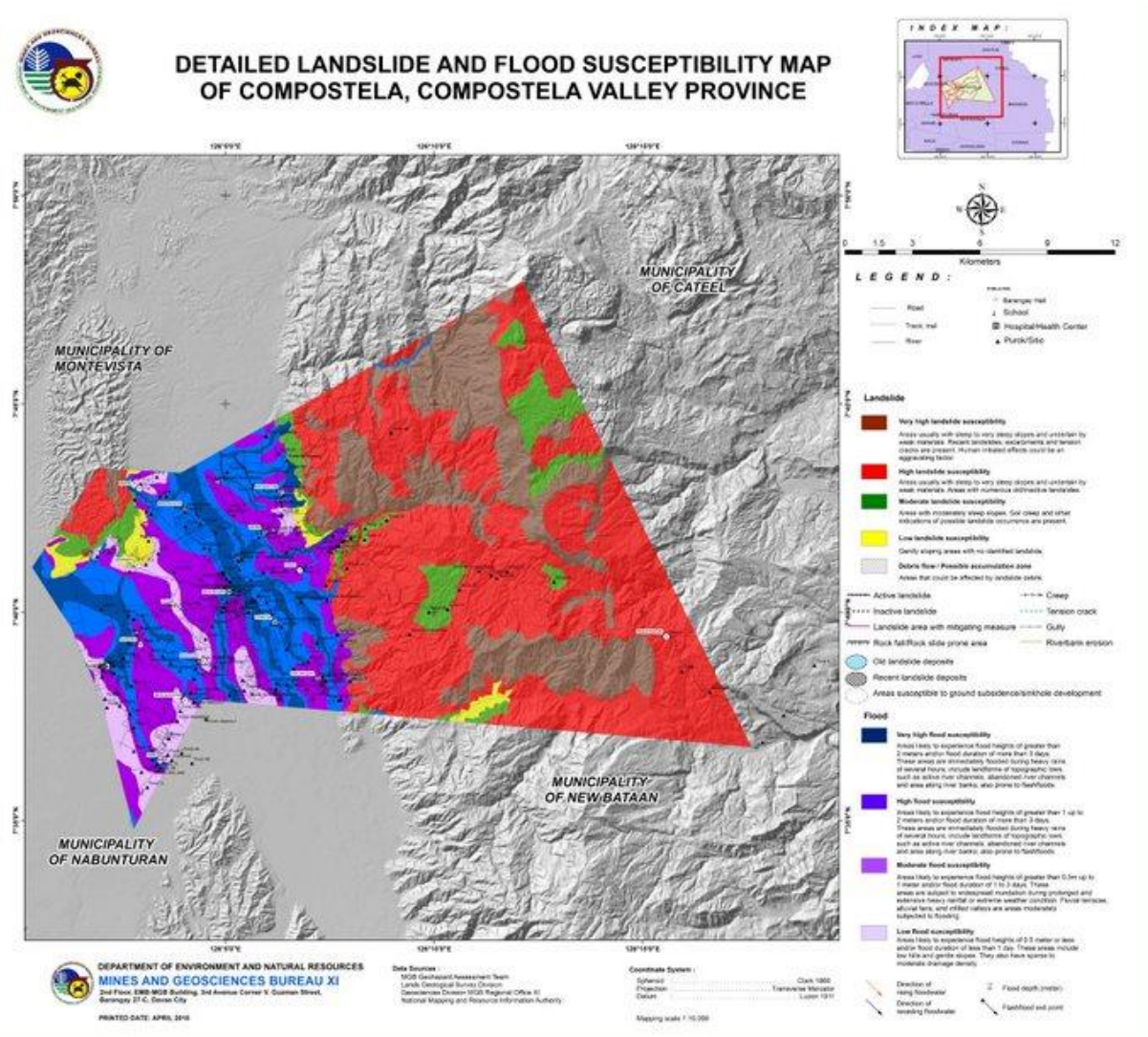
All of the information on the geologic map—such as strike and dip, trend and plunge, relative age and rock unit—are obtained by the hard work and trained eyes of geologists working in the field. But the real beauty of geologic maps—not just the information they represent—is in their colors.

