Stay afloat

Examining the effectiveness of flood mitigation infrastructure

Year Level:	7-8	**Subject:**	Geography (Water in the world + Landforms and landscapes + Changing nations)	**Topic:**	Extreme weather – floods
Duration:	2 x 50 minute lessons **Lesson 1 -** Introduction and model research **Lesson 2 -** Building and testing	**Curriculum:**	**Content description codes:** • **VC2HG8K05:** The causes of, impacts of and responses to an atmospheric or hydrometeorological hazard • **VC2HG8K21:** strategies and responses to manage and improve the liveability and environmental sustainability of Australia's cities, and to adapt to climate change • **VC2HG8S06:** identify a strategy for action in relation to environmental, economic, social or other factors, explain potential impacts and develop appropriate actions	**Climate Topics:**	• Climate change risks • Extreme weather – floods • Extreme weather preparedness • Climate change mitigation / adaptation strategies

Brief Overview

Human-induced climate change is increasing the frequency and intensity of extreme weather events in Australia. This lesson examines the connection between climate change and flood events and the importance of preventative infrastructure such as sea walls, stilts and mangroves. By designing and testing physical models that represent different flood mitigation strategies, students will explore how these solutions work and assess their effectiveness in reducing flood impacts.

Learning outcomes
Learning Intention Students will investigate how communities can prepare for and reduce the impacts of flooding through the design and testing of different mitigation strategies. **Success Criteria** ● Explain how climate change can change the frequency and intensity of flood events ● Identify and evaluate flood mitigation strategies ● Apply these strategies to an Australian context

Introduced climate science concepts	Presumed knowledge
● Climate risks ● Extreme weather events ● Climate change impacts (environmental, economic and social) ● Mitigation / adaptation strategies (natural and human-made)	**VC2HG6K05:** the impacts of bushfires and other climate hazards on environments and communities, and how people and communities manage prevention, preparedness, response and recovery **VC2S6U06:** sudden geological changes or extreme weather conditions can affect Earth's surface and atmosphere; the impacts of natural hazards, including earthquakes, volcanic eruptions, wildfires and floods, can be reduced by human actions and technological innovations

Teaching materials and resources					
Tool ID	**Student/ teacher**	**Tool and link**	**Overview**	**Source**	**Approx. price**
R0	Teacher	Glossary of climate terms	This document provides teachers with a glossary of key terms relevant to this lesson plan	MCCCRH	–

R1	Teacher	Lesson PowerPoint	PowerPoint slides with lesson content and activity instructions for students to follow. Includes speaker notes	MCCCRH	–
R2	Teacher + Student	Video – Climate Change's link to flooding (**5:22 mins**)	The video showcases the connection between climate change and flood events. It explains how floods occur, where they have taken place, and how to limit their impacts.	The Guardian Australia	–
R3	Teacher	Model reference diagrams	Diagrams of each flood-mitigation model, materials lists, and step-by-step testing instructions	MCCCRH	–
R4	Student	Stationary: scissors, sticky tape, paper, staples and stapler	For students to cut materials, stick them together and create their models	School or students to supply	–
R5	Student	Foil trays (~10)	Used as a base to build the model in	Teacher or school to supply	$12.98 (20 Pack)
R6	Student	Cardboard	Used to create model base and slope (under top clay layer) and for the houses	Students, teacher or school to supply	-
R7	Student	Duct tape	To attach and seal cardboard to foil tray, and hold other model elements together	Teacher or school to supply	$6
R8	Student	Modeling clay	Used to create model land and some flood mitigation strategies	Teacher or school to supply	$6 (900g)
R9	Student	Sponge	Used to create mangrove tree tops	Teacher or school to supply	$1.80
R10	Student	Pipe cleaners	Used to create mangrove tree roots	Teacher or school to supply	$2.98
R11	Student	Tea bags	Use to create sandbags	Teacher or school to supply	$3

R12	Student	Sand or fine dirt	Used to fill sand bags	Students will find outside OR teacher can supply	–
R13	Student	Straws	Used to create drainage pipes	Teacher or school to supply	$1.40
R15	Student	Small container, bowl, or cups	Used for a ‘basin’ in the drainage model	Teacher or school to supply	–
R15	Student	Wooden skewers	Used to create stilts	Teacher or school to supply	$2.50
R16	Teacher	Measuring jug	Used to pour water in when testing the flood models	Teacher or school to supply	$5
				Approx total: $41.66	

Lesson outline				
Stages	**Description**	**Tool ID**	**Slide Number**	**Time**
Before lesson: Material prep	**For this lesson you will need craft/construction materials as listed in the table above. Ensure these have all been sourced before starting this lesson.** **Teacher / student helpers:** Set up the materials station – using items sourced by the teacher, or provided by the school – at the back or side of the room so it doesn’t distract students during presentations or the activity later on.	R4-15	–	–
Part 1: Learning introduction	**Teacher:** Begin the lesson with the powerpoint (slides 1-4).	R1-4	1-6	10 mins

