



National Curriculum Development in Climate Change Mitigation and
Adaptation and Disaster Risk Reduction
St. Vincent and the Grenadines



Prepared by
David Selby, Fumiyo Kagawa
and Rowan Oberman

SUSTAINABILITY FRONTIERS CIC, UK

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Form 1

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Strand 1: Hazards & Disasters

Unit 1: What is a hazard? What is a disaster?

Topic 1: Types of hazard and disaster

Activity 1: What is a 'Hazard' and What is a 'Disaster'?

Purpose: Helping students understand the concepts of 'hazard' and 'natural hazard' and reach an initial understanding of the concept of 'disaster.'

Time needed: 80 minutes

Resources needed

- A dice
- Sheet of paper and pencil for each pair of students
- Blackboard and chalk

Procedure

Step 1: Have students work in pairs, sitting on chairs or the floor facing each other. Ask everyone to quietly think of times when they have done something risky that might have led to them being harmed or hurt in one way or another or losing something valuable. Invite pairs to take turns to tell their stories to each other and describe their feelings when they took the risk and afterward. Bring the students together and encourage them to share their thoughts on the questions: Are risks something to welcome? Or, are they something to be avoided? (15 minutes)

Step 2: At the end of the discussion, ask all the students to circle. Have each group member choose and note down a number from 1 to 6, explaining that, "They are to take place in an imaginary dice game in which those whose number is not thrown will forfeit all their money and property to those whose number is thrown. Allow time for a few throws!" Then explain to the class that they have been playing the old French game of 'Hasard' (write on board), where gamblers put some or all of their possessions at stake in a chance game of throwing dice. From those origins, a 'hazard' has come to mean something that brings severe risk and danger, such as loss of life, injury, damage to property, social disruption, financial loss, or a combination of all of these. Ask class members what they think about 'throwing caution to the wind' as in such a game. What are the positives, and what are the negatives? Overall should we seek to reduce and guard against risk in how we live? (10 minutes)

Step 3: Ask pairs to rejoin and note down ideas and examples of what a 'natural hazard' might be. Have them underline in their list what they think are the most severe natural hazards facing St Vincent and the Grenadines. Also, have them consider whether the hazards they note down are likely to affect just a few people or whole communities of people. Have pairs report back, and follow this with a class discussion to reach an agreement on the most severe natural hazards facing St Vincent and the Grenadines. (20 minutes)

Step 4: “Hold a brief, whole-class brainstorm on what a disaster is and how it differs from a hazard.” Write all ideas on the board. Then ask the class to identify ideas they think are the most convincing. (15 minutes)

Step 5: Write on the board the old French word *désastre* from which the English word ‘disaster’ is derived. Explain that the word comes in turn from the old Greek words *dus* (bad) and *aster* (star) based on the ancient belief that calamity on Earth was caused by the position and movement of the stars in the sky. Ask for opinions on this! End by asking, ‘If it is not the stars in the sky that cause disasters, then what does?’ Take a few responses – likely to be very varied – and say that the issue will be taken up in the next lesson. (20 minutes)

Potential/Facilitation Tips

This is an introductory activity designed to build an understanding of key terminology. It takes students through consideration of ‘hazard’ and ‘natural hazards’ and finishes by stimulating thinking on what a ‘disaster’ is. In so doing, it is likely to raise first questions about the difference between a ‘hazard’ and a ‘disaster’ and about whether hazards and disasters are entirely natural or made worse by human agency. If such issues are raised, probe further with the students.

Curriculum Links

This activity falls under Form 1 Social Sciences; in particular, the theme of ‘Environment’ under which the achievement indicators include ‘examine the impact of natural hazards’ and ‘identify and discuss appropriate responses against the impacts of natural hazards.’ It also complements the Form 1 Health and Family Life Education ‘Disaster Preparedness’ theme under which students are called upon to define the term disaster, differentiate between natural and human-made disasters, and understand the nature of natural disasters that can affect SVG.

Source: Adapted from Selby & Kagawa (2014). Disaster Risk Reduction Education Toolkit. (St Michael: CDEMA).

Activity 2: Sorting Hazard Photographs

Purpose: Taking students through a process whereby they reach an initial understanding of categories of hazard, namely, climatological and geophysical hazards, natural and human-made hazards, sudden onset, and slow-onset hazards.

Time needed: 60 minutes

Resources needed:

- The same set of 12 hazard photographs for each group of students
- Markers and a few sheets of paper per group

Procedure

Step 1: Ask students to form into four groups and designate an area of floor space for each group. Hand each group a set of photographs, a few sheets of paper, and markers. (5 minutes)

Step 2: Explain to the groups that their task is to sort the photographs according to different types or categories of hazard. At this stage, give no further guidance. Say that when they have put the pictures into clusters or categories, they should provide each an explanatory label using the papers and markers provided. (10 minutes)

Step 3: When groups have done the task to their satisfaction, ask groups one-by-one to explain what they have done. Encourage other groups to give their responses. This done, ask if the class has reached any conclusions on categorizing hazards. (10 minutes)

Step 4: Then, drawing on information in *Box 1* below, explain some of the categories commonly used in the field of disaster risk reduction. (10 minutes)

Box 1: Natural Hazards

Natural Hazards are naturally occurring physical phenomena. They can be **geophysical** (i.e. earthquakes, landslides, tsunamis, volcanoes) or **hydrological** (i.e. avalanches, floods) or **climatological** (i.e. extreme temperatures, drought, wildfires) or **meteorological** (i.e. hurricanes, cyclones, storms, storm surges) or **biological** (i.e. disease epidemics, insect and animal plagues). They can be a mix of more than one of the above.

Natural hazards can be **rapid onset events** (i.e. they come on quickly and strongly, such as a sudden storm) or **slow onset events** (i.e. they come on slowly, such as drought or biodiversity loss).

Human-induced (anthropogenic) Hazards are, as the name suggests, caused or

made worse by human agency. They include industrial accidents, transport accidents, pollution, environmental destruction, famine caused by misguided human actions, and conflict and wars.

Source: International Federation of Red Cross & Crescent Societies [<https://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/definition-of-hazard/>]; UNISDR Terminology [<https://www.unisdr.org/we/inform/terminology#letter-h>]

Step 5: Ask students to return to their groups and photo sets and rework their arrangement of hazard categories in the light of their new knowledge, again organizing the photographs and giving titles to any of the categories they create. Once the work is finished ask each group to share their work and take questions from other groups. Finish by asking students to summarize what they have learned. (25 minutes)

Potential/Facilitation Tips

This activity familiarizes students with the key categories into which hazards are placed through a sequence of steps. Students may find their first sorting of photographs rather difficult, but it is essential to reveal what they know and gaps in their knowledge. After the input, the whole task will, paradoxically, be more manageable but at the same time more complex. That complexity arises first from their being introduced to many more categories and, second, from the fact that some photographs will not simply fit into one category. They may have to overlap categories to cope with this, perhaps using Venn Diagrams or drawing in two-way arrows between categories. The increased complexity is likely to be expressed in the closing discussion

Curriculum Links

This activity falls under the Form 1 Health and Family Life Education 'Disaster Preparedness' theme, where students are called upon to define the term disaster, differentiate between natural and human-made disasters, and understand the nature of natural disasters that can affect SVG. It also falls under Form 1 Social Sciences; in particular, the theme of 'Environment' under which the achievement indicators include 'examine the impact of natural hazards' and 'identify and discuss appropriate responses against the impacts of natural hazards'.

Request photos from NEMO: Earthquake; Flood, Drought, Fire, Landslide, Volcanic Eruption, Transport Accident, Chemical Spill, Epidemic, Environmental Damage, Coastal Storm Surge.

Strand 1: Hazards & Disasters

Unit 1: What is a Hazard? What is a Disaster?

Topic 2: Sharing Hazard Experiences

Activity 3: Disaster People Search

Purpose: Encouraging students to share their personal experiences, knowledge and feelings concerning natural hazards and disasters

Time needed: 40 minutes

Resources needed:

- A copy of the *Natural Disaster People Search* handout for each student
- A pencil or pen per student

Procedure

Step 1: Ask students to stand in an available open space and give each student a copy of the handout to read.

Invite them to walk around and find *one student* who can answer 'yes' to one of the statements in the handout. In a brief conversation, they should ask the person to speak about their understandings, experiences, /feelings about natural disasters in a short discussion.

Explain that the classmate they meet will also expect them to speak about a statement they can answer 'yes' to. Once once both have had a question answered by the other they should move on to meet other classmates for further exchanges on different statements.

Encourage students to jot down names and what is said during each exchange. Also, please encourage students to get as many answers as possible in the time available but not to rush; each pair must have a proper conversation. (20 minutes)

Step 2: In a subsequent whole-class discussion, prompt students to share the stories that have been told and the feelings and ideas shared. Then go on to ask students what questions the stories have raised in their minds about hazards and disasters. List the questions on the board to take forward into future classes. (20 minutes)

Extensions

1. Have each student choose to research one or two of the statements that they could not respond to when asked by their classmates. They can do this using the Internet or seeking information from adults at home or in the community. They should come to the next 'filling gaps' class ready to speak to their chosen statements.

2. Have students, singly or in pairs, follow up on Statement 4 by interviewing an older person about their hazard and disaster coping memories. They should come to class ready to present what they learnt.

Potential/Facilitation Tips

This is a busy activity. For the 'people search' section, a 'busy' classroom mood should be encouraged but not so busy that students are bent upon completing the sheet rather than listening to each other. Stress the importance of being an active listener. Possible whole class discussion questions for *Step 5* include:

- Did you learn anything from anybody that surprised or shocked you?
- Did you find that you had feelings and experiences in common with others? What were those feelings/experiences?
- Did you disagree with or argue with classmates you met? About what?
- What has the activity revealed about what you *do not know* about hazards and disasters?

The last question provides a platform for *Extension 1*.

This activity might trigger emotional reactions from students. The teacher should create a safe learning environment where complicated feelings can be expressed openly and received seriously, providing pastoral care as necessary.

Curriculum Links

This activity falls under Form 1 Social Sciences; in particular, the theme of 'Environment' under which the achievement indicators include 'examine the impact of natural hazards' and 'identify and discuss appropriate responses against the impacts of natural hazards.'

Extension 2 can be picked up under the Form 1 English curriculum Learning Outcome 2, 'Communicate to Send and Receive Information,' where Achievement Indicator 10 asks students to 'conduct short interviews and present findings.'

Source: Adapted from Selby & Kagawa (2014). Disaster Risk Reduction Education Toolkit. (St Michael: CDEMA).

Handout: Natural Disaster People Search

Find someone who:		Name
1	Has experienced flooding	
2	Can talk about a disaster threat that worries them most	
3	Knows what signs in nature warn that a tsunami is coming	
4	Has listened to an older person in the community speaking of their experiences of past natural disasters and how they coped	
5	Knows what to do if there is a hurricane warning	
6	Has seen a landslide destroy houses and property	
7	Knows about Kick 'em Jenny	
8	Has found themselves out in nature and in an exposed place when a storm struck	
9	Has experienced people being evacuated from their homes because of a natural hazard or disaster	
10	Knows when the La Soufrière volcano last erupted and what happened	
11	Worries that there will be more and worse natural disasters in the future	
12	Remembers long periods of drought and what people did to cope	
13	Was frightened when a hurricane or other bad storm passed through their community	
14	Is concerned about the pollution of land and sea	
15	Has taken part in a beach clean or other environmental protection action	
16	Knows of the Caribbean or SVG people or organizations working to prevent and reduce the effects of natural disasters	
17	Knows of farmers whose crops have suffered from extreme weather events	
18	Worries about the destruction of nature and the loss of natural habitats and wildlife	
19	Whose family has taken steps to reduce the danger from natural disasters	
20	Believes that people should respect the power of nature more	

Strand 1: Hazards & Disasters

Unit 1: What is a Hazard? What is a Disaster?

Topic 3: Hazard: Basic First Aid Responses

Activity 4: First Aid Introduction

Purpose: Understanding what first aid is and why it is an essential part of disaster preparedness; practicing some basic first aid skills

Time Needed: 50 minutes

Resources Needed

- A cut-up set of first aid skills cards
- Materials to be used in the role play (e.g., clean cloths, towels, a bucket filled with water, a cushion, dressings, blankets, disposable gloves, soaps, sterile swabs)

Procedure

Stage 1

Step 1: Ask students to form pairs to discuss the following questions for three minutes:

- What does first aid mean to you?
- What first aid skills do you know?
- Have you ever received first aid, or has it helped someone you know?

After three minutes, invite a few pairs to share what they have discussed. Encourage the class to discuss similarities and differences between what has been shared. At an appropriate point, explain that first aid is the immediate assistance or treatment given to an injured person or suddenly taken ill before medical or professional help becomes available or arrives. It may involve improvisation and making use of whatever facilities or available materials. Point out that the main aims of first aid include: preserving the casualty's life, preventing the worsening of the condition, and promoting the casualty's recovery. Make it clear that first aid skills and practice are essential if young people and their communities are to be better disaster prepared, i.e., equipped to help those suffering injury in a disaster or an emergency. (10 minutes)

Step 2: Ask students to form five groups and give each group one of the first aid cards. Ask each group to read it and prepare for a short role-play (up to 2 minutes), one member playing the injured person and others giving first aid as they demonstrate necessary first aid procedures described in the card. (10 minutes)

Step 3: One by one, invite groups to perform their role-playing. After each role-play, encourage the audience to make suggestions and ask questions. Also, request the role played group to share their reflections (15 minutes)

Step 4: Point out that what is expected in all first aid procedures is to provide psychological support ('psychological first aid'). Go on to explain what psychological first aid means, drawing on the information included in *Box 2*. Invite the students to join in a final whole group discussion. (15 minutes)

Box 2: Psychological First Aid

Psychological first aid is about being 'on the spot' to extend essential human support, deliver practical information, and show empathy, concern, respect, and confidence in the abilities of the affected person. Situations that may create a need for psychological first aid include critical events, such as disasters, illness, accidents, and conflicts.

Psychological first aid immediately after a critical event involves four key elements:

1. *Stay close:* A person in crisis temporarily loses their basic sense of security and trust in the world. Help rebuild trust and safety by staying close.
2. *Listen attentively:* To support someone going through a difficult time, listen carefully without hurrying them or intruding.
3. *Accept feelings:* Keep an open mind about what is being said and accept the affected person's perception of the sequence of events. Acknowledge and respect the affected person's feelings. Be prepared to encounter outbursts of emotions.
4. *Give general care and practical help:* When someone is in a crisis, it is an excellent help if another person lends a hand with practical things.

Source: IFRC (2009) Facilitator Guide for Community-based Health and First Aid in Action.

Extension

In small groups, have students investigate the first aid equipment at school: Where are first aid kits located?; Are they accessible?; What is included in the kits?; Are there any items that have expired? What should be added to the kits? Do they have any allergic reactions to particular medications?

Potential/Facilitation Tips

This introductory activity is designed to familiarize students with basic first aid understandings and first aid skills. Encourage a focused attitude on the part of the students through what you say and through your demeanor. Also, encourage each group to make the role play as realistic as possible by choosing a particular scenario for the accident/critical incident and using the materials available to demonstrate first aid skills.

Continue to emphasize that first aid training is essential for disaster risk reduction. As the Department of Disaster Management *Emergency Safety and First Aid Handbook* for Bhutan says, 'Proper first aid always helps reduce casualties in a post-disaster situation.'

Note that there are no poisonous snakes in St Vincent and the Grenadines. The Caribbean islands with venomous snakes are Martinique, Guadeloupe, St Lucia, and Trinidad and Tobago.

Touch base with SVG Red Cross Society for additional information and support as appropriate.

Curriculum Links

This activity can be used to complement the 'Health Promotion' theme in the Year 1 Health and Family Life Education curriculum. It can also be part of the Physical Education program.

Handouts: First Aid Cards

Helping someone who is bleeding heavily

Sign of heavy bleeding: Blood is flowing from a wound (and it's too big for a plaster)

Basic First Aid Steps:

- Help the person lie down and elevate the wound above the heart level if you can.
- Ask the bleeding person to apply pressure to the wound themselves
- Cover the injury with any clean cloth and put pressure on the wound. (Note: bleeding usually stops after a while, or blood flow will slow).
- Do not use this method if there is an object in the wound or a suspected fracture. Please do not remove the object (it is helping to plug the hole and stop the blood flow) and apply pressure around it.
- Don't wash a wound that is bleeding heavily; if you put a heavily bleeding wound under a tap, you may make it bleed more.
- If the person is in shock, cover the person to keep warm. Give psychological support by explaining what is happening and giving reassurance.

Helping someone who has cuts and grazes

Sign of cuts and grazes: A visible wound that involves only slight bleeding

Basic First Aid Steps:

- If possible, wash your hands with soap and water before dealing with the wound. Put on personal protection equipment to prevent contamination.
- Wash any dirt and debris from the wound with clean water, if available, until it is clean. Do not rub the injury to get the debris out
- Dry the area around the wound gently using a sterile swab but do not touch the wound directly
- If bleeding persists, apply direct pressure
- If there is an object sticking out of the wound, do not remove it. Leave it there.
- Cover the wound with a sterile pad or a clean cloth

Helping someone who has burns or a scalds

Sign of burns and scales:

Minor burns and scales: The skin turns red, feels hot, and is swollen but not broken after coming into contact with something hot.

Severe burns and scales: The skin may blister, and there is severe pain and swelling

Basic First Aid Steps:

- Cool the burn with cold running water or immerse in cool water for 15-20 minutes. Don't use ice as it could damage the skin
- If you don't have cold water, use any cold harmless liquid such as milk, orange juice, or fizzy drink
- Remove any clothing or jewellery if they are not stuck to the skin. Don't remove clothing that is sticking to the burn or scald
- Don't use any adhesive bandages as they will stick to the skin and cause further damage. After the burn has been cooled, cover the burn with clean, preferably sterile material
- Don't open blisters that are not discharging
- Don't apply lotions, cream, or ointments to the injured area

Helping someone who has a fracture

Signs of bone injuries: The person has pain that increases with movement, bruising, or swelling, is unable to move the injured part normally or is lying in an unnatural position following a fall or a blow from an object

Basic First Aid Steps

- Support the injury with your own hands or use a cushion or items of clothing to prevent unnecessary movement
- Never attempt to put dislocations back in place. Take the person to the hospital for treatment
- Cool the injury with ice wrapped in a towel if ice is available.
- Avoid bearing weight on an injured lower limb
- Continue supporting the injury until help arrives
- Give psychological support by explaining what is happening and giving reassurance

Note: a fracture is a broken or cracked bone.

Helping someone who had animal bites

Basic First Aid Steps

Animal bites:

- As with other wounds, stop any bleeding by putting pressure on the wound
- Once the bleeding is controlled, clean the wound with soap and warm water. Don't be afraid to clean inside the wound
- Put antibiotic ointment on the wound and cover the injury with a clean, dry dressing
- Watch for signs of infections (redness, swelling, heat, weeping pus)

Snake bites

- Remain calm
- Ask the person to lie down and keep still
- Immobilize the bitten arm or leg
- Use water and soap to wash out the wound if available. Do not scrub the wound
- If the victim has to walk, have the victim sit calmly for 20-30 minutes to let the venom localize at the site, then proceed calmly to the nearest source of help and try to avoid unnecessary exertion which stimulates circulation of the venom
- Do not cut or suck on the wound to remove the venom
- If possible, identify the type of snake as it will help in getting the specific anti-venom

Note: Animal bites, especially from dogs, cats, foxes, rats, horses, or bats, can carry many germs, including rabies. If a dog bites a person, it is crucial to determine whether the dog has been ill or behaves strangely. Signs of rabies in a dog include foaming around the mouth and showing severe thirst. A person bitten by a dog with rabies will need to be referred to a hospital, clinic, or health center where the anti-rabies vaccine is available.

Source: British Red Cross (u.d.). *First Aid Learning for Young People: Educator Skill Guide*; Department of Disaster Management, Ministry of Home & Cultural Affairs, Bhutan (u.d.). *Emergency Safety and First Aid Handbook*.

Strand 2: Climate Change
Unit 2: Introducing Climate Change
Topic 1: Weather and Climate

Activity 5: Weather and Climate

Purpose: Clarifying the difference between the concepts of climate and weather while alerting students to levels of public confusion about the two terms

Time needed: 40 minutes

Resources needed

- A Marker
- Sheet of paper, a sheet of chart paper, a marker, a glue stick, and a cut-up set of *Weather or Climate?* cards for each group of four students
- A copy of the *Climate and Weather* handout for each student
- Masking tape

Procedure

Stage 1

Step 1: Ask the class to form groups of four. Without an explanation, ask groups to discuss their understanding of the difference between weather and climate, ending their discussion by writing a one-sentence definition of each term on their sheet of paper (also noting down differences of opinion if they cannot reach an agreement).

Step 2: Have each group present their definitions and disagreements, encouraging questions and discussion about each presentation.

Step 3: At an appropriate moment, distribute a copy of the handout to each student. Please go through it with the whole class. End by explaining that while the difference between weather and climate is not so difficult to understand, there seems to be frequent and widespread confusion about the two terms, often making for muddled debate on climate change.

(20 minutes)

Stage 2

Step 1: Give each group a set of Weather or Climate cards, a sheet of chart paper, a glue stick, and a marker. Ask groups to draw two columns headed 'Weather' and 'Climate' on their chart paper. That done, ask them to read each card and decide whether it describes weather or climate, and then paste it in the appropriate column. If they cannot decide which column to place a card in, ask them to paste the card across the dividing line between the two columns, writing notes alongside explaining their difficulty.

Step 2: Have groups hang their charts on the classroom wall and then visit the work of other groups to note down queries or disagreements they have, paying particular attention to cards pasted across the dividing line.

Step 3: Discuss with the class the cards that most caused confusion and disagreement about whether they were about 'weather' or 'climate.'

(20 minutes)

Extension

Step 1: Set students the task of asking four adults to write their definitions of climate and weather on a sheet of paper, adding their chosen pseudonym for each adult against each definition. Have students arrange all the sheets on a pin board, the floor, or a large table surface in the classroom.

Step 2: Have the class read all the definitions and then discuss the differences in understanding and the misperceptions they see. Ask what implications the misunderstandings might have for an informed public debate on climate change.

Variation

Begin the class session with the *Weather or Climate?* Group exercise followed by a whole class discussion during which you introduce and discuss the handout. Then have groups return to their *Weather or Climate* charts and make any amendments they feel are necessary with regard to the handout discussion. Have groups report back on the changes they have made.

Potential/Facilitation Tips

This activity makes a valuable starting point for considering climate change by straightening out likely confusion over the concepts of climate and weather. In discussing the outcomes of the card activity, it is essential to play devil's advocate by teasing out the confusions deliberately woven into some cards.

Curriculum Links

This activity aligns with the Integrated Science and Technology in Form 1. The Extensions could be taken on from the English or Social Science classroom.

Source: Adapted from Selby & Kagawa (2014). Disaster Risk Reduction Education Toolkit. (St Michael: CDEMA).

Weather or Climate? Cards

<p>Everybody agreed that the day was just suitable for a swim. What a bright, sunny morning!</p>	<p>Antarctica has been freezing cold, even in the summertime, for tens of thousands of years.</p>
<p>There is a tropical storm coming in from the Atlantic!</p>	<p>This 'global warming' idea is garbage; it's been a cold and grey few weeks at a time we can expect blue skies and hot sunshine.</p>
<p>'The Caribbean region usually experiences about 12 to 15 major storms each year, four or five of which turn into hurricanes.</p>	<p>'Recently, birds have started returning early from the Caribbean to their North American breeding sites because northern springs are getting warmer.</p>
<p>'We are calling for a hot, hot week in Miami, and there will be smog over the city,' said the newscaster.</p>	<p>The sun was beating down on the desert landscape.</p>
<p>A tropical storm advisory was issued for the Windward Islands.</p>	<p>The sweltering heat wave went on and on and on. 'Wow,' she said, 'this is really global warming!'</p>
<p>September is the worst month for hurricanes</p>	<p>That year rainfall in Bridgetown far exceeded the yearly average of 127 centimeters</p>

Handout: Climate and Weather

Weather

Weather is what we see when we get out of bed in the morning and say, 'what a lovely day!' or 'It looks like a stormy day.'

It's a brief moment in a long movie about the air conditions surrounding us and affecting our lives. That moment can't be relied upon to give you a sense of the whole film.

When you listen to a 'weather forecast' on the radio or television, the presenter will say what conditions people in different islands and island areas can expect based on satellite and other information collected by 'meteorologists' (weather scientists who study what is happening to the 'atmosphere,' the air surrounding the earth). The forecast will say what temperature a place can expect; whether there will be (what is called 'precipitation' - that which falls to the ground from the skies); whether it will be cloudy or sunny; how windy it will be, and from what direction (north, south, east, west or in between the compass points); how far you will be able to see (what is called 'visibility'); likely levels of air pollution; and how much moisture there will be in the air (what is called 'humidity').

So, the weather is the mix of conditions and events that we experience over a short period: a day, a week up to a few months. It is not the same everywhere. It might be hot, dry, and sunny where you live, but fifty kilometers away wet and cold. Weather change happens quickly.

Climate

Climate is about weather patterns over a long period, usually 30 years. Meteorologists keep all the weather information - for example, daily temperature, rainfall measurements, wind speeds, and directions - they have collected for each day of each year in the 30 years and work out, on averaged past evidence, what weather is likely in any period in any place.

