 Water in the world

Stage 4 Geography

Key inquiry questions

* Why does the spatial distribution of water resources vary globally and within countries?
* How do natural and human processes influence the distribution and availability of water as a resource?
* What effect does the uneven distribution of water resources have on people, places and environments?
* What approaches can be used to sustainably manage water resources and reduce water scarcity?

Overview

Students:

* examine water as a resource and the factors influencing water flows and availability of water resources in different places
* investigate the nature of water scarcity and assess ways of overcoming it
* discuss variations in people’s perceptions about the value of water and the need for sustainable water management’
* investigate processes that continue to shape the environment including an atmospheric or hydrologic hazard.

Outcomes

A student:

* locates and describes the diverse features and characteristics of a range of places and environments **GE4-1**
* describes processes and influences that form and transform places and environments **GE4-2**
* explains how interactions and connections between people, places and environments result in change **GE4-3**
* discusses management of places and environments for their sustainability **GE4-5**
* acquires and processes geographical information by selecting and using geographical tools for inquiry **GE4-7**
* communicates geographical information using a variety of strategies**. GE4-8**

Outcomes and other syllabus material referenced in this document are from:

* [Geography K-10 Syllabus](http://syllabus.nesa.nsw.edu.au/hsie/geography-k10/) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2015

Teaching and learning activities

Inquiry questions

For each key inquiry question, students are encouraged to design their own inquiry questions as a subset in order to complete the geographical inquiry process which forms the bases of these teaching and learning sequences.

Assessment

The strategies require students to demonstrate their learning and are all either assessment for learning or assessment as learning activities. Some activities might be selected and included in a school assessment schedule for assessment of learning.

Syllabus references

The water cycle

Students:

* investigate how the operation of the water cycle connects people and places, for example: (ACHGK038)
  + identification of water cycle processes
  + explanation of water flows within a catchment area
  + examination of factors influencing water flows and the availability of water resources in different places e.g. latitude, altitude, topography, location, climate change

Water resources

Students:

* investigate the characteristics and spatial distribution of global water resources, for example:(ACHGK037)
  + classification of water resources
  + identification of different forms of water used as resources
  + examination of spatial distribution patterns of water resources

Australia’s water resources

Students:

* investigate the quantity and variability of water resources in Australia and other places, for example: (ACHGK039)
  + analysis of spatial variations in Australia’s water resources e.g. groundwater, rivers
  + explanation of variations in freshwater water availability across Australia e.g. precipitation, groundwater, runoff
  + assessment of variations in freshwater water availability between continents

Water scarcity and water management

Students:

* investigate the nature of water scarcity and ways of overcoming it, for example: (ACHGK040)
  + description of the nature, extent and causes of water scarcity in different countries
  + assessment of strategies used to overcome water scarcity and the role of governments, nongovernment organisations, individuals and communities in sustainable water management
  + proposal of individual actions contributing to water management

The value of water

Students:

* investigate the economic, cultural, spiritual and aesthetic values of water for people, including Aboriginal and Torres Strait Islander Peoples and/or peoples of the Asia region, for example: (ACHGK041)
  + description of the ways water is used by people e.g. agricultural, commercial, industrial and recreational uses
  + discussion of variations in people’s perceptions about the value of water e.g. economic versus aesthetic
  + comparison of the importance of water to ONE Aboriginal and Torres Strait Islander community and/or ONE Asian community

Natural hazard

Students:

* investigate ONE contemporary atmospheric hazard or hydrologic hazard including causes, impacts and responses, for example: (ACHGK042)
  + explanation of the spatial distribution, cause and impact of the disaster
  + examination of responses by individuals, groups and government to the impact of the disaster
  + prediction of the impact of climate change on the occurrence, frequency and extent of this type of hazard
  + discussion of management strategies to reduce the future impact of similar hazard events.

Learning sequence 1

Teachers’ note

The concept of water as a finite resource must be introduced prior to these learning sequences.

