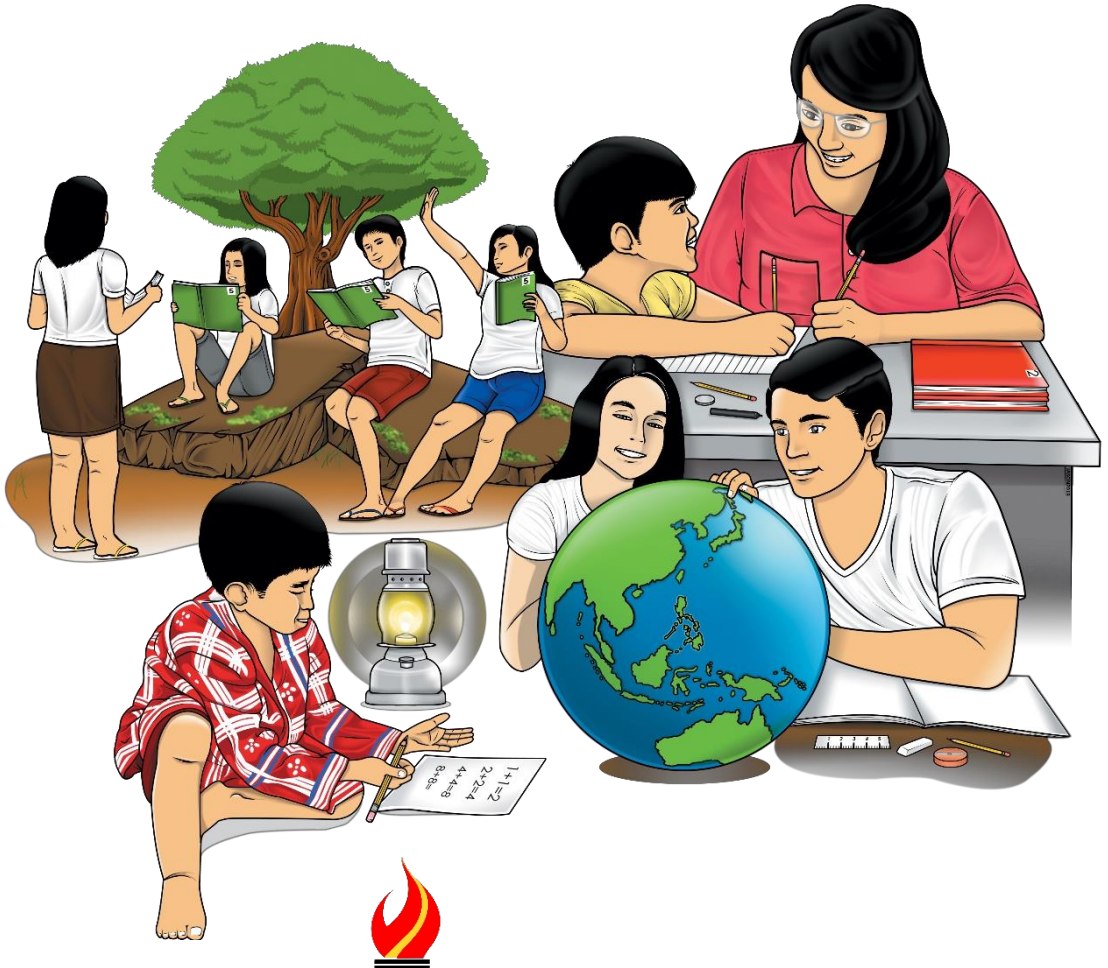
Senior High School

DepED
DEPARTMENT OF EDUCATION

Disaster Readiness and Risk Reduction

Quarter 2 – Module 5:

Mitigation Strategies: A Prevention to loss of Lives and Properties



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ADM

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Quarter 2 – Module 5:

Mitigation Strategies: A Prevention to Loss of Lives and Properties

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1. 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

Landslides and sinkholes belong to natural disasters that pose physical and environmental threats in communities near in a landslide area. These cause disruption of transportation routes, damage of properties, injuries, and even death. On February 17, 2006, Southern Philippines encountered a massive landslide that buried a village, recorded 85 deaths and 981 missing individuals which were assumed dead based on the United Nations Office for the Coordination of Humanitarian Affairs report. To avoid or eliminate such disaster from happening again, this module will discuss mitigation strategies including preventive measures to avoid loss of lives and properties.

