# Geography 7-10: Changing places learning sequence

This resource addresses one part of the Changing Places topic – Australia’s urban future. It is intended for use as part of a wider sequence of learning. Teachers should ensure that all aspects of the syllabus are addressed.

## Key inquiry questions

* How does urbanisation change environments and places?
* What strategies are used to manage environmental change in urban places to enhance sustainability?

## Outcomes

A student:

* **GE 5-2** explains the processes that form and transform places and environments
* **GE 5-3** analyses the effect of interactions and connections between people, places and environments
* **GE 5-5** assesses management strategies for places and environments for their sustainability
* **GE 5-7** acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry
* **GE 5-8** communicates geographical information to a range of audiences using a variety of strategies

## Syllabus content

Students:

* investigate the management and planning of Australia’s urban future (ACHGK059), for example:
  + description of Australia’s projected population growth
  + discussion of the implications of population forecasts for the future growth and sustainability of urban places
  + explanation of strategies used to create economically, socially, and environmentally sustainable places
  + proposal of ways for individuals and communities to contribute to a sustainable urban future.

Outcomes and key terms referred to in this document are from [Geography K–10 Syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/hsie/geography-k-10) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2015.

### Management and planning of Australia’s urban future – urban heat islands

**Teacher note - a**s populations increase in Australia’s urban areas, there may be challenges in ensuring that cities of the future are sustainable because of increasing temperatures and heat islands. This case study looks at Mosman and Penrith. However, teachers can use similar areas that may be more relevant to their context. In task 4, the compare function on the NSW Planning [‘Projections Explorer’](https://www.planningportal.nsw.gov.au/population/) shows visual representations of the differences between suburbs. Before starting the next activity, give students a demonstration on how to use this tool.

#### What’s making it hotter in western Sydney?

* Observe 2 aerial photos, one of the leafy streets in the harbourside suburb of [Mosman](https://www.sydneyimages.com.au/-/aerial-photography-gallery/mosman-aerial-photography) and one of a higher density western suburbs housing development in [Penrith](https://www.sydneyimages.com.au/-/aerial-photography-gallery/penrith-aerial-photography).
* Using a [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645#.YBy1ikcEKUA.link) strategy, note the major differences between the 2 suburbs. Answers could relate to:
  + water
  + vegetation
  + block size
  + dark colours.
* As a class, discuss why some suburbs of Sydney are hotter than others. Answers could relate to:
  + topography
  + climate change causing general temperature increases
  + lack of sea breeze further from the coast.
* Watch [The heat island effect](https://www.youtube.com/watch?v=4SihdPRRMPI) (duration 1:38) and write a definition for the heat island effect.

#### What causes heat islands and how can they be managed?

* Use at least 3 of the resources below to complete a [thinking hats](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/545) activity about the causes and management strategies for heat islands:
  + white hat: seek facts, questions and define the issue of urban heat islands
  + green hat: make proposals, suggestions, new ideas and alternatives about combating urban heat islands
  + blue hat: consider what the government could do about this issue
  + black hat: consider the reasons why urban heat islands are a problem.
* Resources for the task:
  + [How Western Sydney is tackling the mysterious 'heat island' effect behind rising temperatures](https://www.abc.net.au/news/2018-03-01/how-western-sydney-is-tackling-the-heat-island-effect/9361156)
  + [How will urban heat change Sydney?](https://www.environment.nsw.gov.au/news/how-will-urban-heat-change-in-sydney)
  + [The Albedo Effect, Urban Heat Islands, and Cooling Down Your Playground](https://www.sciencefriday.com/educational-resources/the-albedo-effect-urban-heat-islands-and-cooling-down-your-playground/)
  + [Australian summer temperatures increase danger of 'heat islands' in our suburbs](https://www.abc.net.au/news/2020-10-16/climate-change-australia-temperatures-heat-islands-trees/12731738)
  + [Greening urban areas can help reduce future impacts of heatwaves](https://blog.csiro.au/greening-urban-areas-can-help-reduce-future-impacts-of-heatwaves/)
  + [Warning over 'heat island' effect in cities as tree coverage declines](https://www.abc.net.au/news/2020-02-13/climate-warning-over-heat-island-effect-as-city-greenery-decline/11923890)
  + [Heatwaves may mean it is too hot for people to live in parts of Sydney within decades](https://www.abc.net.au/news/science/2021-01-24/heatwaves-sydney-uninhabitable-climate-change-urban-planning/12993580)
  + **Extension option:** Penrith City Council ‘[Cooling the city strategy](https://www.penrithcity.nsw.gov.au/waste-environment/cooling-the-city)’
* Using the research from the previous task, complete the following table to consolidate your understanding of urban heat islands.