So, the climate is about long periods. It is about weather averages. Knowing the climate of a place leads us to expect a certain kind of weather in a particular place at a specific time of year; for example, storms in the Caribbean in September. But remember we are talking averages – there are sometimes periods without storms in September!

Scientists also use the information they collect to see if the climate is changing. For example, they may look at the thirty years of data for, say, 1970-2000 and then at the thirty years of information for 1980-2010 to find out if there is a change in the average climate picture. Doing such exercises warned them that rises in surface temperatures were happening around the planet, especially in certain regions. This is what we call 'global warming' or 'climate change' that, unlike the weather, cannot be so easily experienced on a day-to-day basis, making some people question whether it is happening.

Strand 2: Climate Change

Unit 2: Introducing Climate Change

Topic 2: What is Climate Change?

Activity 6: What is Climate Change?

Purpose: Exploring the increase in greenhouse gas emissions, the greenhouse effect, and consequent changes in the global climate.

Time needed: 55 minutes

Resources needed

- Data group handout sheets, paper, and pens for drawing graphs for four groups
- Climate change article and statements handout for each group

Procedure

Step 1: Have the class discuss what they have learnt about the different types of graphs and ways of presenting data. What do they tell us? Have a look at bar charts, line graphs, and pie charts. What do you need to decide for each one in terms of axis, scales, and so on? (10 minutes)

Step 2: Divide the class into four groups. Give each group one of the data group handouts. Working in their groups, ask them to read the information and graph the data in the way they see it as most useful. They may want to try different ways to see which works best. Looking at their graphs asks them to consider what it tells them, what they think is behind the results, and what questions it raises. Ask them to present their graphs, explaining its information, findings, and questions. (20 minutes)

Step 3: Reform the groups so that each new group has at least one person from each data set group. Ask them to read the article describing global climate change. Looking at the statements drawn out of the article, ask them to use their data and decide how confident they feel that each idea is true. How does the evidence support the statements? For which statements would they like to find further proof? (15 minutes)

Step 4: As a class, discuss what is understood by 'global climate change'. (10 minutes)

Variations

For *Step 3*: Reform the groups so that each new group has one person from each data set group. Based on all their data, ask them to present their understanding of climate change. What do the data tell us or suggest is happening?

Before the activities described under *Procedure* above: ask the students to measure the weather using thermometers recording the temperature over a week. Ask them

to calculate the average temperature for the week and plot the temperature on a graph. Discuss as a class what this graph shows.

Then, as a class, plan how they would find out the average temperature for St. Vincent and the Grenadines for the following year. How often would they need to take the temperature? What time of day? How many days? How many places? How would they do this if they were finding an average temperature for the Caribbean or the world?

Potential/Facilitation Tips

When discussing the statements, encourage the students to give reasons for their confidence level. They should consider where evidence is lacking. For example, the temperature data does not indicate how the temperature has changed in different places. Some places are experiencing more extreme climate change than others. What will happen in the future can be predicted but cannot be precisely known. The impact of climate change on people will depend on how well we adapt to and are resilient to climate change and the level of climate change itself.

To support differentiation, handouts for data groups 1 and 2 are less challenging than those of data groups 3 and 4.

Curriculum Links

This activity aligns with the Mathematics grade 7 curriculum. It falls under the *Data Handling* strand of the curriculum and, in particular, learning objective 3, organizing and displaying data using different forms of representation, and learning objective 5 interprets data and draws conclusions. The variation activity, collecting data on the weather, aligns with the *Measurement* strand of the grade 7 Mathematics curriculum learning outcome 5, recording and interpreting and calculating temperature measurements.

Handout data group 1: Greenhouse gas emissions by sector

The greenhouse effect is a process that occurs when gases in the Earth's atmosphere trap the sun's heat. This process makes Earth much warmer than it would be without an atmosphere. The greenhouse effect is one of the things that makes Earth a comfortable place to live.

Greenhouse gases are gases that add to the greenhouse effect. There is a wide range of greenhouse gases. In terms of their warming effect, two of the most important are Carbon dioxide (CO₂) and Methane (CH₄).

The table below shows you what human activities cause greenhouse gases to be emitted. It takes the total greenhouse gases emitted and divides them according to the total emitted by different human activities.

Have a look at the table below.

- How would it be best to present this information? What would be the best type of graph to use?
- Present this information in your chosen type of graph.
- What does it show you?
- Why do you think this is the case?
- What questions does it raise for you?

Present your graph, findings, and questions to the class

Human activities	Percentage of Greenhouse gas emissions produced by each sector globally
Electricity and heat production	25%
Agriculture, forestry and other land use	24%
Buildings	6%
Transport	14%
Industry	21%
Other Energy (i.e., emissions from the energy sector which are not electricity or heat production such as fuel extraction and transportation)	10%

Data taken from: <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>

Handout data group 2: Carbon dioxide emissions

When we burn coal, oil, and gas, we release carbon dioxide. The table below shows the total amount of carbon dioxide emitted globally for the years listed.

Have a look at the table below.

- How would it be best to present this information? What would be the best type of graph to use?
- Present this information using your chosen type of graph.
- What does it show you?
- Why do you think this is the case?
- What questions does it raise for you?

Present your graph, findings, and questions to the class

Year	Total annual CO2 emission in gigatons
1950	5.98
1960	9.43
1970	14.87
1980	19.45
1990	22.29
2000	24.71
2010	33.50

Data extracted from: <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>

A gigaton is a billion metric tons. An elephant weighs about six metric tons, so about 17 million elephants a gigaton.

Handout data group 3: Temperature anomalies

For nearly 200 years, the temperature in different places worldwide has been taken and recorded regularly. We can work out the global average temperature by registering the temperature at different times and places.

A good way of understanding changes in temperature is to compare the temperature at a particular time with the average temperature over a long period. The table below shows the difference between the average temperature for the years listed and the average temperature for 99 years 1901-2000.

Have a look at the table below;

- How would it be best to present this information? What would be the best type of graph to use?
- Present this information using your chosen type of graph.
- What does it show you?
- Why do you think this is the case?
- What questions does it raise for you?

Present your graph, findings, and questions to the class

Year	Difference between the average temperature for the year and the average temperature for 99 years 1901-2000
1900	-0.1
1910	-0.4
1920	-0.2
1930	-0.1
1940	0.1
1950	-0.2
1960	0.0
1970	0.0
1980	0.3
1990	0.4
2000	0.4
2010	0.7
2018	0.8

Data extracted from: <https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature>

Handout data group 4: Carbon dioxide levels

When measuring gases like carbon dioxide, oxygen, or methane, the term concentration is used to describe the amount of gas by volume in the air. The two most common units of measurement are parts-per-million. 1000 Parts-per-million of carbon dioxide means that if you divide the air into a million bits, 1000 of these would be carbon dioxide. Nine hundred ninety-nine thousand (999,000) would be other gases.

The table shows you the average amount of carbon dioxide in the atmosphere for different years.

Have a look at the table below.

- How would it be best to present this information? What would be the best graph to use?
- Present this information as your chosen graph.
- What does it show you?
- Why do you think this is the case?
- What questions does it raise for you?

Present your graph, findings, and questions to the class

Year	The average amount of carbon dioxide in the atmosphere in ppm.
1960	316.91
1970	325.68
1980	333.69
1990	354.19
2000	369.48
2008	385.34

Data taken from: <https://www.esrl.noaa.gov/gmd/ccgg/trends/mlo.html#mlo>

Handout: Climate Change Article and Statements

Explaining Climate Change

Climate change describes the change in the Earth's climate brought about by human activity. Over the last 100 years, there have been more and more factories, more and more cars and planes, more and more power stations making electricity, and changes in what we build and eat and how we produce our food. These changes have meant that we burn more fossil fuels (coal, oil, and gas). Burning fossil fuels emits carbon dioxide into the Earth's atmosphere. At the same time, forests, which take in carbon dioxide, have been reduced, meaning they no longer hold back increased carbon dioxide levels so much (i.e., act as a 'carbon sink').

Carbon dioxide, along with other greenhouse gases, acts like a greenhouse around the Earth, trapping some of the heat from the sun. As the concentration of carbon dioxide and other greenhouse gases goes up, the Earth gets warmer. This process is called the 'greenhouse effect.'

The impacts of climate change are already being felt and vary significantly from place to place. In general, climate change makes weather patterns more unpredictable and increases the number and severity of extreme weather events like hurricanes, droughts, and floods. Climate change already impacts and will continue to impact our ability to grow food.

Article based on Oberman (2016) *Creating Futures, Trocaire, Dublin*.

Look at the statement below, most of which have been drawn from the article above. Looking at your graphs and your own experience, how confident do you feel that these statements are true?

Discuss this in your groups and choose a level of confidence.

Confident Quite confident Unsure Unconfident Need more evidence

Statements suggested by the article:

- *The temperature around the world is rising.*
- *The amount of carbon dioxide in the atmosphere is rising.*
- *More carbon dioxide is being emitted because of increases in transport, factories, power stations, and changes in farming.*
- *The increase in carbon dioxide in the atmosphere is causing the temperature around the world to rise.*
- *The temperature around the world will continue to rise.*
- *The rise in global average temperature is causing more extreme weather.*
- *People's health is badly affected by the rise in global average temperature.*
- *The temperatures in some places are affected more than others.*

Strand 2: Climate Change
Unit 2: Introducing Climate Change
Topic 3: What is Causing Climate Change?

Activity 7: What is Causing Climate Change?

Purpose: Exploring the physical, social and economic causes of climate change

Time needed: 80 minutes

Resources needed

- Plenty of small pieces of paper or cards and pens for each group of three or four
- A copy of the *1.5 is Still Alive* song text for each pair of students
- A cut-up set of the *Causes of Climate Change* cards for each group of three or four

Procedure

Step 1: Divide the class into groups of three or four and hand each group a pile of small pieces of paper or cards. Ask the groups to brainstorm the causes of climate change, writing one cause on each piece of paper. If the group needs support with this, use the images of causes of climate change from the following link: <https://climatevisuals.org/images?f%5B0%5D=theme%3ACauses>. (15 minutes)

Step 2: Give copies of the Panos *1.5 is Still Alive* song. Have the class also listen to the song at <https://soundcloud.com/panos-caribbean/1pont5-to-stay-alive>. As a class, discuss what causes of climate change are suggested in the song. Invite groups to add to their brainstorming as required. (20 minutes)

Step 3: Ask each group to read out each of their suggested causes. Each group can add to their pile of causes any good suggestions made by other groups. Invite people to question other groups' proposals, asking for clarity, understanding, or pointing out what they think are mistakes or unwarranted assumptions. If helpful, read out or give out the *Causes of Climate Change Cards* to provoke further suggestions, allowing the group to add these to their brainstormed ideas. (15 minutes)

Step 4: Ask groups to divide and cluster the causes into different categories (they might think about causes relating to individual actions and behaviors, social causes, economic causes, or causes arising from how we organize society and our choices. Also, ask groups to rank their causes from those they think are *most significant* to those they believe are *least significant*. Have groups report back on their categorizations and rankings before engaging the whole class in a general discussion on the causes of climate change. (30 minutes)

Variation

Give out one set of *Causes of Climate Change* cards to each group and ask half the groups to rank the causes according to their significance in causing climate change and a half to rank the causes in terms of solvability (i.e., are some causes easier to address than others?).

Extension

Have students write reflective pieces on 'What to do about Climate Change?'

Potential/Facilitation Tips

At an appropriate point in the activity, it is vital to highlight the critical importance of limiting the surface temperature increase to 1.5 degrees Celsius above pre-industrial levels, a target that lies at the most ambitious end of *the Paris Agreement for Climate Change*. The risks of drought, floods, extreme weather events will be significantly worsened if the surface temperature rise goes beyond 1.5C, and there will be devastating consequences. Leading climate scientists call for urgent and unprecedented changes to reach the 1.5C target.

Curriculum Links

This activity can easily be aligned with the Earth Science theme in the Form 1 Integrated Science and Technology syllabus ('Earths Weather and Climate'). It can also be used to complement the Form 1 Social Science 'Environment' theme of understanding the world's physical environment in which students live. The *Extension* can be used as an English writing exercise.

Handout: 1.5 is Still Alive written by Saint Lucian poet and dramatist Kendel Hippolyte and musician Taj Weekes

1.5 IS STILL ALIVE
(In Thanks and Praise for Our Mother)

*So we have reached where we are
Some say it's too late for a turning
Poison in the air, sea and land
The body of Our Mother is burning
Our children and children of our children
Look into our eyes with a question:
How could you know what you knew
And yet still you all let it happen?
Some are saying it's just too late
Total extinction is our fate
But we've not reached the end of the rope
There's a degree, a fraction, of hope*

CHORUS

*1.5 is still alive
1.5 – we can survive
Spread the word, we still can thrive
The way begins at 1.5*

*How did we reach where we are?
1% with their lies and their power
Maintaining a system of greed
Cannibalizing Our Mother
Things and more things and more things
Is how their system keeps going
Selling us what we don't need
Feeding a giant that's growing*

CHORUS

*1.5 is still alive
1.5 – we can survive
Spread the word, we still can thrive
The way begins at 1.5*

*Global matricide is what they've begun
But we're Her children - can't let it go on
Climate justice is where we start
The guilty nations must pay their part*

CHORUS

*1.5 is still alive
1.5 – we can survive
Spread the word, we still can thrive
The way begins at 1.5*

*Never have we seen it like this
Every day brings a sign and a wonder
Disasters and profits go up
People and countries go under
The order we live in must change
People must come before profit
We're greening the system for now
But sooner than later must change it
Honor The Mother, beginning and end
Fight for Her ways to guide everything
Justice and Earth-needs go hand in hand
A system that serves ALL is what we demand
*(And till then)**

Causes of Climate Change Cards

<p>Since the industrial revolution, things are made in factories rather than by hand. Factories are run on power generated by burning fossil fuels.</p>	<p>When volcanoes erupt, they send carbon dioxide into the atmosphere.</p>
<p>People travel further and more often in cars and planes. These run on fossil fuels and emit carbon dioxide and other greenhouse gases into the atmosphere.</p>	<p>Governments refuse to take firm action on climate change because it would make them unpopular, and so they allow people to continue burning fossil fuels.</p>
<p>Big businesses want to continue making large profits, encouraging people to buy more than they need even though it is terrible for the planet.</p>	<p>People around the world eat more meat now than previously. Meat production causes more greenhouse gas emissions than vegetarian food production.</p>
<p>There is massive inequality between people. Some countries use a lot more resources than others which means they burn more fossil fuels, releasing more carbon dioxide into the atmosphere.</p>	<p>Rich people want to continue living in luxury even if it causes climate change.</p>
<p>The government and businesses are not changing from non-renewable to renewable resources fast enough.</p>	<p>Around the earth is a layer of greenhouse gases that acts as a blanket, trapping the heat radiating from the Earth's surface. Giving off more of these greenhouse gases is like making this blanket thicker, causing the Earth to get hotter.</p>

Strand 3: Climatological Hazards
Unit 3: Storms and Hurricanes
Topic 1: Hurricane Impact Stories

Activity 8: Hurricane Stories

Purpose: Exploring hurricane stories from the Caribbean region; reflecting on students' own hurricane experiences as they share them with others.

Time needed: 80 minutes with greater space for *Stage 2*, *Steps 3*, and *4* if *Variation* is followed.

Resources needed

- One cut-up set of hurricane stories
- A sheet of flipchart paper and a couple of markers per group
- A copy of the *Hurricane Story Guide* per student

Procedure

Stage 1

Step 1: Divide students into three groups and distribute one of the hurricane stories, a sheet of flipchart paper, and markers. Ask them to divide the chart paper into three columns titled *Hurricane Emotions*, *Hurricane Effects*, and *Hurricane Preparedness*. In the first column, ask groups to list emotions felt on reading the story. In the second column, groups list the social, economic, and psychological effects of a hurricane as suggested by the story. In the third column, invite students to consider what people in the story could do to better prepare for future hurricanes. (20 minutes)

Step 2: In a whole group reporting, first have those who worked with each story summarize it for the benefit of other groups. Then, group by group, have students share their *Hurricane Emotions* columns and encourage whole-class discussion. Go on to repeat the process for the *Hurricane Effects* and *Hurricane Preparedness* columns. (20 minutes)

Stage 2

Step 1: Ask each student to write their own hurricane story. Please give them the handout to guide their hurricane story writing. Tell them to brainstorm their ideas using the *Guide* and compose their own stories in prose or poetry form. (20 minutes)

Step 2: Ask students to form small groups and share each other's stories. (10 minutes).

Step 3: Hold a whole-class discussion to draw out what has been learnt. (10 minutes)

Variation

Personal story writing (Stage 2, Step 1) can be set as a homework task so that each student can spend a long time writing their own stories, and more lesson time can be devoted to sharing stories and class discussion.

Extension

Have students repeat the story writing by interviewing a significant adult in their lives and bringing their story to the class.

Potential/Facilitation Tips

Stage 1, examining hurricane stories from the Caribbean region, is a good prompt for students to reflect upon their own hurricane experience. Teachers might add SVG hurricane stories as additional stimulus materials.

In *Stage 2*, be prepared for an emotional response when students reflect on their own hurricane stories and/or listen to others' stories in SVG.

In a whole-class discussion in both *Stage 1* and *Stage 2*, encourage students to consider practical preparedness actions to reduce the hurricane impacts.

Curriculum Links

This activity is suitable for the disaster preparedness theme in the Health and Family Life Education curriculum ('demonstrating an awareness of appropriate responses to educating the impact of disaster'). It is also suitable for English lessons (Learning Outcome 1, Achievement Indicator 1, 7, 11, and 17, Grades 7/8, 'respond appropriately in conversation about literary texts,' 'listen to, recall, retell information,' 'listen to and create poetry,' 'make oral presentations of original work').

Handout: Hurricane Stories in the Caribbean

Danessa and Katy's Story, Turks and Caicos

The settlement where Danessa Estima (14 years old), Katy Estima (15 years old), and their family live is one of the poorest and most vulnerable communities in the Grand Turk Island of the Turks and Caicos.

Reflecting on the night Hurricane Irma battered the island in 2017, Danessa wrote lap lyrics in her notebook:

*“Wake up, wake up!
But 5:32?
Why the hell am I waking up at 5:32?
Ma, what’s going on?
What do you want me to do?
Did something happen to be up at 5:32?
She is finally over,
Hurricane Irma is finally done”*

Outside of their house, half of the zinc roof was lying on the ground. Mattresses, furniture, and home appliances - all wet and ruined by the heavy rains - were scattered around.

‘Right after the hurricane, everything was wet and destroyed,’ says Katy. ‘The water system was not working, so we had to fetch water from a container up the hill. It is dirty, yellow, so we had to put bleach in. We were mainly using it for washing and cleaning, but we were running out of water. We didn’t have enough money to buy drinking water.’

Source: Adapted from UNICEF <https://www.unicef.ca/en/blog/no-calm-after-storm-caribbeans-poorest-children>

Nathaly, Alain and Adam's Story, Cuba

In the small fishing village of Cojímar, just a few kilometers from the centre of Havana, the strong tropical storm winds of Hurricane Irma arrived on the morning of Saturday, 9 September 2017. Sea swelling occurs several times a year, so initially it did not surprise anyone, but the situation changed dramatically as the day went by.

'Here, the sea always swells,' says Nathaly, mother of two children, Adam (4 years old) and Alain (11 years old). 'But none of us thought it would make things worse in such a short time. It caught us all by surprise. At four o'clock in the afternoon, the sea was already entering the house, and at dawn, the sea completely covered the roof.'

Nathaly and her two children spent the hurricane with relatives a few streets higher up. From there, they watched as people carried both their possessions and children uphill where the sea continued to rise and destroy homes.

'What scared me most was to see the sea inundate us with that strong wind,' says Alain. 'I went as far from the sea as I could because it sounded very strong, it was very dark and I did not know what was going to happen.'

After losing the stove and with nothing to cook, the family depended on the prepared food stall that had been installed temporarily in the lower area of the village.

Preliminary reports in mid-September show that between 210,000 and 220,000 homes and more than 2,262 schools across Cuba have been affected due to rain and strong winds from Irma. Sanitation and hygiene remained top concerns, as scarcity in safe water supply and the high risk of pollution from flooding can increase the risk of water-borne diseases.

Source: Taken from UNICEF

https://www.unicef.org/infobycountry/antiguabarbuda_100934.html

Deltin's Story, Dominica

Deltin, 16, is one of the thousands of Dominican students who had been affected by Hurricane Maria in 2017.

When classes were dismissed on the Friday afternoon of 15 September, he had no idea that Hurricane Maria's 160 miles per hour winds would shear the roof off his school and throw the completion of his secondary school education into question.

Missing roofs, broken windows, books, and desks were strewn all around the school compound. As estimated, 90 percent of buildings on the islands were damaged or destroyed, and the schools weren't spared.

'This was not imaginable... the destruction I've seen since this hurricane is something I never thought I would see,' says Deltin, whose family also lost their home. When I first saw the damage to my home and island-wide, there was fear, but then I thought again, we rebuild. We can do it again; rebuild stronger.'

Deltin is in his final year of secondary school education, preparing for examinations in nine subjects. He worries that the prolonged school closure will defer his and his classmate's dreams.

'It's very worrying because I want to finish school and move on to college and make a life for myself, but school is at a standstill, and I don't know when we will be able to get back on track,' he says. 'I would really like school to be rebuilt fast, or they find temporary spaces for school.'

Several schools are also among the 130 official shelters providing a haven for the 2,500 people who lost their homes in the hurricane. Deltin, his mother Angela, and brothers Sarael, 14, Jervon, 11, and Jaden, 9, live in a shelter.

Source: Taken from UNICEF <https://www.unicef.org/stories/hurricane-maria-aftermath-dominica>

Handout: Hurricane Story Guide

- When it happened: _____
- Where I was: _____
- Who I was with: _____
- What I was doing: _____
- The first thing I heard about the hurricane was...
- The most surprising thing I saw was...
- The most upsetting thing was...
- The most confusing thing was...
- One good thing that happened was (if any)...
- One thing I can do to better to prepare for a future hurricane is...

Strand 3: Climatological Hazards
Unit 3: Storms and Hurricanes
Topic 2: Safety Measures and Practice

Activity 9: Hurricane Preparedness

Purpose: Critically reviewing hurricane preparedness at home; understanding how to be better prepared at home for a hurricane

Time needed: 40 minutes (25 for *Steps 1* and 15 minutes for *Step 2*)

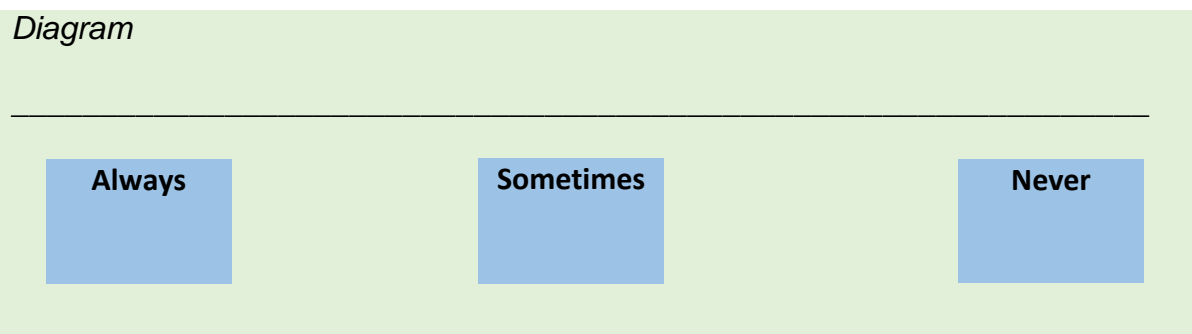
Resources needed

- Open space in the classroom
- A set of three large labels (*Always*, *Sometimes*, *Never*) as per the diagram below

Procedure

Step 1: Create an open space, chalk a long straight line on the classroom floor and place the labels in position. Ask all the students to stand up and be ready to move to an appropriate position along the line in response to each of several questions concerning hurricane preparedness at home. (40 minutes)

Diagram



Read out the first question from *Box 3* below and ask students to move to the appropriate location. Give 30 seconds for students to talk to people in the same group about why they chose to stand close to the label in question and to encourage them to share concrete examples, if any. Pick out some students to explain why they chose their specific location. Repeat the process until all the questions have been covered. (25 minutes)

Box 3

- Has your family created a family hurricane plan detailing who does what, where you go if you need to evacuate, and what you take along?
- Does your family store enough non-perishable food items (e.g., canned or bottled food, bagged and boxed items, energy boosters such as granola bars and nuts) to sustain your family for one week?

- Does your family make sure there is enough drinking water available to sustain each family member for two weeks (minimum one gallon of water per person per day for 14 days)?
- Does your family secure all windows and doors with plywood and/or does your family close hurricane shutters if you have them?
- Does your family keep updated on a storm's status by listening to advisories from NEMO and the Met Office?
- Does your family remove all loose items from your backyard?
- Does your family make sure that the gutters are tightly hinged and that they drain freely?
- Does your family check all the windows and doors to ensure no loose window panes/hinges?
- Does your family keep flashlights handy with fresh batteries?
- Does your family check for any loose sheeting or loose nails on your roof?
- Does your family trim back any trees that touch power lines or hang over the house?
- Has your family assembled an emergency supply kit?

