

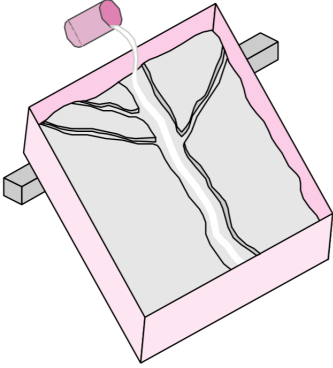
FLOOD MANAGEMENT

Ages 4 to 7 (Level 1)

Description:	Learners will explore the most frequent natural disasters that are floods by beginning to understand their causes and far-reaching effects. They will research the effect of floods on plants, animals and people, and design an emergency response kit including a safety guide and disaster kits
Leading question:	Can you help manage a flood in your community?
Age group:	4– 7 years
Subjects:	Geography (Social Sciences), Literacy and Numeracy
Total time required:	~4 hours over 5 days
Self-guided / Supervised activity:	Medium
Resources required:	<ul style="list-style-type: none"> - 1 large flat container or tray with sides (a deep tray), soil or modelling clay, sponge, little rocks, - Empty plastic container and marker - Plastic bottles, rope, thread, and large plastic bag

Learning outcomes:	<ul style="list-style-type: none"> - Understanding the causes of floods and the impact of excess rains - Understanding standards units of measure and designing your own scale - Identify the impact of flooding - Identify protective and emergency measures to avoid or mitigate the consequences of flooding
Required previous learning:	None
Inspiration:	FEMA Resources USAID Resources

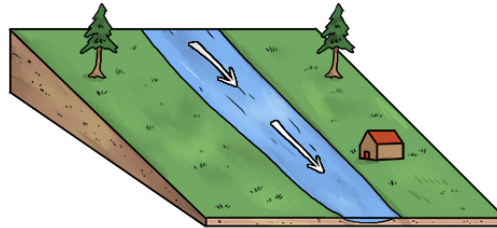
Topics/concepts covered and skills developed	
<ul style="list-style-type: none"> ● Floods and impact of excess water ● Human causes of flooding ● Measuring intensity of flooding ● Impact of floods on humans ● Preparing for floods ● Creativity skills ● Research skills ● Presentation and communication skills 	

Day	Time	Activity and Description
1	15 minutes 45 minutes	<p>Learners will be introduced to the most frequently occurring natural disasters globally: floods, and begin to understand some of the reasons why they occur. We will explore floods that are natural disasters created by extreme weather conditions</p> <p>Learners will think of a flood as extra water in a usually dry land</p> <p>Learners will make an illustrated list of the natural sources of water and water bodies that they know. They can include some of the following examples on their list:</p> <ul style="list-style-type: none"> - Rain - Sea - Rivers - Lakes - Glaciers etc. <p>Learners will make models to explore the impact of our human activity on creating floods. Learners should record what they see with each experiment with drawings and / or a few descriptive sentences on the floods.</p> <p>Flood Model Set Up:</p> <p>Students will follow the next steps to build the model:</p> <ul style="list-style-type: none"> ● Take any large flat container or tray/pan with sides. ● Place sufficient modelling clay or soil at the bottom of the tray. ● Carve a “river bed” in the clay/soil. Water will run through this carved path. ● Place little stones or toy houses along the river. These will be the “homes” of people. <p>The model should look similar to this:</p>  <p>Learners can pour water into the “river” and observe what happens. The water should initially stay within the river path. They can then add a “rainstorm” by pouring more water.</p>

Experiment 1: Learners can observe what will happen to the neighboring areas. Learners can move the little stone homes around their model and notice that those closest to the river get more flooded

Learners will then begin to explore the multiple human factors causing floods including:

Experiment 2: Straightening river channels and paths



Learners should try keeping a straightened river path as shown above and testing the speed of the water flow and the amount of flooding.



Learners should then attempt to create a meandering or zig-zag / curved river path and test the speed of water flow and the amount of flooding.

Learners will observe that the curving river path slows down the speed and the intensity of the water flow and reduces the amount of flooding.

Experiment 3: Improper garbage disposal

Learners will place some rigid objects in the river path to represent garbage. Pour water along the river and observe how the build up of garbage obstructs natural flow of water leading to flooding of the surrounding areas

Learners will complete their drawings and notes from the different experiments to understand what happens when it rains a lot. For younger learners, they can orally voice over their understanding based on the experiments and drawings.

<p>2</p>	<p>15 minutes</p>	<p>Learners will explore and measure the intensity of floods.</p> <p>Learners will understand how rain and water levels are measured and build scientific instruments to measure hazards.</p> <p>Numeracy extension: Learners will now make their own ruler / scale.</p> <p>Tell the learners: A ruler / scale is used to measure distances. Distance is how far are two things from one another. Each ruler or scale is marked in equal intervals that represent the units of measurement, for example meters, centimeters, etc.</p> <p>To build the ruler, learners should follow the next steps:</p> <ol style="list-style-type: none"> 1. Take any rigid object with a straight border, e.g. a piece of wood, cardboard or even thick paper. 2. Determine the units of measure as cms or inches. Learners should use the unit of familiarity in their context. Learners should use the unit of familiarity in their context. 3. Place their index finger perpendicular to the ruler and add a mark. 4. Repeat several times until all the surface is covered. Each of the markings will not be exactly a cm or an inch, but it is important to ensure that the distance between them is equal. 5. (Optional) Older learners can divide each cm or inch into smaller units of measurement including millimeters or centimeters.
	<p>20 minutes</p>	<div data-bbox="716 1148 1079 1696" data-label="Image"> </div> <p>Rain gauge to measure the amount of rainfall.</p> <p>Learners will now use this newly created scale to measure the amount of rain or water in a cup.</p>