You could have a geologic map without using colors, just lines and letter symbols in black and white. But it would not be user-friendly, like a paint-by-numbers drawing without the paint. What colors to use for the various ages of rocks? There are two traditions that arose in the late 1800s: the harmonious American standard and the more arbitrary International standard. The familiarity with the difference between the two makes it obvious at a glance where a geologic map was made.

These standards are just the beginning. They apply only to the most common rocks, which are sedimentary rocks of marine origin. Terrestrial sedimentary rocks use the same palette but add patterns. Igneous rocks cluster around red colors, while plutonic rocks use lighter shades plus random patterns of polygonal shapes. Both darken with age. Metamorphic rocks use rich, secondary colors as well as oriented, linear patterns. All of these complexities make geologic map design a specialized art.

Every geologic map has its reasons to deviate from the standards. Perhaps rocks of certain time periods are absent so that other units can vary in color without adding confusion; perhaps the colors clash badly; perhaps the cost of printing forces compromises. These are the reasons why geologic maps are so interesting: each one is a customized solution to a particular set of needs. In every case, one of those needs is that the map must be pleasing to the eye. Geologic maps, especially the kind still printed on paper, represent a dialog between truth and beauty.

Take a look at the province of the Compostela Valley in Mindanao, Philippines as an example.



Republic of The Philippines, Department of Environment and Natural Resources, Mines and GeoSciences Bureau Region XI, GeoHazard Maps. http://region11.mgb.gov.ph/geohazard-maps/

Landslide

Very high landslide susceptibility
Areas usually with steep to very steep slopes and underlain by weak materials. Recent landslides, escarpments and tension cracks present. Human initiated effects could be an aggravating factor.

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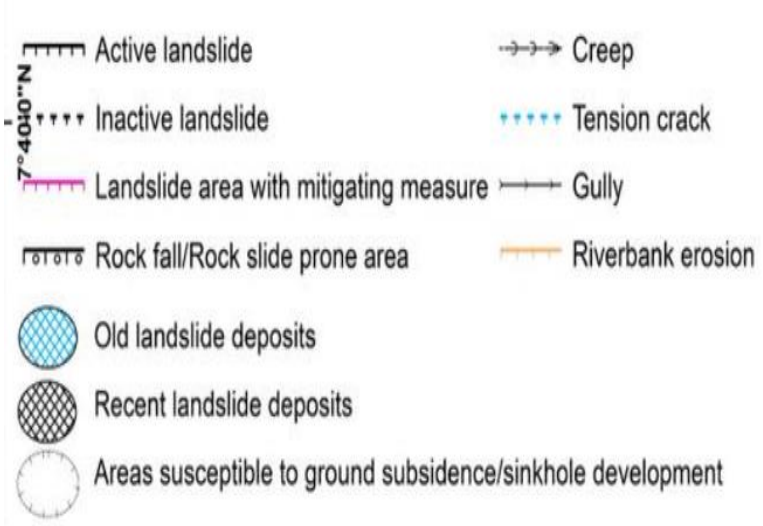
Low landslide susceptibility
Gently sloping areas with no identified landslide

Debris flow / Possible accumulation zone
Areas that could be affected by landslide debris

Symbols and its Interpretation



Susceptibility

Title

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

MINES AND GEOSCIENCES BUREAU XI

2nd Floor, EMB-MGB Building, 3rd Avenue Corner V. Guzman Street, Barangay 27-C, Davao City

PRINTED DATE: APRIL 2018

Sources

Data Sources :

MGB Geohazard Assessment Team
Lands Geological Survey Division
Geosciences Division MGB Regional Office XI
National Mapping and Resource Information Authority