The water cycle

Audio Rap\*

\*proposed assessment task

Teacher’s note – Search for the Water Cycle Rap on YouTube, and play it for students to listen to only. (Do not show visuals.)

1. Whilst listening to the audio source, students make notes on key points and processes.
2. Students create a visualisation (diagram) of the water cycle
3. Students describe what has been drawn.

Introduce The Water Cycle and explain how it connects people and places. See:

* [NASA website – exploring the water cycle](https://pmm.nasa.gov/education/lesson-plans/exploring-water-cycle)
* [Learning to Give website – where does our water come from: the water cycle](http://www.learningtogive.org/lessons/unit370/lesson2.html)

Learning sequence 2

Water resources

Key inquiry question

* Why does the spatial distribution of water resources vary globally and within countries?

Water in the world conference

You are going to attend a Water In The World conference with your colleagues. You and your colleagues are the keynote speakers at this conference. This conference is to be podcasted globally.

Your task is to produce a two-three minute speech on global water resources, using the information from this [infographic from Suez](http://www.suez-environnement.fr/wp-content/uploads/2012/03/SUEZ_EAU_20120309_72_EN.jpg).

As a minimum your speech needs to include information about:

* different forms of water - solid, liquid, gas
* global distribution - who does and doesn’t have access to water and why (physical and human reasons) Use explicit examples to illustrate your reasons
* the number of people that use water as a resource, at a variety of scales
* the per capita usage of water
* what water is used for – e.g. industry/agriculture, and other classification examples from a variety of scales
* how water usage has changed over time.

Learning sequence 3

Your keynote address at the Water in the World conference has been very successful. You have been asked to create a short illustrative presentation that summarises the keynote speech, but with an Australian context. The presentation should be predominantly made up of graphs, maps and tables that demonstrate the spatial variation of Australia’s water resources. Your presentation should include five slides or equivalent, with a maximum of ten lines of notes per slide to guide the reader as to what your graphs, maps and tables represent.

Key ideas include:

* different types of water resources found in Australia
* quantity of water resources located in Australia
* where water is located in Australia
* comparison of Australia’s water supply with that of other continents of the world.

Learning sequence 4

4.1 Water audit – fieldwork

Teachers’ note – you will need to hand out the Process for geographical inquiry. This process is central to Geography K-10.

Use the Process for geographical inquiry to determine how sustainable water usage at your school and/or home is currently, and then develop and outline strategies of management for more sustainable water use. If there are already sustainable practices in place, analyse how well they are currently working and suggest strategies that could be implemented that would improve or expand upon them.

Your response needs to be tabled electronically

Ensure that you first determine the geographical questions that you need to answer before embarking on your fieldwork inquiry. You can use these websites as a starting point:

* [Sydney Water website – School water audit](•%09http:/www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq2/~edisp/dd_046576.pdf)
* [Cool Australia website – School water audit activity](http://www.coolaustralia.org/activity/school-water-audit-56/)

You may consider dividing up the strategies of water management you develop into biospheric, hydrospheric, lithospheric and atmospheric strategies. Your peers may discuss how achievable these strategies are.

4.2 – Water scarcity and water management

Key inquiry questions

* How do natural and human processes influence the distribution and availability of water as a resource?
* What effect does the uneven distribution of water resources have on people, places and environments?

The United Nations recognises water scarcity as a global crisis. Your school librarian has asked you to review two websites dealing with this crisis and answer a number of related questions. One of the two websites must be the [United Nations Global Issues – Water website](http://www.un.org/en/sections/issues-depth/water/) and the other website should be an established non-government organisation that aims to improve access to fresh water for those that don’t currently have it.

