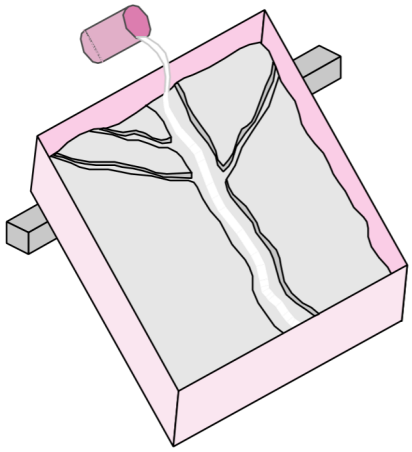
Flood Management (level 3)

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?
Total Time Required	5 hours over 5 days
Subjects Covered	Social Sciences, Art and Design, Literacy, Numeracy
Supplies Required	- 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, a 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	1. Explore the impact of human action on creating natural disasters. 2. Understanding how hazards are measured to provide early warning to reduce the impacts of disasters. 3. Identify the consequences of the flooding. 4. Suggest protective and emergency measures to protect from the consequences of flooding.
Previous Learning	None

Day 1

Today you will begin to explore floods.

Time	Activity and Description
5 minutes	● A flood is an overflow of water that submerges land that is usually dry. ● Brainstorm and make a list of the causes of flood that you know. Think of reasons besides 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.
15 minutes	● Make models to explore the impact human activity on creating floods. First explore the impact of placing human settlements close to river bodies, straightening river paths and deforestations. Record the outcome of each experiment with drawings and notes on the implications of the floods and draw conclusions. ● **Flood model set up:** - Take any large flat container or tray with sides. Place sufficient modelling clay or soil at the bottom of the pan. Carve a river path for water in the container in the clay/soil. Place little stones, wood cubes, or toy houses alongside the river to define the path and also define the settlements.  - Pour water into the model in the river and observe the water staying within the river path. You can add a rainstorm by increasing the volume and the flow of the water. - Observe what will happen to the neighboring areas. Place the homes in different parts of the model and test the impact depending on the location

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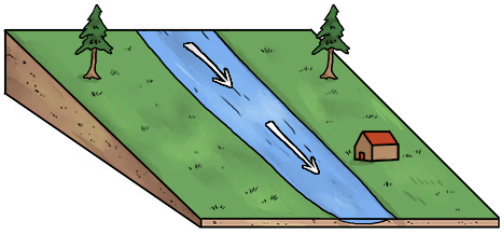
	and proximity to the river and write these down. Usually the settlements close to the river will get submerged first and there will also be more of an impact on the more downstream settlements.
10 minutes	● Let's explore the multiple human factors causing floods including: - Straightening river channels and paths  - Try keeping a straightened river path as shown above and testing the speed of the water flow and the amount of flooding.  - Then attempt to create a meandering or zig-zag / curved river path and test the speed of water flow and the amount of flooding. - Observe that the curving river path slows down the speed and the intensity of the water flow and reduces the amount of flooding. Also add more bends to the curvature to the test assumption.
10 minutes	● Let's explore the multiple human factors causing floods including: ● Deforestation of mangroves and wetlands. - 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.

	- 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. - Due to deforestation and urbanization, these important natural features are no longer available to play their important role.
10 minutes	● Let's explore the multiple human factors causing floods including: ● Reduction of natural vegetation causing landslides - Observe how plants can prevent soil erosion by pouring some water on any incline or slope outdoors that has soil or dirt. - Try the experiment on a slope with some grass or shrubs. - Observe how the grass roots hold the soil in place and keep it from washing away and draw conclusions. Alternatively, you can try the same experiment using a tray held at an incline first with the soil without grass and then with grass.
10 minutes	● Let's explore the multiple human factors causing floods including: ● Reduction of natural drainage basins - Create a small pit or hole close to the river path and once again pour water into the model. - 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. ● Improper garbage disposal - 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
10 minutes	● Complete your notes from the different experiments to understand the human causes for floods. ● Share their notes from different experiments with family members for feedback and additional input

Day 2

Today you will explore and measure the intensity of natural hazards.