	<p>15 minutes</p> <p>20 minutes</p>	<ol style="list-style-type: none"> 1. Find a cup Learners can use any cup (paper or plastic). They will use this scale to mark the outside of the cup. 2. Place the cup in an open area (or on some elevated surface), where it is not disturbed when it begins raining. 3. As the rain fills the gauge, the students can measure the height of the water after each rainfall. <p>In the case that it is not raining, learners can simulate or pretend it is raining and fill the cup with water and do the measurement.</p> <p>Additionally, learners will conduct a measure experiment 3 times. Each time, they will hold the cup under any flowing water for 5-10 seconds. Since it rains with different intensity, learners will do this under a fully open tap or fast flowing water, slightly slower flowing water, until it is just a few drops.</p> <p>Learners can be introduced to the following terminology:</p> <ul style="list-style-type: none"> - Hard and fast rain: Downpour - Maximum Rain - Medium amounts of rain: Shower – Medium Rain - Very little rain: Drizzle – Minimum Rain <p>Learners will then complete an illustrated report where they can draw the cup for each of the 3 scenarios and write the terminology associated with it and the measured amount of rain in each scenario. Learners will understand that when it rains a lot (e.g. there is fast flowing water into the cup), the cup gets full very fast and sometimes overflows. Learners who are unable to write will vocalize the terminology</p> <p>Numeracy Extension: Learners will use their scale to measure 5 different items in their homes. They can measure pencils, erasers, books, fingers, furniture, vegetables, etc. They will then draw and label the items they measured and their lengths. Learners will then solve a few simple word problems:</p> <ul style="list-style-type: none"> - What is the longest item you measured? - What is the shortest item you measured? - Were there any two items with the same length? - What is the difference in length between the longest and shortest item? (biggest – smallest) - What is the total length of all the items put together? (add all the numbers) - Can you arrange the numbers from biggest to smallest? - What is the difference between the longest two and the shortest two items?
3		<p>Learners will gather research on the impact and result of floods on humans – they will do this through interviewing family members and reflecting on any of their own experiences of the worst flood in their living memory</p>

	<p>20 minutes</p> <p>20 minutes</p>	<p>Younger learners can ask parents and family members' questions about their experience with the floods. Older learners can create a little survey about the impact of a flood with their family members on any 3 or 4 of the below mentioned areas of impact:</p> <ul style="list-style-type: none"> - Food Supplies - Plants and Trees - Animals - Homes - Roads - Transportation - Schools <p>Learners will share the results of their survey with family members and comment on them.</p> <p>Learners will draw and older learners can write a short note on the 3 scenarios of:</p> <ul style="list-style-type: none"> - Too little rain, also known as <i>droughts</i> (Prompts: What would happen to plants, animals and people with too little water? What color would plants be? What would happen to crops?) - Just enough rain (Prompts: What happens after the rain to plants, animals and people? What are the colors you see after the rain? Etc.) - Too much rain, could lead to a flood (Prompts: What would happen to fields with plants and trees? What would happen to animals that can or cannot swim? What would happen to homes and buildings? What colors do you expect?) <p>Learners will share and present their draft illustration or note with the family members for feedback.</p> <p>Family feedback will include:</p> <ul style="list-style-type: none"> - What did they love about the illustration and the presentation? - What could be improved? - Any other suggestions for improvement <p>Learners will use the feedback to revise the draft illustration or note</p>
<p>4</p>	<p>20 minutes</p>	<p>Learners will prepare themselves and their communities for floods – by designing an emergency ID card and essential survival kit for the flood</p> <p>Learners will begin by designing an emergency details card for what they will do when a flood happens:</p> <ul style="list-style-type: none"> - What are the numbers to dial in case of emergency (fire department, police department or an ambulance)? (e.g. 911 or 100) - What is the safe location in your community area? (e.g. school building, hospital etc.)

	<p>20 minutes</p> <p>10 minutes</p>	<ul style="list-style-type: none"> - If you were to get separated from your parents, you need to know the details to share with emergency contact: Parents Full Name, Full Address, Contact Number etc. - What is the name and number of a close relative or friend? <p>Learners will share the emergency details card with family members for feedback Family feedback will include:</p> <ul style="list-style-type: none"> - What they loved about the emergency details card ? - The correctness of the emergency number of fire/police and ambulance - Any other suggestions for improvements <p>Learners will use the feedback to revise their emergency details card.</p> <p>Learners will now design an essential survival kit for when floods happen. Learners will understand the meaning of some words:</p> <ul style="list-style-type: none"> - Essential – this is something that is absolutely necessary or extremely important - Important – this is something of great value - Optional – this is something that is nice to have <p>Learners will make a chart with 3 columns: Essentials, Important and Optional. Learners will write or draw 2 - 4 items in each of the 3 columns. They can discuss with their families or parents what are the items that they really need or would be nice to have. Alternatively, learners can identify which things they cannot manage without for the entire day e.g. food, water – these are essentials, what are the things that they really need these things are important e.g. blankets etc. and what are the things that they would like to have, but they are ok without e.g. soap etc.</p> <p>Some examples would be:</p> <table border="1" data-bbox="394 1394 1403 1629"> <thead> <tr> <th>Essential</th> <th>Important</th> <th>Optional</th> </tr> </thead> <tbody> <tr> <td>Food (that is more durable e.g. biscuits or canned food)</td> <td>Blankets</td> <td>Torch</td> </tr> <tr> <td>Water</td> <td>Phones and Chargers</td> <td>Soap and Toiletries</td> </tr> <tr> <td>Medicine</td> <td>ID card or papers</td> <td></td> </tr> </tbody> </table> <p>Learners can make colored flags and a help poster to attract attention from the ground</p>	Essential	Important	Optional	Food (that is more durable e.g. biscuits or canned food)	Blankets	Torch	Water	Phones and Chargers	Soap and Toiletries	Medicine	ID card or papers	
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Medicine	ID card or papers													
5	20 minutes	<p>In the final day of the project, learners will pretend to be weather forecasters, prepare a script, and narrate it – this can be recorded by family members. For younger learners, they can draw or write a few key words to help them prepare for the news report</p>												

	10 minutes	<p>Learners will first have to think of a warning issued by their National Weather Service. The warning has to alert people when bad weather might happen.</p> <p>In their news report, learners need to cover:</p> <ul style="list-style-type: none"> - How do floods happen? - How can you measure the different amount of rain? - What will happen if there is a flood? - How can we be prepared for it with our emergency ID cards and survival kit? <p>Learners will present this weather warning report orally or prepare a report for all their family members</p>
Assessment Criteria:	<ul style="list-style-type: none"> - Understanding of the causes of human action on flooding- how human action can cause flooding - Design of the scale / ruler and measuring items - Practicality of the emergency protocol - Understanding of different items as essential, important or optional in the event of flooding - Demonstrated understanding in the final weather watch report 	