Use a website review template such as the one available on the [Shrock Guide website](http://www.schrockguide.net/uploads/3/9/2/2/392267/5ws.pdf) or the one provided at the end of this document, to help you review each website, and then answer these more specific questions:

1. What is the nature of water scarcity in the world (define the term; what are the causes, extent and effect of water scarcity)?
2. What is, or should be, the role of government, non-government organisations, individuals and communities in alleviating this issue?
3. What are two examples of strategies that you consider to be innovative, that are being used in the world to help improve water management? (Briefly describe them including details such as what where and how.)

Upload your website reviews and responses to the three related questions.

4.3 – “Water for the world” day

Key inquiry question

* What approaches can be used to sustainably manage water resources and reduce water scarcity?

The school is going to hold a ‘Water for the world day’ and wants selected students to develop practical activities that their peers can participate in on the day .The activities should educate participants about the scarcity of water in the world and how it is currently mismanaged AND inform them of a strategy involving them - that if implemented could assist others to have access to fresh (safe?) water.

You have been selected and need to provide the librarian with a one-page summary of what you plan to do. Be innovative; think about what you aim to achieve and ensure your strategy is practical and your activity/activities educational and stimulating for your peers.

You may use technology as a medium for demonstration, or other practical ways.

Learning sequence 5

5.1 The value of water

Teachers’ note

There is an excellent unit of work and professional learning activity for teachers from the NSW Aboriginal Educational Consultative Group (NSW AECG). The unit of work has been developed using the Aboriginal and Torres Strait Islander histories and cultures Learning across the Curriculum Content perspective on water management in Australia. Please contact the NSW AECG for further information about how to access this course and the related materials.

Cultural comparison

Write a report that compares and contrasts the value of water for three cultural groups. One cultural group must be an Aboriginal and Torres Strait Islander group, another from the Asia region, and a third cultural group is completely of your choice. Your report should include:

* a map showing where each cultural group is located
* a ten-line summary of each cultural groups’ characteristics, including geographical
* an online video that demonstrates the value of water for this group
* two websites that are reputable and contain valuable information that you have used in your report.
* an answer to the inquiry question – How is water key to the cultural groups’ lives? including a paragraph on the following inquiry sub-questions:
  1. What is the economic value of water for each cultural group?
  2. What is the cultural and spiritual value of water for each cultural group?
  3. How else is water used by these cultural groups?

Examples of water related culture include Brewarrina Fish Traps, Moken (Sea Gypsies), Piraha people of the Amazon.

Finally, include a written response of approximately 300 words in which you identify “The similarities and differences in the ways each of cultural groups values water.”

5.2 Water as a global issue

Teachers’ note

This sequence is a Civics and Citizenship response to the focus area. It works towards the achievement of a number of content area dot points in the syllabus and is a summary of the roles and responsibilities that cities have and can take about water management and relieving water scarcity.

Fieldwork and response

You are a concerned global citizen. The world is not paying attention to the value of water. You have decided to investigate and collect information about this issue as it affects two locations in the country or city in which you reside and to write a detailed email (500-1000 words) to your appropriate government representative outlining your concerns.

You will start your process of investigation by developing a plan for geographical inquiry in which you outline the following:

* four broad focus questions
* the types of primary and secondary data required to answer each broad focus question
* how you are going to collect the data (graphs, tables, maps, etc.)
* how you are going to process and analyse the data collected.

Note 1 – make sure that your focus questions will cover:

* an overview of the value of water through use (e.g. agricultural, commercial, industrial, recreational and domestic uses)
* current individual, group and government perceptions of the use of water (e.g. economic versus aesthetic uses). (Surveys may be an appropriate tool.)

Note 2 – your information should include:

* a photograph of each of the locations identified
* the bearings of the locations from your school
* the population density of the areas
* a map of the areas
* climatic graphs, to demonstrate precipitation amounts, where appropriate

When you have finalised your investigation, compose the detailed email suitable for communicating your findings and concerns to your appropriate government representative.

