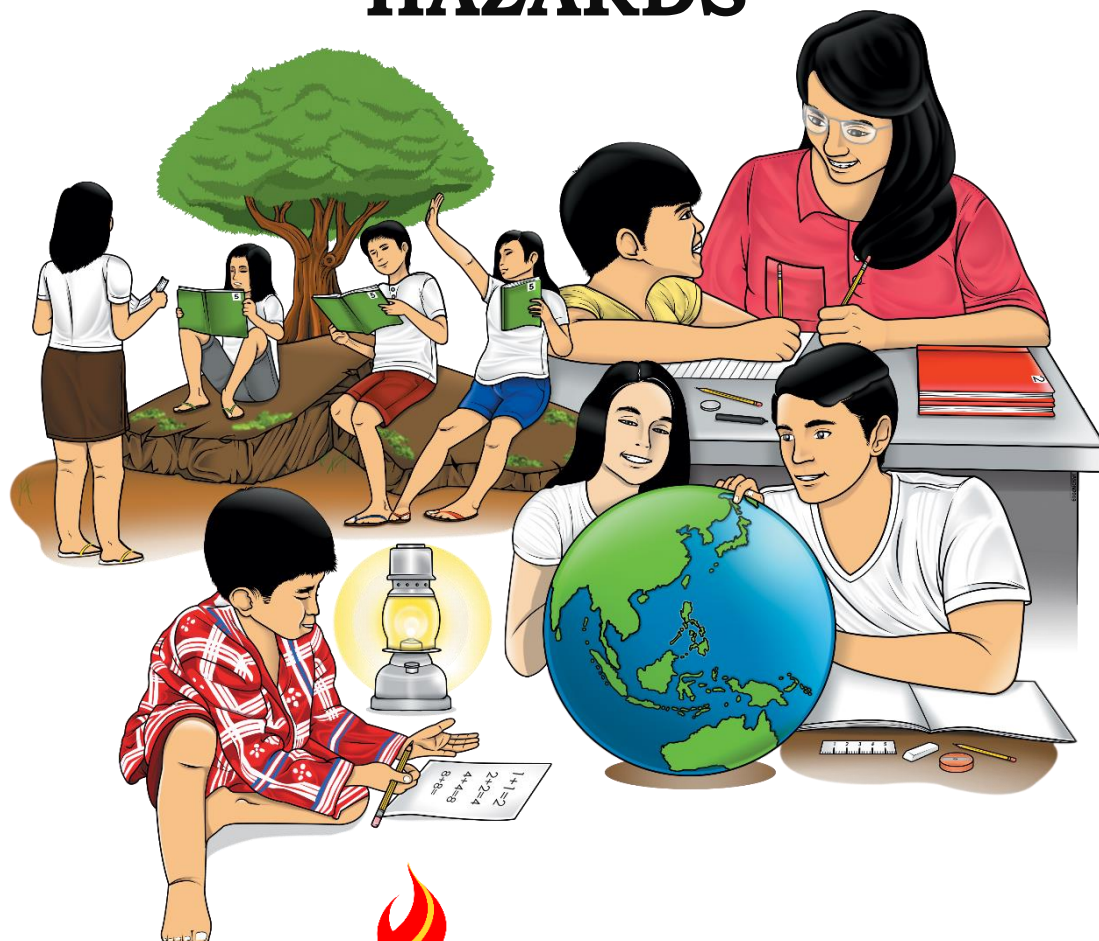


Disaster Readiness and Risk Reduction

Quarter 2 – Module 7:

HYDROMETEOROLOGICAL HAZARDS



**Disaster Readiness and Risk Reduction
Alternative Delivery Mode
Quarter 2 – Module 7: HYDROMETEOROLOGICAL HAZARDS
First Edition, 2021**

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Disaster Readiness and Risk Reduction

Quarter 2 – Module 6:

HYDROMETEOROLOGICAL HAZARDS

Interpret Different Hydrometeorological Hazard Maps

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 Disaster Readiness and Risk Reduction. 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 is intended to equip you with skills concerning reading and interpreting different hydrometeorological hazard maps.