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Time	Activity and Description
5 minutes	● Categorize the intensity of natural hazards as: - 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. ● Understand how hazards are measured and build scientific instruments to measure hazards. Read, record and analyze measurements and understand how these instruments can provide early warning to reduce impacts of disasters. ● Flooding is often caused by strong winds, heavy rains and high tides because of tropical storms called cyclones and hurricanes. Design 4 instruments to measure the impact and assess the risk of floods:
15 minutes	● **An Anemometer;** it rotates the same speed wind and is used to measure wind speed. o Use 4 paper cups, straws/chopsticks, a pin and a pencil. o Use straws/ chopsticks that are inserted horizontally into paper cups piercing both sides. o Each chopstick or straw will have a cup on either side. These two sticks will be inserted with a pin to form an X shape. The pin will be tied to the pencil with a rubber-band. Follow these steps to make the anemometer: 1. Mark one of the paper cups so that you can distinguish it from the rest. 2. Pierce both sides of the paper cups 3. Insert one of the chopsticks or straws through the holes in one cup, so that the cup is hanging towards the end of the chopstick/straw. 4. Repeat Step 2 on the other end of the same chopstick/straw. After this, you should have a cup on both sides of the chopstick/straw. 5. Repeat Steps 2 and 3 with the remaining set of cups and chopstick/straws. 6. Form an X shape with the chopsticks/straws and insert the pin through the intersection. 7. Tie the pin to the pencil with a rubber-band.

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	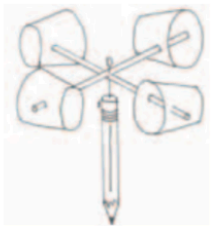 Wind-speed can be recorded based on counting the revolutions (how many times the marked cup comes back to the front) of the anemometer for one minute. Wind speed is usually measured in knots but, in this case, we will be observing how many times the anemometer rotates in 30 seconds to test how fast the wind speed is. Try this at different times in the day or across a few days to test the speed.
15 minutes	● **Measuring floor depth:** Learn how scientists record and monitor floods by observing how rain affects the depth and breadth of local streams. Record and mark the water level during the dry (non-flooded) season and 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. If students are unable to go 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 If you are unable to go to the stream or river, use the model made on the first day and mark the levels during the dry and again during the rainy season.
15 minutes	● **Rain gauge to measure the amount of rainfall.** Use a large, thin, straight-sided, empty plastic container, this will be the rain gauge. Using a ruler or alternatively using your horizontally placed finger as one unit – 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, measure this after each rainfall.

	● Make a permanent measuring post that can also withstand winds and make a stable base to hold the container above the ground. 
15 minutes	● **Barometer** to measure atmospheric pressure (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. Make a barometer by stretching the rubber from a broken balloon or a piece of plastic wrap over the top of a glass jar or metal can. ● Tape the bottom of the glass jar/metal can to secure it on the surface on which it is placed. Tightly secure the balloon rubber with a rubber band. ● 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. ● Place the jar against a wall with the straw parallel to the wall and tape a piece of paper to the wall. Make a mark on the card to show the current air pressure. ● 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. 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 weathe
10 minutes	● Observe the movement of the barometer over several weather changes to determine the high, low and midpoint of the barometer's movement. Then,

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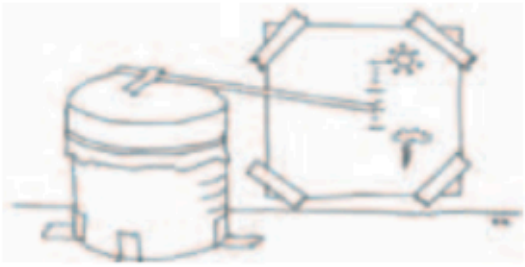
	monitor and record their barometer several times a day along with changes in weather.  Barometer Stick Movement Initial position of barometer stick ↗ Fair weather / Fair weather / Cloudy, warmer → Continuation of present weather / Continuation of present weather / Precipitation likely ↘ Clearing, and 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 ● 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.

Day 3

Today you will gather research on the impact and result of floods on humans.

Time	Activity and Description
20 minutes	● 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

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	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? - 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?
20 minutes	● Ask family or community members who have experienced the devastating floods and collect all their responses.
20 minutes	● 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 and draw an image of the same. ● Present a draft report to the family or community members for feedback and additional input. ● Use the feedback to revise the draft report ● Reflect on the research experience. - What are their key learning points? - What would they do differently next time
20 minutes	Literacy Extension: 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. Share and present the poem/song to your family or community members.

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Day 4

Today you will prepare yourselves and your communities for floods.

Time	Activity and Description
20 minutes	● Design an emergency protocol for your families by brainstorming how a flood would typically play out. ● Some prompt questions can be answered based on the initial model: - 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 required?
20 minutes	● Design your own makeshift **personal flotation device** from clothing, thick plastic bags, plastic bottles and ropes. ● 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. Create “pockets” within this life jacket using thick thread or rope. 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

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	can displace a lot of water compared to its light weight and therefore can float
20 minutes	● **Design a survival kit.** ● Begin by choosing the essential items that are needed to stay alive and healthy and make a list. Mark whether these items are: i) essential, ii) durable / long lasting, iii) can be easily carried and iv) water-proof including: - 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.
10 minutes	● Put all the 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.