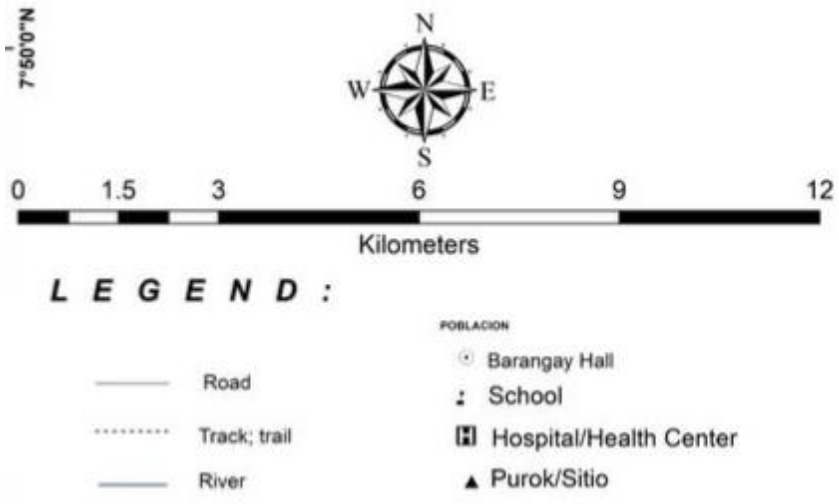
Coordinate System

Coordinate System :

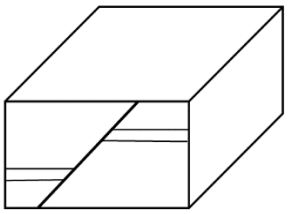
Spheroid : . . . . . Clark 1866
Projection : . . . . . Transverse Mercator
Datum : . . . . . Luzon 1911