After going through this module, you are expected to:

1. identify different hydrometeorological hazard;
2. familiarize with the different hydrometeorological hazard maps and
3. apply different hydrometeorological hazard maps for proper preparation.



What I Know

Read each item carefully and choose the best answer that corresponds to your answer.

1. Which of the following is a map that highlights areas that are affected by or are vulnerable to a hazard. They are typically created for natural hazards, such as earthquakes, volcanoes, landslides, flooding, and tsunamis?
 - a. archaeological map
 - b. hazard map
 - c. Philippine map
 - d. rainfall map

2. Which of the following map shows the delineation of the political boundary of each province in the country?
 - a. base map
 - b. continental map
 - c. hazard map
 - d. rainfall map

3. Which agency/sector in the Philippines that publishes regularly updated color-coded satellite images?
 - a. Philippine Anatomical, Geophysical and Astronomical Services Administration
 - b. Philippine Analytical, Geophysical and Atmospheric Services Administration
 - c. Philippine Astronomical, Geophysical and Atmospheric Services Administration
 - d. Philippine Atmospheric, Geophysical and Astronomical Services Administration

4. Which of the following type of monthly rainfall variations having no dry season are recorded but has a maximum rain period from December to February and still minimum rainfall during the period from March to May?
 - a. TYPE I
 - b. TYPE II
 - c. TYPE III
 - d. TYPE IV

5. Which of the following type of monthly rainfall variations having a dry Season from November-April that state a wet season for the rest of the year?
 - a. TYPE I
 - b. TYPE II
 - c. TYPE III
 - d. TYPE IV

6. Which of the following type of monthly rainfall variations with no dry season and rainfall evenly distributed throughout the year?
 - a. TYPE I
 - b. TYPE II
 - c. TYPE III
 - d. TYPE IV

7. Which of the following is called rain gauges, wherein a funnel collects the rain when it reaches a certain amount of precipitation, sending electrical signals to the receiver?
- bucket rain bag
 - bucket flood gauge
 - tipping bucket rain gauge
 - tipping rocket rain gauge
8. Which of the following refers to the instruments that send out electromagnetic signals which hit objects that are in the way. These objects reflect the electromagnetic signals, and that the radar signal detects are the clouds?
- boppler weather radars
 - coppler weather radars
 - doppler weather radars
 - saver weather radars
9. Which of the following is a tool used to determine flood zone limits inland and in other areas exposed to coastal floods due to different hazards such as storm, surge waves, sea level rise caused by climate change, inland storm surge, heavy rainfall, among others?
- Base map
 - continental map
 - doppler map
 - flood map
10. Which of the following is a program under the DOST, that advances the use of cutting-edge technology and recommend innovative information services in government's disaster prevention and mitigation efforts?
- Department of Agriculture
 - Provincial Social Welfare & Development
 - National Opera Assessment of Hazards
 - Nationwide Operational Assessment of Hazards
11. Which of the following is a significant increase in ocean temperature over the eastern and central Pacific Ocean which at irregular intervals ranging from 2-7 years?
- El Niño
 - La Niña
 - storm surge
 - thunderstorm
12. Which of the following website or portal that DOST-NOAH can be accessed online?
- <http://bonah.dost.gov.ph>
 - <http://jonah.dost.gov.ph>
 - <http://dona.dost.gov>
 - <http://noah.dost.gov.ph>
13. DOST-NOAH is a program that advance the use of cutting edge technology and recommend innovative information services in government's disaster prevention and mitigation efforts DOST stands for _____?
- Department of Science and Technological Services
 - Department of Sociological Technology
 - Department of Science and Technology
 - Department of Science and Technology Office

14. Which of the following equipment that can enable to visualize rain distribution in the Philippines?
- doppler radar
 - Himawari-8
 - Hiraya 16
 - Tipping bucket
15. Which of the following is a process of atmospheric, hydrological or oceanographic nature that may cause loss of life?
- acid rain
 - geological hazard
 - hydro-meteorological hazard
 - storm surge

Lesson

7

Interpret Different Hydro Meteorological Hazard Maps



What's In

Activity 1: PREPARE YOURSELF.

