Depth Study: Water management

# Module 4: Human Impacts

This document references the [Earth and Environmental Science Stage 6 Syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-science/earth-and-environmental-science-2017) © 2017 NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales.

**Time allocated:** 6 hours

## Outcomes

### Working scientifically

* Questioning and predicting - EE11-1 develops and evaluates questions and hypotheses for scientific investigation
* Processing data and information - EE11-4 selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
* Analysing data and information - EE11-5 analyses and evaluates primary and secondary data and information
* Problem solving - EE11-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
* Communicating - EE11-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose

### Knowledge and understanding

#### **EES11-11 describes human impact on the Earth in relation to hydrological processes, geological processes and biological changes**

**Inquiry question** - how can water be managed for use by humans and ecosystems?

Students:

* represent the distribution of the Earth’s water, including the amount available to plants and animals (ACSES060)
* investigate the treatment and potential reuse of different types of water, including but not limited to: (ACSES058)
  + industrial wastewater
  + sewage
  + stormwater
* Describe ways in which human activity can influence the availability and quality of water both directly (for example over-extraction) or indirectly (for example algal blooms) (ACSES080)

### Learning across the curriculum

#### Cross-curriculum priorities

* Sustainability

#### General capabilities

* Critical and creative thinking
* Information and communication technology capability
* Personal and social capability

#### Other areas of learning

* Civics and citizenship

## Task

Through class work and research, you are tasked to design, invent and market a new innovative sustainable waste management system (such as a toilet) that is more efficient. You may wish to use [design thinking](https://education.nsw.gov.au/teaching-and-learning/curriculum/key-learning-areas/science/science-and-technology-k-6/thinking-skills/design-thinking) process to assist you.

From the early days where the basic toilet consisted of burying your waste in the bush of washing it into the rivers, the humble toilet has developed. Our latest design still manages to waste many litres of water every week. Our changing climate means that we will face more severe droughts and heavy rainfall events increasing stress on our sewage systems. Flash flooding and sewage treatment plants overwhelmed with huge amounts of stormwater as well as sewage, can lead to contamination at beaches and in our river systems and are likely to increase in incidence. Towns taking water out of inland rivers and discharging treated waste back into the river can cause issues for towns further downstream. We need to think about society’s relationship with water and research alternative forms of waste management that can solve our current environmental challenges in Australia.

### Task

You are to design an alternative form of waste management system for the household and market this idea in a report. You may want to consider the following:

* What is our current waste management system? What is the problem?
* Propose possible solutions. What will your waste management system look like? Describe it, what material will you need? Justify your modifications/model.
* Predict what impact your design will have on the environment and the future.
* How can you best communicate your design? Can you present/sell your idea using data and visuals?
* Who are you marketing this product to?

You must hand in a design report that includes:

1. Title page - key information and one illustration
2. Summary - one page summary of the project
3. Problem definition - introduces and defines the problem/design requirements
4. Design description - overview, detailed description and use.
5. Evaluation - evaluates design and impact on environment
6. References - list of references used and cited

## Marking guidelines

Table 1 – marking guidelines

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Depth study: Water management | Extensive | High | Sound | Basic | Limited |
| Knowledge and Understanding | Demonstrates extensive knowledge and understanding of human activities and their influence on the quality of water and can apply it to new situations. | Demonstrates thorough knowledge and understanding of human activities and their influence on the quality of water with some applications. | Demonstrates sound knowledge and understanding of human activities and their influence on the quality of water with limited applications. | Demonstrates basic knowledge and understanding of human activities and their influence on the quality of water. | Demonstrates elementary knowledge and understanding of human activities and their influence on the quality of water. |
| Questioning and Predicting | Develops, proposes evaluates and modifies/justifies inquiry questions and hypotheses | Develops, proposes and interprets inquiry questions and hypotheses. | Constructs reasonable hypotheses, asking questions and making predictions. | Constructs basic hypotheses and asks questions and/or making limited predictions. | Constructs elementary hypotheses or asks questions and/or makes limited predictions. |
| Processing Data and Information | Demonstrates an extensive method of organising and analysing information from a variety of representations. | Demonstrates a thorough methods of organising and analysing information from a variety of representations. | Demonstrates competent methods of organising and analysing information from a variety of representations. | Demonstrates basic methods of organising and analysing information from a variety of representations. | Demonstrates limited methods of organising and analysing information from a variety of representations |
| Analysing Data and Information | Analyses and evaluates data effectively in all forms, explaining, describing and synthesising information to draw conclusions. | Analyses data given in all forms, interpreting information by identifying relationships and drawing conclusions. | Displays competence in interpreting forms of data. | Displays understanding of and obtains information from simple graphs, tables and other forms of data. | Displays limited understanding of and obtains some information from simple graphs, tables and other forms of data. |
| Problem Solving | Demonstrates extensive critical thinking skills and creativity in applying a solution to inquiry questions and investigations. | Demonstrates thorough critical thinking skills and creativity in applying a solution to inquiry questions and investigations. | Demonstrates sound critical thinking skills and creativity in applying a solution to inquiry questions and investigations. | Demonstrates basic critical thinking skills and creativity in applying a solution to inquiry questions and investigations. | Applies a solution to inquiry questions or investigations. |
| Communicating | Communicates extensively with clarity and accuracy using qualitative and quantitative information using appropriate forms of media and scientific language suitable for specific audiences. | Communicates thoroughly with clarity and accuracy using qualitative and quantitative information using appropriate forms of media and scientific language suitable for specific audiences. | Communicates competently using qualitative and quantitative information using appropriate forms of media and scientific language suitable for specific audiences. | Communicates using basic qualitative and quantitative information, providing basic forms of media and scientific language. | Communicates using limited qualitative and quantitative information, using limited forms of media and scientific language. |
| Peer review  (graded by peers) | Communicates extensively with clarity and accuracy using qualitative and quantitative information using appropriate forms of media and scientific language suitable for specific audiences. | Communicates thoroughly with clarity and accuracy using qualitative and quantitative information using appropriate forms of media and scientific language suitable for specific audiences. | Communicates competently using qualitative and quantitative information using appropriate forms of media and scientific language. | Communicates using basic qualitative and quantitative information, providing basic forms of media and scientific language. | Communicates using limited qualitative and quantitative information, using limited forms of media and scientific language. |