Step 2: Hold a whole-class debriefing discussion. End the class by giving a copy of the questions to each student. Ask the students to discuss the questions at home with family members. (15 minutes)

Extension

In the following lesson, have the class share what was discussed; share any new intentions brought to the surface through the out-of-school work and any good examples of family hurricane preparedness.

Potential/Facilitation Tips

This activity is a simple one designed to reflect on the current status of hurricane preparedness at home.

During *Step 1*, students need to be honest when choosing a position; the activity relies on the stance chosen, reflecting reality rather than an ideal. Also, during *Step 1*, have each student keep notes on how many 'Always,' 'Sometimes,' and/or 'Never' positions they have chosen. Have them reflect on their record during the discussion in *Step 2*.

During *Step 2*, explain that the questions are based on some of the critical hurricane preparedness actions recommended by the SVG National Emergency Management Office (NEMO Website and NEMO *Hurricane Guide*). Invite students to share other hurricane preparedness actions taken at home and discuss any challenges involved in taking a specific preparedness action and possible ways of getting around those challenges.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, which calls on students to 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.' It can also feature as part of the Physical Education curriculum.

Strand 3 Climatological Hazard

Unit 3 Storms and Hurricanes

Topic 3 Collecting Local Experience, Pursuing Advocacy and Action

Activity 10: Hurricane Safety Awareness Raising

Purpose: Promoting hurricane safety messages at home

Time needed: 55 minutes

Resources needed

- Two copies of *Hurricane Safety* handouts
- A sheet of chart paper and a few colour markers per group

Procedure

Step 1: Divide students into eight groups and give each group a chart paper and markers. Assign each group one of the following situations concerning a hurricane: during a cyclone, if an evacuation is necessary; after a cyclone (at home); after a cyclone (out in the community). Explain that their task is to consider safety messages on what to do in the given situation and develop a short 'attention-grabbing' radio program of up to 2 minutes. (15 minutes)

Step 2: Give the *Hurricane Safety* handouts relevant to each group. Ask each group to review the handout and finalize their radio program. (10 minutes)

Step 3: Invite groups to give their radio presentation one by one. End with a plenary discussion. (30 minutes)

Extension

Give students a set of the handouts used in the lesson to review with their families and bring ideas to the class for improving and adding to the advice given. Discuss ideas shared in the following lesson. [See *Box 4* for families to go directly to NEMO websites.]

Box 4

- What to do during a hurricane
<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/267-what-to-do-during-a-hurricane>
- What to do if evacuation is necessary
<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/302-what-to-do-if-evacuation-is-necessary>
- What to do after a hurricane
<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/303-what-to-do-after-a-hurricane2>

Potential/Facilitation Tips

This activity is a simple but creative one to communicate hurricane safety messages. For a larger class, eight groups should be created (two groups covering the same situation), while with a small class, four groups should be formed (one group covering one situation).

During *Step 1*, do not share the handouts. Students need to reflect upon their previous hurricane experiences and develop their safety advice at this stage.

In *Step 2*, remind each group not to just read out some sections from the handout but encourage them to make the radio program lively, spontaneous, and attractive for the audience.

Step 3 a plenary discussion, discuss both the content of the safety messages and their presentation. Questions to take the class discussion forward might include the following:

- Do you agree with all the safety messages you have heard in different presentations? If not, explain why.
- Do you think some important safety messages might be missing from the specific presentations you have heard? If so, what are they?
- Which radio presentation grabbed your attention most and why?

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, where students 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.' It can also complement the Form 1 Visual Arts Curriculum (creating, interpreting, and presenting).

Hurricane Safety Handout 1

What To Do and Not To Do - During A Hurricane

- Do not go outside unless it is necessary.
- When the winds get very strong, you are in danger of being hit by flying objects.
- Children should not be taken outside since they may be in danger of being blown away.
- If you are away from home, remain where you are until the hurricane has passed. Many people have lost their lives trying to go from one place to another.
- Keep a hurricane lamp burning, as it may make the night more tolerable.
- If the house shows signs of breaking up, stay under a table or hunker down in a sturdy closet.
- Be prepared for material falling from the ceiling.
- If your glass windows have not been boarded up, place a large, heavy object in front of the window to protect yourself and others from splintering glass.
- Be calm! Your ability to act logically is essential.
- Listen to the radio for information on what is happening.

Source: Taken from the SVG NEMO website:

<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/267-what-to-do-during-a-hurricane>

Hurricane Safety Handout 2

If Evacuation Is Necessary

- Leave as soon as possible (if possible, in daylight).
- Avoid flooded roads and watch for washed-out bridges.
- Evacuation will probably take longer than expected. Give yourself plenty of time.
- Secure your home by unplugging appliances and turning off electricity and the main water valve. Doing this will reduce potential damage to your appliances/devices (from power surges) and your home
- Tell someone outside of the storm where you are going. Relatives and friends will be concerned about your safety. Letting someone know your travel plans will help relieve their fears and anxiety.
- If time permits, and you live in an identified surge zone or area prone to flooding, move furniture to a higher floor. Moving valuable furnishings helps reduce potential damage.
- Bring pre-assembled emergency supplies and warm protective clothing. People frequently arrive at shelters with nothing. Bring these items with you to a shelter:
 - First aid kit, manual, and prescription medications.
 - Baby food and diapers.
 - Cards, games, and books.
 - Toiletries. Battery-powered radio and extra batteries flashlight (one per person) and extra batteries, blankets, or sleeping bags.
 - Identification document(s), valuable papers (copies of insurance papers, passports, and other essential documents)
- Lock up your home and leave. There may be individuals evacuating after you or returning before you.

Source: Taken from the SVG NEMO website:

<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/302-what-to-do-if-evacuation-is-necessary>

Hurricane Safety Handout 3

What To Do and Not to Do - After A Hurricane (At Home)

- Do not empty water stored in bathtubs or other receptacles until the safe drinking water is restored.
- Boil all drinking water until you are sure that a safe water supply has been restored.
- Continue listening to local radio or television stations for information and instructions.
- Electricity equipment should be checked and dried before being returned to service.
- Stay out of the building if water remains around the building.
- When entering buildings, use extreme caution. Use battery-powered lanterns or flashlights when examining buildings. Watch out for animals that may have come into buildings with the floodwaters.
- Examine foundations, walls, floors, doors, staircase, and windows to ensure that the building is not in danger of collapsing.
- Look for fire hazards and electrical system damage. Also, check for gas leaks and sewage and water line damage.
- Watch for loose plaster, drywall, and ceiling that could fall.
- Take pictures of the damage to the building and its contents for insurance claims.
- Open windows and doors to ventilate and dry your home.
- Check refrigerated food for spoilage.
- Service damaged septic tanks, cesspools, pits, and leaching system as soon as possible.

Source: Taken from the SVG NEMO website:

<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/303-what-to-do-after-a-hurricane2>

Hurricane Safety Handout 4

What To Do and Not to Do - After A Hurricane (Out in the Community)

- Do not touch loose or dangling electrical wires. Report these to the power company, the nearest police station, parish council, or fire department. Report any broken sewer or water mains directly to the parish council, the public works department, or water resources authority for your area.
- Immediately after the hurricane, don't use stored water for washing houses, cars, and watering gardens until regular water services have been restored.
- Watch out for fallen trees. Collect fallen branches and other debris and pile them where they can be easily collected.
- Do not go outside barefooted. Wear sturdy shoes. Avoid wearing open shoes and watch out for broken glass.
- If you are evacuated, return home when local officials tell you it is safe.
- Stay away from floodwaters. Floodwaters may last for days following a hurricane. Moving water only six inches deep can sweep you off your feet. Standing water may be electrically charged from underground or downed power lines.
- If you come upon a barricade, follow detour signs or turn around and go another way.
- Help injured or trapped persons and give first aid where appropriate.
- Help a neighbour who may require special assistance - infants, older adults, and people with disabilities.

Source: Taken from the SVG NEMO website:

<http://nemo.gov.vc/nemo/index.php/hazards/hurricane/303-what-to-do-after-a-hurricane2>

Strand 4: Geological Hazards
Unit 4: Earthquakes
Topic 1: Human Impact Stories

Activity 11: Earthquake Survivor Stories

Purpose: Learning of the experiences of earthquake survivors from different parts of the world, exploring immediate and longer-term impacts of earthquakes and the resilience of ordinary people.

Time needed: 60 minutes

Resources needed

- Copies of Subina's Story for half the class; copies of Devon's Story for half of the class
- Sheet of chart paper and marker for each group of three/four students

Procedure

Step 1: Have students brainstorm what they know about earthquakes, their causes and effects, and what happens when a strong earthquake happens. Write down all ideas on the board or flipchart. Then fill in gaps in student knowledge by drawing upon information in *Box 5*. [You can reinforce understanding of the *divergent*, *convergent* and *lateral* movement of tectonic plates by having students do simple hand exercises, i.e., hands moving apart, hands pushing together, hands sliding past each other with some friction.]
(15 minutes)

Step 2: Distribute copies of each story to students, so that half have one story and half the second story. Then ask students to form groups of three/four with the same story. Have group members quietly read their stories.

Hand each group a sheet of chart paper and a marker. Have groups divide the paper into three columns: *Earthquake Emotions*, *Earthquake Effects*, and *Earthquake Resilience*. In the first column, ask groups to list the survivors' emotions during, immediately after, and sometime after the earthquake. In the second column, groups list the social, economic, and psychological effects of the earthquake as suggested by the story. In the third column, groups list examples of courage and resilience in light of the earthquake's devastation.

Step 2: During the debriefing, first ask the students who worked with each story to summarize its contents to benefit the other half of the class. Then group by group, have students share the *Earthquake Emotions* listed, giving space for whole-class discussion after the sharing is complete. Go on to repeat the process for the *Earthquake Effects* and *Earthquake Resilience* columns.

Extension

Have the students write reflective prose pieces or poems out of class using the stories and class discussion. Have these read out and discussed at a subsequent lesson.

Potential/Facilitation Tips

Be prepared for an emotional response to the stories. If necessary, allow for emotional release through moments of quiet reflection, hugging, and deep breathing.

The closing discussion raises the question of where responsibility lies for alleviating the devastating effects of major earthquakes - with the international community, the national government, local government, local communities, and the wealthy?

Curriculum Links

This activity accords with the Form 1 Health and Family Life Education 'Disaster Preparedness' theme, under which students are to show the ability to 'understand the nature of natural disasters that can affect SVG.' It can also fall under the focus in Form 1 Physical Geography on earthquake zones, earthquake causes and effects, and earthquake predictive and precautionary measures. Alternatively, it can be addressed under the English reading curriculum for Form 1, i.e., decoding and comprehending text, responding critically to aesthetic, cultural, and social values in texts, and expressing responses to texts.

Box 5: What is an Earthquake?

The earth's surface is made up of many huge pieces of rock, making up a gigantic jigsaw puzzle. These pieces are called tectonic plates. An earthquake is a sudden violent shaking of the ground caused by the movement of the plates, typically causing great destruction.

For hundreds of millions of years, the forces of plate tectonics have shaped the earth, as the massive plates that form the earth's surface slowly move over, under, and past each other. Sometimes, the movement is gradual. The plates become locked together at other times and cannot release their accumulated energy through movement. When the accumulated energy grows strong enough, the plates break free with a great shuddering causing what we know as an earthquake. If the earthquake occurs in a populated area, it may cause many deaths and injuries, and extensive property damage

Earthquake activity in and around St. Vincent and the Grenadines results from various types of movements within boundary zones of the Caribbean Plate.

There are generally three kinds of plate movements that can cause an earthquake:

- **Spreading:** when plates are spreading or separating from each other, we call the movement **divergent**

- **Colliding:** when plates are colliding or pushing against each other, we call the movement **convergent**
- **Sliding:** when plates are sliding past each other, we call this movement **lateral** (i.e., side-by-side)

The movement of plates causes an accumulation of pressure and energy that can result in a sudden movement of the ground, an earthquake

Estimates indicate that approximately 500,000 earthquakes occur each year; however, only one of every five is felt by humans. The magnitude of an earthquake is usually measured using the Richter scale, from 1.0 to 10.0. An earthquake measuring 2.0 on the Richter scale would not be felt but can be detected by special equipment. An earthquake measuring 9.0 would cause severe devastation, toppling buildings. An alternative scale used to measure earthquakes is the Mercalli scale. This focuses on the effects caused by the earthquake, going from I, where it is not felt, to XII, where it causes enormous destruction.

Source: NEMO website:

<http://nemo.gov.vc/nemo/index.php/hazards/earthquake/260-what-is-an-earthquake>

Handout: Subina's Story (Nepal Earthquake, April 2015)

These days, there are recurring nightmares. On the plane from Kathmandu to London, I drifted off for a while. There were lots of crumbling walls, a deep rumbling noise, and violent shudders. I woke up frightened. All the other passengers were sleeping peacefully.

Part of me always knew I'd have to tell the story of the big quake - and I always hoped that it would never come to that. When it happened, the mind froze. I had just stepped into an art gallery when the building started shaking violently. I stood behind the door, holding on to it while everything around me thundered. People were screaming and running. They could not run in a straight line. Then, it stopped.

The mind works in strange ways. The roles of a mother, wife, daughter, and a journalist get segregated. As I fumbled to reach out to the phone, I got a text from my husband. "We're OK." The mother in me wanted to go home and see with my own eyes that my children were ok. As we drove back everything felt like a movie in slow motion. People had stopped on the road and were staring blankly. Some were crying. There were small cracks on some sections of the road. A local bus decided it was safe to go on. Another aftershock. Then silence again. Or maybe silence is all that I remember - an enormous silence in my head. I don't remember the chaos, until we reached my neighbourhood.

In the square where we park our car, hundreds of people had gathered around. There was fear in their faces. I found my children - playing in the back seat of our car. The car door was locked. My husband, looking pale and chewing his nails, was searching for me in the crowd. Then there was another shock. A man was brought to the square caked in dust and blood. Someone said she was a first-aider. The aftershock brought a few bricks down. The whole square held on to each other, panicked. How fragile life seemed to be then.

It took a while for the noise to build up. For a while, all I could think of was that the vision of earthquake-apocalypse in Kathmandu had not come to pass. Most of the badly built houses were still standing. But when news started filtering in, I realised that many villages outside Kathmandu had been devastated. Even among people I cared for, much went wrong. My cousin and his wife both broke their legs as a neighbour's wall crumbled on them. Their children were saved by seconds. A relative had a head injury and had haemorrhaged to death. My parents' house is badly cracked.

A few hours after the first quake, when we went to Patan Durbar Square, it was hard not to break down. Many of my favourite temples had turned to piles of rubble. There was dust everywhere and people caked in mud from the debris were being whisked to the hospitals.

And I watched with a sense of pride to see friends, neighbours, and local youngsters rise to the challenge of rescue and relief efforts. The very next day, I saw some friends drive with relief materials to badly hit areas. They have not stopped - despite the second quake two weeks later that has undone many people's nerves. Statues and struts of broken temples were being guarded by youth in the absence of authorities. Police and army personnel were stoically working - even while their own homes were in ruins. The worst of the crisis had brought out the best in people.

But it's not been easy. We've been lucky to have a supportive family and our children were whisked to the safety of the UK. Back in Nepal, when the second earthquake hit on May 12, something inside me snapped. Motion of any sort made my heart leap. It's difficult to maintain a journalistic distance in these times. Image of the quake - the broken homes, the lost faces - all make me wake up with a fright every time I sleep. I've nightmares of landslides. The task of rebuilding is going to be mammoth.

Source: Subina Shrestha, 'The story I wish I never had to tell'

<https://www.aljazeera.com/blogs/asia/2015/05/nepal-earthquake-al-jazeera-correspondent-subina-shrestha-story-150524213235333.html>

Handout: Devon's Story (Mexico Earthquake, September 2015)

I was at home when the 7.1 magnitude earthquake hit Mexico City on September 19, exactly 32 years after the 1985 tragedy that killed thousands. There was no warning that the quake was coming, despite the fact that the capital boasts one of the most advanced earthquake alarms in the world.

The first tremble from beneath the earth was minor, and I thought it was a truck passing or the metro slithering underneath - normal things that make the streets rumble in this megalopolis. But the second shock hit with a force that launched me to my feet. The house swayed and twisted as if it was made of paper, and the city erupted into a cacophony of sirens and sounds of destruction as I stumbled out the front door. Suddenly, I was shirtless and shoeless in the street with my neighbours, being thrown back and forth by the ground that seemed to turn to liquid.

As we all reeled in the street, the smell of gas seeped out of the front gate. 'Shut the gas and turn off the electricity, there's a leak!' shouted one neighbour. I hurried back in and tried to open the door to the back patio to reach our tank, but it was blocked. I could smell the gas leaking into the air. I ran back outside to the courtyard, into the neighbours' house and up the spiral staircase to the shared roof so that I could get to our patio from above. The gas tank and some miscellaneous construction material had fallen across the door. I twisted the knob to close the tank and lifted it to an upright position as two neighbours emerged from the roof coughing and gagging from the toxic fumes.

I grabbed a shirt, some flip-flops and my roommate's dog, and left on foot fearing an explosion. I did a slow lap around the block and started to realize the extent of the damage. Around the corner, near the Centro Medico metro station, an apartment building teetered, close to collapsing, as glass and pieces of concrete rained down on the sidewalk. Residents of the building scattered on the street below, their gazes fixed on their precarious homes. Smoke could be seen rising above rooftops, and the streets filled with more and more panicked residents. I tried to call my family and friends but the networks were overwhelmed, and I couldn't get through to anyone.

Returning to my house, the smell of gas had lifted, but we remained without electricity or Internet. I kept trying to make phone calls, with no luck. At a loss, I grabbed my camera and headed out into the streets again. People were embracing each other, frantically trying to reach their loved ones or running in panic. The devastation only seemed to get worse everywhere I looked: Within a few blocks I saw several hospitals that had sustained fatal damage, and patients were being evacuated into the street in wheelchairs. These particular hospitals, and other new buildings built since the catastrophic earthquake in 1985, were supposed to be built with some of the strictest building standards in the world after new laws were passed in 1987.

The chaos and noise only kept growing as the city descended into total gridlock. As white-collar office workers, fled their workplaces by car and on foot, the streets became impassable. Improvised barriers were erected around buildings that were still shedding deadly shards of glass or on the brink of collapse. Public transportation shut down, and a stream of people emerged from underground metro entrances. Millions took to the streets. While the storefronts remained closed, street vendors sold Popsicles and tacos without skipping a beat — it was surreal.

The desperation and panic in the immediate aftermath reached a climax when I came upon a five-story office building that had collapsed, one of about 50 in the city, with at least 10 people still inside. Hundreds, maybe a thousand, had already gathered and worked with their bare hands — in their suits and ties — to remove the rubble that buried their co-workers. Citizens swarmed and formed a human chain, moving the tremendous pile of ruin as fast as humanly possible. Police struggled to establish some order. Ambulances stood by. One man sat on the sidewalk, full of soot, staring blankly into the crowd, struggling to cope with what he'd just seen.

After five or six hours, when power came back on, I was finally able to reach my family and begin to check in with friends in the city. In the following days, the chaos continued as we all worked to rescue

survivors, move donated supplies around the city and locate our loved ones. The response from the Mexican people has been overwhelming. Despite a total breakdown of the state's official disaster response, people continue to offer their time, money and resources to neighbours and strangers during the long clean-up process.

Source: Devon VanHouten-Maldonado. *I survived the Mexican Earthquake. This is My Story*
<https://www.ozy.com/true-story/i-survived-the-mexico-city-earthquake-this-is-my-story/81162>

Strand 4: Geological Hazards
Unit 4: Earthquakes
Topic 2: Safety Measures and Practice

Activity 12: Earthquake Message Match

Purpose: Helping students understand steps to be taken in anticipation of an earthquake, during an earthquake, and immediately after an earthquake.

Time needed: 40 minutes

Resources needed

- CDEMA *We Ready! Earthquake* jingle:
<https://www.youtube.com/watch?v=ydgy9afrErk>
- CDEMA *We Ready (Drop, Cover, Hold-on)* cartoon:
<https://www.youtube.com/watch?v=ixWh2RA0m9Y>
- A large-print, cut-up set of earthquake messages (pasted on cardboard for re-use)
- Chart paper and markers for poster making (for *Extension*)
- Computer (s) with internet access

Procedure

Stage 1

Step 1: Have the class watch and listen to the CDEMA *We Ready! Earthquake* jingle. Play it a couple of times. Then ask the class to sum up the key messages from the jingle regarding what to do in an earthquake.

Step 2: Have the class watch the CDEMA *We Ready (Drop, Cover, Hold-on)* cartoon. Ask for additional messages about earthquake safety that the cartoon puts forward.

Step 3: Reinforce the importance of 'Drop, Cover, Hold-on' in the event of an earthquake. Warn that three times during the class, you will clap your hands loudly. Explain that a clap should be understood as an earthquake suddenly starting and that everyone should react instantaneously by dropping, covering, and holding.

(10 minutes)

Stage 2

Step 1: Invite the class to stand in an open area and give each student one part-message piece of an earthquake safety message (make sure you have jumbled them up before you distribute them). [Take a part-message yourself if the number in the class is uneven; ask a pair of students to share one part-message if there are not enough part-messages to go round.]

Step 2: Explain that the activity is about matching message parts, and there are two parts to each message. Invite students to move around looking for someone whose message fits with their own, i.e., the two part-messages joined together to make sense.

Step 3: When everyone is part of a pair, ask pairs, one by one, to read out their message. Encourage the asking of questions about the messages as the process continues

Step 4: When the discussion is drying up, explain to the class that the messages are taken from the SVG NEMO website and that there are three categories of message on the website: advice on what to do in anticipation of a possible earthquake; advice on what to do during an earthquake; advice on what to do immediately after an earthquake to remain safe. Invite pairs to decide which category their message belongs to and to move around and join up with pairs they think are in the same category as themselves.

Step 5: When the three large groups have assembled, they read out their message one by one. Begin with the 'before' group, then move to the 'during' group and end with the 'after' group. After each group report, ask the class if they think every pair is in the right group. If not, encourage discussion on where they should be.

Step 6: When the messages have been read out, and everyone is satisfied that pairs are in the right group, encourage students to ask questions, raise practical concerns, and share their worries. Ideally, the activity can end at this stage or continue with the extensions described below.

(30 minutes)

Extension

Invite the 'before,' 'during,' and 'after' groups to work individually on a collection of statements. They then turn them into *Before an Earthquake*, *During an Earthquake*, and *After an Earthquake* section of an *Earthquake Code of Behavior* that they can share at home, with the school community, and the local community. As part of their work, ask them to search out other ideas by visiting the NEMO and the University of the West Indies, Seismic Research Centre earthquake safety websites:

- <http://nemo.gov.vc/nemo/index.php/hazards/earthquake>
- <http://uwiseismic.com/General.aspx?id=15>

Have the groups display their work in poster form and arrange opportunities to present their code and posters at a whole school or community gathering, at home, or to the children at a local primary school.

Potential/Facilitation Tips

Don't forget to clap your hands on three random occasions during the activity! Each time ask the students to be self-critical. Were we quick enough? Were we slow on the uptake? What could we do better next time?

This lively, practical activity on earthquake safety measures also allows the students to be earthquake awareness 'ambassadors.'

Questions to pose during *Stage 2, Step 6* that would anticipate work under the *Extension* would be:

- Did the messages offer sound advice that you had not come across before?
- Were there bits of advice you did not quite understand or raise concerns or worries for you?
- Has the activity raised fears you might want to share?
- If we want to get the message out about earthquakes, how can we ensure our *Earthquake Code* has maximum impact? How do we ensure that local young people take notice?

Curriculum Links

This activity complements the Disaster Preparedness theme in Form 1 Health and Family Life Education, where students are enjoined to 'demonstrate an awareness of appropriate responses for reducing the impact of a disaster.' It also fits under the Form 1 'Natural Systems (Physical)' section of the Form 1 Geography curriculum. The third topic in the section looks at earthquake zones, explores causes and effects, and looks at earthquake predictive and precautionary measures. It could additionally be attempted as part of the Physical Education curriculum.

Earthquake Messages

Ensure bookcases, china cabinets	and other tall furniture are bolted to the wall
If you are outside when the shaking starts	drop to the ground in a clear spot until it ends
Each time you feel an aftershock	drop, cover, and hold-on
Keep a flashlight and sturdy	shoes by each person's bed
After the shaking open	closet doors and cabinets carefully as contents may have shifted
Hang pictures, mirrors, and heavy items	away from places where people sleep or sit
Stay away from windows to	avoid being injured by shattering glass
If a power line falls on your vehicle	do not get out but wait for assistance
Ahead of an earthquake, pick safe places in rooms you occupy	such as under sturdy furniture or next to an interior wall
After an earthquake	be ready for the potential aftershock, landslides, or even a tsunami
If you are in bed, stay there	curl up and hold on and protect your head with a pillow
Practice drop, cover, and hold on	in different safe places in home and school
Look around quickly for damage	and if your home is unsafe, get everyone out
If you are in a vehicle when an earthquake happens, pull over to a safe location, stop	and stay inside with the seatbelt fastened until the shaking ends
If near the ocean and you feel an earthquake	leave immediately for higher ground
Look out for damaged power lines	or broken gas lines and stay away from the area
If you are in a mountainous area with unstable slopes	watch out for landslides, falling rocks, and debris
Bolt and brace water heaters and gas appliances to walls	and brace overhead light fixtures

Strand 4: Geological Hazards
Unit 4: Earthquakes
Topic 3: Earthquakes in the News

Activity 13: 'It Rocked the Place Really Hard' – Earthquakes in the News

Purpose: Exploring one of the stronger earthquakes to have struck the Caribbean region in recent years; considering the disaster risk implications for St Vincent and the Grenadines; developing skills in critically reading and creatively composing media messages about earthquakes.