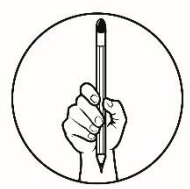
The Module is intended to equip you with knowledge concerning "Mitigation Strategies: A Prevention to Loss of Lives and Properties".

After going through this module, you are expected to:

1. Define, identify, and apply mitigation strategies in preventing or reducing deaths, injuries, property damages, environmental and other losses from rainfall-induced landslide and sinkhole.

2. Synthesize or create an action plan involving both prevention/mitigation and adaption/preparedness components.

3. Value the benefits of understanding mitigation strategies and planning to prevent or reduce the loss of lives and properties.



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 best define mitigation?
   a. Mitigation means to decrease the high risk of loss of life or property before the upcoming disaster.
   b. Mitigation refers to action taken to prevent or reduce the risk to lives, properties, social and economic activities, and natural resources from natural hazards.
   c. Mitigation reduces injuries and loss of life; trauma; damage to property, equipment and infrastructure; community disruption; and economic, environmental, and other losses caused by floods and flash floods.
   d. All of the above

2. It occurs when the spaces underground become bigger and the layer of bedrock above it can no longer support the weight above it, a collapse of the land surface dramatically takes place.
   a. groundwater
   b. rocks
   c. sinkholes
   d. none of these

3. Which of the following actions or plans is/are needed to safeguard human life and property?
   a. include a communications plan
   b. develop and rehearse a family disaster plan
   c. Make a detailed inventory of your personal belongings, home or an apartment, garage and surrounding property, with photographs or videotape.
   d. All of the above

4. Which among the following is not included in the steps to protect your home from the next flooding?
   a. Purchase flood insurance to protect your financial future.
   b. Construct protection barriers to stop floodwater from entering the home.
   c. Be relaxed, do not do anything and wait for the barangay officials to do the precautions needed in your home.
   d. Develop a flood response plan based on your flood protection level, local warning procedures, and the amount of warning time you will have to respond before the flood comes.

5. Which is/are the possible way/s to mitigate rainfall-induced landslide in a landslide prone area?
   a. Plant more trees, grasses, and other vegetation to prevent erosion and for compaction of soil.
   b. Do not build your house on or near steep slopes, mountain edges, drainages, or natural erosion valleys.
   c. Build channels for diversion of mud-flow or debris flow to direct the flow away from your property. Make sure though that diversion does not affect any
   d. All of These

6. Which of the following is **NOT** an appropriate mitigation to rainfall-induced landslide?
   a. Be familiar with your surroundings.
   b. Be updated on news regarding the condition of your area.
   c. If escape is not possible, curl into a tight ball and protect your head and hide in a structure that can serve to protect from debris.
   d. Avoid open storm-water drainage and runoff especially when there is a storm or heavy rainfall.

7. Which of the following show an **INAPPROPRIATE** action to do DURING rainfall-induced landslide?
   a. Stay on an elevated and sturdy area and avoid low-lying areas and steep slopes.
   b. Be attentive to unusual such as cracking objects, moving debris, and rolling boulders.
   c. Stay away from the path of debris and mud-flow occurs from uplands, and hillsides areas.
   d. Go outside and check for injured or trapped people near the slide, and flooding and report these immediately to the rescuers or authorities.

8. Which of the following is an inappropriate action to do AFTER landslide?
   a. Listen for the latest emergency information.
   b. Check for injured and trapped persons near the slide, without entering the direct slide area.
   c. If the landslide is caused by rainfall, watch out for flooding as it will follow the same path taken by the debris flow.
   d. Wait until the structures on and around the sinkhole stops moving and do not attempt to go back and retrieve your belongings.

