

Beat the Heat

Urban planning for cooler communities in a warming world

Year Level:	7-8	Subject:	Geography (Place and liveability + Changing nations)	Topic:	Urban planning
Duration:	2 x 50 Minute Lessons Best run over a double lesson to keep testing conditions consistent and for time sensitive data tracking	Curriculum:	Content Description Codes <ul style="list-style-type: none"> • VC2HG8K11: responses to enhance the liveability of places at a local scale • 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:	<ul style="list-style-type: none"> • Climate change • Extreme weather • Urban Heat Island Effect • Mitigation / adaptation

Brief Overview

Students explore how smart urban planning can protect communities from rising heat driven by human-induced climate change. They conduct an ice cube experiment to investigate how different surface materials absorb and reflect heat, then apply their findings to redesign a real local space. Using data from their tests, groups create a short council submission with practical, evidence-based solutions for a cooler, climate-ready community.

Learning outcomes

Learning Intention

Students will be able to explain how urban planning strategies can enhance the liveability and environmental sustainability of cities and local areas, particularly in response to rising temperatures and climate change.

Success Criteria

- Describe how increasing heat affects the liveability of places at a local scale
- Analyse and propose strategies to improve the environmental sustainability and climate resilience of urban areas
- Develop and justify a strategy for action that considers environmental, social, and economic factors, supported by data from investigations

Introduced climate science concepts	Presumed knowledge
<ul style="list-style-type: none"> ● Global warming ● Albedo ● Urban Heat Island Effect ● Mitigation and adaptation ● Extreme weather (heatwaves) 	<ul style="list-style-type: none"> ● VC2HG6K05: the impacts of bushfires and other climate hazards on environments and communities, and how people and communities manage prevention, preparedness, response and recovery ● VC2HG6K01: how places and environments are changed and managed by people

Teaching materials and resources				
Tool ID	Student/teacher	Tool and link	Overview	Source
R0	Teacher	Glossary of climate terms	This document provides teachers with a glossary of key terms relevant to this lesson plan	Monash Climate Change Communication Research Hub

R1	Teacher	Lesson PowerPoint	PowerPoint slides with lesson content and activity instructions for students to follow. Includes speaker notes	Monash Climate Change Communication Research Hub
R2	Teacher	Ice-melt test guide	Instructions for the first/data collection part of the activity	Monash Climate Change Communication Research Hub
R3	Student	Ice cube trays	FILL THE DAY BEFORE CLASS. For albedo experiment	School/teacher to provide
R4	Teacher	Optional: Esky	To keep ice cubes cold during the lesson	School/teacher to provide
R5	Student	Table lamps + light bulbs	To provide a light/heat source for the albedo ice cube experiment	School/teacher to provide
R6	Student	Test surfaces: <ul style="list-style-type: none"> • Black card/foam • White card/foam • Aluminium foil • Small mirrors 	Materials used to test impact of albedo on heat transfer	School/teacher to provide
R7	Student	Clear plastic lids/trays	To place under each experiment setup to catch water	School/teacher to provide
R8	Student	Stopwatch	To time ice cube melting	School/teacher to provide
R9	Student	Scissors	For cutting paper/materials	n/a (school to provide)
R10	Student/ Teacher	Paper towel	For mopping up any extra water	School/teacher to provide
R11	Student	Council submission – Student template	A structured worksheet for students to create their council submissions	Monash Climate Change Communication Research Hub
R12	Teacher	Council submission – Teacher guide	An in-depth guide of what should be included in each section of the council submissions	Monash Climate Change Communication Research Hub

R13	Student	Area profiles	Contains 5 briefs each containing: <ul style="list-style-type: none"> • A map of a local urban area for students to design recommendations for • Three community member personas to consider when suggesting changes • One council member persona representing the audience for their submission 	Monash Climate Change Communication Research Hub
R14	Student	Butchers paper	For drafting ideas and design changes to their urban spaces	School/teacher to provide
R15	Student	A3 graph paper	For drawing final, refined designs to include in the submission	School/teacher to provide

Lesson outline				
Stages	Description	Resource ID	Slide Number	Time
Before lesson: Material prep	<p>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.</p> <p>FILL YOUR ICE CUBE TRAYS at least 12h before so they have time to freeze</p> <p>Teacher / student helpers: Set up the materials station – using items sourced by the teacher, or provided at the school – at the back or side of the room so it doesn't distract students during presentations or the activity later on.</p>	–	–	1 DAY BEFORE LESSON
Stage 1: Quickfire introduction	<p>Teacher: Begin the lesson with the powerpoint (slides 1-4).</p> <ul style="list-style-type: none"> • Slide 1 (Optional to show to students): Learning goals 	R1	1-4	5 mins

	<ul style="list-style-type: none"> ● Slide 2: Title slide ● Slide 3 (<i>Discussion question</i>): Is it hotter to live in: A city or a rural area? <ul style="list-style-type: none"> ○ Slide 4: Answer: City (includes temperature difference statistic) <p>Students: Participate in class discussion, raise hand to vote on which option is hotter</p>			
Stage 2: Theory	<p>Teacher: Run through slides 5-10 to deliver the learning theory section (<i>prompts and content information are provided in the speaker notes</i>).</p> <ul style="list-style-type: none"> ● Slide 5 (<i>Discussion question</i>): Why is it hotter to live in a city? <ul style="list-style-type: none"> ○ Slide 6: Three main factors: <ol style="list-style-type: none"> 1. Heat-absorbing surfaces 2. Lack of vegetation 3. Human activity and infrastructure ● Slide 7: The 'Urban Heat Island' effect ● Slide 8: Why it matters (heat risks) ● Slide 9 (<i>Discussion question</i>): How do we counter this? <ul style="list-style-type: none"> ○ Slide 10: Three main solutions: <ol style="list-style-type: none"> 1. Urban greening 2. Different building materials 3. Smarter, efficient design 	R1, R2	7-12	10 mins