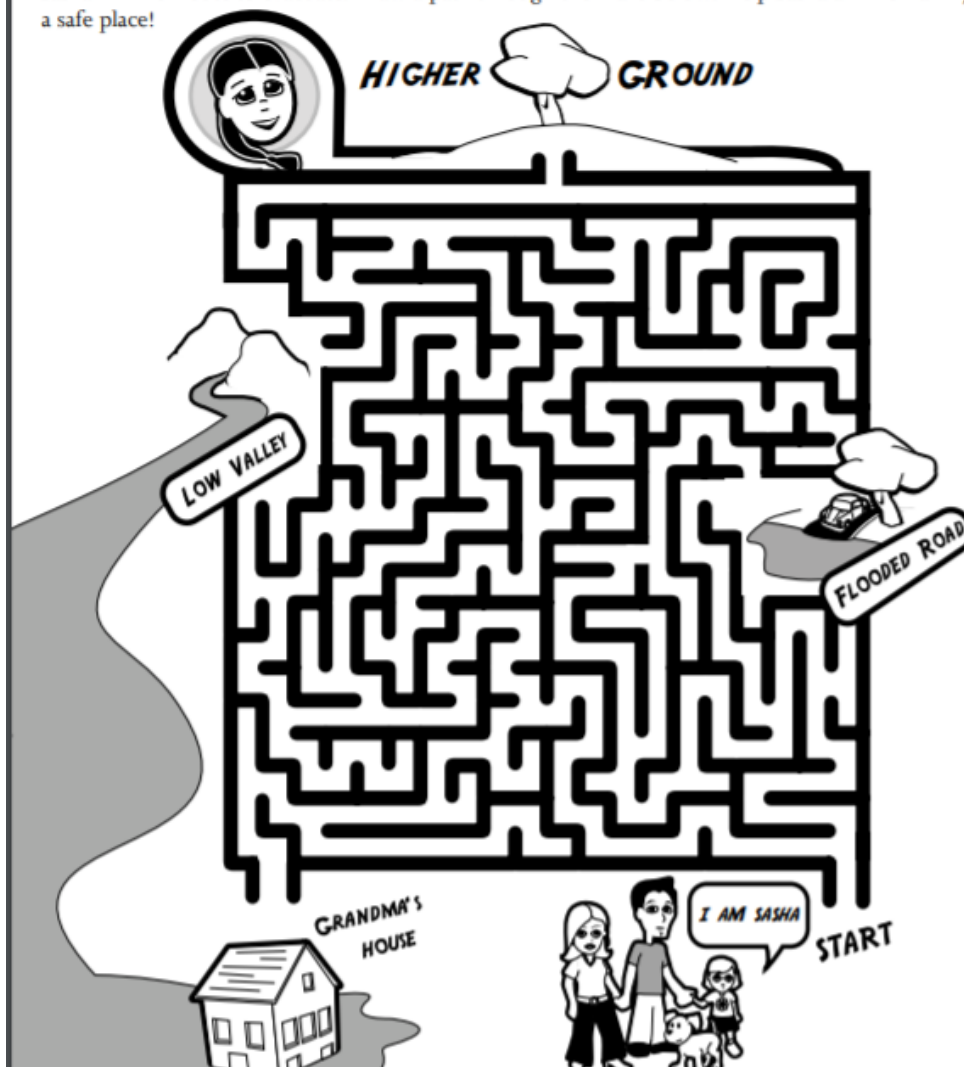
Additional enrichment activities:	
Modifications to simplify the project tasks if need be	Learners can reduce the number of models and the instruments being used for measurements

APPENDIX

WATER, WATER EVERYWHERE

Hi everyone, my name is Rising Waters. We all know that "April showers bring May flowers," but showers that turn into heavy rains can also cause floods. I'm here to remind you that during a flood you and your family can get to higher ground to stay safe.

My friend Sasha needs your help! Last week, there was a lot of rain where she lives. Now the river in her town is rising fast. The river is spilling over its banks. There is flooding near her home. Help Sasha find her route to evacuate. Draw a path through the maze below. Help Sasha and her family find a safe place!

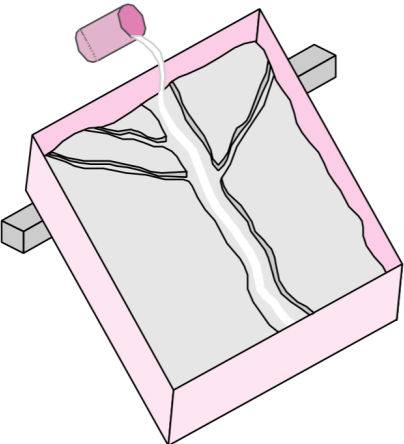


Ages 8 to 10 (Level 2)

Description:	Learners will explore some of the most frequent natural disasters; the floods by beginning to understand their causes and far-reaching effects. They will research the effect of the floods on plants, animals and people, and design an emergency response kit including safety guides and disaster kits
Leading question:	Can you manage a flood in your community?
Age group:	8– 10 years
Subjects:	Geography (Social Sciences), Literacy and Numeracy
Total time required:	~5 hours over 5 days
Self-guided / Supervised activity:	Medium
Resources required:	<ul style="list-style-type: none"> - 1 large flat container or tray with sides (a deep tray), soil or modelling clay, sponge, little rocks, - Empty plastic container and marker - Plastic bottles, rope, thread and large plastic bag

Learning outcomes:	<ul style="list-style-type: none"> - Understanding how human action is related to natural disasters - Understanding how the risk of floods is measured - Identify some of the consequences of flooding - Identify and design protective and emergency measures to avoid or mitigate the consequences of flooding
Required previous learning:	None
Inspiration:	FEMA Resources USAID Resources