9. It doesn't happen on flat ground because gravity caused the earth to travel downwards. What is it?
   a. Groundwater
   b. Landslide
   c. Sinkholes
   d. Water

10. Which of these is not a sign of a possible rainfall-induced landslide?
    a. Two full moons two nights in a row
    b. Soil that loosens and moves away from foundations
    c. Cracks or unusual bulges on cemented ground or walls
    d. Spring, water see pages, or water saturated grounds in areas that are not typically wet.

11. Assuming that you are not in immediate danger, which of these is a sensible thing to do before evacuating your home due to a landslide?
    a. run extremely fast
    b. get distracted by television or radio
    c. panic and scream, causing chaos and disorder
    d. turn off all electrical items and the main switch

12. Which of the following is/are warning sign/s that a sinkhole may be forming?
    a. discolored water
    b. wilting vegetation
    c. structural cracks in walls or floors
    d. all of the above

13. Which of these can trigger a landslide?
    a. an earthquake
    b. a heavy rainstorm
    c. removal of material from the base of a slope
    d. all of the above

14. When is the best time to make an evacuation plan before rainfall-induced landslide?
    a. I don't need an evacuation plan
    b. as soon as possible, if not done already
    c. while your house is slipping down a hill
    d. whenever you have time; the chances of a landslide are very slim

15. What should you do if there is sinkhole in your place?
    a. run as if there's no danger around
    b. call a friend and check the bottom of the sinkhole
    c. call on emergency hotline and report it immediately
    d. ignore it and let people see the sinkhole by themselves

Lesson 1

Mitigation Strategies: A Prevention to Loss of Lives and Properties

What's In

Direction: Look at the picture below and answer the following questions.

Michael Bueza, LIST: Deadly landslides in the Philippines, Rappler, Published 9:00 AM, September 22, 2018, https://www.rappler.com/newsbreak/iq/212440-list-deadly-landslides-philippines

Questions:

1. What can you say about the picture?

_____
_____

2. Have you experience or witness this kind of disaster? Explain you answer.

_____
_____

3. What do you think is the cause of this disaster?

_____
_____

4. How are you going to categorize the situation of the disaster in the picture? Natural disaster or human-made disaster? Explain your thoughts.

_____
_____

5. Do we have ways to prevent or avoid this disaster from happening in the future? If there are, cite some.

_____
_____

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

2012 New Bataan (Compostela Valley) Debris Flow

Rains brought by Typhoon Pablo (Bopha) caused a massive debris flow in Barangay Andap in New Bataan, Compostela Valley on December 4, 2012.The flow of mud, boulders, and gravel rushed towards Barangay Andap, which was on the mouth of a steep mountain drainage network. At least 128 died and 450 went missing as the village was buried under the debris in the wake of the disaster.

Image 1. GRIEF. Residents of New Bataan, Compostela Valley identify the remains of victims of the flooding and landslide in the area, caused by typhoon Pablo (Bopha), on December 5, 2012. Photo by Karlos Manlupig

Michael Bueza, LIST: Deadly landslides in the Philippines, Rappler, Published 9:00 AM, September 22, 2018, https://www.rappler.com/newsbreak/iq/212440-list-deadly-landslides-philippines

Direction: Read the excerpt above and answer the following questions.

1. What is the article all about?

_____

_____

2. Why do you think the natural disaster killed hundreds of residents from New Bataan, Compostela Valley?

_____

_____

3. Can you think of best ways, plans or precautions to prepare in this kind of disaster? Cite your answers.

_____

_____

What is It

Mitigation involves acting to reduce the risk of life or property damage from a potentially dangerous incident. There is no way to avoid natural disasters, but people and organizations may take steps to minimize the harm and losses that they cause. Furthermore, mitigation is defined by Merriam Webster's dictionary as process or result of making something less severe, dangerous, painful, harsh, or damaging. The National Academies Press describes mitigation as actions taken to prevent or reduce the risk to life, social and economic, and natural resources from natural hazards.