Time needed: 120 minutes

Resources needed

- Enough sets of newspaper front pages and social media accounts covering the Venezuela/Trinidad earthquake of 2018 so that there is a set for each group of four students. [Print out the headlines and reports from those listed in *Box 6*; alternatively, share the web links and have groups conduct their Internet search.]
- Have available for showing the social media video accounts of the 2018 earthquake (*Box 6*)
- Two large sheets of chart paper for each group, together with a few small pieces of paper, a paste stick, masking tape, crayons, and markers
- Computer (s) with internet access

Procedure

Stage 1

Step 1: In a stern voice as though a newsreader, read out slowly and emphasize the earthquake event data set out in *Box 7*, leaving a pause after each paragraph for students to take in the information.

Step 2: Point out that the reading gave just a selection of earthquake events regularly affecting St Vincent and the Grenadines. [Explain the Richter scale magnitudes, if necessary, drawing from *Box 8*.] Go on to draw student attention to the 'Earthquakes Near St Vincent and the Grenadines' website to show the constancy of the threat: <https://earthquaketrack.com/p/saint-vincent-and-the-grenadines/recent>

Mention that the combination of magnitude and depth with an epicenter close to human population, so lethal in the Haiti earthquake of 2010, has not been present in recent times in the Caribbean. Recall, though, that the head of the University of West Indies Seismic Research Centre warned in December 2018 that signs indicate a 'big one is coming' should be treated seriously and 'it is better to be prepared for a major earthquake'.

<https://www.caribbeannewsnow.com/2018/12/12/caribbean-told-to-be-prepared-for-a-big-earthquake/>

Step 3: Explain that the class is going to work on newspaper and social media reports on a recent major earthquake event that struck the Caribbean in recent times; the Venezuela/Trinidad and Tobago earthquake of August 2018, which measured magnitude 7.3 ('major') on the Richter scale at its epicenter some way off the Venezuelan coast reducing to 6.9 when it hit Trinidad & Tobago. The earthquake was only semi-deep with few aftershocks. Nonetheless, it was a wake-up call.

Step 4: Divide the class into groups containing four and hand out the reports (or a list of web links to follow up). Have groups work on answers to the following four questions:

- What happened?
- How were people affected?
- How did they react?
- What lessons might be drawn?

Have groups set out their answers on their first sheet of chart paper.

Step 5: Once completed, have each group presents their work, encouraging others to comment and ask questions

(60 minutes)

Stage 1

Step 1: Have each group imagine being a newspaper team preparing the front page of a weekly newspaper a few days after the event. Remind them what is usually on a front page: a big headline, the main story with pictures, side stories with pictures, and comments by the editor. Remind them to give their newspaper a title, too!

Explain that their task is to prepare the front page using their second sheet of chart paper and their crayons and markers. They need to agree on what story angles to take, what stories to write up, what pictures to draw, and who will prepare what. Make clear that parts of the front page can be drawn on smaller pieces of paper and then assembled on the big sheet. Emphasize that the front page should address the questions asked earlier.

Give sufficient creative time for the front pages to be compiled

Step 2: Have groups present their front pages, giving space for feedback, questions, and discussion after each presentation.

(60 minutes)

Variation

With sufficient Internet availability, each group selects an earthquake of their own choice from the region or worldwide.

Potential/Facilitation Tips

In exploring what lessons might be drawn, encourage students to think about actions at different levels (individual, family, community, national, regional) that might be taken to improve earthquake protection.

Curriculum Links

This activity accords with the Form 1 Health and Family Life Education 'Disaster Preparedness' theme, where students are to show the ability to 'respond appropriately to warnings of impending disasters' and 'understand the nature of natural disasters that can affect SVG.' It can also fall under the focus in Form 1 Physical Geography on earthquake zones, earthquake causes and effects, and earthquake predictive and precautionary measures. Finally, it complements the Form 1 English curriculum writing objectives of 'producing text for different purposes and audiences' and 'producing text for self and others for enjoyment' under which news headline writing falls.

Box 6: The Venezuela/Trinidad & Tobago Earthquake of 21 August 2018

Newspapers Responses

- Trinidad RATTLED by SECOND earthquake – 'It rocked the place REALLY HARD' (note title of activity taken from this headline)
<https://www.express.co.uk/news/world/1006928/trinidad-earthquake-tobago-Venezuela-earthquake-USGS-UWI>
- EARTHQUAKE! – 6.8 Magnitude
https://www.trinidadexpress.com/news/local/earthquake---magnitude/article_cbb1b464-a589-11e8-a6f7-bbc3990ecfb2.html
- Venezuela and Trinidad Struck By Massive 7.3 Magnitude Earthquake
https://www.huffingtonpost.co.uk/entry/venezuela-and-trinidad-struck-by-powerful-magnitude-earthquake_n_5b646ccee4b0de86f4a0c57f
- Major 7.3-magnitude earthquake rocks Venezuela
<https://www.nbcnews.com/news/world/major-7-3-magnitude-earthquake-rocks-venezuela-n902706>
- ROCKED BY QUAKE
<https://www.thesun.co.uk/news/7070544/venezuela-trinidad-earthquake-tsunami-warning-cancelled/>

Social Media Videos

- Venezuela-Trinidad compilation video of reactions to the August 2018 earthquake:
<https://www.youtube.com/watch?v=lvLukGnDDL4>
- <https://www.theguardian.com/world/video/2018/aug/22/73-magnitude-earthquake-in-venezuela-rocks-buildings-and-cars-video>

Box 7

It is 27 February 2019. St Vincent and the Grenadines were among the Caribbean islands rocked by a magnitude 4.6 earthquake early this morning, According to the University of West Indies Seismic Research Centre, the quake occurred at about 1:13 this morning with a depth of 22 kilometers. Other islands that felt the earthquake were Barbados and St. Lucia. No injuries were reported.

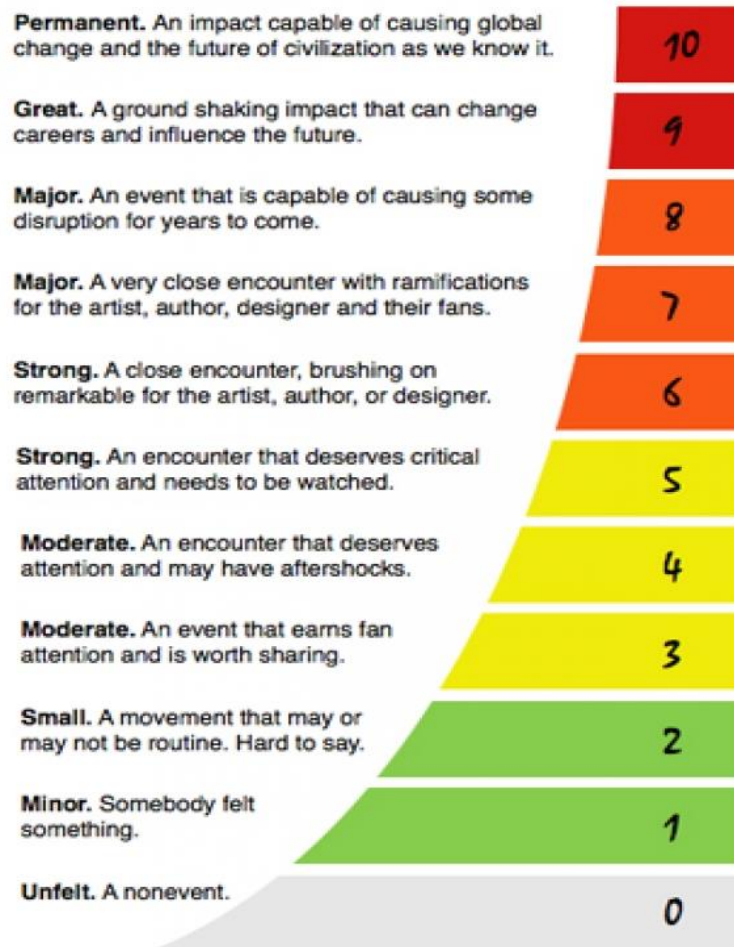
It is 28 September 2018. Vincentian and others in some parts of the Caribbean region experienced an earthquake this morning of magnitude 5.6. The tremor was felt in Martinique, Dominica and St. Lucia.

It is 17 July 2015. Vincentians were jolted out of their normal routine today by a series of earth tremors that occurred mainly during the morning period. The National Emergency Management Organization confirmed that five earthquakes were felt. NEMO had not received any report of damage.

It is 14 May 2015. NEMO says an earthquake with a magnitude of 4.7 was felt here in St Vincent and the Grenadines this morning. NEMO says the epicenter was 64km east of St. Lucia occurring at a depth of 21 km

It is 18 February 2014. St Vincent and the Grenadines is among the regional countries that felt a 6.5 magnitude earthquake early this morning that occurred 172 kilometers north east of Barbados. This was the strongest quake in the eastern Caribbean region since 2007 when a 7.3 magnitude quake struck Martinique

Box 8: Richter scale



Source: <http://www.yousense.info/72696368746572/richter-international-solutions-on-a-human-scale.html>

Strand: 5 Human-Made Hazards & Epidemics

Unit 5: Fire

Topic 1: Bush fires

Activity 14: Bush Fires Causes and Effects

Purpose: Critically exploring the causes and effects of bushfires

Time needed: 40 minutes

Resources needed

- A sheet of chart paper and three markers, each of a different colour, per group
- A copy of the *Bushfire* handout per group

Procedure

Step 1: Invite students to form groups of four or five and distribute a sheet of chart paper and markers. Then ask them to divide the chart paper into three columns and write down one of the following headings in each column: 'Bushfires: My Experience,' 'Bushfires: Causes' and 'Bushfires: Effects.' Ask each group to discuss each heading one by one and write down key points discussed in the appropriate column using a first colour marker. Then using a second colour marker, have them write down any questions they have in the relevant column. (15 minutes)

Step 2: Hand a copy of the *Bushfires* handout to each group. Ask groups to read it together and add new information using a third colour marker in an appropriate column. Then using the second colour marker, have them write down further questions emerging from the handout, while crossing out the questions written during *Step 1* if the handout has offered them answers. (10 minutes)

Step 3: Invite each group to present what they have discussed. Write down questions raised by each group on the board. Hold a whole-class discussion. (15 minutes)

Extension

Have students, individually or in the same group, choose one or two questions written on the board and research them via the Internet or by interviewing appropriate personnel (e.g., parents, community members, someone working in the Fire Department, Fire Brigades, or at a local newspaper). Allot class time for a further round of reporting back and discussion.

Variation

As part of *Step 1*, ask students to draw a local map and indicate the locations where they have witnessed or experienced local wildfire incidents.

Potential/Facilitation Tips

In *Step 1*, check what students understand by bushfires before the group work. If necessary, briefly explain that bushfires (or wildfires) are fires spread through natural vegetation that are large, uncontrolled, and potentially destructive and spread quickly. At this point, avoid giving further detailed explanations of bushfires. Students need to share their existing experience and knowledge.

If students have not witnessed or encountered bushfires, they can share bushfire experiences they have heard of or read.

In a final plenary discussion, while most bushfires are human-made, have students consider how human-made causes of bushfires and a changing climate might be linked or influence each other. Also, encourage students to consider the impacts of bushfires from different angles, including human social and economic impacts, environmental and ecological impacts, and short-term and long-term impacts of bushfires.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, where students ‘demonstrate an awareness of appropriate responses to reducing the impact of disaster’ and, under that heading, to ‘design a home disaster plan.’

Handout: Bushfires

Bushfires (or wildfires) are natural vegetation fires that may also affect agricultural areas. They are often human-caused by specific careless acts or, more broadly, climate change drying the land. Globally, vegetated areas annually affected by fire range between 300 million and 600 million hectares (3 million to 6 million square kilometres).

The incidence of bushfires is a growing concern in SVG. They occur primarily in grassy areas, woodlands, and marginal lands. In 2014 Firefighters responded to 91 bushfires. Bushfires in SVG are caused mainly by human activities, mainly by clearing land for agriculture. Many farmers use the slash and burn method that makes soils more susceptible to erosion beyond causing fires that get out of control.



The Aftermath of a Bushfire in Southern St. Vincent (Kenton X. IPS)

Changing climate - increases in temperature, longer dry spells, and more droughts – creates conditions that encourage more frequent and severe bushfires. Due to the nature of the vegetation along the SVG coastline, the intense dryness caused by heat in July is likely to cause bushfires. Climate change predictions indicate an expansion of the wildfire hazard zone in SVG.

Bushfires affect the ecological functions of many ecosystems by wholly or partially burning the vegetation layers and affecting soil conditions and vegetation growth processes. Bushfires make the topsoil vulnerable and susceptible to soil erosion and rockfalls. There are serious consequences when overlaid by severe weather events such as flooding. For instance, Rose Bank, in north-western St. Vincent, is one of the areas severely affected by the Christmas 2013 floods and landslides. Five people in this community were killed when landslides destroyed their homes. The three landslide locations were the same areas where bushfires had previously occurred. The soils, already loosened by bushfires, triggered the landslides when the floodwaters came.

In SVG, some bushfire awareness-raising public education efforts, mainly focusing on areas affected by fires in the dry season. There are also awareness-raising events for farmers on ways to help protect and preserve the environment, including bushfire dangers.

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Strand 5: Human-Made Hazards & Epidemics

Unit 5: Fire

Topic 2: Safety Measures and Practice

Activity 15: Bushfire Prevention, Preparation, and Protection

Purpose: Becoming familiar with basic actions for preventing bushfires, preparing for bushfires, and protecting against bushfires.

Time needed: 40 minutes

Resources needed

- A cut-up set of bushfire cards per group
- A sheet of chart paper, markers, and glue stick per group

Procedure

Step 1: Ask students to form groups of three or four and give each group a set of bushfire cards, chart paper, markers, and a glue stick. Ask them to group cards under three categories: preventing bushfires, preparing for bushfires, and protection from bushfires. Once a group is all agreed on the categorization of the cards, have them paste the cards on the chart paper, indicating the categories and writing some questions and additional ideas/suggestions concerning bushfire prevention, preparedness, and protection. (15 minutes)

Step 2: Merge two groups and have them share each other's work and ask questions of each other. (10 minutes)

Step 3: Invite the larger groups to briefly report back on the main points discussed and follow with a whole class discussion. (15 minutes)

Extension

Have students research bushfire prevention, preparedness, and protection plans and initiatives in their localities and share their findings.

Potential/Facilitation Tips

This activity is designed to alert students to bushfire prevention, preparedness, and response actions.

In the plenary discussion, ask students to reflect on their family's bushfire prevention and preparedness practices at home. What are the current strengths and gaps? Discuss how students could reduce bushfire risk at home and in the community.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health

and Family Life Education curriculum, where students 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.'

Handout: Bushfire Prevention, Preparation, and Protection Cards

<p>Develop a bushfire safety/evacuation family plan indicating when to leave, where to go, and how to get there. Discuss the plan with family members and practice two ways out of your house/neighborhood in case of evacuation.</p>	<p>Know the nearest bushfire safe place, meeting point, or evacuation center and how to get there.</p>
<p>Ensure dry foliage (e.g., fallen leaves, twigs) is cleared away, particularly from roofs and gutters. Cut back trees overhanging buildings.</p>	<p>Identify and maintain outside water sources such as ponds, wells, swimming pools, and water tanks as a vital supply for firefighters. Have long water hoses available.</p>
<p>Never leave outside fire unattended. Avoid open burning, especially on a windy and hot day. Always ensure that campfires are completely extinguished after use. Don't leave glowing embers.</p>	<p>Monitor conditions and listen to local radio and television regularly for updated wildfire information and instructions from official agencies.</p>
<p>Wear solid shoes or boots. Wear long trousers/pants and long-sleeve shirts made from natural materials (e.g., wool or cotton). Avoid synthetics. These can melt and stick to the skin. Carry a handkerchief to cover your mouth and nose to protect against smoke inhalation.</p>	<p>If you are advised to evacuate, or you think you are in danger, evacuate immediately. Don't wait until too late. Your physical safety must be the priority.</p>
<p>Extreme temperatures from radiant heat cause death from heatstroke. Stay away from the approaching fire and do not run through a fire front. Choose an open space, clearing, or track. Ensure you continue to stay cool and keep drinking water to stay hydrated.</p>	<p>Never play with matches. Never discard cigarette butts and smoking materials on the ground.</p>
<p>Contact the local fire brigade if you notice an unattended or out-of-control fire.</p>	<p>If caught in a bushfire, don't try to outrun the blaze or go uphill. Find the clearest and most open area with little vegetation. Stay low and covered with wet clothing or soil until the fire passes.</p>

Sources: 10 Bushfire Safety Tips <https://www.chubb.com/au-en/articles/bushfire-safety-tips.aspx>;
 Plan for Emergency: Bushfire <https://www.abc.net.au/news/emergency/plan-for-an-emergency/bushfire/>
 Climate 101: Wildfires <https://www.nationalgeographic.com/environment/natural-disasters/wildfire-safety-tips/>

Strand 5: Human-Made Hazards & Epidemics

Unit 5: Fire

Topic 3: Collecting Local Experience; Pursuing Advocacy and Action

Activity 16: Bushfire Research Project

Purpose: Investigating local bushfire incidents

Time needed: Varying amount of investigation time before the lesson and 50 minutes in class

Resources needed

- A copy of the *Bushfire Investigation Guide* for each student
- A sheet of chart paper and a few colour markers per group
- Tape or other adhesive material for sticking charts to the wall

Procedure

Step 1: Ask each student to investigate a local bushfire incident by interviewing family and community members and/or via an Internet search. Have them use the *Bushfire Investigation Guide* to guide their investigation. (Allow sufficient time for this outside of lessons.)

Step 2: Based on the information gathered, have students who investigated the same bushfire incident create a newspaper front-page article covering that bushfire incident. (30 minutes)

Step 3: Have each group hang their work on the wall and encourage students to visit and carefully scrutinize each other's work. (10 minutes)

Step 4: Hold a whole-class discussion. (10 minutes)

Extension

Invite a guest speaker (e.g., someone from the Fire Department, the Fire Brigade, or NEMO) so that students can learn from their experience in dealing with bushfires and can ask questions concerning bushfires.

Potential/Facilitation Tips

In *Step 1*, the teacher can assign incidents of local bushfires to specific students so that the class covers examples of different local bushfires.

In the newspaper front page writing, remind each group to pay attention to the following points: a clear and attention-grabbing headline, a photo (or a drawing) capturing a key aspect of the incident, clear descriptions of the event in a well-sequenced and organized manner, integration of personal stories or quotations to make the article alive.

In *Step 4*, encourage students to identify common themes emerging from the different local bushfire stories. What are common local bushfire causes and challenges? Discuss how each student could positively contribute to bushfire prevention and mitigation.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, which asks students to 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.' It can also complement the Form 1 Visual Arts Curriculum (creating, interpreting, and presenting). The Form 1 English Writing Learning Outcomes 1, 2, and 3, i.e. 'producing text for different purposes and audiences;' 'producing text (including news headlines) for fun,' and 'writing across the curriculum (using the basic conventions of language to communicate effectively in all subject areas using reference materials and multi-media).'

Handout: Bushfire Investigation Guide

Choose a specific local bushfire incident and find out the following information:

- When did the bushfire happen?
- Where did the bushfire start?
- What caused the bushfire?
- Where and how did it spread?
- How long did it burn?
- What were impacts of the bushfire?
- What were lessons learnt from the bushfire incident?

Strand 6: Planning for Disasters
Unit 6: Home
Topic 1: Disaster Risk Assessment at Home

Activity 17: My Family’s Disaster Preparedness

Purpose: Understanding the importance of disaster/emergency preparedness, conducting hazard, vulnerability, and capacity assessment in the home.

Time Needed: 65 minutes in class and varying amounts of assessment time at home

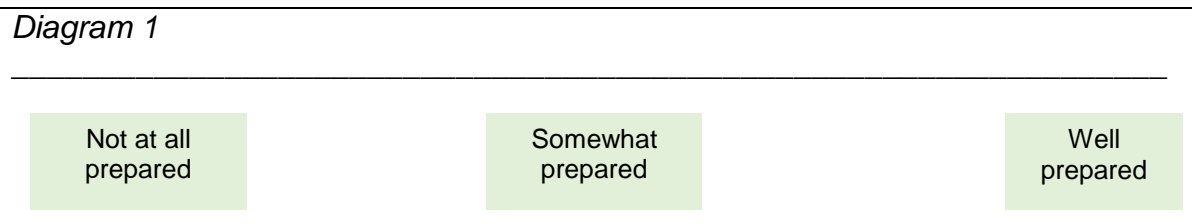
Resources Needed

- Open space in the classroom
- Three large labels with the titles given in *Diagram 1* below
- A copy of the *Checking My Home Environment and Family Disaster Preparedness* handout for each student

Procedure

Stage 1

Step 1: Create an open space, chalk a long straight line on the classroom floor and place the labels in position. Ask all the students to stand up and be ready to move to an appropriate position along the line in response to each particular hazard mentioned concerning family disaster preparedness.



Read out the first question from *Box 9* below and ask students to move to the appropriate location. Give 30 seconds for students to talk to people in the same group about why they chose to stand close to the label in question. Invite a few students to share their views. Repeat the process until all the questions have been covered. (10 minutes)

Box 9

- Is your family prepared for hurricanes and tropical storms?
- Is your family prepared for house fires?
- Is your family prepared for bush fires?
- Is your family prepared for floods?
- Is your family prepared for earthquakes?
- Is your family prepared for tsunamis?

- Is your family prepared for landslides?
- Is your family prepared for volcanic eruptions?
- Is your family prepared for drought?

Step 2: Hold a brief whole-class discussion on why it is essential to be prepared for potential hazards/disasters and what makes a family ‘more prepared’ for potential hazards/disasters. End this stage by explaining that checking the home environment focusing on hazards, vulnerabilities, and capacities, and creating a family emergency plan are two critical actions for all families, and they will learn about these points in this unit. (15 minutes)

Stage 2

Step 1: Explain to students that understanding and assessing their home environment is an essential first step in better preparing for potential hazards/disasters. Ask each student to work with adult family members to investigate their home environment using the *Checking My Home Environment and Family Disaster Preparedness* handout as a guide. (5 minutes plus sufficient time for assessment outside of lessons, back at home)

Step 2: Have students form a group of three. Ask them to share what they have found at home and discuss their family’s level of disaster preparedness. Ask each group to list a few common strengths and challenges. (20 minutes).

Step 3: Invite each group to report back, focusing on common strengths and challenges. Then hold a whole group discussion. (15 minutes)

Potential/Facilitation Tips

Stage 1 intends to raise students’ awareness of the current disaster/emergency preparedness level at their homes. At an appropriate point in *Stage 1 Step 2*, you can refer to the following point in the SVG NEMO *Family Emergency Plan*: ‘families can cope with hazards by preparing in advance and working together as a team and knowing what to do is be their best protection.’ The handout used in this activity is in line with SVG NEMO’s *Family Emergency Plan* document.

For *Stage 2 Step 1*, students need to work with their parents and/or other adult family members in assessing the home environment in terms of disaster preparedness. Working together is a way to raise awareness among family members. Write a brief letter requesting their cooperation and support to ensure their active involvement. Assure them that the school has no desire to pry! The letter should cover family involvement both in *Activity 17* and *Activity 18*.

In *Stage 2 Step 3*, encourage students to share any good practices (examples of items in family emergency supplies and any existing family emergency plan).

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, where students are required to 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.'

Handout: Checking My Home Environment and Family Disaster Preparedness

Hazards at home

What hazards or disasters are most likely in your community and at home?

- hurricanes and tropical storms
- house fires,
- bush fires,
- floods
- earthquakes
- tsunamis
- landslides
- volcanic eruptions
- drought
- others [please specify: _____]

Your house location

- near the river
- near the beach
- by the road
- on the slope
- by the mountain/hill side
- others [please specify: _____]

Your house's construction

- What is it made of? _____
- Is it strong?
 - Yes
 - No
- Is it very flammable?
 - Yes
 - No
- Is the roof attached well, with tie-downs or with beams set into the wall?
 - Yes
 - No

Condition of maintenance

Are there dangers in the following: house structures, electrical installations, pipelines and/or location of cooking fuel?

- Yes If yes, please explain: _____
- No

House map

Draw a floor plan that shows all the rooms, hallways, doors, and windows. Show where the fuse box, water main, gas main (if any), and electrical meter are located. Indicate the potential hazards that may exist in and around your house. Indicate the possible areas for safety and protection in your home. Also indicate resources that might be useful in case of an emergency



[Attach a separate sheet as necessary]

Family disaster awareness and preparedness

Does your family discuss safety threats?

- Yes If yes, please specify: _____
- No

Does your family practice safety drills?

