

Department of Education
National Capital Region

**SCHOOLS DIVISION OFFICE
MARIKINA CITY**

Disaster Readiness and Risk Reduction

First Quarter-Module 5

Exposure and Vulnerability

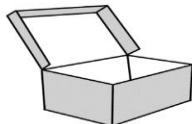


Maybele L. Roa



City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE

Government Property
NOT FOR SALE



What I Need to Know

This module was designed and written with you in mind. It is here to help you master the concepts of exposure and vulnerability to disasters. 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.

The module is divided into two lessons, namely:

- Lesson 1 – Exposure and Vulnerability
- Lesson 2 – Types of Vulnerability

After going through this module, you are expected to **explain the meaning of vulnerability (DRR11/12-Ic-8)**.

Specifically, you are expected to

- a. define exposure and vulnerability;
- b. explain the different types of vulnerability; and
- c. identify scenarios or situations where human lives become vulnerable to disaster.



What I Know

Read each statement carefully. Then, encircle the letter of the correct answer.

1. Which of the following **DOES NOT** describe hazard?
 - A. It stabilizes the economy.
 - B. It may cause harm to humans.
 - C. It refers to a dangerous event.
 - D. It fosters cooperation among people.
2. Which of the following shows an example of hazard?
 - A. Chemicals in the laboratory
 - B. Electrical posts on the street
 - C. Construction materials in the cabinet
 - D. Playing computer games until midnight

3. Improper garbage disposal is already a health hazard that can lead to disaster. Which situation shows the disaster on this event?
 - A. Garbage can tell how unorganized the community is.
 - B. Garbage can show that people don't know how to segregate.
 - C. Garbage can be an eye sore for the community where it is found.
 - D. Garbage can be a breeding ground for insects that bring diseases.
4. Mining in the mountains exposes several people to hazard, and sometimes to disaster. Who among these people are most exposed to danger? (the first one is the most exposed, and the last is the least exposed)
 - A. Miners inside the mining area, personnel operating the machines outside the mining cave, workers digging outside, people in lowland
 - B. Miners inside the mining area, workers digging outside, personnel operating the machines outside the mining cave, people in lowland
 - C. Miners inside the mining area, people in lowland, personnel operating the machines outside the mining cave, workers digging outside
 - D. Miners inside the mining area, workers digging outside, people in lowland, personnel operating the machines outside the mining cave
5. During the COVID-19 pandemic, who among the following are the **MOST** vulnerable to the virus?
 - A. Children
 - B. Senior citizens
 - C. Medical workers
 - D. People with respiratory problems
6. People living in slum areas are exposed to various vulnerabilities **EXCEPT** for what?
 - A. Social conditions
 - B. Political standing
 - C. Educational status
 - D. Sanitation management
7. Level of vulnerability matter in disaster management is important because of the following reasons **EXCEPT** for what?
 - A. It shows how people might get affected.
 - B. It anticipates probable damage in the environment.
 - C. It gives idea what will happen to present jobs or careers.
 - D. It explains why some mild hazards can lead to extreme impacts.



8. Families with low incomes often live in high-risk areas like under the bridge, because they can't afford to live in safer, and more expensive places. What kind of vulnerability is being shown?
- A. Economic vulnerability
 - B. Environmental vulnerability
 - C. Physical vulnerability
 - D. Social vulnerability
9. Enzo's family lives in wooden house which is less likely to collapse in an earthquake, but it may be vulnerable to fire or hurricane. What vulnerability is Enzo's house exposed to?
- A. Economic vulnerability
 - B. Environmental vulnerability
 - C. Physical vulnerability
 - D. Social vulnerability
10. What kind of vulnerability is the river being exposed to if people living nearby improperly disposed their garbage there?
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11. Jubail's father prefers to remain as a truck driver rather than resorting to illegal logging in their community that's why their neighbors treated them differently. What vulnerability is Jubail's family being exposed to?
- A. Economic vulnerability
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 - C. Physical vulnerability
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12. Students are undergoing fire and earthquake drills in school in case these disasters occur while they are in school. This is important because of what reason?
- A. The school is in an environmental vulnerable location.
 - B. The school's structure is physically vulnerable to disasters.
 - C. The students are socially vulnerable as they cannot totally protect themselves.
 - D. The community where the school belongs has to abide by the rules of the society because the school is socially vulnerable.