Direction: Given the PICTURE below write the correct term on the blank provided.

DISCOVER THIS IMPORTANT MESSAGE FOR YOU!

= A = N
 = B = O
 = C = P
 = D = Q
 = E = R
 = F = S
 = G = T
 = H = U
 = I = V
 = J = W
 = K = X
 = L = Y
 = M = Z



Notes to the Teacher

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



What's New

ACTIVITY 2 : Matching Type

Directions: Match the name of the hydro-meteorological equipment and device in the box with their corresponding pictures below. Write your answers on a separate sheet.

Illustration Credits (in alphabetical order)

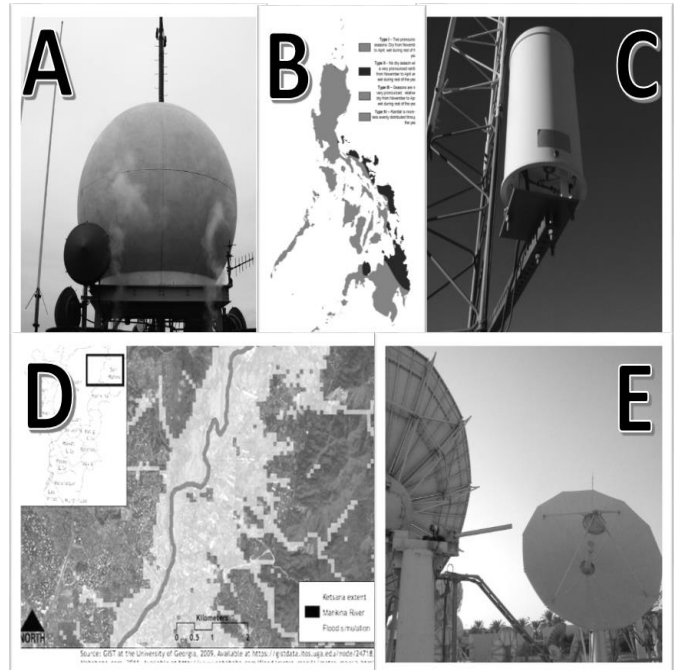
Famartin (2014) *Eureka Airport AWOS tipping bucket rain gauge*. Photograph <https://commons.wikimedia.org/w/index.php?curid=35963004>. Licensed under CC BY-SA 4.0. <https://creativecommons.org/licenses/by-sa/4.0/?ref=ccsearch&atype=rich>

Keller, Paul (2010) *Sattelite uplinks*. Photograph. <https://www.flickr.com/photos/18259771@N00/5114605151>. Licensed under CC BY 2.0. <https://creativecommons.org/licenses/by/2.0/?ref=ccsearch&atype=rich>

Philippine climate map. (2014) Digital Illustration. http://guinobatan.gov.ph/wp-content/uploads/2014/10/Philippine_climate_map.png. Accessed August 1, 2020. http://guinobatan.gov.ph/?page_id=74713.

Schewel, Elias (2014) *Manila Ondoy Maps*. Digital Image. <https://www.flickr.com/photos/41639606@N06/6953813838>. Licensed under CC BY-NC-ND 2.0. <https://creativecommons.org/licenses/by-nc-nd/2.0/?ref=ccsearch&atype=rich>

Schuster, AJ (2004) *Doppler4*. Photograph. <https://www.flickr.com/photos/44124427374@N01/1142188>. Licensed under CC BY-NC-SA 2.0. <https://creativecommons.org/licenses/by-nc-sa/2.0/?ref=ccsearch&atype=rich>



- _____ 1. DOPPLER RADAR
- _____ 2. Flood map
- _____ 3. Modified Coronas Climate Classification
- _____ 4. Tipping Bucket Rain Gauge