- Yes If yes, please specify: _____
- No

Does your family have a family emergency plan?

- Yes If yes, please bring a copy.
- No

Does your family have an emergency supply kit?

- Yes If yes, please specify: _____
- No

Does your family have other resources which might be useful in case of an emergency?

- Yes If yes, please specify: _____
- No

Sources: Adapted from National Emergency Management Organisation (NEMO), St. Vincent and the Grenadines. (2013). *Family Emergency Plan: A Comprehensive Guide to Disaster Preparedness in the Caribbean*; NEMO website, *Family Emergency Plan*.

Strand 6: Planning for Disasters

Unit 6: Home

Topic 2: Developing a Family Emergency Plan

Activity 18: My Family's Emergency Plan

Purpose: Developing a contextualized family emergency plan and assembling a family emergency supply kit.

Time needed: 40 minutes in class and varying amounts of assessment time at home

Resources needed

- A copy of the *Family Emergency Plan* handout for each student

Procedure

Step 1: Explain that a family emergency plan outlines a strategy for family action in the event of a disaster or emergency. It can include many things, but SVG NEMO has developed guidelines (i.e., *Family Emergency Plan*). Tell students that their task is to complete a *Family Emergency Plan* handout working with their parents and/or other adult family members. (5 minutes plus sufficient time for assessment outside of lessons, back at home)

Step 2: Have students bring a completed copy of the Family Emergency Plan handout to school. Ask them to form a group of three or four and share their family emergency plans. Encourage them to discuss similarities and differences in the plans and their thoughts and reflections on developing the plan. (15 minutes)

Step 3: Invite each group to briefly report what they have discussed and hold a whole group discussion. (20 minutes)

Variations

1. Invite a guest speaker (e.g., someone from NEMO, the Fire Department, the National Red Cross Society) or some parents to the class to give feedback on the family emergency plans developed.
2. Combine the family emergency plan development task with the home environment and family disaster preparedness assessment arising from *Activity 17, Stage 2*.

Extension

Send all the family emergency plans to NEMO for their comments and advice. Based on all the comments received, have students discuss their family emergency plan with the family at home and update it as necessary.

Potential/Facilitation Tips

Similar to *Activity 17*, students need to work with their family members to develop a contextualized family emergency plan and assemble a family emergency supply kit. Allow enough time and space between *Step 1* and *Step 2* for each family to work on this.

Emphasize that a family emergency plan is a living document that should be reviewed periodically (at least once a year) and updated. A family emergency supply kit should also be checked periodically. Stored water should be replaced every three months, and the condition of stored food should be checked periodically.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum in which students have to 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.'

Handout: Family Emergency Plan

Post-hazard meeting places

Where will your family go and meet if you have to evacuate your home? You might go somewhere at a safe distance from your home for sudden emergencies such as a fire. Or you might go outside your neighborhood in case you can't return home. Learn where evacuation shelters are located.

Evacuation routes

Draw your floor plan and/or a neighborhood map and outline the quickest and safest route you need to get to your destination. Consider alternative ways, too. Remember, low-lying areas may be unsafe for travelling during a storm. Discuss the possible dangers your family might encounter on taking evacuation routes.

Emergency Context Information

Complete the following table and keep the information in sensible places.

	Phone number	Address
Emergency Services		
Fire Station		
Police		
Doctor/Hospital		
Ambulance		

Family contact person outside the home		
National Emergency Management Organisation (NEMO)		
Central Water and Sewerage Authority (CWSA)		
St. Vincent Electronic Services (VINLEC)		
Building, Roads and General Services Authority (BRAGSA)		

Family Communication Plan

How will you get in touch with each other during an emergency?

Family roles and responsibilities

During an emergency, who will be in charge of what?

How will your family deal with its pets and livestock (if you have any)?

How will you deal with the special needs of the very young, the very old, and disabled persons within your family and your neighborhood? How will you deal with the special dietary or medical needs of family members, if any?

Home Inspection and Repairs

Actions suggested by NEMO

Visually inspect your home and property. Make any repairs necessary. Reinforce structures.

Check the roof for loose sheeting/nails; Clear the gutters and drains to ensure proper drainage; Cut down and take away loose or overhanging branches; Check the ground for debris

List all the actions your family needs to take.

A Family Emergency Supply Kit

Prepare a family emergency supply kit to last at least 72 hours (3 days).

Items suggested by NEMO

Can opener; first aid kit; canned foods; hygiene articles; radio; torches (flashlights, searchlights); spare batteries; bleach to disinfect water; matches; notebook and pencil; any medical needs you have (e.g., inhalers, prescription medicine); water (at least 1 gallon per person per day for drinking and cooking; more for bathing and washing); breathing masks (if you live near a volcano); a waterproof box for your important documents (e.g., personal identification information, medication information, insurance policies, photos of your property) and some cash; essential bedding and a change of clothes for everyone

List all the items included in your family emergency supply kit (include a photo of your family emergency supply kit)



Sources: Adapted from National Emergency Management Organisation (NEMO), St. Vincent and the Grenadines. (2013). *Family Emergency Plan: A Comprehensive Guide to Disaster Preparedness in the Caribbean*; NEMO website, *Family Emergency Plan*.

Strand: 6 Planning for Disasters

Unit 6: Home

Topic 3: Sharing Family Emergency Plans

Activity 19: Sharing Family Emergency Plans

Purpose: Creatively communicating family emergency plans with younger children

Time needed: 65 minutes in class and a varying amount of travel time to the elementary school(s) in question and for presenting

Resources needed

- Family emergency plans developed in *Activity 18*
- Colour markers, crayons, poster/chart papers

Procedure

Stage 1

Step 1: Divide the class into five or six groups. Explain that their task is to develop an attractive short presentation to introduce family emergency planning to elementary school children in assembly or their classes by articulating a plan's purposes and importance while offering practical tips for developing one. Importantly, the presentation should also suggest how primary school children can draw up a family plan. Encourage groups to use mixed presentational methods/approaches which would be attractive to the target audience (e.g., drawings, posters, songs, storytelling, skits/role plays, and questions and answers). (20 minutes)

Step 2: Have each group perform their presentation before the class. Encourage others to provide supportive but critical comments and feedback. (20 minutes)

Step 3: Have each group update their presentation plan based on the feedback as necessary. (10 minutes)

Stage 2

Step 1: Have each group perform their presentation before the primary school children. After the presentation, have students facilitate discussions with the primary school children supported by their teachers. (Allow sufficient time for travel and presentation outside of lessons).

Step 2: Back in the classroom, hold a whole class debriefing and reflection on group presentation experiences. (15 minutes)

Extensions

1. Have each student work with a small group of peers living in the same neighbourhood to share their family emergency plans (adults can be present) to encourage community collaboration.
2. Have groups present their family emergency plans at community disaster management group meetings or similar community occasions.

Potential/Facilitation Tips

By preparing a presentation on a family emergency plan, students will be able to internalize the nature of their plan more thoroughly. Encourage them to develop engaging and attractive methods to communicate with younger children and, if the extension activities are followed, with adults.

It is essential to liaise with the local primary school(s) in question well in advance to arrange the student presentation visit. The student presentations can be given during the whole school assembly or by visiting certain classes.

Curriculum Links

This activity complements the Disaster Preparedness theme of Year 1 of the Health and Family Life Education curriculum, where students must 'demonstrate an awareness of appropriate responses to reducing the impact of disaster' and, under that heading, to 'design a home disaster plan.'

Strand 7: Marine Environment

Unit 7: Coastal/Beach Environment

Topic 1: Effects of Human Activity and Development on SVG Coastal and Marine Environment

Activity 20: Map My Coast

Purpose: Exploring human activity and developments in and around the students' local coastal area.

Time needed: 45 minutes

Resources needed

- A cut-up copy of the *Coastline Threat Cards*
- A copy of the Information on *Coastline Threats*
- Paper and pencils

Procedure

Step 1: Take students to a local beach or coastal area. If you cannot visit a beach or coastal area, *Step 1* can be done in the classroom, and for Steps 2 and 3, students can examine the beach or coastal area from the nearest possible vantage point or using Google Earth as is set out in the *Variation* section below. Give each student one of the *Coastline Threats* cards from below. Ask students to find a partner whose card is either a possible cause or possible consequence of their card. For example, the student with the 'shipping' card might find the student with the card saying 'discharges of wastewater and oil.' If any student cannot find a partner, read out their card to the class and see if anyone else has a card that is either a possible cause or a possible consequence of this card. If students find more than one appropriate partner, allow them to form a larger group and explore the inter-linkages. Ask each pair or group to share how they think the cards connect with the class. As a pair or group shares their connections, ask if anyone else in the group could connect with either of the cards, being either a possible cause or a possible consequence of that card. Have these students link together into a larger group discussing the inter-linkages between different causes and consequences. The information on coastline threats, taken from *Case Study 14* in the *Resource Manual*, is provided in *Box 10* below to support your discussion. (15 minutes depending on travel time)

Step 2: Have the students make a sketch map of the beach or coastal area, including any human activity and development signs. A sketch map is a roughly drawn map without measurements, including significant features. (15 minutes)

Step 3: Have students get into groups of four. Invite students to share their sketch maps, discussing the signs of human activity and development. Can they see any evidence of the coastline threats they explored in *Step 1*? If so, label these on their sketch maps. Ask students to discuss how the beach or coastal area would be different without these developments; the reasons for these developments and

the changes, risks, or benefits these developments have brought about. (15 minutes)

Variation

If it is impossible for students to visit their local beach or a coastal area, use mobile phones or a computer to look at the local area on Google Earth. Go to <https://earth.google.com> put in the name of the school's local coastal area, and then zoom in and use the 3D and 2D options to virtually explore the area. Using this app, students can sketch map their local coastal area. Students could also look at Google maps of their local area, given that some developments may be clearer on Google maps than on Google Earth and visa-versa.

Extension

Ask students to choose another coastal area they have visited or would like to visit. Ask students to look at this coastal area using Google Earth by going to <https://earth.google.com> and putting in the name of their chosen coastal area and then zooming in and using the 3D and 2D options to virtually explore the area. What development and signs of human activity can they see in this area? How are things different from their local coastal area? How are they similar? Why have the two areas been developed differently?

Potential/Facilitation Tips

Each of the three activities included in this unit on marine environments involves a field trip to the local coastal area. The three activities could be done during one field trip. While discussing coastline threats, encourage students to recognize that there are often multiple causes of a problem and that the problem often gives rise or contributes to various threats. In *Step 1*, some students will be able to find more than one appropriate partner as a cause card may be linked to several consequence cards. If students recognize these interlinkages, allow them to form larger groups. When every student is in a pair or group, encourage them to explore these interlinkages further by finding other students with whom they can link.

In preparation for facilitating this activity, read *Case Study 14* in the *Resource Manual*.

Curriculum Links

This activity falls under Form 1 Geography; in particular, it relates to the skills section of the Geography curriculum, specific objective 3, drawing a simple sketch map. It also relates to section 2 of the Man-made Systems (Regional) section of the curriculum, looking at the geography of St. Vincent and the Grenadines.

Handout: Coastline Threats Cards

Removing sand and other materials from the beach	Erosion or loss of the beaches	Negative impact on tourism
Building close to the beach	Changes in natural sand movement	Beach cannot recover as well after a severe storm or hurricane.
Badly planned sea defenses	Damage to coral reefs and sea grass beds	Shorelines move inland
Removing vegetation from coastal areas	Pollution and waste on the beaches	Reduced protection for the beach
Shipping	Discharges of wastewater and oil	Negative impact for beach users
Clearing sites inland	Soil and dirt on beaches and offshore	Increase acidification of seawater
Climate change	Sea level rise	Increases in temperature of seawater
Hurricanes	High waves in winter	Buildup of sargassum

Box 10: Coastline Threats

External threats include:

- Hurricanes and tropical storms between June and November often cause dramatic changes in beach erosion.
- High waves during 'winter' months result from storms in the North Atlantic Ocean, locally known as 'ground seas.'
- Sea-level rise is a long-term factor, i.e., taking place very slowly over decades causes shorelines to retreat inland.

Internal threats include:

- Removing sand and other materials from beaches and dunes for construction purposes causes erosion and the loss of beaches and dunes, destroying the natural heritage of the coast and reducing the vibrancy of the tourism industry.
- Building too close to the beach interferes with natural sand movement and may impede beach recovery after a severe storm or hurricane. Overall, coastal

development has a deleterious effect, as it tends to lead to sewage discharge, urban runoff, and construction waste.

- Poorly planned sea defenses may cause the beach's loss and neighboring beaches.
- Pollution from human activities on the land may damage coral reefs and seagrass beds; these biological systems protect and provide sand for the beaches.
- Removing vegetation from coastal areas destabilizes beaches while clearing sites inland results in increased soil and dirt particles being washed offshore and smothering coral reef systems.
- Land modification causes significant run-off in terms of pollution and sediment.
- Damage from shipping also constitutes a threat, as there are discharges of wastewater from cruise ships, tankers, and yachts, leaks or spills from oil infrastructure, and damage from ship groundings and anchors.

Strand 7: Marine Environment
Unit 7: Coastal/Beach Environment
Topic 2: Beach Problems

Activity 21: Beach Brainstorms

Purpose: Having students reflect on aspects of their local coastal area that they like and characteristics they see as problems

Time needed: 45 minutes

Resources needed:

- Paper and pens
- A copy, or one copy per student, of *Resource Manual Case Study 12 on Sargassum Influxes*

Procedure

Step 1: Ask students to take a sheet of paper and fold it in half. Ask students to sit on their local beach or elsewhere in a close-to-school coastal area and have them write on one side all the things they like about their local beach or coastal area and on the other side all the things they do not like about their local beach or coastal area and which see as problems. (10 minutes)

Step 2: In groups of three or four, ask students to share their lists. Have students discuss the things that they don't like. Are the problems human-made or naturally occurring? What is the cause or root of the problem? For whom or what is it a problem? Have each group of students identify the most significant problem listed. (10 minutes)

Step 3: Have students divide a page into four quarters. Label the quarters each: 'causes,' 'how it impacts,' 'possible solutions,' and 'questions.' Have each group of students brainstorm their chosen problem by noting ideas under the four headings on the page. (15 minutes)

Step 4: Bring the class together and have each group share their work, and invite discussion. (10 minutes).

Extension

Before *Step 3*, model the problem brainstorm using *Sargassum Influxes* as an example. Read through or give out copies of *Resource Manual Case Study 12 on Sargassum Influxes*. Using this case study, ask students to complete the problem brainstorm, using the template set out in *Step 3* on *Sargassum* before turning to their chosen issue.

Potential/Facilitation Tips

This activity should allow students to reflect on their feelings and opinions relating to their local coastal area. Encourage students to think creatively and critically about a 'problem.' It may be that something they don't like about a beach is natural and integral to the beach and that, in these circumstances, the possible solutions might consider how they respond to and cope with the situation. It may be that the problem is complex and would be helped by 'upstream' thinking. For example, if waste on the beach was a problem, it might be tackled by thinking about reduced packaging and waste collecting.

Curriculum Links

This activity falls under Form 1 Geography; in particular, it relates to section 2 of the Man-made Systems (Regional) section of the curriculum, looking at the Geography of St. Vincent and the Grenadines. It also relates to Form 1 Social Sciences, in particular, Theme 3: *The Environment*, Learning Objective 1, which develops an understanding of the physical environment in which they live.

Handout: Sargassum Influxes



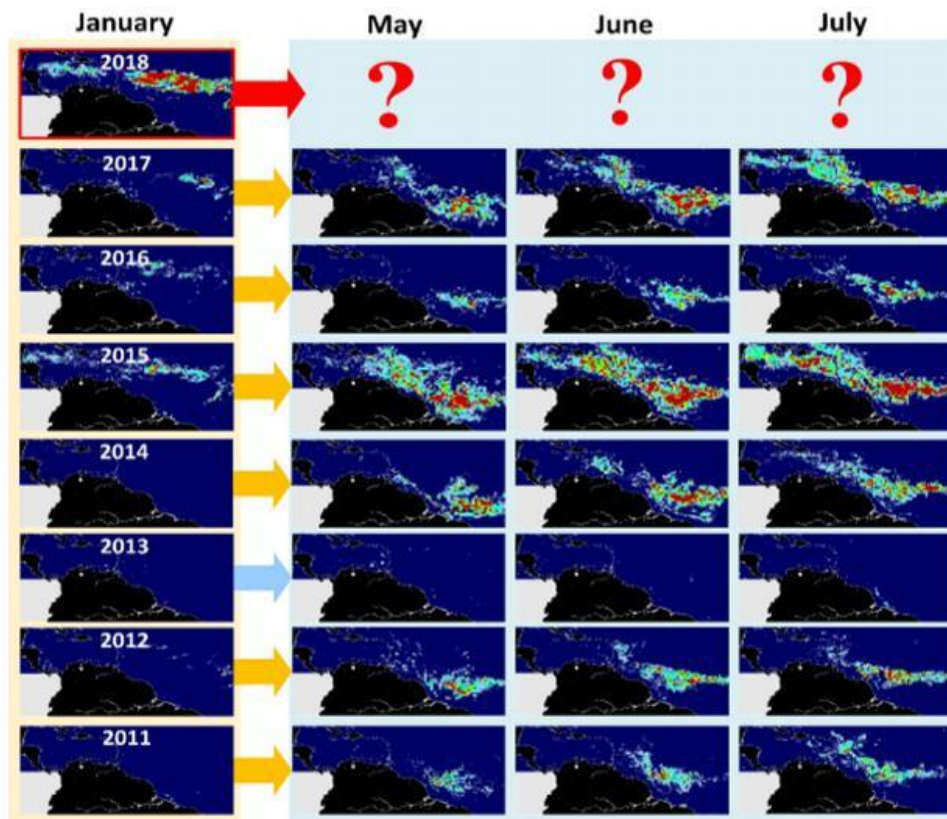
Sargassum. Windward Highway, St. Vincent, St Vincent and the Grenadines, March 2019. (R. Oberman)

What is Sargassum?

Sargassum is a species of brown seaweed that floats in rafts on the ocean. It does not attach to the ocean floor. Scientists have been tracking its movement on ocean currents throughout the Caribbean, the Gulf of Mexico, and the Atlantic Ocean. Since 2011 there have been repeated influxes of sargassum in the Caribbean, most notably in 2015 and 2018. The severity of the impact of sargassum on SVG has been measured as ‘very high.’

What is causing Sargassum Proliferation?

Research is currently underway to provide a better understanding of the cause of recent sargassum influxes. While much uncertainty remains, it is believed that global climate change may be behind the proliferation. Changes in the temperature of the oceans and ocean circulation patterns are linked to increases in sargassum and in turn may be a result of climate change. The UN Sustainable Development Goals are an internationally agreed set of targets for achieving a more sustainable future. Researching and addressing the impacts of the proliferation of sargassum is being discussed in the context of these goals, particularly goal 13, combating climate change and its impacts, and goal 14, conserving and using oceans, seas, and marine resources for sustainable development.



Satellite images showing sargassum blooms in the Caribbean sea taken from: <https://optics.marine.usf.edu/projects/saws.html>

Is Sargassum Ecologically Important?

Sargassum is considered essential habitat for marine species. It provides food, refuge, and a breeding ground for many different fish and sea creatures, including several threatened species of turtles. Photographs capturing the rich marine life living in sargassum are available at <https://ocean.si.edu/ocean-life/invertebrates/world-adrift-life-sargassum>. It is also seen to help nourish and conserve beaches by preventing erosion and fertilizing the plants in the coastal dune.

What problems are created by the proliferation in Sargassum?

The huge deposits of sargassum have presented a problem for St Vincent and the Grenadines and other Caribbean countries.

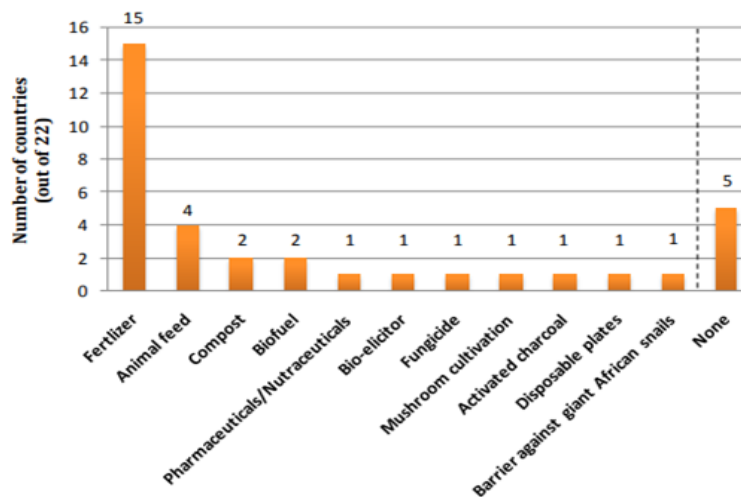
- *Ecological concerns:* The proliferation of sargassum is thought to disturb marine life, smother sea grasses, and coral reefs. Dead fish and sea turtles have been found during sargassum influxes, and scientists believe that as sargassum decays, it releases poisonous hydrogen sulphide.
- *Unsightly and foul-smelling:* Sargassum blocks beaches, repelling swimmers and emitting a bad smell as it decays.
- *Bad for tourism:* Taking over beaches, the sargassum influxes have had a detrimental effect on tourism. Mexico, for example, witnessed a 35% drop in

tourism in early 2018. This decline was attributed to the influx of sargassum.

- *Difficulties for fishing:* A decline in fish numbers has been identified in sargassum years. Furthermore, it is reported that the seaweed damages fishing vessels and interferes with nets and lines.
- *Expense:* Removing the sargassum requires organization and funding.
- *Damage to beaches:* The machinery used to remove sargassum can damage beaches and marine life.

Responses to Sargassum

Most countries collect, transport, and store sargassum once it arrives on shore. Some efforts are being made to collect it offshore before it washes up on beaches. This management technique is thought to be cheaper and less impactful but raises concerns regarding the protection of marine life. The possibility of reusing sargassum is being researched. Different Caribbean countries are experimenting with using this seaweed for fertilizer, chemical compounds, biofuel, and fungicide.



From: UNEP (2018) *Sargassum White Paper - Sargassum Outbreak in the Caribbean: Challenges, Opportunities and Regional Situation.*

References

<https://optics.marine.usf.edu/projects/saws.html>

http://www.cep.unep.org/cep-documents/paper_on_sargassum_side_event_at_unea-2.pdf

[http://www.cep.unep.org/meetings/documents/a00d2efd429fc5ad12b3485ecacb7c33/@_@download/en_file/UNEP\(DEPI\).CAR%20WG.40.INF.8-Sargassum%20White%20Paper%20-%20Sargassum%20Outbreak%20in%20the%20Caribbean-en.pdf](http://www.cep.unep.org/meetings/documents/a00d2efd429fc5ad12b3485ecacb7c33/@_@download/en_file/UNEP(DEPI).CAR%20WG.40.INF.8-Sargassum%20White%20Paper%20-%20Sargassum%20Outbreak%20in%20the%20Caribbean-en.pdf)

Strand 7: Marine Environment

Unit 7: Coastal/Beach Environment

Topic 3: Marine Conservation: Local Good Practice Examples

Activity 22: Marine Modelling

Purpose: Inviting students to artistically represent their hopes and fears for their local coastal areas and consider conservation practices.

Time needed: 90 minutes

Resources needed:

- A copy of the *Sandwatch Landmark Achievements* handout
- Paper and a pencil or pens
- Arts materials

Procedure

Step 1: Explain to the students that they are going to be thinking about how to conserve beaches in this lesson. Ask if any students know about the Sandwatch program. Explain that the program began as a Caribbean-based initiative to protect beaches. Like other environmental initiatives, explain that the program uses a range of approaches to help conservation, including awareness raising (advocacy and education), monitoring, community action, and technologies. Read each of the achievements of the Sandwatch program included below that are taken from the *Resource Manual, Case Study 17*. Ask students to decide which conservation approach they are an example of. (15 minutes)

Step 2: Have students work in pairs. Following on from *Activity 21*, ask each pair to imagine how they would most like their local beach or coastal area. In their pairs, have them discuss this, making rough sketches or notes. Ask them to discuss what they fear could happen to their beach or local area. Again they could make a rough sketch or take notes. (10 minutes)

Step 3: Have one student in a pair create a visual representation of the desired beach or coast area, and the other makes a visual representation of the feared beach or coastal area. They could draw or paint this or use the sand and local coastal materials to construct a model of their represented place. (35 minutes)

Step 4: Ask students to share their representations with the class. Allow other class members to ask questions or otherwise respond to each student's work. (15 minutes)

Step 5: Have students brainstorm what actions should be taken to progress towards their ideal beach or coastal area model. What measures are needed to prevent their feared outcome from occurring? Which individuals, groups of people, and organizations, should be involved? Encourage students to think about the different

approaches taken under the Sandwatch program, i.e., awareness-raising (including advocacy and education), monitoring, community action, and technologies.
(15 minutes)

Extension

When students are back in the classroom, have them use their brainstorm activity to create an action plan for conserving the local beach or coastal area. Following this, have students implement all or some aspects of their action plan.

Potential/Facilitation Tips

This activity encourages students to envisage possible future developments for their coastal area, both desired and possible. As such, it can stimulate creative and innovative ideas and support action. Encourage students to share their models, exploring differences in student fears and hopes.