13. Why is it better to fix our roofs before typhoon season?
- A. Our house is physically vulnerable to typhoon.
 - B. Roofing materials are cheaper before typhoon season.
 - C. Typhoons coming to Philippines are getting stronger every year.
 - D. We should do what other people are doing to fit in the community.
14. Malls in the Philippines are now installing structures that are PWD friendly. What vulnerabilities were being addressed here?
- A. Physical and social vulnerabilities
 - B. Physical and economic vulnerabilities
 - C. Environmental and social vulnerabilities
 - D. Environmental and economic vulnerabilities
15. Some people chose to live even near an active volcano because they don't have other place to go and means to live. What vulnerabilities can arise from here?
- A. Physical and social vulnerabilities
 - B. Physical and economic vulnerabilities
 - C. Environmental and social vulnerabilities
 - D. Environmental and economic vulnerabilities

Lesson 1

Exposure and Vulnerability



What's In

In previous lessons, you have learned all about hazards and disasters. A *hazard* is a dangerous event, substance, human activity or any condition that may cause harm, loss of life, injury or other health impacts, damage to property, loss of livelihood, disruption in economy or environmental damage. Some examples are worn out electrical wire, improper storage of chemicals, rampant noise and among others.

Along with this hazard is *risk*, which refers to the chance (can be high or low) that any hazard may actually cause harm. Look at this example: "Working in a construction site will expose you to falling objects, scattered nails, and pointed objects." *Working in a construction site* is the hazard, and *expose you to falling objects, scattered nails, and pointed objects* is the risk. On the other hand, *disaster* is an event that completely causes damage to human life and property. It has more

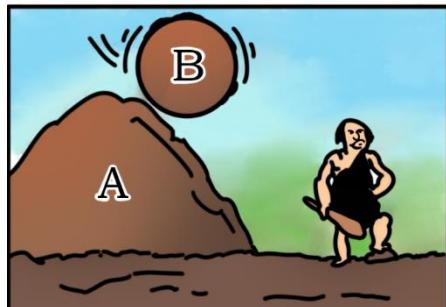


critical consequences and is more tragic. It also happens in a short time, causing more severe effects. Relating hazard and disaster, hazard is a disaster looking for somewhere to happen.

What's New

Now that you have recalled what disaster, hazard, and risk are, study the following pictures. A man is standing near a mountain that is prone to landslides. Can you identify which is the hazard, risk, or disaster?

Activity 1.1. Man in the Mountain



- A. _____ (hazard, risk, disaster)
- B. _____ (hazard, risk, disaster)
- C. _____ (hazard, risk, disaster)

Answer the following questions:

- D. What will happen if the man moves a little farther from the mountain?

- E. What will happen if the man stays on the same place, but the rocks are smaller?





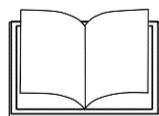
What Is It

From the given picture above, the person is exposed to a hazard by standing near a mountain that is prone to landslide. The danger could be high or low, depending on the size of rocks that could fall on him, or how frequent the rocks will fall during landslide. The disaster part is when the person is directly hit by the rock, causing injury or harm. Within the given example, if the person moved a little farther from the mountain, the person is less exposed to potential disaster, and less susceptible to injury or harm. Also, if the person stays on the same place, but the rocks are smaller, he could still be exposed to source of harm (rocks), but still less vulnerable because the smaller rocks could only cause less injury. Therefore, exposure refers to people, property or the other elements present in hazardous areas that will be subjected to potential losses or harm. Vulnerability, on the other hand, refers to the event or characteristics of a community, system or asset that make it prone to the damaging effects of a hazard (UNISDR, 2009). Exposure is required, but not necessary, to cause risk. Vulnerability is somehow dependent to the number of exposures.

Activity 1.2. Exposure and vulnerability

Try some examples if you can give the vulnerability for each exposure. Copy the following table on a separate sheet of paper and identify the kind of vulnerability with the type of exposure given. Then, explain why.

Exposure	Vulnerability (high, medium or low; explain why)
1. Living near coastal areas	
2. Working in a hospital	
3. Using public comfort room	



What's More

For better understanding of vulnerability and the concepts connected to it, read and understand the following activity. Write down your observations, and answer the questions that follow.