What is It

Climate and Weather-Related Hazards

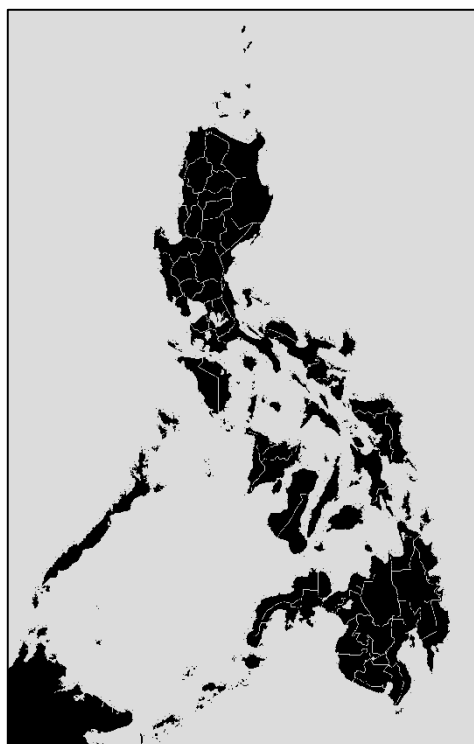
NATURAL HAZARD - a natural process or event potentially damaging that result in loss of life or injury, loss of property, socio-economic destruction or environmental degradation.

CLIMATE- AND WEATHER-RELATED HAZARDS, refer to the direct and indirect effects of observed changes in the frequencies and occurrences of extreme weather/climate events (such as tropical cyclones, droughts, and El Niño and La Niña events).

Interpret Different Hydro-Meteorological Hazard Maps

Natural Hazard is an extreme event that occurs naturally and causes harm to humans and things that we care about, that hazard may categorized as natural and anthropogenic hazards.

Climate and weather-related hazards, such as typhoons and droughts, as well as earthquakes, volcanic eruptions and tsunamis, **ARE NATURAL HAZARDS** while deforestation, mining and climate change is called **MAN-MADE, HAZARDS**.



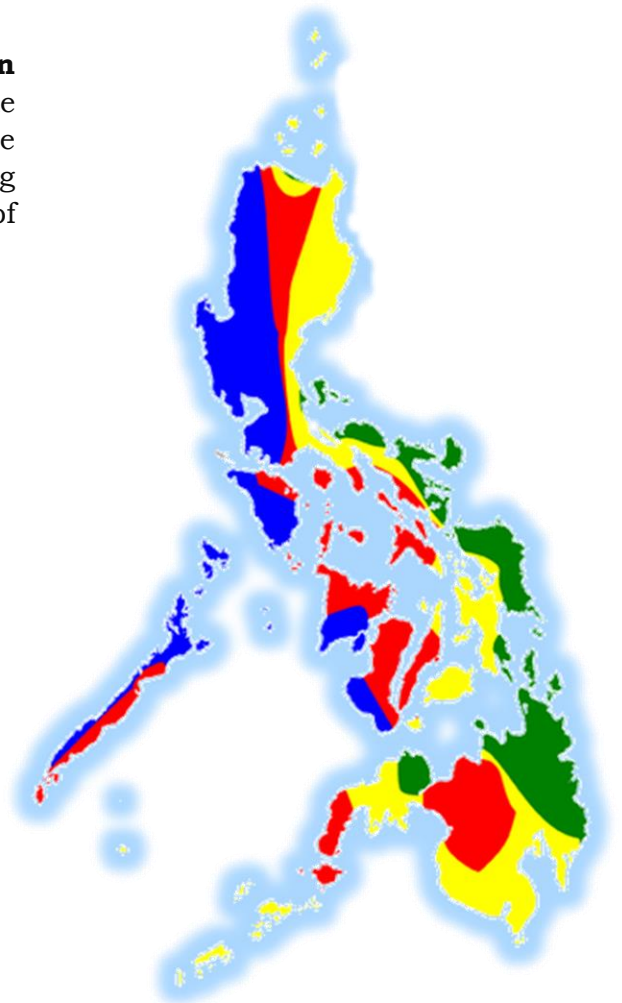
Gonzales, M (2013) BlankMap-Philippines-ProvinceBorders. Digital illustration.
[_https://commons.wikimedia.org/w/index.php?curid=29355165](https://commons.wikimedia.org/w/index.php?curid=29355165). Licensed under CC BY-SA 3.0.
<https://creativecommons.org/licenses/by->

HAZARD MAPS highlights areas that are affected and/or vulnerable to a particular hazard and help prevent serious damage and deaths.