Day	Time	Activity and Description
1	5 minutes	<p>Learners will be introduced to the most frequently occurring natural disasters globally: floods and begin to understand some of the reasons they occur. We will explore floods that are a weather force created natural disaster</p> <p>A flood is an overflow of water that submerges land that is usually dry.</p> <p>Learners can brainstorm and make a list of the causes of flood that they know. Encourage learners to think of reasons beside excessive rain that would result in more than normal water by thinking of other water sources – these would include overflowing rivers, broken dams, storm surges and cyclones and melting ice / snow etc.</p> <p>Learners will make models to explore the impact of human activity on creating floods. They will first explore the impact of placing human settlements close to river bodies, straightening river paths and deforestation. Learners should record the</p>

<p>15 minutes</p>	<p>outcome of each experiment with drawings and notes on the implications of the floods and draw conclusions. Flood Model Set Up:</p> <p>Students will follow the next steps to build the model:</p> <ul style="list-style-type: none"> • Take any large flat container or tray/pan with sides. • Place sufficient modelling clay or soil at the bottom of the tray. • Carve a “river bed” in the clay/soil. Water will run through this carved path. • Place little stones or toy houses along the river. These will be the “homes” of people. <p>The model should look similar to this:</p>  <p>Learners can pour water into the model in the river and observe the water staying within the river path. They can then add a “rainstorm” by increasing the volume of the water.</p> <p>Learners can observe what will happen to the neighboring areas. Learners can place the homes in different parts of the model and test the impact depending on the location and proximity to the river and write these down. Usually the settlements close to the river will get submerged first and there will also be more of an impact on the more downstream settlements</p>
<p>15 minutes</p>	<p>Learners will then begin to explore the multiple human factors causing floods including:</p> <ol style="list-style-type: none"> i) Straightening river channels and paths <p>Learners should try keeping a straightened river path as shown above and testing the speed of the water flow and the amount of flooding</p>

	15 minutes	<p>Learners should then attempt to create a meandering or zig-zag / curved river path and test the speed of water flow and the amount of flooding</p> <p>Learners will observe that the curving river path slows down the speed and the intensity of the water flow and reduces the amount of flooding. Learners can also add more bends to the curvature to test their assumption</p> <p>ii) Deforestation of mangroves and wetlands</p> <p>Learners will place some small strips of kitchen sponge (or any other absorbent materials including cotton if unavailable) beside the river path to represent a mangrove or wetland. Pour water along the river and observe how the mangrove trees and wetland grasses and vegetation act like sponges and reduce our vulnerability to flooding.</p> <p>Background: Mangroves grow on the edge of warm ocean coasts and their spongy roots soak the water. Similarly, wetland marshes surround rivers and their vegetation soak up water. Mangroves and wetlands can also spread out water over large sections of land, and slow the dangerous flow of water. This plays an important role in protecting the nearby communities.</p> <p>Due to deforestation and urbanization, these important natural features are no longer available to play their important role.</p>
	15 minutes	<p>iii) Reduction of natural vegetation causing landslides</p> <p>Learners can observe how plants can prevent soil erosion by pouring some water on any incline or slope outdoors that has soil or dirt.</p> <p>Learners can then try the experiment on a slope with some grass or shrubs. Learners can observe how the grass roots hold the soil in place and keep it from washing away and draw conclusions. Alternatively, learners can try the same experiment using a tray held at an incline first with the soil without grass and then with grass.</p>
	15 minutes	<p>iv) Reduction of natural drainage basins</p> <p>Learners will create a small pit or hole close to the river path and once again pour water into the model.</p> <p>Learners can observe how the water will drain into the basin created and reduce the intensity of flooding. As our human need for land and space increases, we have decreased the number of natural drainage basins increasing the chances of floods</p>
	10 minutes	<p>(v) Improper garbage disposal</p> <p>Learners will place some rigid objects in the river path to represent garbage. Pour water along the river and observe how the build up of garbage obstructs natural flow of water leading to flooding of the surrounding areas,</p> <p>Learners will complete their notes from the different experiments to understand the human causes for floods.</p>

		Learners can share their notes with family members for feedback and additional input.
2	5 minutes	Learners will explore and measure the intensity of natural hazards, categorizing these as: <ul style="list-style-type: none"> - Minor risk: A relatively small possibility of harm. - Moderate risk: A possibility of harm that is neither small nor great, but in between. - Major risk: A serious and significant possibility of harm. <p>Learners will understand how hazards are measured and build scientific instruments to measure hazards. Learners will read and record measurements, analyze measurements and understand how these instruments can provide early warning to reduce impacts of disasters.</p> <p>Flooding is often caused by strong winds, heavy rains and high tides because of tropical storms called cyclones and hurricanes. Learners will design 2 instruments to measure the intensity and assess the risk:</p>
	15 minutes	i) Measuring flood depth: Learners will learn how scientists record and monitor floods by observing how rain affects the depth and breadth of local streams. Learners can record and mark the water level during the dry (non-flooded) season and then again during the rainy season. For example, the recording in the rainy season is 5 fingers or 10 cms above the level recorded during the dry season. If students are unable to visit a local stream or river, they can use the model made in the first day and mark the levels during the dry and again during the rainy season
	15 minutes	ii) Rain gauge to measure the amount of rainfall. Learners will mark a large, thin, straight-sided, empty plastic container using a ruler or alternatively using their horizontally placed finger as one unit – they will use a tape or a pen to mark the outside of the container. This gauge will be placed outside in an open area where it is not tampered with (or on some elevated surface) when it begins raining. As the rain fills the gauge, the students can measure this after each rainfall. Learners should make a permanent measuring post that can also withstand winds, make a stable base to hold the container above the ground.
	5 minutes	Learners will use these instruments to predict the weather changes and also to better understand how scientists are able to measure changes and keep track of changes to put out warnings.
3		Learners will gather research on the impact and result of floods on humans – they will do this through interviewing family members and reflecting on any of their own experiences of the worst flood in their living memory