Activity 1.3. All about cups

Materials: paper cup plastic cup glass cup

Procedure:

1. Place the three cups on the edge of a table. The three cups are the elements at risk. Be careful in handling the glass cup.
 2. Try to imagine a strong earthquake starts to take place. Record your observations for each cup.

Type of Cup	Observation
a. Paper cup	
b. Plastic cup	
c. Glass cup	

3. Try to visualize that the cups will be “exposed” to fire (DO NOT SET ANYTHING ON FIRE). What do you think will happen to the three cups?

Type of Cup	Observation
a. Paper cup	
b. Plastic cup	
c. Glass cup	

4. Next, try to picture that a flood submerged the three cups and remained in the water for one day. Write down what will happen to the three cups as they are immersed in water.

Type of Cup	Observation
a. Paper cup	
b. Plastic cup	
c. Glass cup	



5. Lastly, compare the degree of vulnerability of each cup (exposed element) when exposed to different kinds of hazard.

Hazard	Exposed element	Vulnerability (high, medium or low; then why)
6. C o p y	a. paper cup	
	b. plastic cup	
	c. glass cup	
2. Fire a n d a	a. paper cup	
	b. plastic cup	
	c. glass cup	
3. Flood s w e r	a. paper cup	
	b. plastic cup	
	c. glass cup	

the following questions in a separate sheet of paper:

- a. Which of the three cups are highly vulnerable to:
 1. earthquake? _____
 2. fire? _____
 3. flood? _____
- b. What can be done respectively to highly vulnerable cups to lessen their exposure to each hazard?
 1. cup/s highly vulnerable to earthquake: _____

 2. cup/s highly vulnerable to fire: _____

 3. cup/s highly vulnerable to flood: _____





What I Have Learned

Activity 1.4. Sentence completion

Complete the following statements below based on what you have learned about exposure and vulnerability.

1. Exposure is _____.
2. Vulnerability is _____.
3. Exposure and vulnerability are _____.



What I Can Do

Activity 1.5. My safe and secured home

Imagine that you are an architect or engineer who will renovate your own house to make it safe and secured for living. Before renovation, you have to do the following:

1. Identify five (5) most possible hazards affecting your home. You may refer to the types of hazard given below:

Table 1.1. Table of Different Hazards and their examples

Hazard	Example
Biological hazards	- COVID-19 - HIV
Environmental hazards	- Climate change - Use of hazardous chemicals
Ergonomic hazards	- Lifting objects that are too heavy - Sitting on the same position for a longer time
Hazardous substances	- carbon monoxide - solvent
Physical hazards	- Poor or inadequate lighting - Working near vibrating equipment
Psychological hazards	- Panic due to pandemic - Work-related stress
Radiation hazards	- Sunburn - Flashes from electric welding

2. Copy and complete the following table below in a separate sheet of paper. An example is given for your reference.



Hazard at home	Element that will be exposed to the hazard	How vulnerable will the element be because of the hazard
Ex: Broken roof	Inside of the house especially if it's raining	Things inside of the house might get wet, like appliances, causing short circuit.
1.		
2.		
3.		
4.		
5.		

3. Based on the identified vulnerabilities, think of a plan on how you will address these hazards when renovating your home. Make sure your plan is S.M.A.R.T. (Specific, Measurable, Action-oriented, Reasonable, and Time-bound). You may use the following format:

Hazard	Plan for a Safe and Secured Home
1.	
2.	
3.	
4.	
5.	

Rubrics:

4 Exceeds Expectations	3 Meets Expectations	2 Needs Improvement	1 Not Evident
The plan shows all of the S.M.A.R.T objectives.	The plan shows any 3-4 of the S.M.A.R.T objectives.	The plan shows any 2 of the S.M.A.R.T objectives.	The plan does not show any of the S.M.A.R.T objectives.





Assessment

Read each statement carefully. Then, encircle the letter of the correct answer.

1. Which of the following statements is **NOT TRUE** about hazard?
 - A. All hazards can lead to a disaster.
 - B. Exposure can be lessened to minimize hazard.
 - C. If a situation shows vulnerability, it can be hazardous.
 - D. If a person is exposed to hazard, that person is vulnerable.