Rainfall in the Philippines

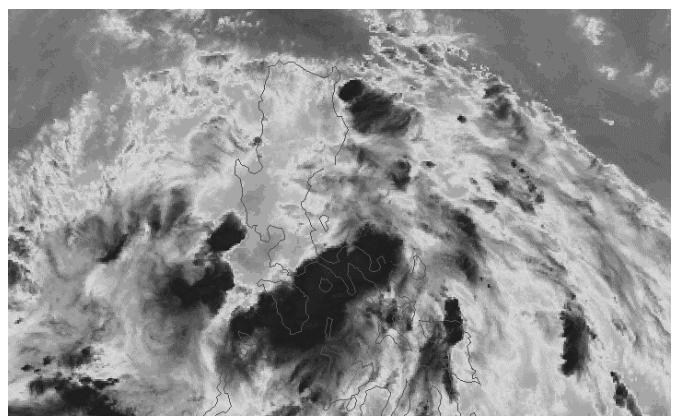
A **Modified Coronas Climate Classification** shows the monthly rainfall variations in the Philippines: Rainfall distribution throughout the country varies from one region to another, depending upon the direction of the winds and the location of mountain systems.

Red	•TYPE I – Two pronounced seasons. Dry from November to April, wet during rest of the year
Yellow	•TYPE II – No dry season with a very pronounced rainfall from November to April and wet during the rest of the year.
Green	•TYPE III – Seasons are not very pronounced; relatively dry from November to April; wet during the rest of the year.
Blue	•TYPE IV – Rainfall is more or less distributed throughout the year.



Rainfall Observation

In their weather forecast, PAGASA or Philippine Atmospheric, Geophysical and Astronomical Services Administration publishes regularly updated color-coded satellite images generated from **Himawari-8** (shown at right), a geo-stationary weather satellite that visualizes rain distribution in the Philippines. This satellite is successor to Japan Meteorological Agency's Multi-functional Transport Satellite



National Oceanic and Atmospheric Administration (2020). *Butchoy 2020 Luzon landfall*. GIF file. <https://www.ssd.noaa.gov/PS/TROP/floater/98W/imagery/wv-animated.gif>

(MTSAT) series, and is currently the most used satellite imagery for weather monitoring.

Today, some provinces of the Philippines are considered areas highly at risk to the occurrence of tropical depressions, tropical storms, typhoons and super typhoons. These are: Cagayan; Albay, Ifugao, Sorsogon, Kalinga, Ilocos Sur, Ilocos Norte, Camarines Norte, Mountain Province, Camarines Sur, Northern Samar, Catanduanes, Apayao, Pampanga, La Union, Nueva Ecija, Pangasinan, Masbate, Tarlac, and Western Samar.

The Philippine Radar Network

In addition to the satellite observation, PAGASA operates 10 weather radar stations all over the Philippines in analyzing rainfall from thunderstorms or typhoons. A rain gauges was use and the most common is the tipping bucket type. For this type of rain gauge, the funnel collects the rain and when it has a certain amount of precipitation, the rain gauge sends electrical signals to the receiver.



ARM Climate Research Facility (2007) *Tipping-Bucket Rain Gauge – Southern Great Plains*. Photograph. <https://www.flickr.com/photos/50130159@N06/4786830625>. Licensed under CC BY-NC-SA 2.0. <https://creativecommons.org/licenses/by-nc-sa/2.0/?ref=ccsearch&atype=rich>



A Doppler Weather Radars was acquired by PAGASA several years. It is an instruments that send out and reflect electromagnetic signals and the receiver for the radar listens for these reflections. The most important objects that the radar signal detects are the clouds.

Doppler radars, tell the amount of rain the clouds bring and have a higher resolution. Doppler radars are located at Aparri, Baguio, Baler, Subic, Tagaytay, Virac, Gulian, Cebu. Hinatuan and Tampakan.