	<p>20 minutes</p> <p>20 minutes</p> <p>20 minutes</p>	<p>Learners will design a questionnaire to capture the different types of impacts of flooding. The questionnaire can include the following questions:</p> <ul style="list-style-type: none"> - Emotional: How can we prepare ourselves emotionally for a disaster? Prompts: How do people feel when disasters happen? How do people get through a disaster? - Infrastructure: What happened to your home and what was permanently or temporarily damaged? Prompts: What happened to homes and belongings? What could be salvaged and how? - Health and Life: Were people affected and how? Prompts: Was there any loss of life? What were the common injuries or illnesses and how did these happen? - Basic Needs: Were there disturbances to all the basic needs? Prompts: Was the clean water supply disrupted? What happened to the connectivity through phone, internet, TV or radio? How quickly were you able to access healthcare and schools? What was the access to food supplies and ration? <p>Learners will ask family or community members who have experienced the devastating floods and collect their responses.</p> <p>Learners will capture the answers and use them as illustration of the impacts of the flood on a report that they will write. The report should also include a section compiling strategies on how families' best dealt with the disaster and draw an image of the same. Learners will share the draft report to family or community report for feedback and additional input. Learners will use the feedback to revise their draft report to produce their final report.</p>
	<p>20 minutes</p>	<p>Literacy Extension: Learners will compose a poem/song about the impact of floods. The poem/song may illustrate the emotional aspects of flooding or depict the floods' impacts on infrastructure, health and life, or basic needs. Learners will share and present the poem/song to the family or community members.</p>
<p>4</p>	<p>20 minutes</p> <p>10 minutes</p>	<p>Learners will design an emergency protocol for their families and communities to prepare for floods.</p> <p>Learners will begin by brainstorming how a flood would typically play out</p> <p>Some prompt questions can be answered based on the initial model that include:</p> <ul style="list-style-type: none"> - If there is a flood, what would be the safest part of your home and why? (answer: a higher floor or roof) - If your home has no higher floor or access to the roof, where in the community would they gather? (an elevated area in the community) - How would you reach these safe higher grounds? - What are the most dangerous areas in the community? E.g. proximity to the water bodies etc.? - What are the emergency phone numbers to ask for assistance? <p>Optional: Learners can answer the questions in the worksheet in the appendix</p>

	20 minutes	<p>Learners will design a survival kit.</p> <p>Learners will begin choosing the items that are needed to stay alive and healthy and make a list. Learners will mark whether these items: i) are essential, ii) are durable/long lasting, iii) can be easily carried, and iv) are water-proof. The list may include the following items:</p> <ul style="list-style-type: none"> - Food (especially long lasting non-salty high energy food and/or canned food) - Water - Medicine and / or first aid kit - Clothing and blankets - Flashlight - Radio - Batteries - ID card and papers - Cash or credit cards - Toiletries (soap) - Whistle or colored flag to attract attention <p>Learners can make the colored flags and a help poster to attract attention from the ground</p>
	10 minutes	Learners can also put all of these items together in a survival kit
5	40 minutes	<p>In the final day of the project, learners will pretend to be weather forecasters, prepare a script, and narrate it.</p> <p>Learners will first have to write a script as a warning issued by their National Weather Service. The warning has to alert people when bad weather might happen. In their news report, learners need to cover:</p> <ul style="list-style-type: none"> - Where is the flood happening and why? - Where is there the most danger? - How severe is the intensity of the flood and how is it being measured? - What might be the consequences? - How can you prepare for it?
	20 minutes	<p>Learners will present this weather warning report to all their family members.</p> <p>Learners will reflect on their experience in doing the project activities:</p> <ul style="list-style-type: none"> - What did they enjoy doing most? - What challenges did they meet and how did they overcome them? - What new thing did they learn which they did not know before?
Assessment Criteria:		<ul style="list-style-type: none"> - Understanding of the causes of human action on flooding - Analysis of the measurements recorded by the scientific instruments to predict weather conditions - Details of the report with holistic understanding of the impact of flooding - Practicality of the emergency protocol - Demonstrated understanding in the final weather watch report

Additional enrichment activities:	<ul style="list-style-type: none"> - Learners can design their own personal flotation devices if floods are a reality in their context - Learners will design their own makeshift personal flotation device (PFD) from clothing, thick plastic bags, plastic bottles and ropes. - Learners need to first use a plastic backpack, or make a life-jacket (sleeveless t-shirt that they can wear) from an existing one at home or cut it out using any thick plastic bag. They will create “pockets” within this life jacket using thick thread or rope. They will then tie multiple empty plastic bottles (with their caps on) upside down together and secure it in the pockets of the lifejacket with the rope. - Try floating this life jacket in water to observe the concept of density in action. Since the life-jacket is filled with light material i.e. the plastic bottles it can displace a lot of water compared to its light weight and therefore can float
Modifications to simplify the project tasks if need be	Learners can reduce the number of models and the instruments being used for measurements

APPENDIX

1. How many people are part of your family? _____
2. Water: You need a 3-day supply. Each person needs 1 gallon per day. How many gallons will your family need? _____
3. Food: You need a 3-day supply of canned foods. List some foods you might put in your supplies kit: _____