2. Which of the following is **TRUE** about disaster?
 - A. All hazards lead to disaster.
 - B. All risk.
 - C. Disaster actually started as hazard.
 - D. High vulnerability does not cause disaster.

3. Which of the following **DOES NOT** describe vulnerability?
 - A. High vulnerability does not cause disaster.
 - B. Exposure is required to cause vulnerability.
 - C. If a situation shows vulnerability, it can be hazardous.
 - D. If a person is exposed to hazard, that person is vulnerable.

4. People are advised to wear masks and face shield during this pandemic. What kind of hazard is being prevented here?

A. Biological hazard	C. Hazardous substances
B. Environmental hazard	D. Physical hazard

5. Some doctors who are already retired went back to their duties just to help in taking care of COVID-19 patients. Which statement **DID NOT** pose a risk for the doctors?
 - A. The doctors have a choice to report for duty or not.
 - B. The doctors can be infected with COVID-19 as they treat the patients.
 - C. The doctors cannot get enough rest because of many patients.
 - D. The doctors can experience mental health problems if they cannot go home to their families.



Lesson 2

Types of Vulnerability



What's In

In lesson one, you have learned what exposure and vulnerability are, and how they are connected. In this lesson, you will learn about the different types of vulnerability. As you can recall, vulnerability is about the event or characteristics of a community, system or asset that make it prone to the damaging effects of a hazard. Vulnerability also takes place when there are existing conditions which greatly affect the community's ability to prevent, mitigate, prepare for, or respond to a hazard. It is also important to note that absence or lacking of coping strategies and ways to address a concern may also refer to vulnerability. For example, being located in a West Valley Fault Line, the Marikina government should have stricter rules in allowing infrastructures in the city; give reasonable prices or taxes of land properties; and have concrete plans in addressing the need for evacuation should there be an earthquake, considering the location of the city. The city should prioritize safety over profit.



What's New

Activity 2.1. Unscramble me

Unscramble the following letters to find the correct word. Write your answers on the space provided.

1. V A L N T E R I L B U I Y - _____
2. P I Y S A C H L F C T A O R - _____
3. S C A I O L F T C A O R - _____
4. E O M N I C O C F T A O C R - _____
5. E V I A E R T O N N M N L F O C T A R - _____
6. I A M C P T - _____
7. D G M A A E - _____
8. A A I L L A V B I T I Y - _____
9. H R Z A A D - _____
10. D E I T A S S R - _____





What Is It

Vulnerability is one among the defining components of disaster risk. We cannot discuss disaster and risk without mentioning vulnerability since it is lacking the ability to resist a natural or man-made hazard or, to respond when a disaster happened. The concept of vulnerability is dynamic, as it depends on several factors.

Physical factor or physical vulnerability refers to the physical impact from the area where the vulnerability (people, community, system) belongs. Some examples of physical vulnerability are found below.

1. Use of low quality or wrong materials for infrastructures, like constructing a 3-storey building using cheap but not yet approved materials.
2. Poor design and construction of houses and buildings, like smaller fire exits.
3. Damage of the infrastructures due to natural or man-made hazards that also cause damage to the contents inside the same groundworks.
4. Unregulated planning of the whole area where an infrastructure is located like near the coast lines, hills prone to landslides, and those built along the fault lines.
5. Lack of implementation of safety and security, and disaster management (preparedness, prevention, response, recovery, and mitigation).
6. Inaccessibility to primary utilities or basic needs, like water supply, means of communications, adequate source of food, community support (school, hospital, police and fire station).



Figure 1.1. An example of a vulnerable house due to the materials used, and its location

Source: Paolobon140. *Nipa Huts and Bangkas at Cantilan, Surigao Del Sur, Philippines*. August 22, 2014. Wikimedia Commons.

https://commons.wikimedia.org/wiki/File:Nipa_hut_e_bangka_a_Cantilan,_Surigao_del_Sur,_Filipine.jpg.



Economic factor or economic vulnerability refers to the probable impact of hazards on economic processes of an individual, community, or even the whole nation. Some examples are the following:

1. Economic status where poor people cannot easily recover when disaster hit them as they lack financial resources to rebuild their house.
2. Community's limited sources of livelihood supposedly leading to income like when there's relocation after a disaster destroyed the place.
3. Unavailability of natural resources like when there's a ban in fishing due to red tide and the fishermen have no other means.
4. Support from the government if a community is suddenly placed under the state of calamity due to disaster.
5. Secondary effects like business interruptions leading to closure and job losses.



