



Developing your understanding 1.1

- 1 More than two-thirds of Earth's surface is covered by water (70.9%) compared to 29.1%, which is covered by land.
- 2 97% of Earth's water inventory is saline water, which cannot be used for drinking, agriculture or industry. Humans require freshwater for drinking and salty water is damaging to pastures and machinery. Only 3% of Earth's water inventory is freshwater and 2% is locked up by ice caps and glaciers, leaving only 1% available for human use.
- 3 Water is important to all life on Earth. Green plants, which are the basis of all food chains and webs, rely on soil moisture, groundwater and surface water for the process of photosynthesis. This process provides the energy plants need to produce new tissue and the oxygen released by plants is used by humans and other animals in the process of respiration. Water must also be directly consumed by humans and other animals or else they will perish. It is used to grow crops and raise livestock for human consumption, supplies seafood and is necessary for health and sanitation.



Developing your understanding 1.2

- 1 There is a strong positive relationship between the locations of ancient settlements and water sources. For example, the ancient Egyptians settled along the River Nile. Ancient civilisations are likely to have chosen such sites in order to provide for their economic, social, cultural and spiritual needs. Rivers provided:

- a reliable supply of freshwater for drinking and bathing
- an abundance of wildlife and fish for food
- fertile soils for agriculture
- a mode of transportation for people and goods for trade
- materials for building
- a spiritual connection.

- 2 Student responses will vary. They might choose from the following inventions mentioned in the text:

- the *shaduf* – this was a device used by the Ancient Egyptians in order to raise water from the Nile for irrigation. It consists of a long rod with a bucket on one end and a weight on the other. The device enabled the people of the time to grow staple and industrial crops, including papyrus and flax.
- aqueducts – built by the Ancient Romans, these were raised channels or canals that enabled water to be moved from one place to another over large distances. Uses for aqueducts included the transportation of water for public baths, toilets, fountains and households. Many of these ancient structures are still standing, such as the Pont du Gard in France. Canal systems are still used today to transport goods and for irrigation.



- Arkwright's water frame – this device was invented during the Industrial Revolution to reduce human labour and increase production, and it completely changed the textile industry.
 - Watt's steam engine – the steam engine was used to run machinery as well as in transport during the eighteenth and nineteenth centuries, and steam is still used as a source of power today.
- 3 Water has played a major role in the expansion of human settlements by providing them with a means of global travel. For example, during colonial times, explorers including the British, Portuguese, Spanish and Dutch travelled across the seas by ship. They often exchanged goods and ideas, and conquered or colonised the places they found. Much of the modern world, including Australia, has been settled and influenced by these overseas explorers.
- 4 Today there is still a strong relationship between the location of settlements and their proximity to water sources. Many of the world's major cities are located along coastlines and/or rivers. Ask students to identify numerous examples from each of the settled continents and name the city, the ocean or sea and/or river. Also ask students to consider the advantages of these locations. Refer to Australia. Most of Australia's capital cities (except Canberra) are located along the coast and have expanded around perennial (permanent) rivers (ask students to identify these from an atlas).

Students should also identify a number of settlements that are located away from the coast or permanent water sources. A discussion of the reasons may include:

- access to other resources, e.g. a mineral
- extensive forms of agriculture.

Ask students where such remote settlements might access their water from.



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Chapter 1 Water: a renewable environmental resource – Suggested textbook responses

Research 1.1

Students could use a graphic organiser similar to the one below to record their initial findings.

Water body	Countries/states that share the water body
Tigris and Euphrates Rivers	Turkey, Iraq and Syria
Jordan River	Israel, Jordan, Syria and the West Bank
Indus River	China, India and Pakistan
Yangtze River	Flows through nine provinces of China: Sichuan, Yunnan, Chongqing, Hubei, Hunan, Jiangxi, Anhui, Jiangsu and Shanghai
Imjin River	North Korea and South Korea
Aral Sea and source rivers Syr Darya and Amu Darya	Kazakhstan, Uzbekistan, Turkmenistan, Afghanistan, Tajikistan and the Kyrgyzstan
Limpopo River	Botswana, Zimbabwe, South Africa and Mozambique
Murray–Darling River system	New South Wales, Victoria, Australian Capital Territory, Queensland and South Australia

Each small group in the class is to select one of the water bodies listed above. Students can research any conflict and/or cooperation that has occurred between the countries or states the water bodies connect with. Teachers should determine the length of the presentations.



Developing your understanding 1.3

- 1 Student responses to this question will vary between states and territories in Australia. The information should be accessed from the relevant water corporation website.
- 2 Conservation is about preserving and restoring the natural environment from loss, damage or neglect. It involves wisely managing and protecting natural resources and the environment so they will be available on a long-term basis. Sustainability includes conservation but, as well as ensuring environmental functions indefinitely into the future, sustainability requires consideration of environmental, economic and social criteria. Teachers should also use the sustainability principles on p. 13 to generate discussion.
- 3 Students could use a graphic organiser like the one below to compare the price of water to other liquid commodities.