Programs that intensify nation's hazard mitigation capabilities includes the following steps:

1. Protection of schools and hospitals

All new schools and hospitals should be located and constructed to ensure that high-hazard areas are avoided and that special provisions are made to reduce the potential for damage by natural hazards. Furthermore, existing school and hospital buildings should be surveyed to determine their resistance levels to relevant hazards.

2. Adoption of nonstructural measures

Businesses and households should adopt non-structural mitigation measures to mitigate casualties from natural hazards and property damage. For example, furniture and equipment can be easily secured to reduce earthquake injuries and damage. Other non-structural steps are vegetation management to reduce damage from wildfires, and structure position away from high-risk areas.

3. Incorporation of mitigation into new development

Local jurisdictions should ensure that new developments are located, designed and built to resist natural hazards. They should use hazard and risk assessment information, land use plans and zoning regulations to limit the development of hazard-prone areas. Compatible uses of floodplains and other hazardous areas should be incorporated into local planning and zoning so that

losses are reduced. Such areas could have a high value for recreation, reserves for fish and wildlife, open space, or other community use.

4. Protection of cultural properties

Mitigation preparation and intervention will include preservation of libraries, landmarks, historic buildings, art works, and other cultural resources. Like preserving and sheltering the following Architectural and artistic significance, artworks, archaeological sites, antiquites, books and manuscripts. The Cultural properties under protection of "International Register of Cultural Property" Pursuant to the 1954 Hague Convention.

5. Protection of natural resources

The mitigation plans and protection measures included in the disaster response plans should identify particularly valuable natural resources such as endangered species of wildlife, fish, and plants. These natural resources are not only present in the wild but also in zoos and parks.

6. Government leadership of mitigation implementation

Government at all levels should set an example by requiring that new facilities that they fund, regulate, or lease be designed, built, and located in accordance with modern building codes and sound. Program disaster resilience expanding mitigation, awareness action and coordination through google meet and zoom.

7. Mitigation training

Training programs should be developed and offered with a focus on contemporary challenges associated with mitigation implementation. Like training conducted by Disaster Risk Reduction and Manangement in the Philippines, through online programs and interactive activities.

8. Hazard-specific research

Recent disasters showed the advantages of mitigation activities, thus emphasizing the need for research to improve mitigation practices. The school should provide Hazard-specific implementation guide for the students.

Actions or plans to protect human lives and properties

1. Develop and rehearse a family disaster plan—what to do if you are forced to leave home.

2. Include a communications plan—how to contact each other if you become separated.

3. Put emergency supplies together, one set for your home and one set for your car. Emergency supplies will contain food, water, a kit for first aid, flashlights, a radio and several batteries. The kit should also have flares and jumper cables inside your car.

4. Know how to shut off your appliances and keep the resources you need in hand. Make sure other family members know how to do that, too.

5. Duplicate important documents such as wills, birth certificates, financial statements, insurance plans and numbers of credit cards. Keep the originals in a box for safe deposit.

6. Make a detailed inventory of your personal belongings, home or an apartment, garage and surrounding property, with photographs or videos and store it in a save place.

Precautionary Measures for Landslide and Sinkholes

Vulnerability and exposure to geohazards are determined and validated through scientific tools, visible signs, and maps. Communities are advised to take precautionary measure to prevent unnecessary damage to lives and properties.

Image 2. "SEEK HIGHER GROUNDS DURING A LANDSLIDE",Source:http://www.docstoc.com/ docs/102608843/LANDSLIDE- PREPAREDNESS-AND-SAFETY-MEASURE

Landslides are also known as country slips. If your area is prone to landslide, plant more trees, grasses, and other vegetation for soil compaction and erosion prevention. Build mudflow or debris flow diversion channels to steer flow away from your property. Make sure that diversion does not affect any neighbor or property and/or result in more substantial damage. Do not build your house on or near steep slopes, mountain edges, drainages, or natural erosion valleys.

Here are some steps to consider before, during and after a landslide:

A. Before a Landslide

1. Be familiar with your surroundings. Watch for any changes to certain objects' presence or positions. When there is a sudden debris flow, this could be a good indicator of an incoming landslide.

