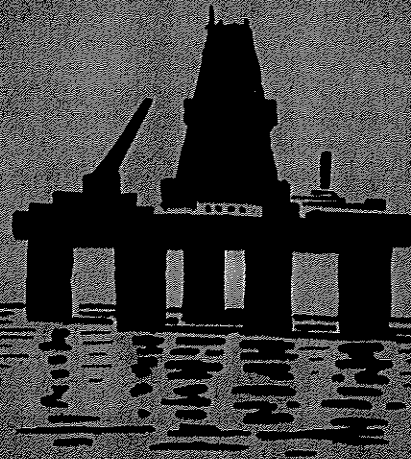
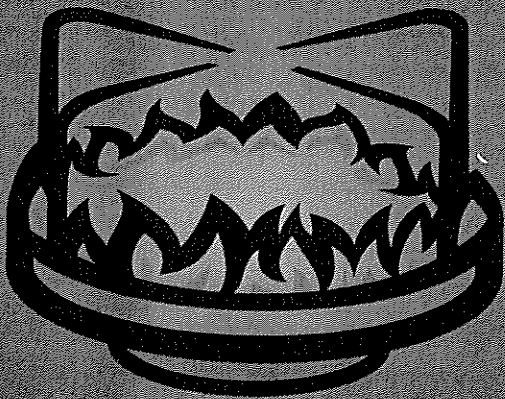
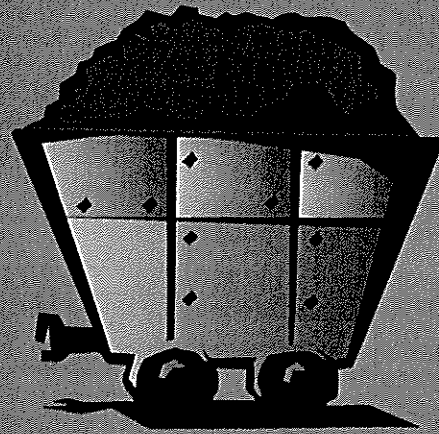
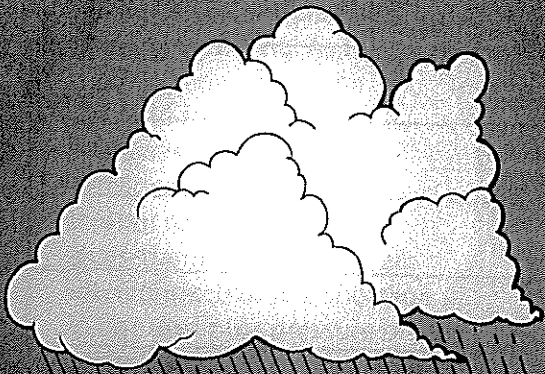


Section 2:

Water



Water: Forms And Accessibility

Read the information and complete the tasks.

Water Forms – Water can be found in three main different states: solid (ice), liquid (water) and gaseous (steam or vapour). Fresh water is for drinking and salt water is from the ocean.

A. Label the different forms of water below. Use the words: solid, liquid and gaseous.







B. Complete the sentences.

Fresh water is: _____

Salt water is: _____

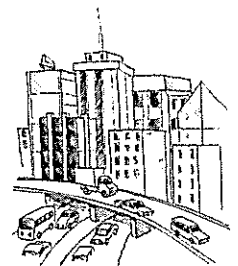


Water, is of course, essential for all aspects of human life. Most people in the world have clean water for drinking and for irrigation on farms to produce their food, but accessing clean water is a major problem in the poorer areas of the world. Water pollution such as that found in parts of Asia can lead to dangerous bacterial diseases, such as E coli, which is life threatening. It is estimated that 1.8 million people die each year from water-related diseases. In Australia the water industry is regulated. The Water Corporation is responsible for delivering water to homes and businesses. This water must have gone through various processes such as: purification,

sewage treatment, distillation, plumbing and filtering. Due to the ever increasing population of Australia, two more ways of increasing our fresh water supply have been put into practice: desalination plants and the recycling of sewage water. Desalination plants remove the salt from ocean water and turn it into water for humans to drink and use in irrigation. Recycled sewage water is known as reclaimed water. Sewage is treated to remove solids and impurities, and in Australia it is then used in irrigation and to recharge groundwater (water naturally found under the ground). Singapore has been

ACCESSIBILITY

one of the leading countries in the use of reclaimed water. Since the 1970s they have been advancing their technology and the amount of reclaimed water that they use. In Queensland in 2006, a trial to use reclaimed water was suggested by the Queensland water authority, however the Queensland people did not support it. As our population grows and our rainfall is unreliable people may need to become more open to the idea of using recycled water.