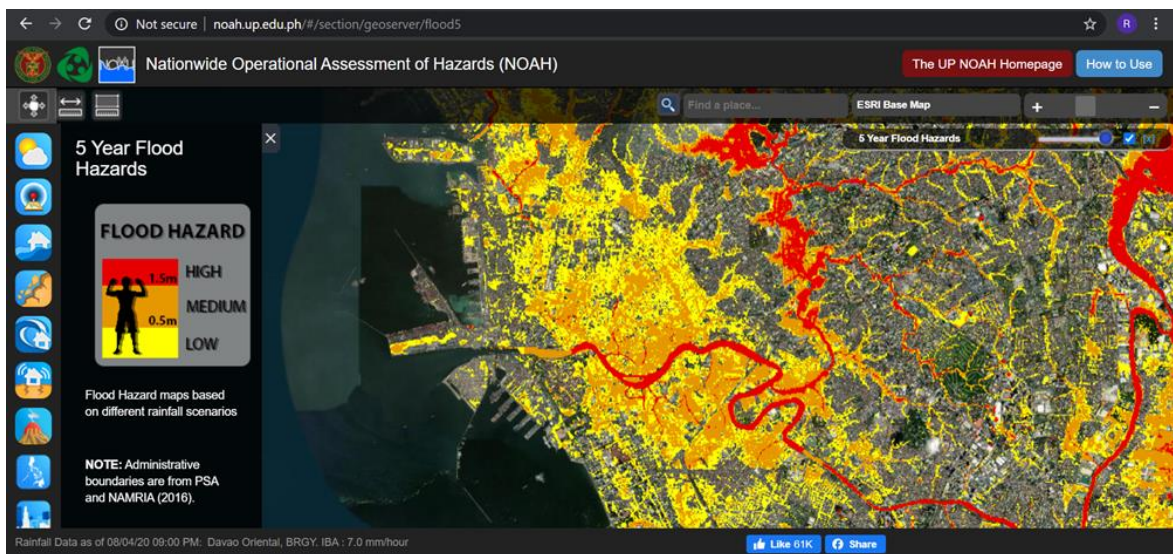
Du Toit, Damien (2007) *Golf ball Overberg*. Photograph. <https://commons.wikimedia.org/w/index.php?curid=32523337>. Licensed under CC BY 2.0. <https://creativecommons.org/licenses/by/2.0/?ref=ccsearch&atype=rich>

FLOOD HAZARD MAP

A tool that determines flood zone areas due to different hazards such as storm, surge waves, sea level.

The NOAA Nationwide Operational Assessment website displays the PAGASA radar data, rainfall measurements of rain gauges of DOST, and has flood hazard maps in the Philippines. Nationwide Operational Assessment of Hazards or NOAA, a program under the Department of Science and Technology (DOST), advance the use of cutting edge technology and recommend innovative information services in government's disaster prevention and mitigation efforts. DOST-NOAH can be accessed online at <http://noah.up.edu.ph/>. Below is a screen shot from the Project NOAH web page, indicating the flood prone areas of Manila. Note the meaning of the colors indicated on the left of the screen shot.

Paraphrase to avoid copyright violations and give citation to the owner of information using Chicago manual style of referencing.



EL NIÑO HAZARD

While we are usually concerned with heavy rainfall events, lack of rain is also a significant condition that we also experience. The Philippines experiences the El Niño Southern Oscillation (ENSO) or simply El Niño.

El Niño a significant increase in ocean temperature and it occurs at irregular intervals ranging from 2-7 years. Months prior to the onset of El Niño, PAGASA publishes Drought/Dry spell outlook meant as a warning for impending dry conditions so the people can prepare for such extreme events.

La Niña that describes the cooling of surface ocean waters and is a counterpart to El Niño, which is unusually warm ocean temperatures in the equatorial region of the Pacific Ocean.

Below is an infographic from PAGASA issued last July 7, 2020 http://pubfiles.pagasa.dost.gov.ph/pagasaweb/files/climate/monthlyclimateassessment/jun-jul_2020_mcao.pdf. What weather phenomenon is expected to arrive in the next few months?