Commodity	Price per litre
Water	
Milk	
Soft drink	
Petrol	

The findings will generally show that the price of water supplied to households is relatively low compared to other liquid commodities. This is to ensure that water, which is essential to life, is affordable and accessible by all. In general, water corporations also tier their pricing structure so that the price per kilolitre increases as



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more water is used throughout the meter-reading year. This is to help encourage the careful use of water.

4 Other incentives to encourage water conservation include:

- opportunities to swap old for new water-saving technologies, such as shower heads, free of charge
- monetary grants to schools for water-wise projects.

Students could research other incentives or create their own.



End-of-chapter questions

Short-answer questions

- 1 According to the definition of a renewable environmental resource, water meets the criteria because the operation of the water cycle enables the replenishment of ground, surface and stored water. However, if water resources are not carefully managed in places, then overuse can lead to water depletion, and pollution can mean that water is no longer useable.
- 2 Water connects places as it moves through the environment. Some of the ways include the following:
 - The operation of the water cycle causes water to move in different forms from one place to another. The actions of people in one place can therefore influence the quality of water in another place.
 - Water is a shared resource. There are currently more than 250 river basins and countless aquifers that cross the political boundaries of two or more countries. For example, the Murray–Darling River System connects places in NSW, Victoria, the Australian Capital Territory, Queensland and South Australia. Water has been and continues to be a source of both cooperation and conflict.
- 3 Water depletion and degradation in one place can affect the water and environment in another place because water is continuously circulated through means of the water cycle. One of the processes of the water cycle is surface run-off. If water depletion or pollution occurs in places upstream, the effects will also be seen in places downstream. For example, industrial waste from towns in the Indian provinces of Western Uttar Pradesh and Uttaranchal is discharged into the Ram Ganga and Kali Rivers. As a result, places further downstream, including Kanpur and Allahabad, receive toxic water, resulting in increased fish deaths and cases of



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gastroenteritis.

(There are many other examples that students could use relating to the movement of water from one place to another.)

4 Three ways the first Australians read the landscape in order to find ground and surface water include:

- They followed animals such as dingos to rock pools and waterholes.
- Ants lead them to underground water resources.
- The presence of gumtrees in a relatively dry area suggested the presence of groundwater.

5 Many clans lived a nomadic lifestyle, moving from place to place. They would move with the seasons, ensuring the resources they used were not depleted before they moved on. In this way, the people lived with the land rather than living off it. All Australians can learn the importance of only using water resources less than or equal to the rate of replenishment and only using what is needed.

Extended-response question

Some of the potential impacts of the bottled-water industry in Australia that students may gain from their research are in the following table.

1 Environmental	2 Social	3 Economic
<ul style="list-style-type: none">• Often criticised as an environmental menace with bottles cluttering landfills	<ul style="list-style-type: none">• Marketed as a convenient, healthy alternative to sugary drinks, increasing consumer choice	<ul style="list-style-type: none">• Marketed as a convenient, healthy alternative to sugary drinks



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<ul style="list-style-type: none">• Large amounts of resources and energy required to produce and transport• According to the Australasian Bottled Water Institute, the industry uses less than 0.01% of total groundwater drawn from Australia	<ul style="list-style-type: none">• Bottled water exported from Australia provides a source of safe drinking water in developing nations	<ul style="list-style-type: none">• Australia exported approximately \$216 million worth of water in 2007–11
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(Note: This list is by no means exhaustive.)

Before students attempt this higher-order question they should be briefed on the following:

- The key verb used in the question is ‘assess’. Explain to the students that when they are assessed for their work, they are often given a mark or a rating. In a similar way, they are to give the Australian bottled-water industry a rating or a mark out of 10. The mark that they give should be based on how well the student thinks the industry meets the sustainability criteria shown in Source 1.11 and Source 1.14. For example, if the student’s research reveals that the industry meets most of the criteria then they would rate it 8 or 9 out of 10. If the industry meets very little of the criteria, they might give a mark of 2 or 3. The following table provides a general guideline that could be used to show the students how to assess.



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Justification of assessment	Assessment (mark out of 10)
The student's research reveals that the industry's environmental, economic and social benefits all outweigh the environmental, economic and social disadvantages, and the industry also meets most of the criteria outlined in Source 1.14.	8–10
The student's research reveals that the industry's environmental, economic and social benefits mostly outweigh the environmental, economic and social disadvantages, and the industry meets some of the criteria outlined in Source 1.14.	5–7
The student's research reveals that the industry's environmental, economic and social disadvantages mostly outweigh the environmental, economic and social benefits, and the industry meets very little of the criteria outlined in Source 1.14.	1–4

- The format for presentation – the report format, including a cover page, contents page, information pages (with headings and subheadings), reference page and appendix, should be modelled to the students.