C. Circle the correct answers.

- | | | |
|--|-------------------------------|----------------------------------|
| 1. Ocean water can be converted into drinking water. | <input type="checkbox"/> FACT | <input type="checkbox"/> FICTION |
| 2. Australia has problems with bacteria in its water. | <input type="checkbox"/> FACT | <input type="checkbox"/> FICTION |
| 3. Reclaimed or recycled water uses sewage water. | <input type="checkbox"/> FACT | <input type="checkbox"/> FICTION |
| 4. Water in solid form is called liquid. | <input type="checkbox"/> FACT | <input type="checkbox"/> FICTION |
| 5. Purification, plumbing and filtering all treat water. | <input type="checkbox"/> FACT | <input type="checkbox"/> FICTION |

D. How would you feel about drinking recycled sewage water, watering your garden with it and showering in it? Reflect and respond to this question on the back of this page or in your workbook. Before doing this, think about the claim that the population of Australia will increase from 22 million to 35 million over the next 20 years.

Reclaimed Water

Complete the tasks.

- A. Research the full process of recycling sewage water for human consumption. Complete the Synthesis Journal below by finding information from four sources and then drawing your own conclusion about whether or not Australia needs to use reclaimed water. Write your conclusion on the back of this sheet or in your workbook.

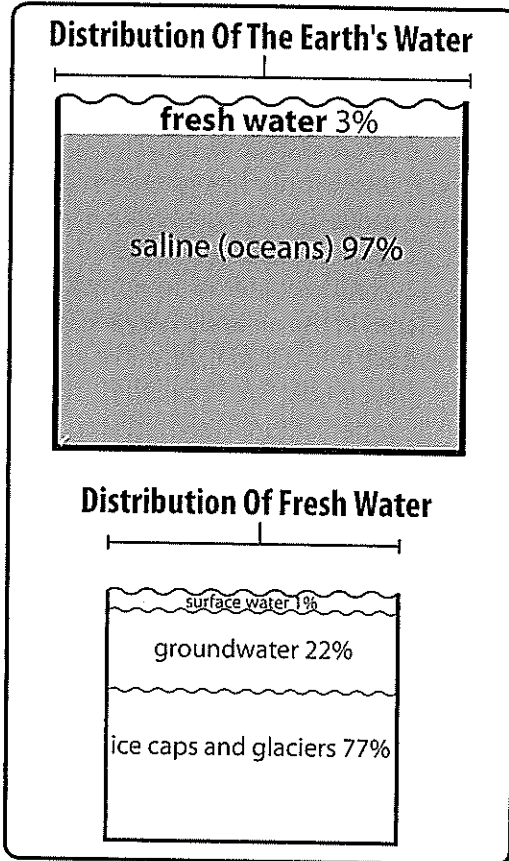
SYNTHESIS JOURNAL

Name: _____ Subject: _____ Date: _____			
SOURCE 1: Key Information	SOURCE 2: Key Information	SOURCE 3: Key Information	SOURCE 4: Key Information

- B. Write a short story about a city or town which has no water left. Write your story in your workbook or on the back of this sheet.
- C. Create a poster promoting why people should embrace recycled (reclaimed) water. Think about your target audience, headings for the poster, slogans and jingles. Create a good copy of your poster on the back of this page, on A4 paper or in Comic Life posters (MacBook application).

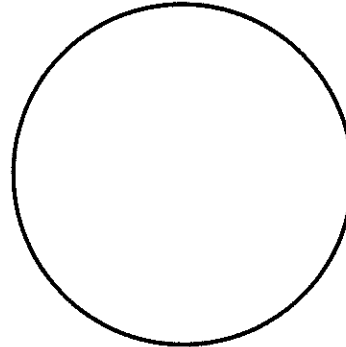
Using And Accessing Water

Read the information and complete the tasks.