Figure 1.2. An example of economic vulnerability where poor people will experience more impact than those living in condominiums or bigger houses if river water suddenly rises.

Source: NAGATA, Tomotaka. *Riverside Houses in Japan*. August 19, 2006. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Riverside_houses_in_Japan.jpg.

Social factor or social vulnerability refers to the impact of social standards or events to some people or organization.

1. Level of well-being of individual and society (children, elderly, single parent, persons with disability (PWD), people with health concerns, pregnant women, poor communities, etc.)
2. Aspects linked to levels of literacy and education
3. Peace and security existence to all gender, race, ethnic, or religion
4. Access to basic human rights and system of good governance
5. Respect to traditional values, customs, beliefs, and norms



Figure 1.3. Examples of people who are socially vulnerable due to their standing (left to right): senior citizens, children, pregnant women, and people with disability

Source:

- (1) Vidamo, Justin. "The Fates." Flickr, February 23, 2008. <https://www.flickr.com/photos/21160499@N04/5436454737>.
- (2) COD Newsroom. "High School Students Visit COD for Teacher's Ultrasound 2014 17." Flickr, October 16, 2014. <https://www.flickr.com/photos/codnewsroom/14965618093>.
- (3) Judgefloro. *39th National Disability Prevention and Rehabilitation Week Celebration*. July 18, 2017. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:06659jf41th_National_Disability_Prevention_and_Rehabilitation_Week_Celebrationfvf.jpg.

Environmental factor or environmental vulnerability refers to the probable impacts of events connected to environment.

1. Natural resources depletion
2. Degradation of sources
3. Extinction of species
4. Poor environmental regulation and management
5. Secondary effects of the previous vulnerabilities like climate change



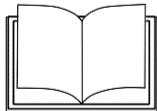
Figure 1.4. Examples of environmental vulnerability due to drought, species extinction, and deforestation

Source:

- (1) Nichols, Bob. "Corn Shows the Affect of Drought in Texas on Aug. 20, 2013." Wikimedia Commons, August 20, 2013. https://commons.wikimedia.org/wiki/File:Corn_shows_the_affect_of_drought.jpg.
- (2) Kratochvil, Vera. *Deforestation*. 2020. PublicDomainPictures.Net. <https://www.publicdomainpictures.net/en/view-image.php?image=296125&picture=deforestation>.
- (3) "English: Elephant Tusk Carved with Figures in Relief." Wikimedia Commons. Accessed August 13, 2020. https://commons.wikimedia.org/wiki/File:Brooklyn_Museum_35.679_Elephant_Tusk_Carved_with_Figures_in_Relief.jpg.



Based on the given examples, we can, therefore, say that the said factors (physical, economic, environmental, and social) tell us how it can affect people's level of vulnerability and their ability to cope and recover from hazards and disasters.



What's More

To check your understanding of the different kinds of vulnerability, do the following activity.

Activity 2.2. Which is Which?

Write **P** if the vulnerability being described is a physical vulnerability, **EC** if it is an economic vulnerability, **S** if it describes social vulnerability, and **EN** if it is an example of environmental vulnerability.

- _____ 1. Poor people choose to supply first their basic need for food over their comfort.
- _____ 2. Morisette's community doesn't have any evacuation areas if disaster suddenly occurs.
- _____ 3. Farmers are suffering from loss of income after some insects infested their crops.
- _____ 4. Ben's family cannot leave their ancestral land near the mountain even after a series of earthquakes on nearby areas.
- _____ 5. Michael participated in their school's tree planting activity to lessen soil erosion in their place.
- _____ 6. Daryl almost got into accident when he went into an elevator which is under repair but no warning sign.
- _____ 7. Bugoy can no longer sell his 50 sacks of rice because it was submerged in flood when a typhoon hits their place.
- _____ 8. Children like Moira and Jason should be secured first whenever there is fire in the household.
- _____ 9. People in lowlands are exposed to disaster if a dam nearby suddenly get damaged.
- _____ 10. Bela's father is a miner but the mining area was affected by sudden volcanic eruption.