2. Avoid open storm-water drainage and runoff as these areas are likely to receive debris and soil from higher elevations, especially when there is a storm or heavy rainfall.

3. Be updated on news regarding the condition of your area.

4. Be aware of the disaster plans of your local government.

5. Learn and participate in emergency response and evacuation plans for your community.

B. During a Landslide

1. Be attentive to unusual such as cracking objects, moving debris, and rolling boulders.

2. Stay away from the path of debris. This is more dangerous if mudflow occurs because it increases in strength as it meets more water from ponds or streams and it could be aggravated by heavy rain.

3. Stay alert and awake. Listen for unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together

4. Stay on an elevated and sturdy area. Avoid low-lying areas and steep slopes.

5. If escape is not possible, curl into a tight ball and protect your head. Find a structure that can serve to protect you from the flow of debris.

C. After a Landslide

1. Stay away from a slide area as there is still danger of more landslides.

2. Listen for the latest emergency information.

3. Follow warnings and instruction from the local government.

4. If the landslide is caused by rainfall, watch out for flooding as it will follow the same path taken by the debris flow.

5. Check for injured or trapped people near the slide, and flooding as it will follow other potential hazards. Report these immediately to the rescuers or authorities

Sinkhole, also known as a cenote, swallet, swallow hole, or doline. The sinkhole is a depression or hole in the ground caused by some form of surface layer collapse. Most of them are caused by processes of karst-the chemical dissolution of carbonate rocks or suffosion. Sinkholes vary in diameter and depth from 1 to 600 m (3.3 to 2000 ft) and vary in shape from soil-lined bowls to bedrock-edged chasms. Sinkholes may gradually or suddenly form, and are found all over the world.

In an event that sinkholes are not detected earlier and it appears suddenly, do the following:

1.Find refuge in a stable ground or open area.

2. Wait until the structures on and around the sinkhole stops moving. Do not attempt to go back and retrieve your belongings.

3. Wait for the local government's announcement when it is safe to go back.

After a sinkhole's appearance, here are the following steps to do:

1. Stay away from the sinkhole.

2. Monitor the damages on objects. For example, if the crack gets longer or wider the sinkhole may still enlarge.

3. Do not throw anything into the sinkhole. Anything thrown into it may contaminate the groundwater.

4. Secure whatever is left of your properties and relocate to safe grounds, preferably far from this location because the same bedrock or soil profile may characterize the vicinities of the sinkhole.

What's More

Activity A.

Instruction: As a grade 12 students like you, what are the actions or plans should you take to protect you and your family and property from future risks? Give 5 mitigation and precautionary measures for rainfall-induced landslide and sinkhole.

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

Activity B.

Instruction: List down at least 5 possible examples of precautionary measures implemented in your area in case of the following:

A. Landslide

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

B. Sinkhole

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

What I Have Learned

COMPLETE ME!
Direction: Answer the following and write it on your DRRR notebook:

Mitigation is _____

_____

I learned that _____

_____

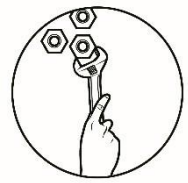
I realized that _____.

_____

I hope to learn more on _____

_____

We can mitigate, prevent, or reduce risks through_____



What I Can Do

Direction: Create your own informative flyer or brochure about Mitigation Strategies on Rainfall-induced Landslide and Sinkhole. Your output will be graded using the rubrics below.

	Exemplary 16-20 points	**Accomplished 11-15 points**	**Developing 6-10 points**	**Beginning 1-5 points**	**TOTAL**
Content	Flyer addresses all the necessary	Flyer addresses some of the	Flyer has some good ideas.	Flyer is poorly organized and	

	elements. Clear and well organized.	necessary elements. Follows pattern.	Lacks the necessary information to make this flyer believable.	difficult to understand. Does not include believable facts.	
Technical	Little or no grammatical errors in the flyer. Clear and organized. Easy to follow. Good use of visual displays.	Few spelling and grammatical errors in the flyer. Good organization. Some use of visual displays.	Several spelling and grammatical errors in the flyer. Needs more organization.	Many spelling and grammatical errors in the flyer. Poorly organized. Lacks creativity.	
Technical Criteria	Flyer includes little of the necessary information from the instructions.	Flyer includes some of the necessary information from the instructions.	Flyer includes the necessary information from the instructions.	Flyer includes more than the necessary information from the instructions.	
Completed Tasks on Time	Did not complete the assignments by the due date.	Did not complete the assignment by due date and was one (1) or more days late.	Completed most of the assignments by the due date.	Completed all of the assignments by the due date.	