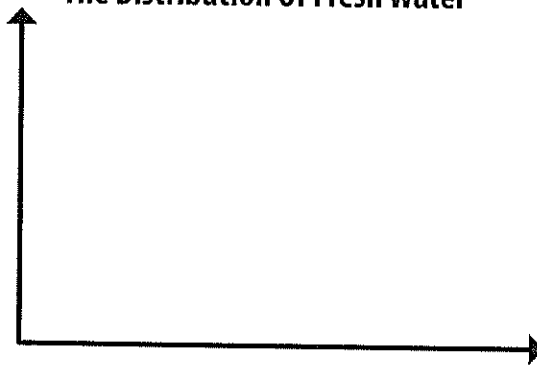


A. Record the information left as a pie graph and a bar graph.

The Distribution Of The Earth's Water



The Distribution Of Fresh Water



B. Think about your family's daily water usage. Estimate how much water you use for each activity listed in the table right. You could choose from the percentages below to complete the table.

2% 25% 9% 39% 1% 4% 7% 6%



Water Use	Estimated Percentage
1. showers and baths	
2. toilets	
3. washing machines	
4. taps – brushing teeth, washing hands, glasses of water	
5. evaporative air conditioners	
6. dishwashers	
7. watering gardens	
8. pool and/or spa	

Did You Know?

Businesses and industries in Australia use less scheme water in total than private users. To ensure that businesses achieve this they are required to submit a Water Efficiency Management Plan.

Rainfall And The Water Cycle

Read the information and complete the tasks.



It is hard to imagine, but there is a limited amount of water in the world. The water that you may drink today has actually been recycled millions of times before it reaches your cup. This process of water recycling is known as the water cycle. The next time you have a drink of water think about where it has come from - it may have been a part of the iceberg that the Titanic hit or water which was once snow on the top of Mount Everest!

Water is constantly being recycled throughout the world. Water is considered a precious resource due to the large differences in its availability

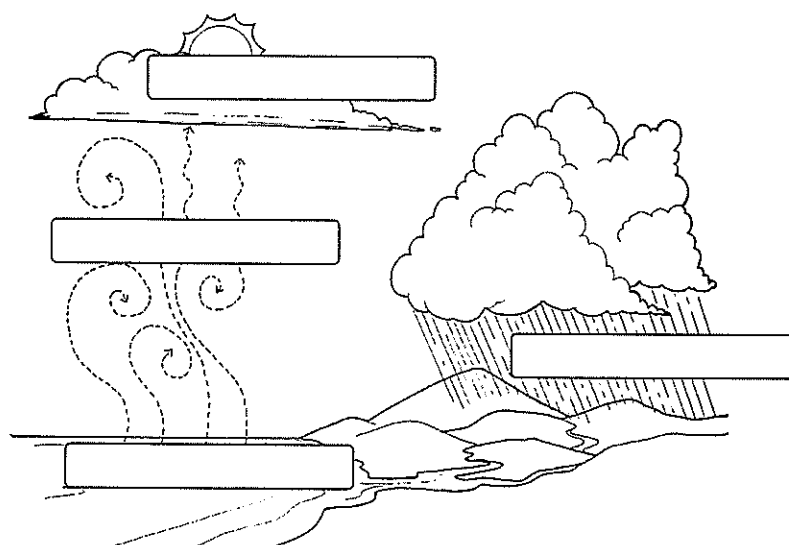
in different countries. Some countries have an abundance of water such as New Zealand; other countries, such as Australia, have little water due to long periods of drought and large desert areas. Even within one country the availability of water can change greatly. For example, parts of Australia such as New South Wales and Victoria often suffer from extreme flooding due to heavy rainfall, while other outback regions frequently experience droughts.

Water is capable of taking many forms to serve many purposes. Firstly, water in its liquid form evaporates.

Evaporation occurs when the sun heats up the water in lakes, rivers and oceans, and turns it into vapour or steam. The vapour then rises into the air. This is the start of the water cycle. The water vapour gets cold in the air and changes back into a liquid, forming the clouds. This is called condensation. The third step in the water cycle process is precipitation - another name for rain. Rainfall occurs when the air can no longer hold the condensed air, and it falls back to Earth. The last step in the water cycle is collection - the return of the rain (water) back into the Earth's oceans, rivers, lakes and groundwater.

- A. Label the diagram to show the four stages of the water cycle. You could provide further explanation of each stage in the spaces around the diagram.

The Water Cycle



- B. Tell a partner how the water cycle works without looking at this sheet.

Challenge

- C. The Australian Bureau of Meteorology (BOM) publishes daily reports on dam water levels, rainfall predictions and actual annual rainfall in each region of Australia. Look up the actual rainfall recorded in your area for June for the last three years. Has the amount of rainfall increased or decreased during this time? Record your findings on the back of this sheet.