Mapping scale 1:10,000

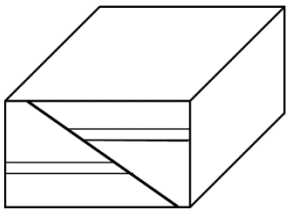
Legend



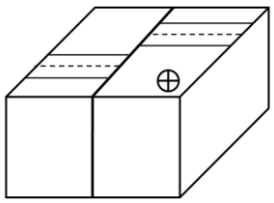
Direction of movement on Faults



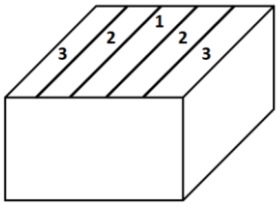
1. NORMAL FAULT



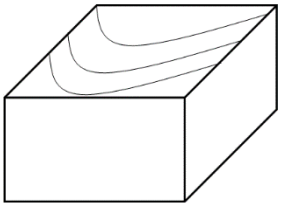
2. REVERSE FAULT



3. STRIKE SLIP FAULT



4. ANTICLINE



5. PLUNGING SYNCLINE

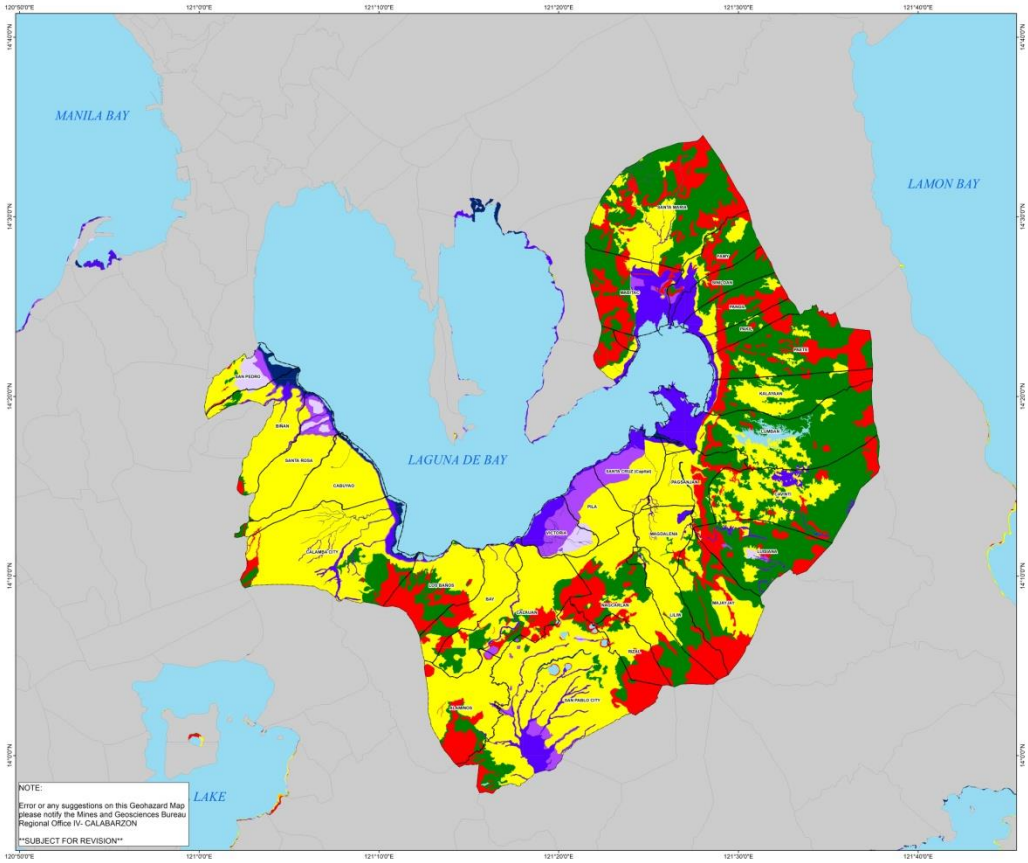
What's More

Activity 2: Tell me!

Directions: Study the hazard map below, then answer the following questions. Use the landslide susceptibility legends previously discussed.

1. What are the different colors used to distinguish different areas in the map?
2. What do the colors symbolizes in the susceptibility?
3. For each hazard and level susceptibility, what actions should someone in a particular area take during periods of intense rain?

LANDSLIDE AND FLOOD HAZARD MAP OF PROVINCE OF LAGUNA



Republic of the Philippines, Department of Environment and Natural Resources, Mines and Geosciences Bureau. *Landslide and Flood Hazard Map of Province of Laguna.* Map. http://region4a.mgb.gov.ph/geohazard-maps/. Marked as free domain. Accessed 30 August 2020.

What I Have Learned

Directions: Complete the following sentences by giving the appropriate answers needed in the blank.

Geological Map is _____

_____

It identified the _____

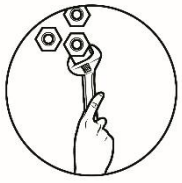
_____

It used for _____

It is very significant because_____

_____

_____



What I Can Do

A. Do this if you have access to internet.

A.

Download geohazard maps from one of the four source. For MGB website, follow these simple easy steps:

1. Go to http://.www.mgb.gov.ph

2. Click on the icon on the top left hand-side of the MGB webpage for GEOHAZARD MAPS. This will bring you to http://gdis.denr.gov.oh/mgbpublic/ which will show a map of the Philippines with squares superimposed on top.

3. Click on the square containing the city or municipality where the school is located in. This action will download the map in jpeg format.

4. View the download map.

Again, identify the different elements of the map.

B. Do this if you *do not* have access to internet or wifi.

Draw a Geological Map of your town and ask your parents about a brief history of it.