What I Have Learned

Activity 2.3. Now I Know

Complete the following statements based on what you have learned about the different types of vulnerability.

1. First, _____

2. Second, _____

3. Lastly, _____

4. Now I know, _____



What I Can Do

Activity 2.4. Do Something!

Read on the following situations based on different types of vulnerability. What will be your plans to address such problem to lessen the impact of effects? See to it that your action plan will follow the S.M.A.R.T objectives.

1. You are a newly-hired Assistant Safe and Security officer, and your immediate supervisor is not approving your proposals about disaster management for your company.



2. Your community is located near a river bank, and always experiencing flood every typhoon season. All you want is to have a river wall to at least lessen the flood in your area. Instead, the local government builds a road which you think will increase the level of flood. _____
- _____
- _____
- _____

Rubrics:

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Assessment

Read each statement carefully. Then, encircle the letter of the correct answer.

- Which refers to the impact on the area where the vulnerability (people, community, system) belongs? (For example, weak structure of buildings can cause disaster to its residents.)
 - Economic vulnerability
 - Environmental vulnerability
 - Physical vulnerability
 - Social vulnerability
- What vulnerability refers to probable impact of hazards on certain processes that affect an individual's source of income?
 - Economic vulnerability
 - Environmental vulnerability
 - Physical vulnerability
 - Social vulnerability



3. Harvesting of shark's fin is no longer allowed because the sharks are already exposed to this kind of vulnerability. What vulnerability is being described here?
 - A. Economic vulnerability
 - B. Environmental vulnerability
 - C. Physical vulnerability
 - D. Social vulnerability
4. Participating in a run for a cause should be a matter of knowing first the goal of the said event before joining. What kind of vulnerability a person might be exposed to base on the given situation?
 - A. Economic vulnerability
 - B. Environmental vulnerability
 - C. Physical vulnerability
 - D. Social vulnerability
5. Some tribal people have a deep respect to the place where they bury their dead ancestors. After some instances of landslides, they are being asked to relocate their burial grounds in the mountains. What kind of vulnerability do these tribal people being exposed to?
 - A. Economic vulnerability
 - B. Environmental vulnerability
 - C. Physical vulnerability
 - D. Social vulnerability



Posttest

Read each statement carefully. Then, encircle the letter of the correct answer.

1. Which of the following shows an example of hazard?
 - A. Chemicals in the laboratory
 - B. Electrical posts on the street
 - C. Construction materials in the cabinet
 - D. Playing computer games until midnight
2. Which of the following **DOES NOT** describe hazard?
 - A. It stabilizes the economy.
 - B. It may cause harm to human.
 - C. It refers to a dangerous event.
 - D. It fosters cooperation among people.



3. Mining in the mountains exposes several people to hazard, and sometimes to disaster. Who among these people are most exposed to danger? (the first one is the most exposed, and the last is the least exposed)
 - A. Miners inside the mining area, personnel operating the machines outside the mining cave, workers digging outside, people in lowland
 - B. Miners inside the mining area, workers digging outside, personnel operating the machines outside the mining cave, people in lowland
 - C. Miners inside the mining area, people in lowland, personnel operating the machines outside the mining cave, workers digging outside
 - D. Miners inside the mining area, workers digging outside, people in lowland, personnel operating the machines outside the mining cave
4. Improper garbage disposal is already a health hazard that can lead to disaster. Which situation shows the disaster on this event?
 - A. Garbage can tell how unorganized the community is.
 - B. Garbage can show that people don't know how to segregate.
 - C. Garbage can be an eye sore for the community where it is found.
 - D. Garbage can be a breeding ground for insects that bring diseases.
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 - B. Political standing
 - C. Educational status
 - D. Sanitation management
6. During the COVID-19 pandemic, who among the following are the **MOST** vulnerable to the virus?
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 - B. Senior citizens
 - C. Medical workers
 - D. People with Respiratory problems
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 - B. It anticipates probable damage in the environment.
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- A. Our house is physically vulnerable to typhoon.
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 - C. Typhoons coming to Philippines are getting stronger every year.
 - D. We should do what other people are doing to fit in the community.