In preparation for facilitating this activity, read *Case Study 17* in the *Resource Manual*.

Curriculum Links

This activity fits in with the Form 1 visual arts curriculum, particularly with strand 1, creating, interpreting, and presenting. It develops point xii of the curriculum regarding making creative education socially relevant.

Handout: Sandwatch Landmark Achievement

- June 2005 Bequia Community High School won second prize in the UNESCO Community Sandwatch Competition (secondary section) for cleaning up a garbage-strewn drain in the village of Paget Farm. The drain rehabilitation project involved: water analysis; raising public awareness of the issue through radio and television programs and specifically using media to encourage local fishermen to stop polluting the beach and near-shore area; debris clearance; excavating mud and trees to allow free flow of water (thus helping control the mosquito population); installing debris traps; landscaping the area and making it a recreational facility; recruiting community youth to take ownership of and maintain the area.
- In June 2006 the first edition of *The Sandwatcher* community newsletter was published, describing Sandwatch activities on SVG.
- In February 2007 the Sandwatch group began advising gravel miners who extract gravel from two small rivers flowing into beaches in the Richmond and Larikai area from the slopes of the La Soufriere volcano on how to harvest the gravel at sustainable levels. The miners, who are largely women, were trained in Sandwatch monitoring and measuring techniques.
- In September 2007 30 Sandwatch students conducted a beach cleanup of Paget Farm beach, removing 165 bags of garbage as well as clearing away heavy-duty machine and building leftovers.
- In November 2007 the Sandwatch group created history by launching the first secondary school radio station in SVG.
- From April to July 2008 students collected bottle caps from beaches as part of an anti-litter campaign and school art project and created an environmental mural from the caps. The mural's strapline was 'Bequia Sweet, keep it clean!'
- From May to July 2009 the Sandwatch group joined with the SVG Bureau of Standards in a water quality analysis project at the Bequia Fisheries Complex, Paget Farm, taking samples from the limited water sources available - sources becoming ever more limited with climate change and the increasing unpredictability of the rainy season - to determine the presence of bacteria and other harmful elements. The aim was to feed data into the technical planning of water filters for a reverse osmosis installation where water would be pumped uphill, cleaned and desalinated and then delivered by gravity to a thousand households in the village. The student initiative was described as an example of 'how students can get involved in experimental education and contribute in a big way towards determining the way forward for an entire community'.

Strand 8: Land Environment
Unit 8: Deforestation
Topic 1: What Lies Behind Forest Loss?

Activity 23: Deforestation Flowcharts

Purpose: Acquainting students with global deforestation facts and figures and key issues and concerns and eliciting initial responses

Time needed: 60 minutes

Resources needed

- Internet access to the *Deforestation: Facts, Causes & Effects* video (1.51 minutes): https://www.youtube.com/watch?v=aS_IRabpggw
- A cut-up set of statements from the *Forest Matters* handout for each group of three or four students
- Paste sticks
- A large sheet of chart paper and markers of different colours for each group

Procedure

Step 1: Introduce the topic of deforestation and show the short video twice over. After the second showing, ask the class what startling facts and critical issues emerged for them (they are likely to volunteer remarks on the speed of forest loss, the short time left before the forests are gone at present rates of devastation, causes of deforestation, the links to climate change and species loss). Make a note of contributions on the board. (10 minutes)

Step 2: Divide the class into groups of three or four and give each group a set of *Forest Matters* statements, chart paper, and markers. Draw attention to the paste sticks to be shared between groups. Explain that their task is to arrange the statements in any way they wish, so their presentation makes a clear statement. They may want to put the statements in clusters with headings; they may want to put them in a sequence or prioritize them in a particular order. Whatever they choose, they should draw arrows connecting different parts of their statement arrangement, so the whole becomes a flowchart. Emphasize using a ‘trial and error’ approach, negotiating the arrangement of statements without sticking them down until all are satisfied. When all group members are satisfied, they should paste the statements down, write comments, draw arrows, and even add cartoon-like pictures. (25 minutes)

Step 3: Bring the whole class together and have groups share and speak to their flowchart, taking comments and questions from other groups. Towards the close, ask the class to assist you in summarizing the main points, questions, and issues related to deforestation that have emerged from the activity. (25 minutes)

Variation

Instead of groups coming together as a class, have each group stick their flowchart on a class wall with one group member staying alongside the chart to explain it to visitors from other groups. The 'host' person should be rotated so that everyone has a chance to circulate and view others' work.

Potential/Facilitation Tips

This activity helps draw out a range of perspectives on deforestation. It encourages discussion and consideration of various viewpoints within groups and across the whole class. The flowchart element considers relationships between different causes and effects of forest loss. In facilitating *Step 1* and *Step 3*, draw on *Box 11* below as and when appropriate.

Box 11: Forest Facts

Deforestation is when trees and forests are cut down to clear land for other human uses. Every minute of every day a forest area the size of 20 football fields is cut down. In 100 years, if we keep cutting at the rate we are, it is estimated that there will be no rainforest left.

Before humans began to build cities many centuries ago it is thought that 60% of the Earth was covered by forest. Now there is less than 10% left. Forests that have never been cut down are called 'primary' or 'old growth' forests. Forests grown on previously deforested land are called 'secondary' forests. It an area is reforested it takes hundreds and hundreds of years to regain the richness and diversity of primary forests.

Rainforests (that is tropical forests with consistently heavy rain) cover only 6% of the world's surface yet they are the home to more than 50% of the plant and animal species on Earth.

Estimates of rainforest loss vary but all are startling. The UN Food and Agricultural Organization estimate that despite efforts to stop forest loss 18 million acres, roughly the size of Panama, are still being destroyed each year. The World Wide Fund for Nature reckons that the Amazon rainforest will be gone by 2030 at the present loss rate. Since 1990, the organization says, 90% of the rainforest on the coast of West Africa has been lost and 88% of South Asia's rainforests.

Curriculum Links

This activity accords with the Form 1 'Natural (Physical)' section of the Geography curriculum where under 'Man-Made Systems' students explore the 'value of trees' including a topic on the cutting down of trees and effect on both the human and physical environment. It also accords with the Form 1 'Health Promotion' theme of the Health and Family Life Education curriculum where students are required to 'demonstrate an understanding of preserving the environment' by discussing the terms preservation, sustainability, and conservation, by considering means of

conserving the environment and by demonstrating understanding the independence of living things in sustaining the environment.

Handout: Forest Matters

Overpopulation

With over 7 billion people on the planet (and 11.2 billion expected by 2100), land is needed to build cities, build highways, raise livestock and grow food. This issue is causing rampant deforestation. Forest destruction is also happening because a growing population needs furniture, paper, building materials, and other wood products.

'Slash and Burn' Agriculture

The largest amount of deforestation (an estimated 48%) is caused by subsistence 'slash and burn' farming where trees and bush are cut down and burnt to provide ground for crops and livestock to grow (the ash making the soil fertile). After a few years, the soil deteriorates, and another forest area is slashed and burnt. Used areas of land take a very long time to grow back.

Plantation Agriculture

An estimated 32% of deforestation provides space for the mass growing of crops for the global marketplace. Trees are cleared to make way for plantations of sugarcane (for sugar and ethanol, an alternative fuel), plantations of oil palms (for palm oil that is used in food and soap production and as a fuel), and soya (for soya beans used in animal and human foods).

Ranching

Deforestation for cattle ranching for the global beef burger industry is most evident in Latin America, where in the past 40 years, the forest area has been reduced by some 40%.

Loss of Species

Deforestation is quickening the rate of extinction of plant and animal species. Species lose their natural homes with no other place to go. We are losing 137 plant, animal, and insect species every day, which means 50,000 species a year. Species have the right to survive! We are losing species before we even know they exist. Some of the lost plants may carry the cure to terrible human diseases. Even with reforestation, some plants and animals will never return as they have become extinct.

Climate Change

Trees store a large amount of carbon in their trunks, branches, leaves, and roots. When trees are cut down, the carbon gets into the atmosphere as carbon dioxide, the main greenhouse gas causing climate change. Scientists calculate that 1.5 billion tons of carbon are released into the atmosphere each year because of deforestation. This release amounts to 20% of greenhouse gas emissions. Live trees soak up carbon; cut and burnt trees release carbon. This speaks to the need for massive, worldwide reforestation programs.

Disasters

Deforestation can lead directly to disasters in the form of flash floods and landslides. The intricate root systems of trees and other vegetation in high places soak up and hold rain and act as a buffer to prevent significant volumes of rainwater from rushing downhill to flood low-lying areas and human settlements. There is nothing to stop flooding and flash flooding with its associated landslides happening without the trees. There is nothing, too, to prevent the topsoil where the trees once stood from being washed away downstream to the sea, making it harder to reforest.

Logging

Trees are cut down to obtain timber for papermaking, furniture making, and building materials. Cutting down trees is called 'logging.' Trees are also cut down to provide fuelwood for cooking heating. And charcoal making. Logging for industry causes 14% of the world's deforestation, and another 5% of deforestation happens because trees are cut down, often illegally, for fuel.

Life Quality

Deforestation harms the life quality of millions of people worldwide, especially indigenous people who are often native to the forest. The lives and livelihoods of small-scale farmers and gatherers of natural materials, such as cork, fruits, nuts, and natural oils, are disrupted. People who find joy and spiritual inspiration in the forests are saddened by forest loss. Forests, they say, are sacred and have enriched our souls and imaginations. In their loss, they become reduced as people.

Drought

Deforestation can cause drought in once rainy areas. There is a water cycle in which trees and other plants take in water, the water evaporates (i.e., goes into the air), causing clouds to form, and the clouds give rain. Loss of forest cover has a warming and drying effect so that the climate can become hotter with more frequent and extended periods of drought. Rain becomes less predictable. So, deforested areas can become desert-like.

Forest Fires

Each year fires burn millions of hectares of forest worldwide. Fires are part of a natural cycle, but they happen more often as forests are weakened by cutting and human activity. They are increasingly happening, too, because of less regular rainfall and increasingly frequent and increasingly severe hotter weather periods resulting from climate change.

Mining

The rising global demand for metal and consequent high mineral prices is putting increased pressures on forests. Mining projects are not just the mines themselves, massive as they are, but require building roads, railways, power stations, and power lines.

Sources:

Active Wild. 2015. *What is deforestation for kids: Information and facts.*
<https://www.activewild.com/what-is-deforestation-for-kids-information-and-facts/>

World Counts, undated. *In 100 years, there will be no rainforests: Deforestation facts for kids.*
<https://www.theworldcounts.com/stories/Deforestation-Facts-for-Kids>

World Wide Fund for Nature. *Deforestation Causes.*
https://wwf.panda.org/our_work/forests/deforestation_causes2/

Futurism. *Deforestation – Causes, Effects and Solutions.*
<https://futurism.media/deforestation-causes-effects-and-solutions>

Strand 8: Land Environment
Unit 8: Deforestation
Topic 2: Impacts of Forest Loss

Activity 24: Deforestation and Disaster

Purpose: Exploring the connections between deforestation and disastrous events on St Vincent and looking for solutions

Time needed: 60 minutes

Resources needed

- Copies of the *Deforestation and Disaster 1, 2, and 3* handouts for each group of three or four students
- A sheet of chart paper and marker for each group

Procedure

Step 1: Divide the class into groups of three or four and begin with questions designed to recall what was learnt about deforestation on a global scale in the last session. Say that the focus of this session will be on SVG deforestation. Ask groups to prepare their charts by writing in the title *SVG Deforestation* and dividing the chart paper into three columns titled *Causes*, *Effects*, and *Solutions*. (5 minutes)

Step 2: Ask groups to read the *SVG Deforestation and Disaster 1* handout and discuss what it is saying about the causes and effects of deforestation on SVG. Invite them to write their ideas in the first two columns on their chart paper. Then ask them to think of solutions to the problem that are either stated or implied in the reading. (10 minutes)

Step 3: Repeat the process using the *SVG Deforestation and Disaster 2* handout. (10 minutes)

Step 4: Repeat the process a third time using the *SVG Deforestation and Disaster 3* handout (10 minutes)

Step 5: Have groups share the causes and effects of SVG deforestation in the readings before turning the discussion to the solutions that the readings suggest or imply. Conclude by broadening the discussion to include students' ideas on ways to combat deforestation and its impacts. [Explain that the next session will look more closely and critically at actions to address the deforestation crisis.]

Variation

Have the class read the original full articles from which the handouts are taken (web links are given under *Sources* below).

Extension

Invite a representative of Forestry Services St Vincent and the Grenadines to visit the class to speak on deforestation causes and effects and reforestation endeavors and take students' questions.

Potential/Facilitation Tips

Having looked at the wider international deforestation situation in *Activity 23*, this activity zeros in on causes and effects with an initial look at potential solutions in SVG itself. As the activity unfolds, keep referring back to issues raised and insights gained in the previous lesson.

Curriculum Links

This activity accords with the Form 1 'Natural (Physical)' section of the Geography curriculum where under 'Man-Made Systems' students explore the 'value of trees' including a topic on the cutting down of trees and effect on both the human and physical environment. It also accords with the Form 1 'Health Promotion' theme of the Health and Family Life Education curriculum where students are required to 'demonstrate an understanding of preserving the environment' by discussing the terms preservation, sustainability, and conservation, by considering means of conserving the environment and by demonstrating understanding the independence of living things in sustaining the environment. The disaster dimension of the activity complements the 'Disaster Preparedness' theme of the same curriculum.

Handout: SVG Deforestation and Disaster 1: Poor Land Use Worsens Climate Change in St Vincent (Part 1)

KINGSTOWN, May 14 2015 - For 32 years, Joel Poyer, a forest technician, has been tending to the forest of St. Vincent and the Grenadines. His job allows him a unique view of what is taking place in the interior of this volcanic east Caribbean nation, where the landscape mostly alternates between deep gorges and high mountains. Poyer, a 54-year-old social and political activist and trade unionist, is hoping that he can get the government and people of St. Vincent and the Grenadines to focus on how human activities on the nation's in its forests are exacerbating the impacts of climate change.

'Right now, it's like a cancer eating [us] from the inside.' He tells of the actions of persons, many of them illegal marijuana growers, who clear large swathes of land for farming – then abandon them after a few years and start the cycle all over again.

Over the past few years, extreme weather events have shown the people of St. Vincent and the Grenadines how activities happening out of sight in the forest can have a devastating impact on coastal and other residential areas. In April 2011, heavy rains resulted in landslides and caused rivers to overflow their banks and damage some 60 houses in Georgetown. Vincentians expressed surprised at the number of logs the raging waters deposited onto the town. On Dec. 24, 2013, unseasonal heavy rains triggered landslides and floods, resulting in 122 million dollars in damage and loss. Again, residents expressed surprise at the number of logs that floodwaters deposited into towns and villages and the ways in which these logs became battering rams, damaging or destroying houses and public infrastructure. Not many of the trees, however, were freshly uprooted. They were either dry whole tree trunks or neatly cut logs.

The scope of deforestation in St. Vincent and the Grenadines is extensive. In some instances, persons clear up to 10 acres of forest for marijuana cultivation at elevations of over 3,000 feet above sea level, Poyer says. 'Some of them may cultivate using a method that is compatible, whereby they may leave trees in strategic areas to help to hold the soil together and attract rain. Other will just clear everything, as much as five to ten acres at one time for marijuana,' he explains. But farmers growing legal produce, such as vegetables and root crops, also use practices that make the soils more susceptible to erosion at a time when the nation is witnessing longer, drier periods and shorter spells of more intense rainfall.

Many farmers use the slash and burn method, which purges the land of many of its nutrients and causes the soil to become loose. Farmers will then turn to fertilisers, which increase production costs. 'When they realise that it is costing them more for input, they will abandon those lands. In abandoning these lands, these lands being left bare, you have erosion take place. You may have gully erosion, landslides,' Poyer explains.

Source: Adapted from *Poor Land Use Worsens Climate Change in St. Vincent*. Inter Press Service: <http://www.ipsnews.net/2015/05/poor-land-use-worsens-climate-change-in-st-vincent/>

Handout: SVG Deforestation and Disaster 2: Poor Land Use Worsens Climate Change in St Vincent (Part 2)

KINGSTOWN, May 14 2015 – Poyer also says that sometimes access to these lands is so difficult that reforestation is very costly. ‘Sometimes we will have to put in check dams to try to reduce the erosion and allow it to come under vegetation naturally and hope and pray that in two years when it begins to come under vegetation that someone doesn’t do the very same thing that had happened two years prior,’ he explains.

As climate change continues to affect the Caribbean, countries of the eastern Caribbean are seeing longer dry spells and more droughts. Emergency management officials in St. Vincent and the Grenadines have warned that the rainy season is expected to begin in July, at least four weeks later than is usually the case. Similar warnings have been issued across the region. This makes conditions rife for bush fires in a country where the entire coastline is a fire zone because of the type of vegetation.

The nation’s fire chief, Superintendent of Police Isaiah Browne, tells IPS that this year (2015) firefighters have responded to 32 bush fires, compared to 91 in all of 2014.

In May alone, they have responded to 20 bush fires – many of them caused by persons clearing land for agriculture.

Poyer tells IPS that in addition to the type of vegetation along the coast, a lot of trees in those areas have been removed to make way for housing and other developments.

‘And that also has an impact on the aquatic life,’ he says. ‘That is why sometimes we hardly see any fish along the coastline, because there are no trees to cool the water for the algae to get food.’

The effects of bush fires, combined with the severe weather resulting from climate change, have had catastrophic results in St. Vincent. Three of the areas where landslides occurred in the 2013 floods were three areas where fires were always being lit. It affected the soil because as the bush was being burnt out, the soil did get loose, so that when the flood came, those areas were the areas that had the landslide.

‘The drying out of streams in the dry season is also a result of deforestation taking place in the hills, in the middle basin and along the stream banks,’ Poyer tells IPS. ‘Once you remove the vegetation, then you open it up to the sun and the elements that will draw out a lot of the water, causing it to vaporise and some of the rivers become seasonal, he explains.

Source: Adapted from *Poor Land Use Worsens Climate Change in St. Vincent*. Inter Press Service: <http://www.ipsnews.net/2015/05/poor-land-use-worsens-climate-change-in-st-vincent/>

Handout: SVG Deforestation and Disaster 2: St. Vincent Takes to Heart Hard Lessons on Climate Change

PASTURES, St. Vincent, Oct 29 2014 (IPS) - Glenda Williams has lived in the Pastures community in eastern St. Vincent all her life. She's seen the area flooded by storms on multiple occasions.

But the last two times, it was more 'severe and frightening' than anything she had witnessed before.

"The last time the river came down it reached on the ball ground [playing field] and you had people catching fish on the ball ground. So this time now (Dec. 24, 2013), it did more damage," Williams, 48, recalls.

Williams was giving a first-hand account of the landslides and flooding in April 2011 and the December 2013 floods that resulted from a slow-moving, low-level trough.

Prime Minister Ralph Gonsalves told the Inter Press Service that in St. Vincent and the Grenadines, there is a major problem with degradation of the forests and this has contributed to the recent floods.

The debris left behind by the cutting of timber, Dr. Gonsalves argued, 'helps to cause the blockages by the rivers and when the rivers overflow their banks, we have these kinds of flooding and disasters.'

'The trees are cut down by two sets of people: one set who cut timber for sale and another set who cut timber to clear land to plant marijuana,' he explained. "And when they cut them they would not chop them up so logs remain, and when the rains come again and there are landslides they come down into the river."

The country's ambassador to the Organization of Eastern Caribbean States, Ellsworth John, said the clearing of the forests is a serious issue that must be dealt with swiftly.

'It's something that the government is looking at very closely... the clearing of vegetation in our rainforests maybe is not done in a timely fashion and it is something that has to be part of the planning as we look at the issue of climate change,' he told IPS.

Gonsalves admitted that policing of the forests is a difficult task but added, 'If we don't deal with the forest, we are going to have a lot of problems.'

Source: Adapted from *St. Vincent Takes to Heart Hard Lessons on Climate Change*. Inter Press Service:

<http://www.ipsnews.net/2014/10/st-vincents-takes-to-heart-hard-lessons-on-climate-change/>

Strand 8: Land Environment

Unit 8: Deforestation

Topic 3: Local Action to Combat Deforestation

Activity 25: Where Do We Draw the Action Line?

Purpose: Considering the relative effectiveness and ineffectiveness and the relative acceptability and unacceptability of a range of actions to combat deforestation

Time needed: 60 minutes

Resources needed

- A set of cut-up *Action Cards* for each student
- A long strip of paper for each student
- Paste sticks and markers

Procedure

Step 1: Explain that the class will explore actions that might be taken to combat deforestation. Give each student a set of *Action Cards* and a long strip of paper. Have them write a plus (+) sign at one end of the strip and a minus (-) sign at the opposite end and draw a straight line between the two points. Explain that their task is to read and reflect on the twelve statements and then order them along the line. Half of the groups are to place them on a continuum from *Acceptable* (+) to *Unacceptable* (-) by laying the cards along the line. The other half is to order them on a continuum from *Effective* (+) to *Ineffective* (-). Emphasize that spacing matters. Cards can be bunched together if considered equally acceptable/effective or far apart if the student considers there is a real gulf in acceptability/effectiveness. Explain, too, that they should draw a line to signify where the zone between actions that are considered acceptable (effective) and cards held to be unacceptable (ineffective) is located. Give ample time for personal reflection and for students to stick down their cards and draw the line. (20 minutes)

Step 2: The task complete, have students form pairs (both having worked with the *same* continuum) to compare, contrast, explain and argue their decisions. (10 minutes)

Step 3: Now, ask pairs to join with another pair who has worked with the *different* continuum to compare and contrast, explain and argue the decisions they have made. (10 minutes)

Step 4: End the activity with a whole class discussion that can be fired by asking different groups to explain the main issues and arguments they came up against meeting in both pairs and fours. (20 minutes)

Potential/Facilitation Tips

During *Step 4*, encourage surfacing and expressing of different perspectives and points of view by asking questions such as ‘do we all agree with what has just been said?’ or ‘is there another way of seeing this?’ or ‘why are you ruling out certain forms of action? Also, try to problematize the criterion used by asking, for instance, ‘what do you think is meant by “effective”’ or ‘will different people have a different understanding of “acceptability”?’ Ask, too, about the power of so-called ‘soft actions’ such as tree-hugging and adopting a meat-free diet. Can they be very effective in some ways? Devote the activity’s closing stages to ask students what actions they would be ready to take and which not and why.

Curriculum Links

This activity accords with the Form 1 ‘Natural (Physical)’ section of the Geography curriculum where under ‘Man-Made Systems’ students explore the ‘value of trees’ including a topic on the cutting down of trees and effect on both the human and physical environment. It also accords with the Form 1 ‘Health Promotion’ theme of the Health and Family Life Education curriculum where students are required to ‘demonstrate an understanding of preserving the environment’ by discussing the terms preservation, sustainability, and conservation, by considering means of conserving the environment and by demonstrating understanding the independence of living things in sustaining the environment. Additionally, it complements the Integrated Science and Technology curriculum under its ‘Earth Science’ theme, where students are introduced to the concepts of renewable and non-renewable resources.

Action Cards

Stop Eating Meat <p>Farming is the most significant cause of deforestation, and animal rearing, especially beef, is the biggest culprit. Forests are devastated to grow beef for beef burgers. There would be far less deforestation if we adopted a vegetarian or vegan diet.</p>	Educate Others <p>Many people are unaware of the severe deforestation issue we are facing. Educate your friends, family, and community about deforestation's facts, causes, and effects. Encourage them to live in a way that does not harm the environment.</p>
Reduce Paper Consumption <p>Choose recycled paper products, including printing paper, notebooks, napkins and toilet paper. Use half the toilet paper you normally use. Avoid paper plates and napkins. Print both sides of the paper or go paperless!</p>	Use Renewable and Sustainable Wood <p>We must not take wood from primary forests that are not renewable. Use wood only from renewable second-growth forests. Also, use sustainable, locally sourced wood and charcoal for cooking or heating homes as an alternative to fossil fuels.</p>
Join Organizations <p>Learn more about deforestation, sign petitions, mount protests, write letters, and volunteer at organizations campaigning and working against deforestation.</p>	Influence Government Policy <p>Find the contact details of the people who represent you and call or email them asking them to take action to develop more robust government policies to stop deforestation (e.g., prohibiting 'slash and burn') and promote reforestation in SVG.</p>
Plant Trees <p>Plant trees to restore or regrow forests that have been lost, making tree planting an ongoing, well-planned, and organized process and not just a one-off event.</p>	Purchase and Support Sustainable and Green Business <p>Support companies that produce products that cause minimum harm to the environment. Green business concerns re-use and recycling and green (environmentally friendly) production methods. Don't buy anything from large multinationals that are actively or indirectly involved or responsible for clearing forestland.</p>

<p>Stop ‘Slash and Burn’ farming</p> <p>Create and implement government laws/regulations to stop ‘slash and burn’ farming, to offer incentives for reforestation projects and sustainable farming.</p>	<p>Refuse Unsustainable Palm Oil, Soya, and Meat Products</p> <p>Significant amounts of rainforest are cleared every hour to make way for palm oil, soya, and meat production. Do not buy palm oil and meat products at all unless there is concrete proof and certification of sustainable production</p>
<p>Reduce Your Consumption</p> <p>Always ask yourself if you are buying something you need or just buying something because you want it. Only purchase what you need. Reduce or avoid any consumption that drives deforestation, including buying meat, palm oil, and soy products.</p>	<p>Hug Trees</p> <p>Hug the mighty trees and encourage others to do so. Hugging a tree with its sap pulsing through its trunk and branches is an emotional way of reconnecting with and feeling oneness with nature. Emotion is vital to committed environmental activism</p>

Strand 9: Ecosystem and Biodiversity Threats

Unit 9: Threats to Ecosystems

Topic 1: Ecosystems and Biodiversity: Importance and Fragility

Activity 26: Web of Life

Purpose: Understanding key concepts and terms associated with ecosystems and biodiversity and why it is vital to conserve biodiversity.