Learning sequence 6

Natural hazard

Teachers’ suggestion – use Learning Sequence 6 Natural Hazard from Water in the World and Learning Sequence 4 Geomorphic Hazard from Landscapes and Landforms as an authentic culminating activity, titled “Hazards”, relevant to many of the Stage 4 Geography outcomes.

Divide into groups of four. Each group is allocated a different natural hazard from the following: droughts, floods, storms, or tropical cyclones.

Your group task is to create a word document (up to 12 pages) that includes the following information about your allocated natural hazard:

* identification of areas of the world, and Australia, prone to experiencing this type of natural hazard
* a description of the main geographical processes associated with the natural hazard (you must include a variety of charts to illustrate the description)
* information about a specific event outside of Australia where this natural hazard occurred (when, where, how much damage was caused)
* information about a specific event within Australia where this natural hazard occurred (when, where, how much damage was caused)
* satellite images and interpretation
* a summary of the consequences of each of these specific events (i.e. information about the economic, environmental and social impacts)
* information about how people have reacted to the event, giving sample responses from individuals, groups (e.g. SES, police, charity groups) and government
* general information about the actions that different responsible parties have taken to implement management strategies with regards to this natural hazard, both within and beyond Australia.

Include web links, photographs, diagrams and newspaper headlines and articles to enhance your information.

Your document will be shared with the other groups and you and your group will be required to answer questions related to your research.

Resources

* [Cool Australia website](http://www.coolaustralia.org/)
* [NASA's Earth Observatory website](http://earthobservatory.nasa.gov/Experiments/Biome/)
* [UN Water website](http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/SDG6-Interlinkages%201and2.pdf)
* [State Emergency Service website](https://www.ses.nsw.gov.au/)
* [Sydney Water website](http://www.sydneywater.com.au/swe/index.htm)

Geographical terminology

Water management, water scarcity, water cycle, evaporation, transevaporation, condensation, precipitation, finite, run-off, water table, infiltration, groundwater, biosphere, atmosphere, hydrosphere, lithosphere, scarcity, NGO, economic, cultural, spiritual, aesthetic, alleviate, perceptions, population density, bearings, contemporary, hazard, impacts, responses, drought, flood, tropical cyclone, storm, geographical processes, charts.

Concepts, inquiry skills and tools

Geographical concepts

The following geographical concepts have been integrated into the teaching and learning sequence:

* Place – the quality and quantity of water varies between places
* Space – the spatial distribution of global water resources
* Environment – the effect of human activities on natural and human environments, including the overuse of water, for example
* Interconnection – how people affect the environment such as how their use of water impacts on its quality and availability as a resource
* Scale – the human water footprint, and its management across a range of scales from local to global; responses and actions undertaken by governments, organisations and individuals
* Sustainability – pressures on the Earth’s water resources; the need to manage environments for a long-term future; sustainable management approaches
* Change – changes to water as a resource over time through natural and human geographical processes and events; the effect of management strategies in reducing its impact

Geographical inquiry skills

The following geographical inquiry skills have been integrated into the unit.

Acquiring geographical information

* develop geographically significant questions and plan an inquiry, using appropriate geographical methodologies and concepts (ACHGS047, ACHGS055)
* collect, select and record relevant geographical data and information, using ethical protocols, from appropriate primary data and secondary information sources (ACHGS048, ACHGS056)

Processing geographical information

* evaluate information sources for their reliability and usefulness (ACHGS049, ACHGS057)
* represent data in a range of appropriate forms, with and without the use of digital and spatial technologies (ACHGS049, ACHGS057)
* represent the spatial distribution of different types of geographical phenomena by constructing maps at different scales that conform to cartographic conventions, using spatial technologies as appropriate (ACHGS050, ACHGS058)
* analyse geographical data and other information using qualitative and quantitative methods, and digital and spatial technologies as appropriate, to identify and propose explanations for spatial distributions, patterns and trends and infer relationships (ACHGS051, ACHGS059)
* apply geographical concepts to draw conclusions based on the analysis of the data and information collected (ACHGS052, ACHGS060)

Communicating geographical information

* present findings, arguments and ideas in a range of communication forms selected to suit a particular audience and purpose; using geographical terminology and digital technologies as appropriate (ACHGS053, ACHGS061)

Geographical tools

The following geographical tools have been integrated into the unit.