PAYONG PAGASA



Issued: 07 July 2020

MONTHLY CLIMATE ASSESSMENT AND OUTLOOK

OVERVIEW

During the past two months, sea surface temperatures (SSTs) across the central and eastern equatorial Pacific had become cooler than average, however, slightly warmer SSTs were still observed in the western Pacific. The atmospheric indicator was also slightly negative. Most international climate models show that ENSO-neutral conditions will likely continue until the July to September 2020 season and ~50% probability for La Niña to develop before the end of the year.

Assessment in June 2020

WEATHER SYSTEMS THAT AFFECTED THE COUNTRY

L LOW PRESSURE AREA (LPA)
Areas of lowest pressure characterized by cloudiness and rainshowers; areas where a tropical cyclone can form

E EASTERLIES
Warm winds blowing from the east that may bring cloudiness over the eastern part of the country

INTERTROPICAL CONVERGENCE ZONE (ITCZ)
Series of low pressure areas brought about by converging northeast (NE) and southeast (SE) winds that cause thunderstorms and rainshowers

LOCALIZED THUNDERSTORM
Isolated heavy and dense dark clouds with one or more sudden electric discharges manifested by lightning and thunder often accompanied by showers of rain.

H RIDGE OF HIGH PRESSURE AREA (HPA)
An extension of a high pressure area characterized by very light wind and clear skies

SW SOUTHWEST MONSOON (HABAGAT)
Warm moist winds from the southwest causing rains over the western portion of the country from May to September

1 TROPICAL CYCLONES
Tropical Storm "Bucoy" (Jun 11-12)

RAINFALL CONDITION

The onset of the rainy season associated with the SW monsoon season was declared on June 12.

WAY BELOW NORMAL
Greater than 60% reduction from the normal*

BELOW NORMAL
20%-60% reduction from the normal

NEAR NORMAL
+20% or -20% from the normal

ABOVE NORMAL
120% greater than the normal

northern and central parts of Luzon

Most parts of the country



TEMPERATURE

Generally, near to above average surface air temperatures were experienced over most parts of the country.

Mountainous Luzon
15.4°C – 27.8°C

Metro Manila
24.5°C to 36.7°C

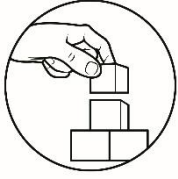
Mountainous Mindanao
17.5°C – 33.0°C

Lowlands Luzon
20.0°C – 38.0°C

Visayas
22.0°C – 36.8°C

Lowlands Mindanao
21.4°C – 36.2°C

For further information, please contact the Climatology and Agrometeorology Division (CAD) at telephone numbers (02) 434-0855 or (02) 435-1675.



What's More

Direction: Enumerate examples of hydrometeorological hazard maps used to reduce future hazards in the community. (Give at least 3)

1. _____
2. _____
3. _____



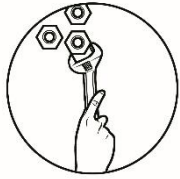
What I Have Learned

Short Term: Hydrometeorological Hazards Maps

1. Draw a risk map & analyze whether your home ground is/are prone to typhoons and/or thunderstorms.
2. Allow appreciation of house location, relative to its surroundings with emphasis on topography, waterways/drainage system, mountain slopes, etc. You could seek help from your parent, friends, neighbors or any adult close to you.
3. Indicate areas in the map prone to hydrometeorological hazards discussed in class (floods, flash floods, storm surges).
4. Provide a color legend for the following hazards for standardization.

Suggested color scheme: Red – flood-prone, Orange – flash flood-prone, Purple – storm surge-prone

5. After finishing hazard maps, you must present your output to parents/ guardian and have them signed on your personalized hazard map as a proof that you made this task done.



What I Can Do

Activity 1: Create an IEC Materials

Direction. Create an INFORMATION, EDUCATION & COMMUNICATION leaflets about the hydro-meteorological hazard map. Determine all the information for hydro-meteorological hazard. Use your resources to create a creative leaflet. Be creative and include emergency hotlines as much as possible. You will be graded based on rubrics given.