RUBRICS

Criteria	8	12	16	20	TOTAL
Creative Eye Catching Output	Not eye-catching	Sort of eye catching, lacks of colors and creativity	Eye-catching	Captivating output, Exceptional eye catching	
Accurate Use of Geological Informatio n	Poor use of geological information . Missed a lot of information	Average use of geological information . Missed some of importatnt information	Good use geological information . Included the important points	Exceptional use of geological information . Found additional information	
Inclusion of plants and animals	No plants and animals shown in the ouput	Only plants or animals displayed	Appropriate Plants and animals displayed	More than 4 plants and animals displayed	

https://www.ndstudies.gov/sites/default/files/images/ggc_poster_r

Assessment

Read each item carefully and choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Geological Map defined as the following, EXCEPT

   a. Geological map is a complete compilation of information about the solid Earth we live on.
   b. Geological map is a map of the different types of rocks or structures that are on the surface of the earth.
   c. Geological Map shows locations of cities large and small and does not show topographic features like mountains.
   d. Geological Map shows geological features, rock units or geologic strata are shown by color or symbols to indicate where they are exposed at the surface.

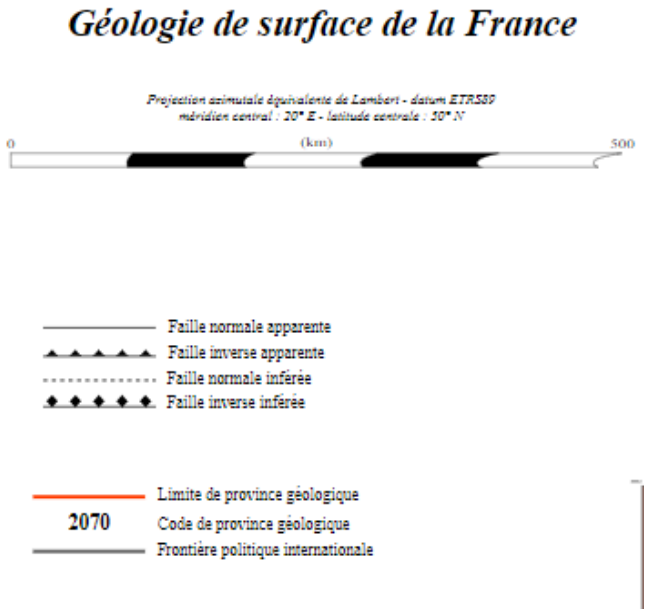
2. Which of these is not included in Geological Map features?
   a. clay
   b. faults
   c. folds
   d. rock layers

3. Which of the following is NOT belong in Geological Parts?
   a. incapable
   b. interpretation
   c. susceptibility
   d. title

4. What do the colors on a geologic map represent?

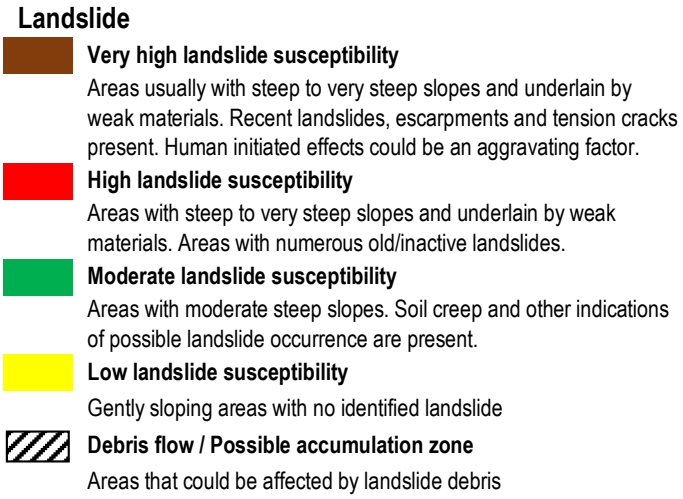
   a. contact
   b. different colors
   c. fault
   d. folds

5. What part of Geological map is this?



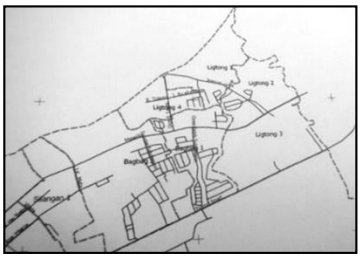
a. direction
b. legend
c. susceptibility
d. symbols and interpretation