Time needed: 150 minutes (*Stage 1*, 50 minutes; *Stage 2*, 70 minutes)

Resources needed

- A set of *Food Chain Cards* comprising six picture cards and ten blank slips of paper of similar size for each group of four students
- Chart paper, a marker, and a glue stick for each group
- A set of six large photographs of natural life on St Vincent and the Grenadines
- A collection of nine *Conserving Biodiversity Cards* for each pair of students

Procedure

Stage 1: Key Concepts and Terms

Step 1: Ask the class what they had for breakfast. Write a few contributions on the board. Then ask why they needed breakfast at the start of the day. Beyond responses such as ‘we were hungry,’ students will light on the idea of food as a source of energy. Choose a plant-based food, write it on the board, and ask where it obtained the energy it contains. Answers are likely to include ‘the soil,’ ‘rain,’ and ‘the sun.’ Illustrate these as a chain with arrows on the board. Then choose an animal-based food written on the board. Ask where it obtained its energy. Answers are likely to include other animals, insects, or plant food (the plants get their energy and nutrients from soil, rain, and sunshine). Again, illustrate the answers as a chain with arrows. Explain that the class has just constructed a *food chain*. Use *Box 12* to explain key aspects of a food chain. [10 minutes]

Box 12

A food chain is a series of living organisms that pass energy and minerals from one to another, each providing food for the next in the chain. The first organism in the food chain is called the *producer* (plants that build energy and nutrients from the sun and the soil), while the rest in the chain are *consumers* (i.e., animals that eat producers and other animals). A food chain thus shows the transfer of energy from organism to organism, each organism providing food for the next in the chain.

Source: Environmental Education Committee, St. Vincent and the Grenadines, *Environmental Education Resource Booklet for Primary and Secondary Schools*, undated, p. 15.

Step 2: Invite the class to form groups of four and hand out a set of six food chain picture cards to each group along with ten blank slips of paper, a sheet of chart paper, a glue stick, and a marker. Ask each group to organize the six picture cards on their sheet of chart paper, drawing in arrows, so they make up a food chain. [They should leave plenty of space for more information to be added.] Ask them, additionally, to pastedown their chain and mark each picture item as either a *consumer* or *producer*. Have groups share and discuss their work. [10 minutes]

Step 3: Go on to explain that, in the real world of nature, things are much more complicated than a simple, linear chain. Insects, birds, and mammals often eat more than one thing: some plants catch and digest insects. Some plants feed on the rotting bodies of animals and other plants. There are creatures at the top of the food chain, for instance, owls, parrots, eagles, snakes, and larger mammals, that eat both plants and other animals. This reality is captured by the idea of a *food web* that comprises a complicated web or network of feeding relationships. Ask the groups of four to write now the names of a mix of different plants and creatures, one on each slip of paper. Once they have done this, have them create a food web comprising the living things written on their ten slips of paper and those depicted on their set of food chain picture cards. Ask them to denote an energy flow by drawing in one-way (in some cases two-way) arrows to show what consumes what. Their chart should be pasted down. [15 minutes]

Step 4: Have each group present their food web chart, asking other groups to critique and comment on each presentation. At the end of the presentations, make a brief input following *Box 13*. [15 minutes]

Box 13

All living things, including humans, are caught up in an intricate *web of life*, otherwise called an *ecosystem* in which every living thing in the ecosystem is, in one way or another, connected to every other living thing. There are small ecosystems, for instance, all the life in a title rock pool, a garden, or a cow's stomach. Then there are larger ecosystems such as a rainforest, a system of lakes, a whole coastal area, and the Arctic. In the end, all of life on earth, including the rocks and soils, represent an entire global ecosystem. We call this the *biosphere*, i.e., the zone on earth and just above the earth where living things are to be found.

Stage 2: Biodiversity

Step 1: Ask the class to clear their minds and concentrate and show them, one by one, a set of six large pictures depicting natural life on St Vincent and the Grenadines. Leave a few moments for individual contemplation before asking the class to share feelings they experience on seeing the photographs. Write the sentiments expressed on the board. Say, in closing, that they have just been looking at the rich biodiversity on St Vincent and the Grenadines. Explain, too, that the word *biodiversity* refers to the vast, teeming diversity of living organisms in ecosystems

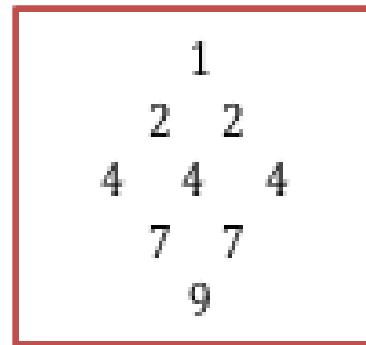
across the planet. Go on to briefly discuss biodiversity and the related concept of *habitat* using the explanation in *Box 14*. [15 minutes]

Box 14

Biodiversity refers to the great variety of animal and plant life in the world or to be found in a particular ecosystem or habitat (a habitat is a place where specific populations of plants and animals form a community, such as in a desert, a rainforest, a coral reef, the broader oceans, mountains, and wetlands). Biodiversity also refers to the great variability to be found in one species, for instance, different breeds of cattle and varieties of crop, variations in a species caused by living in a different environment. The diversity of land-based life forms generally becomes greater the nearer to the equator. These life forms is why SVG's diversity is so rich. Scientists estimate that there are 10 to 14 million life forms, of which only 1.2 million have been named and documented, with 86% still not described. Given the increasing threat to biodiversity from human behaviors, we are losing species forever before we have even known or described them.

Step 2: Invite the class to form pairs and have each pair sit down on the floor or at a table. Give each pair a cut-up set of nine *Biodiversity Cards*. Explain that pairs are to read all the cards and then negotiate a ranking of the cards in a diamond formation (see *Fig. 1*). The criterion for ranking is *convincing*. The card that, in their view, offers the most compelling justification for protecting biodiversity is to be placed at the top of the diamond. The following two are to be placed in second equal position. The three across the center of the diamond are fourth equal in their capacity to convince. The following two are seventh equal. The card at the foot of the diamond is the one the pair found least convincing as a justification for protecting biodiversity. [15 minutes]

Fig. 1



Step 3: When pairs have completed their task, ask them to form groups containing six. Have each pair explain and justify their ranking to the two other pairs (who can ask critical questions) before asking the three pairs to negotiate a consensus ranking for the group as a whole. [15 minutes]

Step 4: Ask each group of six to report back on their consensus ranking and hold a whole-class discussion of issues raised and agreements and disagreements raised. [25 minutes]

Variation

Use a different criterion to 'convincing,' for instance, 'realistic,' 'interesting,' 'challenging,' and 'thought-provoking.'

Extension

As homework, have students write an essay: 'My thoughts and feelings on biodiversity'.

Potential/Facilitation Tips

Stage 1 offers a structured, step-by-step journey through key ideas, concepts, and terminologies associated with ecosystems and biodiversity. Use the running text and boxed information to deliver precise and succinct inputs

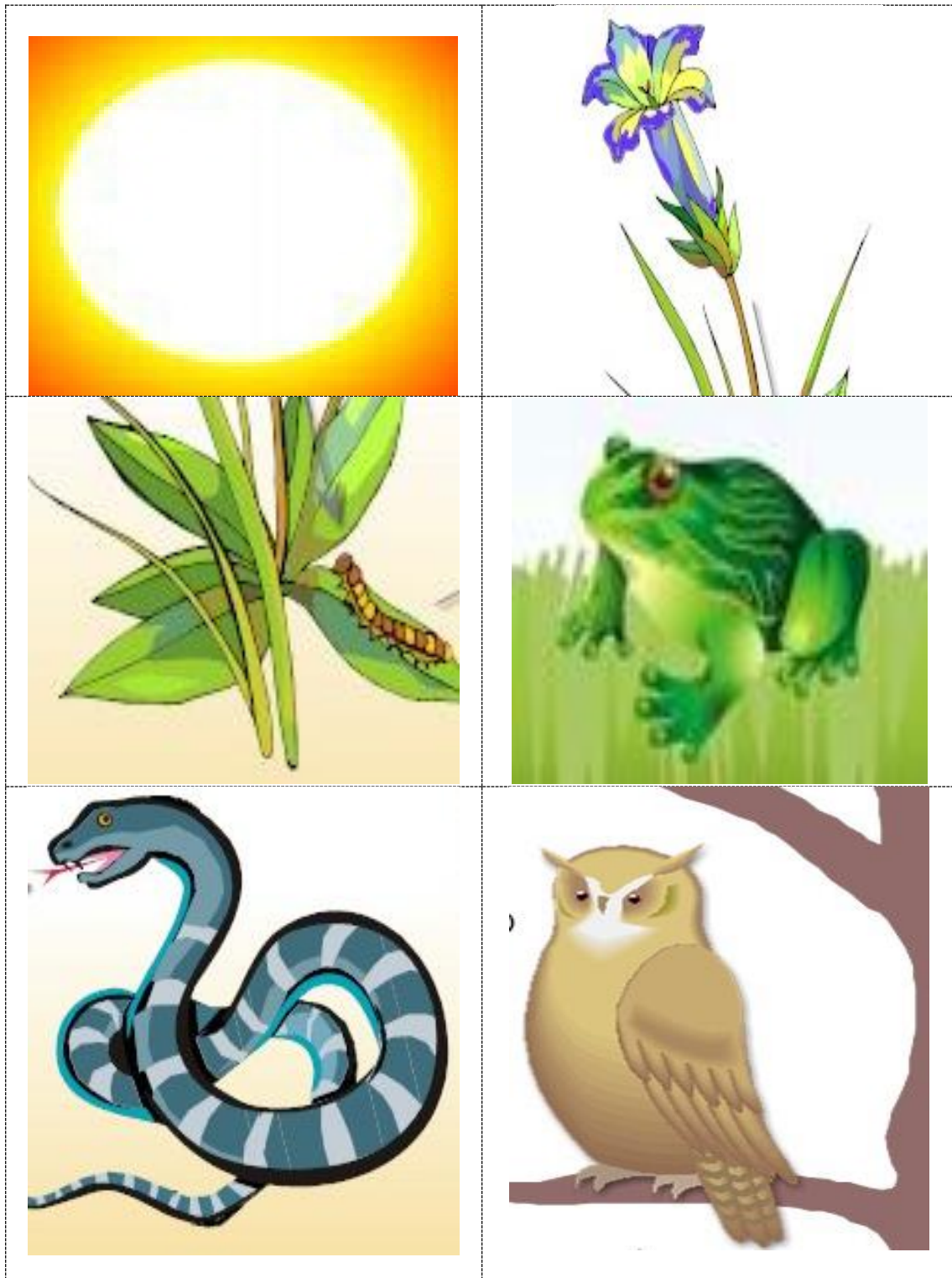
The *Stage 2* activity challenges students to confront and think about various opinions and perspectives on why biodiversity is important. They are challenged by the opinions on the cards. They are also challenged by trying to reach consensus within pairs and within their joined groups of six. In facilitating the final discussion (*Step 4*), play devil's advocate with ideas and positions put forward and encourage students to challenge what each other says. At the core of the activity is the tension between different kinds of *valuing*. Note that: some cards suggest *instrumental valuing* (i.e., valuing nature because of its usefulness to human beings), while others put forward *intrinsic valuing* (i.e., nature being valued in its own right regardless of its usefulness to humans). Some cards fall between the two positions.

The *Extension* activity is recommended to reinforce and personalize student learning.

Curriculum Links

This activity accords with the Health and Family Life Health Promotion theme where it calls upon Form 1 students to 'demonstrate an understanding of preserving the environments' by discussing the terms preservation, sustainability, and conservation, by considering means of conserving the environment and by demonstrating understanding of the interdependence of living things in sustaining the environment. This activity also complements Form 1 Integrated Science and Technology Life Science work under the following attainment target: 'The learner should be knowledgeable about living and non-living things and value life.' Under this heading, the following achievement indicators are particularly relevant: 'Understand the relationship between organisms in food chains and food webs'; 'Classify organisms found within the environment (producers and consumers).' The activity also foreshadows the Form 2 Integrated Science and Technology Earth Science theme with its focus on ecosystems and relationships within ecosystems and might be held over or returned to in greater depth during Form 2 studies. The *Extension* activity meets the Form 1 English learning objective concerned with 'producing text for different purposes and audiences.'

Food Chain Picture Cards



St Vincent and the Grenadines Nature Photos







Photo sources:

<https://news.globallandscapesforum.org/viewpoint/natures-underestimated-potential-mitigate-climate-change/>

<https://travelintense.com/vermont-nature-trail-st-vincent-parrot/>

<https://twitter.com/bluegrenadines/status/1048223965406224385>

<https://www.caribbeannewsnow.com/2019/06/03/st-vincent-and-the-grenadines-to-host-sustainable-tourism-development-conference-in-august/>

<https://www.pinterest.com/pin/351912442849954/>

<https://www.iexplore.com/destinations/caribbean/top-10-things-to-do-st-vincent-and-grenadines>

Conserving Biodiversity Cards

<p><i>Future Generations</i></p> <p>It is vital to conserve biodiversity so that future generations inherit a world just as full of the rich treasures of nature as we have inherited</p>	<p><i>Protecting Our Souls</i></p> <p>It is important to conserve biodiversity because nature's richness, beauty, and diversity make us human, enrich our souls, and fire our imaginations. Imagine what human beings would be like if they were born into a dull, uninspiring world!</p>
<p><i>Food to Consume</i></p> <p>It is vital to conserve biodiversity to have the most comprehensive and richest possible range of food sources to consume. There are foods out there we have yet to discover.</p>	<p><i>The Right to Be Alive</i></p> <p>It is important to conserve biodiversity because all the organisms and creatures in the world have value in their own right. It is not up to us to decide whether or not they are valuable and whether or not they deserve to live. I say: Live and Let Live!</p>
<p><i>Preserving Human Health</i></p> <p>It is vital to conserve biodiversity because we constantly find new plants that provide medicines that save lives. It is just not sensible for us to destroy ecosystems and habitats. There are living things there that might be our medicines of the future, our new antibiotics.</p>	<p><i>Eco-Tourism</i></p> <p>It is important to conserve biodiversity because our economic future depends on maintaining nature reserves, the rainforests, and the diversity of life around our coasts to attract and bring in tourists.</p>
<p><i>Morally Wrong</i></p> <p>It is vital to conserve biodiversity because it is just morally wrong for humans to wipe out animal and plant species and destroy the rich diversity making up the web of life.</p>	<p><i>Destroying Ourselves</i></p> <p>It is important to conserve biodiversity because we know now that all life, including human beings, is intricately caught up in the web of life. If we destroy ecosystems and the forms of life making up ecosystems, this will ultimately rebound and destroy us.</p>

Quality of Life

It is important to conserve biodiversity because so many people rely on the diversity of nature for their quality of life. Scientists need biodiversity for their research. Bird watchers, scuba divers, and photographers use nature for recreation. We all love to sit in a deckchair taking in the richness and beauty of nature.

Strand 9: Ecosystem and Biodiversity Threats

Unit 9: Threats to Ecosystems

Topic 2: Biodiversity Loss

Activity 27: Threats to Biodiversity

Purpose: Deepening understanding of the causes of biodiversity loss and, hence, the threats to biodiversity

Time needed: 120 minutes (*Stage 1:* 80 minutes: *Stage 2:* 60 minutes)

Resources needed

- A cut-up set of *Threats to Biodiversity* statements for each group of four to five students
- A large sheet of chart paper for each group
- A paste stick and a few markers for each group together

Procedure

Stage 1: Examining Biodiversity Threats

Step 1: Remind the class that the issue of biodiversity loss was from time to time raised during the last unit. Then present the alarming statistics of plant and animal species loss as set out in *Box 15*. After inputting, have students brainstorm their reactions and questions, noting down what is said on the board. [20 minutes]

Box 15

According to the World Wide Fund for Nature (WWF) *Living Planet Report 2014*, the planet lost 52% of its biodiversity between 1970 and 2010. In the same 40-year period the global human population doubled. In that period the planet lost 76% of freshwater wildlife, 39% of wildlife living on land and 39% of marine wildlife. Latin American biodiversity plunged by 83% and elsewhere in the tropics animal populations were down by 56%. In temperate zones the loss was 36%. WWF reports that low-income countries are suffering the greatest ecosystem losses but attributes much of the problem to high-income countries that are consuming more resources per person than nature can replenish. Each year humans devour 1.5 planet's worth of natural resources. The day upon which we use up our annual supply of renewable natural resources is getting earlier year-by-year. WWF identified 20 August as 'overshoot day' in 2014.

The fact is we do not know how many plant and animal species there are on Earth. WWF say that the lowest number of species is 2 million while the upper estimate is 100 million. Given that experts calculate that between 0.01% and 0.1% of all species are becoming extinct each year at 2 million species that means between 200 and 2,000 extinctions per year while at 100 million that means that between 10,000 and 100,000 extinctions per year. Experts estimate that species loss is estimated as between 1,000 and 10,000 times higher than the natural extinction

rate (i.e. the rate of extinction if humans were not around).

Sources:

http://wwf.panda.org/our_work/biodiversity/biodiversity/
<https://www.nathab.com/blog/wwfs-living-planet-report-2014-we-now-have-less-than-half-the-biodiversity-of-just-forty-years-ago/>

Step 2: Have students form groups of four or five and give each group a set of the *Threats to Biodiversity* statements, a large sheet of chart paper, the three markers, and a paste stick. Explain that their task is to arrange the statements on the chart paper, consider each statement carefully, and then list against each of the practical things that they think could be done to prevent or neutralize the threat. Go round, prompt, and support groups as the work is undertaken, asking them to think of links between threats and how remedies for one threat might also help remedy other threats. (25 minutes)

Step 3: Have groups come together and invite them to present their work, take questions, and deal with clarification requests following their presentation. (25 minutes)

Step 4: Have groups negotiate which of the *Threats to Biodiversity* statements they will follow up on and give groups the task of researching further into their appointed biodiversity threat and into ways it might be combatted using Internet search, by seeking ideas from their community and by approaching organizations such as the following:

- St. Vincent and the Grenadines National Parks, Rivers and Beaches Authority <http://nationalparks.gov.vc/nationalparks/index.php/conservation/biodiversity>
- Birdlife http://datazone.birdlife.org/userfiles/file/IBAs/CaribCntryPDFs/st_vincent_and_the_grenadines.pdf
- SusGren (Sustainable Grenadines) <http://www.susgren.org>

Explain that groups are to be ready on a given date to present their research using posters and video material and with contributions from all group members. They can also invite a significant adult to join them in presenting, perhaps by including a short interview with the person in question. (10 minutes).

Stage 2: Presenting Biodiversity Threats

Step 1: Have each group (perhaps with guests) present their work. The presentation might be confined to the classroom. Or it might be given to the whole year group or the wider school community. Parents might be invited to the event. (60 minutes)

Extension

Invite an officer of an organization engaged in biodiversity protection to attend class present and answer students' questions.

Potential/Facilitation Tips

This activity introduces students to biodiversity loss and its causes. It calls on students to research threats to biodiversity and present their findings. Throughout, encourage students to also think of how the different threats to biodiversity are interrelated and exacerbate each and how remedies they suggest might address more than one threat.

In preparation for facilitating the activity, reread key case studies in the *Resource Manual*, i.e., *Case Study 10, Bushfires*; *Case Study 12, Exotic and Invasive Species*; *Case Study 14, Vehicle Usage*; *Case Study 15, Biodiversity Loss and Conservation on St. Vincent and the Grenadines* and *Case Study 18, Mangrove Restoration on St. Vincent and the Grenadines*.

Curriculum Links

This activity accords with the Health and Family Life Health Promotion theme where it calls upon Form 1 students to 'demonstrate an understanding of preserving the environments' by discussing the terms preservation, sustainability, and conservation, by considering means of conserving the environment and by demonstrating understanding of the interdependence of living things in sustaining the environment. The activity also complements Form 1 Integrated Science and Technology Life Science work under the following attainment target: 'The learner should be knowledgeable about living and non-living things and value life.' It can be held over or used again to realize the Form 3 Life Science learning outcome, 'Appreciate that organisms and their environment need to be protected, conserved and preserved' under which are the following achievement indicators: 'Discuss ways in which man's activity can adversely affect organisms and their environment'; 'Discuss ways in which man can protect, conserve and/or preserve the environment.'

Threats to Biodiversity Statements

Climate Change

Climate change presents a significant threat to biodiversity. Many plants and animals occupy a 'climatic envelope,' i.e., the range of temperatures and rainfall in which they can exist comfortably. If their 'envelope' moves because the climate gets hotter or drier or wetter, they may no longer survive, and if they cannot move quickly enough or there are obstacles to them moving, they will die out. Plants, especially, are not mobile. Temperature spikes bringing prolonged heatwaves can kill off species, as can raging forest and bush fires caused by the heat and dryness of climate change. Warming seas can bleach coral reefs and lead to them dying off. Climate change also spreads deserts and melts polar environments, pushing species over the edge.

Alien Species

Biodiversity is threatened by the introduction of what are called 'alien' or 'exotic' species that come from elsewhere and are accidentally introduced to SVG through trade and travel. The exotic species may displace native species through competition for limited resources. Introduced species may prey upon native species and drive them to extinction or alter the habitat to the point that many native species can no longer survive. One alien maritime or land species can disrupt an entire ecosystem and lead to the loss of several animal or plant species. Under the heading of 'alien' species, the introduction of genetically modified crops through the import of grain or animal fodder can bring about the degradation or extinction of crop species that are native to the country.

Uncontrolled and Unsustainable Land Usage

Unsustainable agriculture is a major threat to biodiversity. Slash and burn crop cultivation involving squatter farming that moves on from one forest location to another constantly reduces the remaining area of natural diversity. Forest and other habitats are being lost or broken up because of agricultural clearance, squatting, charcoal burning, and illegal marijuana growing. Adding to the pressure on biodiversity is the under-controlled sale of land for housing and commercial development.

Touristic and Coastal Development

While tourism can be good for biodiversity conservation in that tourists want to see unspoilt nature, coastal development of hotels and marinas can threaten marine and coastal biodiversity. Yachting can pollute harbors and coastal waters. When plans for a marina at Ashton Lagoon on Union Island, a Marine Conservation Area, were allowed to go ahead, a biodiversity 'hotspot' was nearly destroyed. The Lagoon, the largest bay in the Grenadines, was very special, containing a richly diverse mangrove and coral reef ecosystem, including a long outer reef, a protected inner lagoon, seagrass beds, tidal mudflats, salt ponds, and the largest continuous mangrove habitat in the region. The marina development nearly destroyed the Lagoon, but it is being restored happily.

Other Human-caused Threats

Other human practices threatening biodiversity include: overgrazing by farm animals, illegal harvesting of eggs and birds, including the trapping of the St Vincent Parrot and other species for the illegal international pet trade, the increasing number of bushfires, pollution caused by pesticides, fertilizers, sewage, and oil spills, and pollution from factories, cars, and trucks. Poverty and unemployment often lead to those living in poor communities going into wild areas to find food, firewood, and other necessities, so threatening biodiversity. All of these factors add to biodiversity loss.

Strand 9: Ecosystem and Biodiversity Threats
Unit 9: Threats to Ecosystems
Topic 3: Biodiversity/Conservation Field Involvement

Activity 28: Biodiversity Fieldwork

Purpose: Allowing students to experience places of rich biodiversity and to express and convey their responses to being immersed in the natural world; giving them, too, practice with field-based skills.

Time needed: 40 minutes in class followed by a whole day or half-day field experience followed by class and out-of-class time to prepare a work display

Resources needed

- Internet connection in class to view one or more videos listed in *Box 16*.
- For each student on the field visit: writing pad and paper, pens and pencils, sketch pad
- Available for groups or individuals to use on the field visit: yarn and scissors, audio recording facility, cameras, magnifying glasses

Box 16

Vermont Nature Trail Videos

- The Vermont Nature Trail (4.38 minutes)
<https://www.youtube.com/watch?v=NYn1J5Ryz24>
- Vermont Nature Trail (10.36 minutes)
<https://www.youtube.com/watch?v=HQw1OR0AFrM>

Montreal Gardens Video

- The Amazing Montreal Gardens (15.55 minutes)
https://www.youtube.com/watch?v=n5gYs_k4aOQ

Procedure

Stage 1: Preparing for the Field Trip

Step 1: When the field trip has been arranged, parental consent secured, and parental/community support in facilitating the trip are secured, hold a pre-trip class session to explain the details of the trip, what materials and equipment students are to bring and what other materials and equipment will be made available for students to draw upon (see *Resources needed* section). Explain the various activities in which the class will be engaged - options are laid out under *Stage 2, Step 2*. (10 minutes)

Step 2: Then introduce and show the video(s) relevant to the chosen location for the field trip (see *Boxes 16 and 17*). Vermont Nature Trail and the Montreal Gardens are

recommended for the trip. For other possibilities, follow the web link given under *Variations* below. (20 minutes)

Box 17: Field Visit Locations

The lush rainforest of the Vermont Trail offers a rich, bio-diverse mix of plants, birdlife, reptiles, and other fauna endemic to SVG or endemic to the Caribbean region. Use website information on the Trail's biodiversity in introducing the film(s): <http://nationalparks.gov.vc/nationalparks/index.php/visitor-sites/vermont-nature-trail>

Montreal Gardens in the Mesopotamia Valley are botanical gardens set in tropical rainforest, standing at an altitude of 1500 feet and surrounded by craggy mountains and verdant rolling hills. Tended by local folk, the gardens are rich in colour, full of the sound of birdsong, and home to some of SVG's most endangered endemic species. The gardens open up into wild rainforest with a river running through it. Use website information in introducing the film: <http://www.montrealestgdns.f9.co.uk>

Step 3: After showing the videos, invite reactions questions. (10 minutes)

Stage 2: The Field Trip

Step 1: Arriving at the location, begin, if possible, with a pre-arranged introduction for the students from a member of the field staff (10 minutes).