Maps

* political maps
* maps to identify direction, scale and distance, area and grid references, latitude and longitude, altitude, area, contour lines, gradient, local relief

Graphs and statistics

* data tables, pie graphs, column graphs, line graphs, climate graphs, multiple tables and graphs presented on a geographical theme, statistics to find patterns and trends

Spatial technologies

* satellite images, global positioning systems (GPS), geographic information systems (GIS)

Visual representations

* photographs, aerial photographs, illustrations, flow charts, annotated diagrams, multimedia
* web tools

Assessment task and rubric

Outcomes

* describes processes and influences that form and transform places and environments GE4-2
* acquires and processes geographical information by selecting and using geographical tools for inquiry GE4-7
* communicates geographical information using a variety of strategies. GE4-8

Audio Rap

Teacher’s note: Search for the Water Cycle Rap on YouTube, and play it for students to listen to only. (Do not show visuals.)

1. Whilst listening to the audio source, students make notes on key points and processes.
2. Students create a visualisation (diagram) of the water cycle
3. Students describe what has been drawn.

Rubric

9-10 marks

* Summarises all of the information described in the infographic succinctly.
* Summarises global distribution of water correctly.
* Clearly defines and discusses in detail one specific water resource.
* Demonstrates excellent understanding of how the resource has changed over time, providing numerous resources.
* Provides a comprehensive detailed visualisation of the water cycle.

7-8 marks

* Summarises most of the information described in the infographic succinctly.
* Summarises global distribution of water.
* Clearly defines and discusses one specific water resource.
* Demonstrates good understanding of how the resource has changed over time, providing resources.
* Provides a detailed visualisation of the water cycle.

5-6 marks

* Summarises some of the information described in the infographic.
* Summarises some elements of global distribution of water.
* Includes some information about one specific water resource.
* Demonstrates some understanding of how the resource has changed over time.
* Provides some detail in the visualisation of the water cycle.

3-4 marks

* Includes some of the information described in the infographic.
* Includes basic information about the global distribution of water.
* Includes basic information about one specific water resource.
* Demonstrates a basic understanding of how the resource has changed over time.
* Provides basic detail in the visualisation of the water cycle.

1-2 marks

* Includes limited information described in the infographic.
* Includes limited information about the global distribution of water.
* Includes limited information about one specific water resource.
* Demonstrates a limited understanding of how the resource has changed over time.
* Provides limited detail in the visualisation of the water cycle.

Website evaluation – criteria

Title of website:

URL:

How did you locate this site you are evaluating?

Respond to the following statements with yes or no

Design features

* Is well-organised and is easy to navigate
* Contains an explanation of what the page is about
* Contains useful information presented in an accessible format
* Contains tables and/or graphics which are readable and load easily
* Is visually interesting with pictures, colour, sound and/or video clips

Ease of use

* Loads quickly and has an easily understood front page
* Information can be easily accessed within the site and there are links back to the original page
* Offers search engines and/or help options (such as a site map) to make for ease of navigation through the site
* Distinguishes clearly between internal and external links

Content

* Has a suitable title which explains what the site is all about
* Has meaningful content which is useful for the intended purpose
* Information is easy to read
* Content is grammatically correct and spelling is correct
* Content is current (up to date)
* Has links to external sites which are relevant and useful
* Includes pictures which contribute to the overall appearance and which are relevant and usable

Credibility

* Includes information about the author (e.g. contact details)
* Includes a recent date when the site/page was last updated
* Includes references or links to sources used in developing the site
* Does not inappropriately request fees or names and addresses
* Does not request that you buy something
* Does not include advertising which takes a long time to load