	• **Slide 1 (*Optional to show to students*):** Learning goals
	• **Slide 2:** Title slide
	• **Slide 3 (video - 5:22 mins):** 'Climate change and flooding' (**R2**)
	• **Slide 4 (*video recap questions*):** What are flood…
	  ○ Causes
	  ○ Types
	  ○ Impacts
	  ○ Preventions
	  ■ *Answers provided in speaker notes*
	
	Students:
	Take notes from slides and participate in class discussion
	
	Differentiation discussion strategy:
	Use the 'popcorn discussion' method and call on hesitant sharers first to name the easier or more obvious words/options. Call on extension students when obvious ones have already been said.			

Part 2: Activity introduction + Control test	**Teacher:** To start the activity, go through **slide 5** that gives a brief overview of the activity: In groups, students will be assigned a flood-mitigation method to model. All models will be tested together to assess how effectively they reduce the impacts of flooding. Change to **slide 6** to begin the first part of the activity – demonstrating the control model to the class (see **R3** for how to build and conduct the experiment).	R1, R3 R4-8 (for model) R16 (for test)	5-6	15mins

	NOTE: This model can be built ahead of time, or constructed live with the class. Before testing, ask students to predict what will happen and explain why. Afterward, discuss whether their predictions matched the results and why. **Students:** Watch the control demonstration and participate in class discussion.			
Part 3a: Mitigation strategy introduction + student model drafting	**Teacher:** Go through **slide 7**, briefly explaining each of the five flood mitigation strategies students will be modeling: 1. Mangroves 2. Sea wall 3. Sandbags 4. Drainage 5. Stilts High-level summaries for each method are included in the speaker notes. NOTE: A more in-depth breakdown of each strategy will be covered ***after*** the activity, using the experiment results to discuss the pros and cons. Once these have been covered, split students into groups of 4* and assign each group one of the flood mitigation strategies. **Adjust group numbers as needed – more than one group can build the same model type.* Move to **slide 8** with the activity instructions.	R1, R3	7-8	25mins

	Students: In their groups, students are to: 1. Research and draft their assigned mitigation method ● This should be a quick scope to find examples of their strategy and plan how it will be built onto the control base. ● Students are to present their drafts to the teacher before building, to check their designs accurately model the mitigation method. ○ See **R3** for examples of how each model should look.			
Start of Lesson 2 (*if split over two single periods*)				
Part 3b: Student model building	2. Build their model ● Students build their models by re-creating the control setup and ***adding*** their assigned mitigation strategy. ● This ensures every test uses the same base for a fair comparison. NOTE: Materials for each mitigation model are listed in the Teaching Materials and Resources table. Provide the relevant materials (or similar substitutes) to each group.	R1, R3 R4-15 (for models)	8	20mins
Part 4: Model testing	**Teacher:** Change to **slide 9** and have students bring their models to the front for testing. Follow the instructions on the last page of **R3** for how to conduct the test. During testing, for each model ask students: 1. What do you predict will happen? 2. What worked well? 3. What didn't work?	R1, R3 R16 (for test)	9	15mins

	Students: Watch the model testing and participate in class discussion. *<u>Differentiation discussion strategy:</u>* *Rotate responses by calling on a different student each time, or move along the row so all students participate.*			
Part 5: Expanding and reflecting on activity learning	**Teacher:** Once testing is complete, have students return to their desks and go over **slides 10-23** using what they learnt from the experiment to discuss the effectiveness and pitfalls of each mitigation method. Slides **10-23 are built slides** and are formatted as follows: 1. 'Title slide' – the name of the flood mitigation strategy 2. Pros of the strategy 3. Cons of the strategy This structure repeats for all five of the different flood mitigation methods. Finish on **slide 24** with the discussion question: ● Are there any other strategies? – both directly and bigger picture ○ *Prompts are included in the speaker notes* **Students:** Take notes from slides and participate in class discussion *<u>Differentiation discussion strategy:</u>* *Use the 'popcorn discussion' method and call on hesitant sharers first to name the easier or more obvious words/options. Call on extension students when obvious ones have already been said.*	R1	10-24	15mins

Links for further reading
Climate Change: • What Is Climate Change? – UN • Australia's changing climate – CSIRO • How can we address the causes of climate change? – CSIRO **Climate Change in Victoria:** • How is Victoria's climate changing? – VIC Gov **Flooding:** • Hazards: Floods – Australian Climate Service • Managing flood risk together – Melbourne Water