The IEC Materials will be assessed based on the following rubric:

Assessment Criteria Dimensions	VS - 5	S - 3	NI - 1
1. Quality: Workmanship, Appearance			
2. Accuracy: Dimension;(optional) Accurate function of the elements			
3. Objectives: Specific Measurable Attainable Realistic & Time-bound objectives			
4. Speed: Submission on time +1, before the expected time +2, after the expected time - 2			

Rating Scale:

VS – Very Satisfactory = 15 – 11

S – Satisfactory = 10 – 5

NI – Needs Improvement = 6 and below



Assessment

1. Which of the following is a map that highlights areas that are affected by or are vulnerable to a hazard. They are typically created for natural hazards, such as earthquakes, volcanoes, landslides, flooding, and tsunamis.
 - a. archaeological map
 - b. hazard map
 - c. Philippine map
 - d. rainfall map

3. Which of the following map shows the delineation of the political boundary of each province in the country?
 - a. base map
 - b. continental map
 - c. hazard map
 - d. rainfall map

3. Which agency/sector in the Philippines that publishes regularly updated color-coded satellite images.
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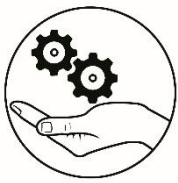
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 - b. TYPE II
 - c. TYPE III
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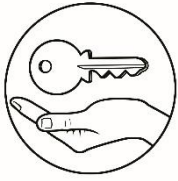
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 - bucket flood gauge
 - tipping bucket rain gauge
 - tipping rocket rain gauge
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 - coppler weather radars
 - doppler weather radars
 - saver weather radars
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 - Provincial Social Welfare & Development
 - National Opera Assessment of Hazards
 - Nationwide Operational Assessment of Hazards
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 - La Niña
 - storm surge
 - thunderstorm
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 - <http://jonah.dost.gov.ph>
 - <http://dona.dost.gov>
 - <http://noah.dost.gov.ph>
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- Department of Science and Technological Services
 - Department of Sociological Technology
 - Department of Science and Technology
 - Department of Science and Technology Office

14. Which of the following equipment that can enable to visualize rain distribution in the Philippines
- a. doppler radar
 - b. Himawari-8
 - c. Hiryu 16
 - d. Tipping bucket
15. Which of the following is a process of atmospheric, hydrological or oceanographic nature that may cause loss of life?
- a. acid rain
 - b. geological hazard
 - c. hydro-meteorological hazard
 - d. storm surge



Additional Activities

As a Grade 11/12 student in your school, you were assigned as a coordinator of Student DRRM. What ways or actions are you going to implement in your school to make it less vulnerable to hydrometeorological hazard? Write your answer on a separate sheet.



Answer Key

What I Know

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

What's New

1. DOPPLER RADAR
2. Modified
Coronas Climate
Classification
3. TIPPING BUCKET
4. FLOOD MAP
- 5.

Assessment

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

What's In

Activity 1: PREPARE
YOUSELF

**“PREVENTION IS BETTER
THAN CURE”**

What's More

1. Flood map
2. Modified
Coronas
Climate
Classification
3. Tipping Bucket
Rain Gauge

References

DEPARTMENT OF SCIENCE AND TECHNOLOGY. (n.d.). DOST – Project NOAH, <http://bagong.pagasa.dost.gov.ph/information/climate-philippines#:~:text=Rainfall%20is%20the%20most%20important,location%20of%20the%20mountain%20systems>.

Gonzales, M (2013) BlankMap-Philippines-ProvinceBorders. Digital illustration. [_https://commons.wikimedia.org/w/index.php?curid=29355165](https://commons.wikimedia.org/w/index.php?curid=29355165). Licensed under CC BY-SA 3.0. <https://creativecommons.org/licenses/by-sa/3.0/?ref=ccsearch&atype=rich>

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (2020). *Butchoy 2020 Luzon landfall*. GIF file. <https://www.ssd.noaa.gov/PS/TROP/floaters/98W/imagery/wv-animated.gif>

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