4. Medicine and Supplies for your First Aid kit: _____

5. How will you listen to the news for weather updates and official instructions?

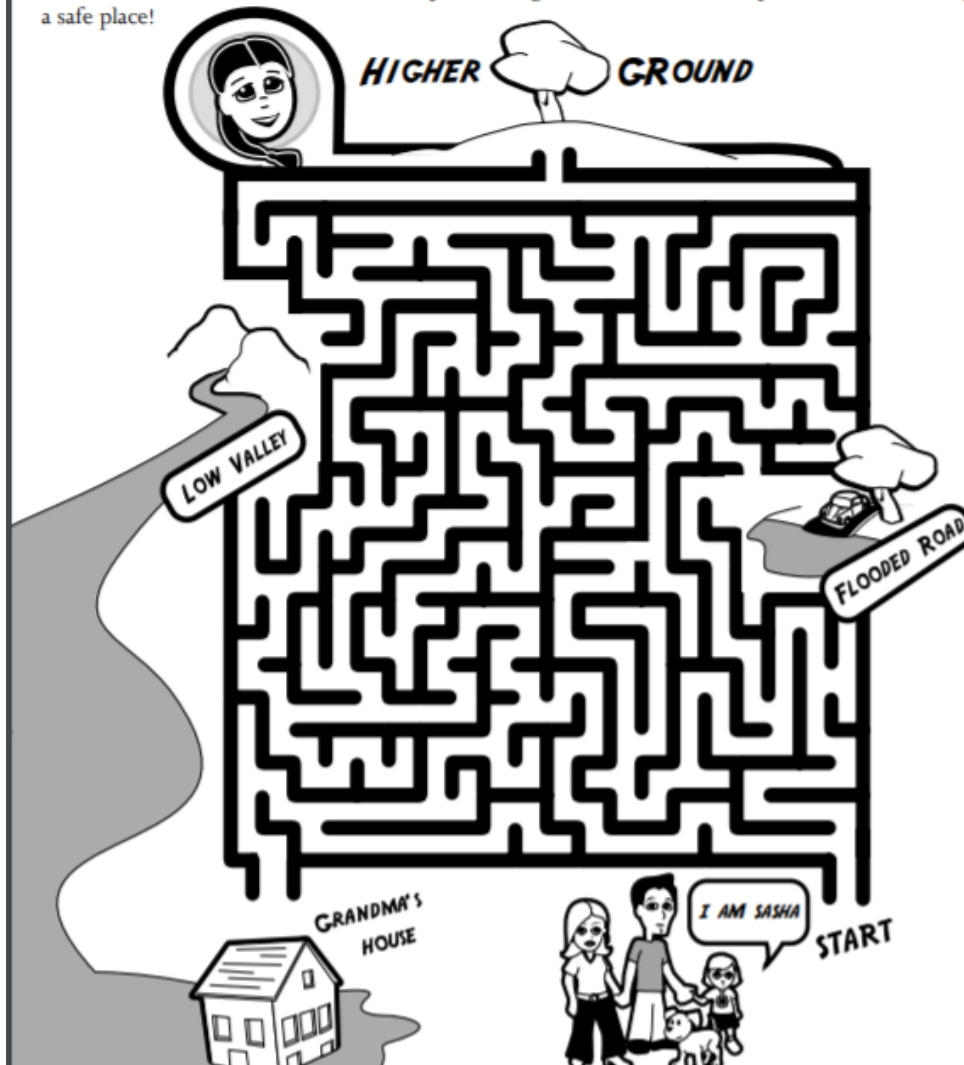
6. If the power goes out, what will you use to see in the dark?

7. What will you need to open cans of food?

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My friend Sasha needs your help! Last week, there was a lot of rain where she lives. Now the river in her town is rising fast. The river is spilling over its banks. There is flooding near her home. Sasha needs your help to evacuate. Draw a path through the maze below. Help Sasha and her family find a safe place!

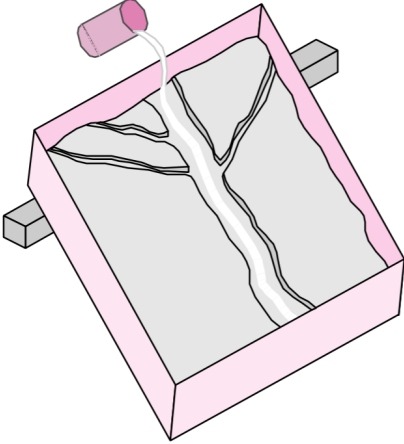


Ages 11 to 14 (Level 3)



Description:	Learners will explore some of the most frequent natural disasters by beginning to understand their causes and far-reaching effects. They will research the effect of the natural disaster on plants, animals and people, and design an emergency response kit including safety guides and disaster kits
Leading question:	Can you manage a flood in your community?
Age group:	11 – 14 years
Subjects:	Geography (Social Sciences) and Literacy
Total time required:	5 hours over 5 days
Self-guided / Supervised activity:	Medium
Resources required:	<ul style="list-style-type: none"> - 1 large flat container or tray with sides (a deep tray), soil or modelling clay, sponge, little rocks, - 4 paper cups, straws/chopsticks, a pin, rubber band and a pencil - Empty plastic container and marker - Rubber from a broken balloon or a piece of plastic wrap over the top of a glass jar or metal can - Plastic bottles, rope, thread and large plastic bag

Learning outcomes:	<ul style="list-style-type: none"> - Understand how human action is related to natural disasters. - Understand how the risk of floods hazards is are measured - Identify consequences of flooding - Identify and design protective and emergency measures to avoid or mitigate the consequences of flooding
Required previous learning:	None
Inspiration:	FEMA Resources USAID Resources

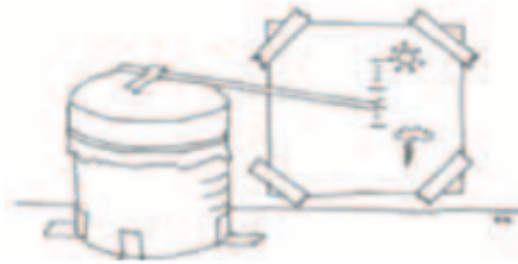
Day	Time	Activity and Description
1	5 minutes	<p>Learners will be introduced to the most frequently occurring natural disasters globally: floods and begin to understand some of the reasons they occur. We will explore floods that are a weather force created natural disasters</p> <p>A flood is an overflow of water that submerges land that is usually dry.</p> <p>Learners can brainstorm and make a list of the causes of flood that they know. Encourage learners to think of reasons beside excessive rain that would result in more than normal water by thinking of other water sources – these would include overflowing rivers, broken dams, storm surges and cyclones and melting ice / snow etc.</p>

	<p>15 minutes</p>	<p>Learners will make models to explore the impact of human activity on creating floods. They will first explore the impact of placing human settlements close to river bodies, straightening river paths and deforestation. Learners should record the outcome of each experiment with drawings and notes on the implications of the floods and draw conclusions.</p> <p>Flood Model Set Up:</p> <p>Students will follow the next steps to build the model:</p> <ul style="list-style-type: none"> • Take any large flat container or tray/pan with sides. • Place sufficient modelling clay or soil at the bottom of the tray. • Carve a “river bed” in the clay/soil. Water will run through this carved path. • Place little stones or toy houses along the river. These will be the “homes” of people. <p>The model should look similar to this:</p>  <p>Learners can pour water into the model in the river and observe the water staying within the river path. They can then add a “rainstorm” by increasing the volume and flow of the water.</p> <p>Learners can observe what will happen to the neighboring areas. Learners can place the homes in different parts of the model and test the impact depending on the location and proximity to the river and write these down. Usually the settlements close to the river will get submerged first and there will also be more of an impact on the more downstream settlements</p>
	<p>10 minutes</p>	<p>Learners will then begin to explore the multiple human factors causing floods including:</p> <ol style="list-style-type: none"> i) Straightening river channels and paths