Day 5

Today you will pretend to be weather forecasters.

Time	Activity and Description
40 minutes	● Write a script that conveys a warning issued by your National Weather Service. The warning has to alert people when bad weather might happen. ● In the news report, you need to cover: - 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?

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20 minutes	● Present this weather warning report to all their family members.

Additional Enrichment Activities	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. plastic bottles it can displace a lot of water compared to its light weight and therefore can float.
Modifications for Simplification	Learners can ignore the activities on day 2 around designing measurement instruments.

Assessment criteria

A majority of my learners were able to:

- Understand of the effects of human action on flooding.
- Analyse the measurements recorded by the scientific instruments to predict weather conditions.
- Script details of the report with holistic understanding of the impact of flooding.
- Design personal flotation devices and measurement instruments.

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. 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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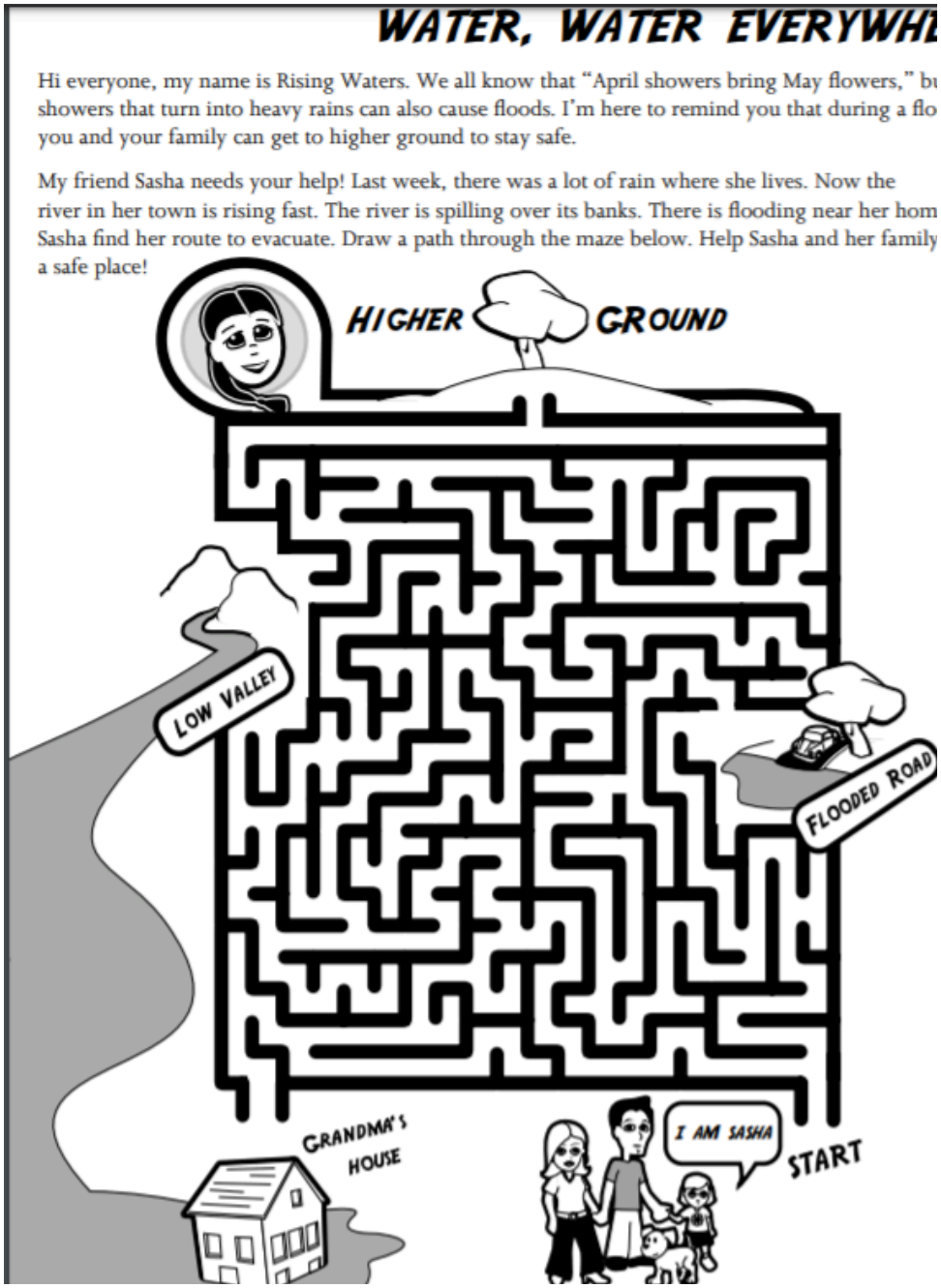

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