	<p>Students: Participate in class discussion, note taking optional.</p> <p><i><u>Differentiation discussion strategy:</u></i> 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.</p>			
<p>Stage 3: Materials and temperature tests</p>	<p>Teacher: Run through slide 11 to give a brief overview of the first activity:</p> <p style="padding-left: 40px;">In groups, students will test how different surface materials absorb and reflect heat by comparing melt rates of ice cubes placed on black card, white card, foil, and mirror surfaces.</p> <p>Divide the class into groups of around 6, and change to slide 12.</p> <p>Using the instructions in the <i>Ice-melt test guide (R2)</i> and the materials listed above, have students set up their experiment stations.</p> <p>Depending on the weather, tests can be conducted outdoors in sunlight or indoors under LED lamps/near a bright window.</p> <p>Students will simultaneously monitor and record their results while continuing with the next part of the lesson and activity.</p> <p>Students: Following the experiment instructions on slide 12, students should work in their groups to collect all required materials and set up their testing stations.</p>	<p>R1, R2</p> <p>R3-10</p>	<p>5-6</p>	<p>10 mins (will overlap with Stage 4)</p>

	<p>When students are ready to begin their first material test, a nominated group member should go and collect an ice cube from the teacher (or teacher can deliver an ice cube to each station).</p> <p>Students should complete tests for all four surfaces (black card, white card, foil, and mirrored) throughout the lesson, continuing to observe and record results while also working on the next part of the activity.</p> <p><u>Engagement management strategy:</u> <i>If students struggle to multi-task or become distracted by their experiments, set the tests up at the front or side of the classroom. Allow one group member to check progress, with each test scenario assigned a nominated observer.</i></p>			
<p>Stage 4: Council submission drafting + temperature testing</p>	<p>Teacher: Continue to slide 13 to begin the next element of the activity:</p> <p style="padding-left: 40px;">In groups, students will put together a council submission with recommendations to reduce heat in a local area, considering different stakeholders and community perspectives using persona cards.</p> <p>Have each ice cube monitoring group divide into two smaller groups of three for this part of the activity. They should still continue to monitor their ice cube tests as a group of six.</p> <p>Distribute to each group:</p> <ul style="list-style-type: none"> ● R11: Council Submission – Student template (complete in their groups of three) ● R13: An Area Profile (includes map and personas) ● R14: Butcher’s paper for drafting redesigned spaces 	<p>R1</p> <p>R3-10</p> <p>R11-15</p>	<p>13-14</p>	<p>60 mins (will overlap with Stage 3)</p>

- **R15: A3 graph paper for final refined designs**

Change to **slide 14** for a summary of what will be included in the council submissions. A more in depth outline of what each section should include is provided in the *Council submission - Teacher guide (R12)*.

Students:

Students should **continue monitoring their ice cube melting tests while drafting their council submissions** (one representative from each smaller group for each test).

In their smaller groups of three, students should work through the *Council Submission – Student Template*. To do so:

1. Review the Area Profile
 - Read through their assigned local area map and persona cards to understand the space and the people who live or work there
2. Identify key issues
 - Discuss what challenges their area faces during heatwaves or hot weather, and how these affect their assigned personas
3. Plan improvements
 - Brainstorm design changes or planning strategies to make the area cooler and more liveable
 - Sketch ideas on butcher’s paper before refining their final plan
4. Develop recommendations
 - Write clear, specific actions for council to consider – for example, adding shade, redesigning surfaces, or improving green spaces
 - Describe how each proposed change will benefit the people represented in their persona cards

	<p>5. Use evidence collected</p> <ul style="list-style-type: none"> ○ Include results from their ice cube melt tests (and graphs) to support their recommendations, explaining what the data shows about different surfaces and heat absorption <p>6. Finalise the submission</p> <ul style="list-style-type: none"> ○ Draw their refined design to A3 graph paper and complete their written council submission using the provided template 			
<p>Stage 6: Evaluating and actioning ideas</p>	<p>Teacher: Once submissions are complete, have a representative from each group present a brief summary of their recommendations for their urban area (~2mins).</p> <p>Change to slide 15 to conclude with a class discussion on the next steps for turning these ideas into action, using the following question prompts:</p> <ol style="list-style-type: none"> 1. How feasible are these recommendations to implement? 2. What local actions could help make them happen? <p>Students: When called upon, one person from each group will briefly share their recommendations for their assigned area with the class.</p> <p>After presentations, students are to participate in the final class discussion.</p> <p><u><i>Differentiation discussion strategy:</i></u> <i>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.</i></p>	R1	15	15 mins

Links for further reading

- [Urban heat: State of the Environment](#) – AUS GOV
- [Greening our cities](#) – CSIRO
- [Planning A Green-Blue City](#) – VIC GOV (Advanced resource)
- [How can we address the causes of climate change?](#) – CSIRO