|  |  |  |
| --- | --- | --- |
| Definition: Heat islands | Causes of heat islands? | Strategies for managing heat islands |
|  |  |  |

* As a group, assess the general strategies for managing heat islands in the table above and rank them in order of most to least useful for the chosen location (with 1 being the most useful).

#### Planning to manage heat islands in Penrith

* For the strategy ranked as most useful, develop a [concept map](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.YFPBmSuPNzE.link) for a specific project that could be implemented in Penrith. For example, if the group determines that adding water to the landscape is the best strategy, a specific plan for a large pond in the main street may be proposed.
* Write a 500-word persuasive letter to the government requesting funding for the specific project to aid in the reduction of the heat island effect in the location. The letter should contain:
  + a brief explanation of heat islands
  + a description of some of the main causes of heat islands
  + an annotated aerial map of the suburb
  + the suggested solution along with the costs and benefits to the location.

#### Why are the western suburbs growing faster than the rest of Australia?

* Use the [Projections tools](https://www.planningportal.nsw.gov.au/population/) at the NSW Planning portal to complete summary notes comparing projected changes in population between Mosman and Penrith in the areas of:
  + annual percentage growth in populations
  + age composition of the populations
  + percentage of change in population related to migration.
* Complete a [Plus Minus Interesting (PMI)](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/551?clearCache=11e43a84-ee93-21c8-e929-56cfaf41c96) chart on the differences between the projected percentage changes in the overall population of Australia versus the projected percentage changes in Western Sydney.
* Resources for the task:
  + Australia’s overall population: [Australian Bureau of Statistics](https://www.abs.gov.au/statistics/people/population/population-projections-australia/latest-release#:~:text=Australia's%20population%20in%202017%20(24.6,between%2039.5%20and%2043.0%20years.)
  + Western Sydney’s population: [NSW Planning and environment](https://www.abs.gov.au/statistics/people/population/population-projections-australia/latest-release#:~:text=Australia's%20population%20in%202017%20(24.6,between%2039.5%20and%2043.0%20years.)
* Create a [concept map](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/577#.YFPBmSuPNzE.link) titled, ‘The future of Penrith’ that identifies how the suburb will be impacted if there is no heat island management strategy and the population increases as predicted. The concept map should cover:
  + environmental sustainability
  + social factors
  + economic factors.

### Local inquiry – portable buildings as urban heat islands

**Teacher note** - where schools don’t have portable buildings, an area of the school that is hotter than other parts may be selected. Students should work in small groups for each part of this activity.

* As schools grow, many more portable buildings are appearing and can be warmer than in other places around schools. Work in groups to conduct a geographical inquiry into the spaces around portable buildings to answer questions including, but not limited to:
  + Is it hotter around portable buildings?
  + Why is it hotter around portable buildings?
  + What strategies can be implemented at a school level to manage this issue?
* Conduct fieldwork to measure, collect and record the temperature at 5 places around the school. Examples of locations may include:
  + on bitumen near portable buildings
  + on an oval
  + in the hallway
  + outside a permanent building
  + under the shade of a tree.
* Graph your results in a [bar chart](https://support.microsoft.com/en-us/office/add-a-chart-to-your-document-in-word-ff48e3eb-5e04-4368-a39e-20df7c798932) with temperature in degrees Celsius on the vertical axis and location on the horizontal axis. Discuss the results as a class.
* In groups, brainstorm possible strategies to reduce the temperature around the portables. Choose the best strategy and complete an [annotated map](https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/english/literacy/Pages/annotating-diagrams-graphs-or-maps.aspx) of the school to help explain the solution.
* Now that you are an expert on heat islands, prepare a presentation for the school principal to propose a solution to this problem. Your presentation should include:
  + an explanation of why heat islands are a problem (as illustrated by your temperature measurements)
  + your proposal to implement at the school, including estimated costs and benefits of this solution.