	<p>10 minutes</p>	<p>Learners should try keeping a straightened river path as shown above and testing the speed of the water flow and the amount of flooding</p> <p>Learners should then attempt to create a meandering or zig-zag / curved river path and test the speed of water flow and the amount of flooding</p> <p>Learners will observe that the curving river path slows down the speed and the intensity of the water flow and reduces the amount of flooding. Learners can also add more bends to the curvature to test their assumption</p> <p>ii) Deforestation of mangroves and wetlands</p> <p>Learners will place some small strips of kitchen sponge (or any other absorbent materials including cotton if unavailable) beside the river path to represent a mangrove or wetland. Pour water along the river and observe how the mangrove trees and wetland grasses and vegetation act like sponges and reduce our vulnerability to flooding.</p> <p>Background: Mangroves grow on the edge of warm ocean coasts and their spongy roots soak the water. Similarly, wetland marshes surround rivers and their vegetation soak up water. Mangroves and wetlands can also spread out water over large sections of land, and slow the dangerous flow of water. This plays an important role in protecting the nearby communities.</p> <p>Due to deforestation and urbanization, these important natural features are no longer available to play their important role.</p> <p>iii) Reduction of natural vegetation causing landslides</p> <p>Learners can observe how plants can prevent soil erosion by pouring some water on any incline or slope outdoors that has soil or dirt. Learners can then try the experiment on a slope with some grass or shrubs.</p> <p>Learners can observe how the grass roots hold the soil in place and keep it from washing away and draw conclusions. Alternatively, learners can try the same experiment using a tray held at an incline first with the soil without grass and then with.</p> <p>iv) Reduction of natural drainage basins</p> <p>Learners will create a small pit or hole close to the river path and once again pour water into the model.</p> <p>Learners can observe how the water will drain into the basin created and reduce the intensity of flooding. As our human need for land and space increases, we have decreased the number of natural drainage basins increasing the chances of floods</p> <p>(v) Improper garbage disposal</p> <p>Learners will place some rigid objects in the river path to represent garbage. Pour water along the river and observe how the build up of garbage obstructs natural flow of water leading to flooding of the surrounding areas</p>
	<p>10 minutes</p>	
	<p>10 minutes</p>	

	15 minutes	<p>The anemometer should look like this:</p> 
	15 minutes	<p>Wind-speed can be recorded based on counting the revolutions (how many times the marked cup comes back to the front) of the anemometer for one minute.</p> <p>Wind speed is usually measured in knots but, in this case, we will be observing how many times the anemometer rotates in 30 seconds to test how fast the wind speed is. Learners will try this at different times in the day or across a few days to test the speed of the wind.</p>
	10 minutes	<p>ii) Measuring flood depth. Learners will learn how scientists record and monitor floods by observing how rain affects the depth and breadth of local streams.</p> <p>Learners can both record and mark the water level during the dry (non-flooded) season, then again during the rainy season, and compare the observations. For example, the recording in the rainy season may be 5 fingers or 10 cms above the level during the dry season.</p> <p>If students are unable to visit a local stream or river, they can use the model made on the first day and mark the levels during the dry and again during the rainy season.</p> <p>iii) Rain gauge to measure the amount of rainfall.</p> 

		<ul style="list-style-type: none"> ● Learners will use a large, thin, straight-sided, empty plastic container. This will be the rain gauge. ● Using a ruler or, alternatively, using their finger as one unit – they will mark a specific length in the container (looking at it vertically). Learners may use tape or a pen to mark the outside of the container. ● This gauge will be placed outside in an open area where it is not tampered with (or on some elevated surface) when it begins raining. As the rain fills the gauge, the students can measure this after each rainfall. For this, learners will need to build a permanent measuring post that can also withstand winds. They can make a stable base to hold the container above the ground. <p>iv) Barometer to measure atmospheric pressure.</p> <p>Atmospheric pressure is the force pushing down against objects from the weight of the air above it. It is used to measure storms or cyclones. If there is low or rapidly falling pressure, this will contribute to the formation of clouds and suggest a storm or cyclone approaching.</p> <p>Learners can make a barometer by:</p> <ol style="list-style-type: none"> 1. Stretching the rubber from a broken balloon or a piece of plastic wrap over the top of a glass jar or metal can. 2. Tape the bottom of the glass jar/metal can to secure it on the surface on which it is placed. 3. Tightly secure the balloon rubber with a rubber band. 4. Tape a straw horizontally at the center of the balloon so that at least half of the straw hangs out over the edge of the jar. 5. Place the jar against a wall with the straw parallel to the wall and tape a piece of paper to the wall. 6. Make a mark on the card to show the current air pressure. <p>As the barometric pressure rises or falls, the balloon will expand and contract. Higher pressure will make the balloon sink down, causing the straw to go up; lower pressure will make the balloon expand and cause the end of the straw to go down.</p> <p>Learners will observe the movement of the barometer over several weather changes to determine the high, low, and midpoint of the barometer's movement. Learners can then monitor and record their barometer several times a day along with changes in weather</p>
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		Barometer Stick Movement		
		Rising or steady	Slowly falling	Rapidly falling
Initial position of barometer stick	↗	Fair weather	Fair weather	Cloudy, warmer
	→	Continuation of present weather	Continuation of present weather	Precipitation likely
	↘	Clearing, and cooler	Precipitation	Storm coming

In times of low pressure – warm and high speed winds usually rush in to fill in the gaps – and so it is really important to be able to predict cyclones / hurricanes based on changes of atmospheric pressure

Learners will use these instruments to predict the weather changes and also contribute to understanding how scientists are able to measure changes and keep track of changes to put out warnings

3


20
minutes

Learners will gather research on the impact and result of floods on humans, trees and animals – they will do this through interviewing family members and reflecting on any of their own experiences of the worst flood in their living memory

Learners will design a questionnaire to capture the different types of impacts of flooding including:

- Emotional: How can we prepare ourselves emotionally for a disaster?
Prompts: How do people feel when disasters happen? How do people get through a disaster? What does it take to make yourself feel the way you felt before the disaster?
- Infrastructure: What happened to all the physical and electrical infrastructure and what was permanently or temporarily damaged?
Prompts: What happened to electrical appliances? What happened to homes and belongings? What could be salvaged and how?
- Health and Life: Were people affected and how? Prompts: Was there any loss of life, and how? What were the common injuries and how did these happen? What were the longer-term diseases or illnesses that were a result of the flooding? How were these treated?