Step 2: Then have the students in groups or working on their own undertake the following tasks:

- *Still and Silent.* Have the students either stand or sit in silence for 15 minutes away from their peers and listen and watch, noting down everything they see happen. Explain that people who walk through nature, often in conversation, see very little, while those who stay still and silent are likely to see a lot more!
- *Biodiversity in a Square Meter.* Have students in small groups mark out a square meter on the forest floor using the yarn available and have them record and describe everything they see within - or that moves through - the square meter in ten minutes. Give them a magnifying glass for the observation. Ask that they repeat the ten-minute observation at least a second, if not a third time in the same or different locations.
- *Drawing Something Special.* Encourage students to identify something – plant, animal, or landscape feature - they find especially beautiful or impressive as they walk around and make a careful drawing of what they see using their pencil and sketchpad. Have them take notes, too, on why they found their chosen subject so special.
- *Interview.* Have students, individually or in small groups, interview visitors about why they decided to visit, what their impressions are, what nature means to them, and what being in nature does to them.

- *Personal Writing.* After students have become sufficiently immersed in their new surroundings, call on them to write a personal statement – in poem or prose form – capturing their feelings about the place and its biodiversity.
- *Photo and Sound Collages.* Have some or all of the students make a photographic record of things, big and small, that they observe. Have them also keep a sound record of the different sounds – birdsong, animal calls, insects’ hums, flowing water, tree noise – they encounter.
- *Interpretation Signs and Centers.* Encourage students to read the signs interpreting nature for visitors that they will periodically come across and note down questions they would like answering. When/if they come to a visitor center that interprets the surrounding nature, have them similarly note down their questions.

Step 3: End the visit if possible, with a pre-arranged session with a warden, at which students can pose their questions, follow up on things they have not understood, share some of their work, and convey their thoughts and feelings. (20 minutes)

Stage 3: Back at School

Step 1: Allot class and homework time to develop a display of their field visit work. This can include samples of writing and artwork, a photo display, sound recordings, square-meter results, a selection of transcribed interviews, and literature gathered from any visitor center.

Step 2: Set up the display in a well-frequented area of the school and have students host it and respond to other students’ questions.

Step 3: Make the end-of-year field-based biodiversity exhibition an annual feature in school life, perhaps coinciding with either the International Day for Biological Diversity on 22 May (<https://www.un.org/en/events/biodiversityday/>) or World Environment Day on 5 June (<https://www.un.org/en/events/environmentday/>)

Variation

Use another of the biodiversity locations recommended by the SVG National Parks, Rivers, and Beaches Authority for the field visit. Go to: <http://nationalparks.gov.vc/nationalparks/index.php/visitor-sites>

Potential/Facilitation Tips

Prepare for the field visit in good time, ensuring permission from the principal and school authorities and consent for a visit is obtained from parents or guardians. Arrange the involvement of wardens in good time, so they are ready and able to give time to meet the students at the beginning and end of their visit. Prepare the students, too, by familiarizing them with the tasks they will be asked to undertake out in the field. There will be no time to teach them what to do when everyone is busy performing tasks!

Curriculum Links

This activity accords with the Health and Family Life Health Promotion theme where it calls upon Form 1 students to 'demonstrate an understanding of preserving the environments' by discussing the terms preservation, sustainability, and conservation, by considering means of conserving the environment and by demonstrating understanding of the interdependence of living things in sustaining the environment.

Strand 10: Water & Solid Waste

Unit 10: Water & Solid Waste Issues

Topic 1: Increasing Water Scarcity: Statistics and Issues

Activity 29: Rainfall Graphs

Purpose: Creating graphs using annual and monthly rainfall data from different locations in SVG; discerning patterns and trends in data; considering social and human implications of rainfall statistics and trends

Time needed: 70 minutes

Resources needed

- An *Annual Rainfall Data* handout per student
- A *Monthly Rainfall Data in 2014* handout per student
- Student's notebook, ruler, and six different colour pens/pencils

Procedure

Stage 1: Annual Rainfall Data

Step 1: Give each pupil a copy of *Annual Rainfall Data* handout. Explain that the information is from the Central Water and Sewage Authority (CWSA) and is gathered from different stations across SVG. Briefly explain the role of the Water Resource Management Unit (WRMU) of CWSA using the information in *Box 18*.

Box 18

The Water Resource Management Unit (WRMU) maintains a hydrological database and provides data and information to government ministries, non-government institutions, and students.

The Unit is involved in assessing the status and overall management of water resources in St Vincent & the Grenadines (SVG) through monitoring hydrological and meteorological parameters in the upper and lower watersheds.

Source: Taken from CWSA <http://www.cwsasvg.com/wrmu.html>

Ask students to work independently to create line graphs using the data in the handout. Explain that the horizontal axis is for years and the vertical axis for millimeters (mm) of rainfall and that they are charting different years of total rainfall on the same graph. Have them use a different colour pen/pencil for the data from a different station. (10 minutes)

Step 2: Ask students to form groups of three to compare their graphs. Then have them discuss the patterns and trends they have noticed from the graphs created. (10 minutes)

Step 3: Invite the class to share what they have found and discuss emerging insights. Then ask the class to consider the implications of the trends they see for a Vincentian way of life in different locations and what might be done to protect that way of life. (15 minutes)

Stage 2: Monthly Rainfall Data

Step 1: Give each student a copy of the *Monthly Rainfall Data* handout. Explain that the information is also from CWSA. Ask students to work independently to create line graphs using the data from one of the stations in the handout. Explain that the horizontal axis is for months and the vertical axis for millimeters (mm) of rainfall and that they are charting different years of rainfall in one station on the same graph. Have them use a different colour pen/pencil for the data from a different year. (10 minutes)

Step 2: Once completed, ask students to find another student who has worked on the data from a different station and compare their graphs. Then have them discuss the patterns and trends they have noticed from the two graphs created. (10 minutes)

Step 3: Invite the class to share what they have found and discuss emerging insights. Then ask the class to consider the implications of the trends they see for a Vincentian annual way of life in different locations and what might be done to protect the yearly way of life. (15 minutes)

Extension

1. Have the class come up with a few questions they would like to ask the Water Resource Management Unit of the CWSA and send them to the Unit for their responses (email: cwsa@vincysurf.com). Or, alternatively, invite relevant CWSA personnel to the class to discuss students' questions.
2. Have the class create graphs using the temperature data (Handout: Temperature Data) and discuss the patterns and trends they have noticed.

Potential/Facilitation Tips

By analyzing annual and monthly data gathered by CWSA, this activity will give students important insights into changing rainfall patterns in different locations in SVG.

In *Stage 1*, students will examine the annual rainfall data over 6 years (from 2009 to 2014). Questions to take the class discussion forward might include:

- What are the similarities and differences in terms of the rainfall trends in six different stations?
- What does the data for 6 years tell you about rainfall patterns in SVG?
- What are social and human implications of the annual rainfall patterns you have noticed in different locations in SVG? Are there different implications in different locations?
- What might be done to cope with changing annual rainfall patterns?

In *Stage 2*, students will examine the monthly rainfall data in two specific years (2009 and 2014). Questions to take the class discussion forward might include:

- What do the two graphs (2009 and 2014) in one location tell you about monthly rainfall patterns in 2009 and 2014? What are the changes you have noticed if any? Are the changing patterns similar in different locations?
- What are the social and human implications of the monthly rainfall patterns you have noticed in different locations in SVG? Are there other implications in different locations?
- What might be done to cope with the changing monthly rainfall patterns?

Curriculum Links

This activity aligns with the Form 1 Mathematics learning objectives, such as 'organize and display data' and 'interpret data and draw conclusions.'

Handout: Annual Rainfall Data

1. Catchment Area: Soufriere Windward; Station: Fancy

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	2380.2	2404.8	2669.1	2515.3	1277.4	1162.8

2. Catchment Area: Kingstown; Station: Rivulet Agri St.

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	1835.2	2460.5	2778.4	1456.8	1719.3	1406.1

3. Catchment Area: Buccament; Station: Layou

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	1940.5	2684.4	2699.0	2367.0	2298.4	1839.8

4. Catchment Area: Cumberland; Station: Hermitage

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	4282.6	2684.4	4180.7	4201.4	4568.3	3126.6

5. Catchment Area: Bequia; Station: Bequia Airport

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	971.2	1324.4	1427.4	920.3	1055.8	690.7

6. Catchment Area: Union Islands; Station: Clifton

Year	2009	2010	2011	2012	2013	2014
Annual Totals (mm)	716.2	1100.8	965.5	815.8	829.7	618.2

Source: Central Water & Sewerage Authority. Rainfall Data. <http://www.cwsasvg.com/wrmu.html>

Handout: Monthly Rainfall Data in 2009 and in 2014

1. Catchment Area: Soufriere Windward; Station: Fancy

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	232.2	136.5	41.7	274.9	326.0	238.1	206.4	264.6	317.9	71.5	22.5	45.4

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	53.5	82.7	66.1	37.6	23.9	86.4	86.8	173.8	148.0	125.5	228.7	49.8

2. Catchment Area: Kingstown; Station: Rivulet Agri St.

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	166.8	96.0	45.8	329.7	117.1	259.0	256.6	196.1	141.2	111.1	68.2	47.6

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	96.1	66.8	91.6	20.3	37.5	77.8	151.1	144.4	206.4	174.0	282.6	57.5

3. Catchment Area: Buccament; Station: Layout

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	173.9	133.6	12.0	58.8	98.5	180.0	386.3	289.6	210.3	211.5	111.5	74.5

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	179.5	104.1	54.7	13.3	32.7	119.3	227.7	260.0	301.3	129.4	342.8	75.0

4. Catchment Area: Cumberland; Station: Hermitage

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	632.0	378.8	156.7	387.8	439.1	410.3	515.0	322.6	259.9	283.7	367.7	128.9

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	303.7	277.7	202.8	70.2	139.2	175.0	313.9	458.8	471.5	233.7	290.7	199.4

5. Catchment Area: Bequia; Station: Bequia Airport

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	99.7	84.6	5.5	34.3	129.0	94.5	175.2	140.1	62.8	77.4	39.3	28.8

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	43.3	37.6	52.1	8.0	15.9	15.0	78.3	21.7	143.4	49.9	204.3	21.2

6. Catchment Area: Union Islands; Station: Clifton

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	113.6	48.8	19.4	23.9	30.3	108.2	143.2	70.5	22.2	109.3	4.5	22.3

2014	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Totals (mm)	55.1	15.9	17.4	2.8	10.6	33.2	150.2	105.2	106.2	63.1	23.4	35.1

Source: Central Water & Sewerage Authority. Rainfall Data. <http://www.cwsasvg.com/wrmu.html>

Handout: Temperature Data

1. Belle Isle Climate Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010 Monthly average (Celsius)	30.5	31	31.4	30.5	31.2	30.8	30.7	30.9	30.7	31	30.4	29.3
2011 Monthly average (Celsius)	28.7	28.5	29.1	29.5	31.4	31.4	29.9	30.8	30.8	30.9	30.3	29.8
2012 Monthly average (Celsius)	27.8	27.7	28.4	29	29.6	29.7	30.8	30.5	30.8	30.5	30	29.7
2013 Monthly average (Celsius)	28.4	28.7	30.2	29	30	30	30.5	31	30.9	29.6	30	28.3
2014 Monthly average (Celsius)	27	27.9	28.3	29.4	30.4	30.5	29.3	30.5	30.8	30.2	29.9	29.5

2. Rabacca Climate Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010 Monthly average (Celsius)	28.8	31.6	32.2	32	33	32.6	31.9	33.2	33.2	33.3	31.5	30.3
2011 Monthly average (Celsius)	29.6	28.4	29	30.9	31.3	30.8	31	32.3	32.7	30.1	30.1	30
2012 Monthly average (Celsius)	29.2	27.7	28.2	29.4	29.9	31	31.7	31.3	33	32.4	31.5	29.8
2013 Monthly average (Celsius)	28.9	28.9	30.4	31.1	31.5	30.6	32	32.1	33.7	32.9	31.4	30.1
2014 Monthly average (Celsius)	28.7	28.5	29.2	30.1	31.1	31.1	30.6	31.5	32.5	33.3	31.8	31.3

Source: Central Water & Sewerage Authority. Climate Station Data (2009-2015).
<http://www.cwsasvg.com/wrmu.html>

Strand 10: Water & Solid Waste
Unit 10: Water & Solid Waste Issues
Topic 2: Waste Disposal: Practices and Issues

Activity 30: What a Waste!

Purpose: Exploring solid waste information at the global level and considering the implications for SVG; examining CWSA's solid waste reduction tips and implementing them at home

Time needed: 65 minutes plus varying homework time

Resources needed

- A *What a Waste 2.0* handout per student
- A cut-up set of Solid Waste Tips cards and pens for each group
- Three sheets of chart paper and three glue sticks

Procedure

Stage 1: Solid Waste Challenges

Step 1: Distribute a *What a Waste 2.0* handout to each student. Explain that this is an infographic based on World Bank's 2018 global study on solid waste. First, ask students to look at the top half of the infographic. Get the whole class to brainstorm reactions to the infographic information. Write down what is said on the board. After a couple of minutes, ask students to look at the bottom half of the infographic. Read aloud the following sentences: 'In low-income countries, over 90 % of waste is mismanaged. This increases emissions and disaster risk, which affects the poor disproportionately. Have the class consider the links between 'waste mismanagement,' 'emissions,' 'disaster risk,' and 'the very poor.' Write the ideas on the board. (15 minutes)

Step 2: Ask students to discuss the infographic at home, focusing on the following: (a) approximate percentages of different types of solid waste (i.e., metal, glass, plastic, paper/cardboard, food/green) generated at home every month; (b) the links between 'waste mismanagement,' 'emissions,' 'disaster risk,' and 'the very poor'; (c) specific solid waste issues they are concerned about in their family and community. (Varying time at home)

Step 3: Invite students to share what they have discussed at home in groups consisting of three, followed by a whole-class discussion. (15 minutes)

Stage 2: Solid Waste Management Action at Home

Step 1: Divide the class into six groups. Give each group a set of *Solid Waste Tips* cards and some pens. Explain that the cards are based on CWSA's Solid Waste Management Unit (SWMU)'s advice on solid waste management, and their task is to lay out the cards according to the criteria to be given. Then assigning one of the

following spectrums to each group: (a) easiest to least easy to implement at home; (b) least costly to most costly to implement at home; (c) most effective to least effective to reduce solid waste at home. Make sure that two groups are working on the same criteria. Encourage each group to add their own solid waste management ideas using the blank cards. Have the groups discuss the ordering of the cards and the reasons behind the ordering. (10 minutes)

Step 2: Put the two groups working on the same criteria together. Give each group a sheet of chart paper and a glue stick. Have each group explain their order and negotiate a mutually agreeable order. Have them paste the cards on the chart paper and write down key points discussed. (10 minutes)

Step 3: Invite each group to present a mutually agreed order of the cards, followed by a whole-class discussion. Discuss which actions they are prepared to implement at home and create an action list. (15 minutes)

Extension

Have students implement solid waste management actions for two weeks at home and have them report back if and how their actions have made a difference in reducing solid waste at home.

Variation

Skip *Stage 1 Step 1* and start this lesson with student discussion at home.

Potential/Facilitation Tips

By the end of *Stage 1*, ensure that students have had the opportunity to explore the links between ‘waste mismanagement,’ ‘emissions,’ ‘disaster risk,’ and ‘the very poor.’ Write these keywords on board and indicate relationships using arrows with some explanations. At an appropriate point in *Step 3*, draw upon the information in *Box 19*.

Box 19

- While more than one-third of waste in high-income countries is recovered through recycling and composting, only 4 percent of waste in low-income countries is recycled
- The Latin American and the Caribbean region recycles 4.5 percent of its waste
- It is estimated that 1.6 billion tonnes of carbon-dioxide-equivalent were generated from the treatment disposal of waste in 2016 – representing about 5 percent of global emissions
- Uncontrolled waste and poorly disposed waste is harming human health and local environments while adding to climate change.
- It is often the poorest in society who are adversely impacted by inadequate waste management.
- Without improvement, solid waste related emissions will increase to 2.6 billion tonnes of CO₂ equivalent by 2050. Improving waste management will

help cities become more resilient to the extreme climate occurrences that cause flooding, damage infrastructure, and displace communities and their livelihood

- The Latin American and the Caribbean region recycles 4.5 percent of its waste

Source: World Bank. (2018). *What a Waste 2.0*.

<https://www.worldbank.org/en/news/infographic/2018/09/20/what-a-waste-20-a-global-snapshot-of-solid-waste-management-to-2050>

The procedure in *Step 2* encourages students to examine CWSA *Solid Waste Tips* critically. Encourage them to develop their own solid waste management tips by writing new ones or amending those of CWSA ones.

In preparation for the facilitation of this activity, read *Case Study 23* in the *Resource Manual*.

Curriculum Links

This activity can be used to complement the health promotion theme of the Grade 8 Health and Family Life Education curriculum. The theme recognizes ‘the adverse consequences of health that result from not protecting the environment.’

Handout: What a Waste 2.0



Source: Taken from World Bank

<https://www.worldbank.org/en/news/infographic/2018/09/20/what-a-waste-20-a-global-snapshot-of-solid-waste-management-to-2050>

SVG Solid Waste Management Tips Cards

Do not litter or illegally dump waste.	Use the 4R's approach – Reuse, Recycle, Recover and Reduce.
Re-use containers and bags wherever possible.	Donate unwanted items to others who might want or need them.
Shop wisely. Take your bags when shopping to avoid excess wrapping. Buy reusable items instead of disposable ones.	Compost all organic waste from the kitchen (peelings etc.) and garden trimmings to produce humus for growing plants.
Be considerate to collection staff.	Store waste in covered bins, away from animals and put out only on collection day.
Raw meat and fish waste should be kept frozen until collection day, then wrapped in newspaper before being put out.	Broken glass and other sharp objects should be wrapped in newspaper before being put into the trash bin.
Injection needles should be disposed of in covered hard plastic containers (e.g., bleach bottles).	Encourage neighbors, relatives, and friends to follow good waste management practices.
Do not dispose of construction waste and bulky items such as beds, television sets, fridges, stoves with regular household waste.	In the case of bulky items, bring them to the landfill yourself or call the Solid Waste Management Unit about what to do.
Lawn and garden trimmings, including tree trunks and branches should not be put out for collection.	

Source: Adapted from SWMU/, CWSA. *Solid Waste Tips*
<http://www.cwsasvg.com/newsandpublications/Solid%20Waste%20Tips.pdf>

Strand 10: Water & Solid Waste

Unit 10: Water & Solid Waste Issues

Topic 3: Home Water Conservation (including Fieldwork)

Activity 31: Saving Water at Home

Purpose: Alerting students to water conservation measures prior to surveying home practice and promoting a broader conservation approach.

Time needed: 70 minutes in class (30 minutes for *Stage 1*; 40 minutes for *Stage 2*) and homework time

Resources needed

- A *Water Usage: Good Practice* Handout for each student
- A *Water Usage: Good Practice* Handout for each group
- A vessel containing one gallon of clean water
- A sheet of chart paper and a few markers

Procedure

Stage 1

Step 1: Recall all that has been said in previous lessons about changes in rainfall patterns and their impacts, extended dry seasons, drought and water shortages, and the importance of water conservation in ensuring a continued sufficient water supply for all. Say, too, that the lesson will involve some homework time spent surveying water usage in homes. (5 minutes)

Step 2: Show the gallon of water. Say that the average Californian uses 196 gallons a day while the SVG Central Water and Sewerage Authority (CWSA) estimates that the per-person usage figure in St Vincent is 30 gallons a day. The whole class discusses what they think of these water usage figures. Then brainstorm water conservation ideas at home, writing brainstormed items on the board. Have the class see if the items can be grouped, with each cluster given a heading. (20 minutes)

Step 3: Distribute a copy of the *Water Usage: Good Practice* handout to each student and explain that their task is to discuss water conservation practice at home with parents and other family members by ticking an appropriate box for each good practice statement and answering the two questions at the end of the handout. (5 minutes)

Stage 2

Step 1: Divide the class into two groups. Give a blank copy of the handout to each group and ask them to compile the data gathered so that it is clear how many families have ticked 'Never.' 'Sometimes' and 'Always' for each tip. Also, ask them to summarize the answers to the two questions. Once completed, ask each group to

prepare a short presentation highlighting the patterns identified using a sheet of chart paper. (25 minutes)

Step 2: Invite each group to give their presentation. Follow this with a class discussion concerning recurring gaps in good family practice and areas for future improvement. (15 minutes)

Extensions

Have the class develop a family code of good water conservation practice and ask students if their families will abide by the code. Ask families joining the scheme to record how they do and have the students report back on progress after one month.

Potential/Facilitation Tips

During *Step 1* of *Stage 2*, encourage students to report back on the two questions to suggest good water conservation practices they found that should be added to the *Good Practice* handout. It is also a good idea to get families on board in helping with the activity by informing them and seeking consent ahead of time about the coming questionnaire.

Curriculum Links

This activity supports the Form 1 Social Sciences curriculum, where there is a consumption theme and students are enjoined to discuss the rights and responsibilities of the consumer.

Handout: Water Usage: Good Practice

In the Home

	Never	Sometimes	Always
<i>Turn off the Tap:</i> Avoid shaving, brushing teeth, or handwashing of dishes with a continuous flow of water from the tap by turning the tap off and on as necessary			
<i>Wash only Full Loads:</i> Wash only full loads of clothes and full dishwasher loads			
<i>Repair Leaks Promptly:</i> Look out for dripping taps and leaky toilets and fix them as soon as they are noticed			
<i>Shower Speedily:</i> Take a two-minute, not five-minute shower, and choose a shower instead of a bath			
<i>Think Shallow if Taking a Bath:</i> Fill the bath only halfway or less			
<i>Allow Time not Water to De-freeze Food:</i> Avoid using running water to thaw frozen food and plan beforehand to let the thawing happen naturally			
<i>Increase Water Efficiency:</i> Install a water-efficient showerhead or water-saving toilet flush system (a simple way is to put a large plastic bottle full of water in the cistern to reduce fill-up)			
<i>Boil Shallow:</i> Boil vegetables and other foods in as little water as possible.			

Outside the Home

	Never	Sometimes	Always
<i>Water Efficiently (1):</i> Only water the root zone of plants, not the foliage (which brings disease anyway, and the water evaporates wastefully)			
<i>Water Efficiently (2):</i> Use a shut-off valve on the hose so you can turn off the water as you move from plant to plant			
<i>Water Efficiently (3):</i> Make sure the hose or sprinkler system is not watering paths, the house, and the street and that it never runs when it is raining			
<i>Water Efficiently (4):</i> Use a watering can without a hose to direct water at specific plants or think if installing a drip irrigation system			
<i>Garden Differently:</i> Reduce the lawn area and replace it with shrubs and ground cover plants			

that can best tolerate dry or drought conditions			
<i>Mulch Gardens:</i> After watering, mulch the ground with compost to keep the soil cooler, reduce evaporation and discourage weed growth			
<i>Use a Broom:</i> Sweep driveways, pavements, and paths, avoiding using a hosepipe			
<i>Shift the Watering Schedule:</i> Water the garden in the late evening or at dusk so that plants have the benefit overnight			
<i>Repair Leaks:</i> Check for any leaks on a hosepipe system and repair them			
<i>Change Car Washing Habits:</i> Use an automatic shut-off if washing the car by hosepipe or, better still, use a bucket of water or use a car wash that recycles water			
<i>Re-use Indoor Water Outdoors:</i> Recycle indoor-used 'grey' water that would otherwise go down the drain for watering the garden (e.g., put a bucket in the shower, siphon off the bathwater, use cooled cooking water, wash fruit and vegetable over a bucket)			
<i>Install a Rain Barrel:</i> Harvest rainwater by catching it in a barrel and use the water for the garden			

Source: Primarily taken from the advice given by the Central Water & Sewerage Authority; <http://www.cwsasvg.com/newsandpublications/Water%20Conservation%20Tips.pdf>

What are important water conservation practices that families follow that are not mentioned in the handout?

Which suggestions in the handout are impractical or too challenging to implement?