6. The part of Geological Map shown below is:

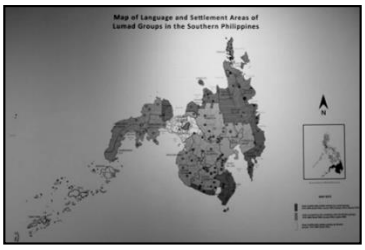


a. direction
b. legend
c. Susceptibility
d. Symbols and interpretation

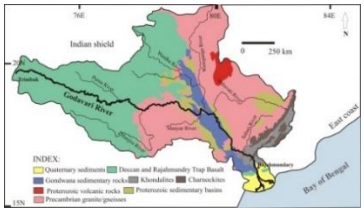
7. Which of the following is a Geological Map?

a. 

Judgefloro. (2018). *File:1881Rosario Roads Cavite Landmarks Barangays 08.jpg*. Photograph. https://search.creativecommons.org/photos/b26e082b-ff00-4370-ac06-885ca84a1b44. Marked with CC0 1.0. https://creativecommons.org/publicdomain/zero/1.0/deed.en?ref=ccsearch&atype=rich.

b. 

Todd, Gary. (2016). *"Map of Language & Settlement Areas of Lumad Groups in Southern Philippines.* Photograph. https://search.creativecommons.org/photos/9ee229e3-0fff-465e-8ba4-9326ae29cad5. Marked with CC0 1.0. https://creativecommons.org/ publicdomain/zero/1.0/deed.en?ref =ccsearch&atype=rich.

c. 

Kulgoyesh19. (2017). *File:Generalized Geological Map of Godavari Drainage Basin.jpg*. Digital Image. https://commons.wikimedia.org/w/index.php?curid=62349537. Licensed under CC BY-SA 4.0. https://creativecommons.org/licenses/by-sa/4.0/?ref=ccsearch&atype=rich

d. All of the above

8. What part of Geological Map is being shown below?

Data Sources:
MGB Geohazard Assessment Team
Lands Geological Survey Division
Geosciences Division MGB Regional Office XI
National Mapping and Resource Information Authority

a. direction
b. legend
c. Sources
d. Susceptibility

9. Which is NOT true about Geological Map?

a. geologic map portrays the distribution of rocks, deposits, or other geologic features in a specified area.

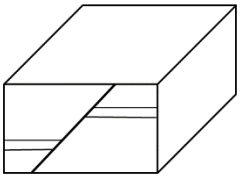
b. Many different types of lines and symbols are found on geologic maps.

c. Geological maps are uniquely suited to solving problems involving Earth resources, hazards, and environments.

d. All of These

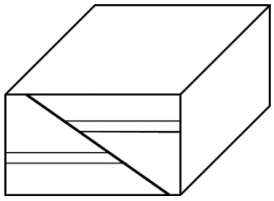
10. What Fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



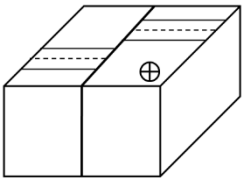
11. What fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



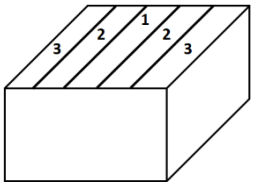
12. What fault movement is being shown below?

a. anticline
b. normal fault
c. reverse fault
d. strike slip fault



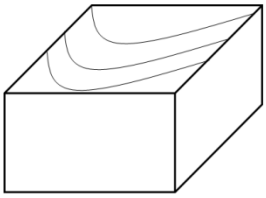
13. What fault movement is being shown below?

a. anticline
b. reverse fault
c. strike slip fault
d. plunging syncline



14. What fault movement is being shown below?

a. anticline
b. reverse fault
c. strike slip fault
d. plunging syncline



15. Which of these is a Symbols in Geological Maps?

a. dotted contact lines
b. hick lines and thin lines
c. first capitalized letter in a geologic unit
d. all of these choices are precise and correct

Additional Activities

Directions: On the space provided, make your own geological map in your area and label its parts.

Answer Key

What I Know

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

What's More

No specific answer needed.

Assessment

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

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