	<p>20 minutes</p> <p>20 minutes</p>	<ul style="list-style-type: none"> - Economics: What was the impact on life-style? Prompts: What jobs and livelihood was lost? What happened to accumulated assets and wealth? - Basic Needs: Were there disturbances to all the basic needs? Prompts: Was the clean water supply disrupted? What happened to the connectivity through phone, internet, TV or radio? How quickly were you able to access healthcare and schools? What was the access to food supplies and ration? - Plants and Animals: What was the impact on wildlife, pets, cattle and vegetation? Prompts: How were they impacted? What could be done to save them? <p>Learners will ask family or community members who have experienced the devastating floods and collect all their responses</p> <p>Learners will capture all these results and impacts in a report of the floods that includes a section compiling strategies on how families best dealt with the disaster</p> <p>Learners will present their draft report to the family or community members for their feedback and additional input.</p> <p>Learners will use the feedback to revise their draft report</p> <p>Learners will reflect on their research experience.</p> <ul style="list-style-type: none"> - What are their key learning points? - What would they do differently next time
	<p>20 minutes</p>	<p>Literacy Extension: Learners will compose a poem/song about the impact of floods. The poem/song may illustrate the emotional aspects of flooding or depict the floods' impacts on infrastructure, health and life, or basic needs.</p> <p>Learners will share and present the poem/song to the family or community members.</p>
<p>4</p>	<p>20 minutes</p>	<p>Learners will prepare themselves and their communities for floods</p> <p>Learners will design an emergency protocol for their families. They will begin by brainstorming how a flood would typically play out</p> <p>Some prompt questions can be answered based on the initial model that include:</p> <ul style="list-style-type: none"> - If there is a flood, what would be the safest part of your home and why? (answer: a higher floor or roof) - If your home has no higher floor or access to the roof, where in the community would they gather? (an elevated area in the community) - What would happen to plugged in electrical appliances when wet? - What are the emergency escape routes to reach these safe higher grounds? - What are the most dangerous areas in the community? E.g. proximity to the water bodies etc.?

	20 minutes	<p>- What are the emergency phone numbers needed to ask for assistance?</p> <p>Learners will design their own makeshift personal flotation device (PFD) from clothing, thick plastic bags, plastic bottles and ropes.</p> <p>Learners need to first use a plastic backpack, or make a life-jacket (sleeveless t-shirt that they can wear) from an existing one at home or cut it out using any thick plastic bag. They will create “pockets” within this life jacket using thick thread or rope. They will then tie multiple empty plastic bottles (with their caps on) upside down together and secure it in the pockets of the lifejacket with the rope.</p>  <p>Try floating this life jacket in water to observe the concept of density in action. Since the life-jacket is filled with light material i.e. the plastic bottles it can displace a lot of water compared to its light weight and therefore can float</p>
	20 minutes	<p>Finally, learners will design a survival kit.</p> <p>Learners will begin choosing the essential items that are needed to stay alive and healthy and make a list. Learners will mark whether these items are: i) essential, ii) durable / long lasting, iii) can be easily carried and iv) water-proof including:</p> <ul style="list-style-type: none"> - Food (esp. long lasting non-salty high energy food and / or canned food) - Water - Medicine and / or first aid kit - Clothing and blankets - Flashlight - Radio - Batteries - ID card and papers - Cash or credit cards - Toiletries (soap) - Whistle or colored flag to attract attention

		Learners can also put all of these items together in a survival kit. In places of frequent flooding, it is important to keep the survival kit ready so that you can evacuate immediately to elevated ground.
5	40 minutes 20 minutes	<p>In the final day of the project, learners will pretend to be weather forecasters, prepare a script, and narrate it.</p> <p>The script should convey a warning issued by their National Weather Service. The warning has to alert people when bad weather might happen.</p> <p>In their news report, learners need to cover:</p> <ul style="list-style-type: none"> - Where is the flood happening? - Which communities and settlements are most susceptible to damage? - What is the cause of this flood? - What is the intensity of the flood? What instrument is it being used and how is it being measured? - What might be the consequences? - How can you prepare for it? <p>Learners will present this weather warning report to all their family members</p>
Assessment Criteria:		<ul style="list-style-type: none"> - Understanding of the effects of human action and natural factors on flooding - Analysis of the measurements recorded by the scientific instruments to predict weather conditions - Details of the report with holistic understanding of the impact of flooding - Creativity in designing the personal flotation device and measurement instruments - Practicality of the emergency protocol - Demonstrated understanding in the final weather report

Additional enrichment activities:	
Modifications to simplify the project tasks if need be	Learners can ignore the activities for the second day of the project involving designing instruments for measurement

APPENDIX

1. How many people are in your family? _____
2. Water: You need a 3-day supply. Each person needs 1 gallon per day. How many gallons will your family need? _____
3. Food: You need a 3-day supply of canned foods. List some foods you might put in your supplies kit: _____

4. Medicine and Supplies for your First Aid kit: _____

5. How will you listen to the news for weather updates and official instructions?

6. If the power goes out, what will you use to see in the dark?

7. What will you need to open cans of food?

WATER, WATER EVERYWHERE

Hi everyone, my name is Rising Waters. We all know that "April showers bring May flowers," but showers that turn into heavy rains can also cause floods. I'm here to remind you that during a flood you and your family can get to higher ground to stay safe.

My friend Sasha needs your help! Last week, there was a lot of rain where she lives. Now the river in her town is rising fast. The river is spilling over its banks. There is flooding near her home. Sasha needs your help to evacuate. Draw a path through the maze below. Help Sasha and her family find a safe place!