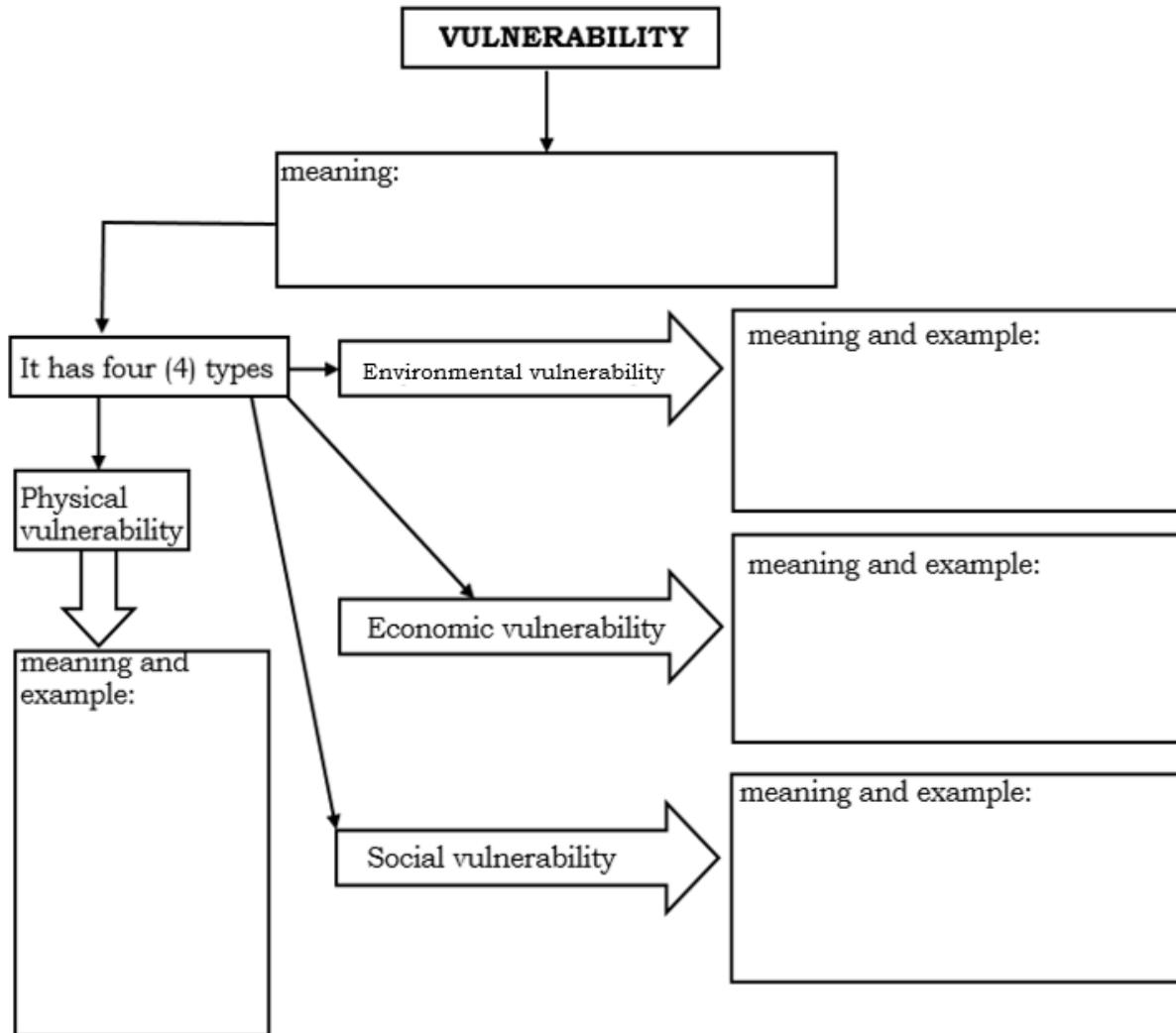
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 - B. The school's structure is physically vulnerable to disasters.
 - C. The students are socially vulnerable as they cannot totally protect themselves.
 - D. The community where the school belongs has to abide by the rules of the society because the school is socially vulnerable.
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- A. Physical and social vulnerabilities
 - B. Physical and economic vulnerabilities
 - C. Environmental and social vulnerabilities
 - D. Environmental and economic vulnerabilities





Additional Activities

Complete the concept map below about the different types or factors of vulnerability. Give also one (1) example for each type of vulnerability.





References

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