Priscilla Akpaita, Flyer Rubric, BL Better Lesson, 2008

https://betterlesson.com/community/document/819527/flyer-rubric-doc

Assessment

Modified TRUE or FALSE

Read each item carefully and choose the best answer. Write your answer on a separate sheet of paper. Write TRUE if the statement is correct. If the statement is false, change the underlined word/s to make the statement true.

_____1. Mitigation reduces injuries and loss of life; trauma; damage to property, equipment and infrastructure; community disruption; and economic, environmental, and other losses caused by floods and flash floods.

_____2. Mitigation refers to action taken to prevent or reduce the risk to lives, properties, social and economic activities, and natural resources from natural hazards.

_____3. Make a seldom inventory of your personal belongings, home or an apartment, garage and surrounding property, with photographs or videotape.

_____4.Build your houses on or near steep slopes, mountain edges, Drainage or natural erosion valleys.

_____5. Plant more trees, grasses, and other vegetation to prevent erosion and for compaction of soil.

_____6. Build channels for diversion of mud-flow or debris flow to direct the flow away from your property. Make sure though that diversion does not affect any

_____7. To protect your home from the next flooding, develop a earthquakeresponseplan based on your flood protection level, local warning procedures, and the amount of warning time you will have to respond before the flood comes.

_____8. Planting trees, grasses and other vegetation prevent erosion and compation of soil.

_____9. Stay on thelowlevel and sturdy area and avoid steep slopes

_____10. Be inattentive to unusual such as cracking objects, moving debris, and rolling boulders.

_____11. Heavy rainfall cannot trigger a landslide

_____12. Cracks or unusual bulges on cemented ground or walls can be the sign of possible rainfall-induced landslide

_____13. Discolored water , structural cracks in walls or floors wilting vegetation are warning signs that asinkhole may be forming

_____14. Spring, water see pages, or water saturated grounds in areas that are not typically wet are signs of possible sinkhole.

_____15. Soil that loosen and moves away from foundation are signs of possible rainfall-induced landslide

Additional Activities

Direction: Explain how mining company contributes to vulnerability of a community in rainfall-induced landslide.

_____

_____

_____

_____

_____

Answer Key

What I Know

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

What's More

Student's answer may vary

1. Develop and rehearse a family disaster plan—what to do if you are forced to leave home.

2. Include a communications plan—how to contact each other if you become separated.

3. When severe weather threatens, turn on your radio to a local station to stay informed of imminent danger.

4. Put together emergency supplies, one set for your house and one for you car. Emergency kits should include food, water, a first aid kit, flashlights, a radio, and plenty of batteries. The kit in you car should also have flares and jumper cables.

5. Know how to turn off your utilities, and keep the necessary tools at hand. Make sure other members of your family know how to do this also. If you turned off your gas, do not turn it back on yourself. Call the gas company.

6. Make copies of vital documents, such as wills, birth certificates, financial records, insurance policies and credit card numbers. Keep the originals in a safe deposit box.

7. Make a detailed inventory of your personal belongings, home or an apartment, garage and surrounding property, with photographs or videotape. Store it in a save place.

Assessment

1. TRUE
2. TRUE
3. DETAILED
4. TRUE
5. TRUE
6. TRUE
7. FLOOD RESPONSE PLAN
8. TRUE
9. ELEVATED
10. ATTENTIVE
11. CAN
12. TRUE
13. TRUE
14. RAINFALL-INDUCED LANDSLIDE
15. 15. TRUE

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