Surface And Groundwater 1

- Read the information and complete the tasks.



If you have ever tried digging a hole in your backyard and you live near a river, lake or ocean, you may have come across water as you have dug down. This water is known as groundwater.

Groundwater is the water which has soaked into the ground from rain, hail, snow

and sleet. Groundwater is used for drinking, irrigation, and for use in households and businesses. Due to gravity, the water moves down into the ground between the particles of soil, gravel, sand and rock until it reaches the other stored groundwater - this area is called the saturation zone.

GROUNDWATER

The top of this zone is called the water table. An aquifer is the name given to the water-bearing permeable rock from which the groundwater is extracted through a water well. The water table can be either close to the ground's surface or hundreds of metres below it.

- A. On the back of this sheet or in your workbook draw a diagram which explains how groundwater is formed and extracted. Label your diagram using the words: new groundwater; particles of soil, gravel, sand and rock; stored groundwater and saturation zone.



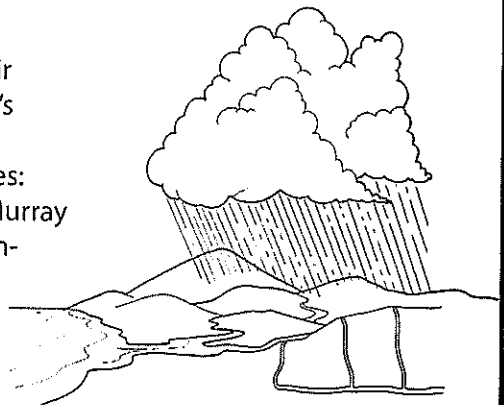
The water in rivers, lakes and ponds is called surface water. Surface water can soak down into the ground and become groundwater. Surface water is replenished by the water cycle.

The management of water resources is very important. In Australia the *Rights in Water and Irrigation Act (1914)* regulates how companies such as The Water Corporation manage the use of available water. Water allocation plans, state how much water is available from a particular

groundwater aquifer at any given time and how much water needs to remain in order for the groundwater to replenish. Licences are issued to companies and councils in order to make them accountable for their usage. For example, Perth's Kwinana Peel region has five groundwater resources: Cockburn groundwater, Murray groundwater, Rockingham-Stakehill groundwater, Serpentine groundwater and South West Coastal

SURFACE WATER

groundwater. Licences are issued to all those in need of the water; they are then accountable for how the water is used and how much is used.



- B. Explain what is happening in the diagram above left. Label surface water and groundwater.

- C. Define surface water and groundwater in your own words.

Surface water: _____

Groundwater: _____

Surface And Groundwater 2

Complete the tasks.

- A. Water is regulated in Australia thoroughly. Each region has its own office representing the Government's Department of Water. Look at the divisions listed in the table below. Use the internet to find out what each division is responsible for and how they meet their responsibilities. Go to the Government Department of Water in your state or territory to find your answers.

Divisions	Notes – What Do They Do?	Questions / Thoughts
Water Licensing		
Resource Planning		
Groundwater and Surface Water Allocation		
River Care/River Restoration		
Waterways Planning and Recreation Management		
Information Collection, Management and Analysis		

- B. Ask your parents if they know anyone who works in the water industry. Find out what their job title is and what they do. Share your information with the class in a feedback session.



SOIL MOISTURE

Soil moisture is an important source of water. Farmers measure the level of soil moisture on their land in order to use their irrigation systems more efficiently by using only the minimum amount of water required to grow their food crops.

Measuring soil moisture is also important as plants grow best in optimum soil moisture for each product. Soil moisture sensors are used more in suburban gardens to save water and on public and private golf courses to prevent over-watering as well as in agriculture.

- C. Bananas require a high soil moisture level in order to grow. Explain what would happen to a banana plantation if there was low rainfall or drought.

Availability Of Fresh Water

- Read the information about why fresh water is limited more in Australia than in other continents, then complete the task.



Fresh water is water which naturally occurs on the Earth's surface. It exists in glaciers, ice caps, ponds, lakes, rivers, bogs, streams and as groundwater in aquifers and underground streams. The amount of fresh water varies greatly from continent to continent, country to country and region to region. Fresh water is essential for all ecosystems to survive. We need fresh water for irrigation, to grow food or for industry to produce goods and resources. If fresh water is contaminated it can have a negative effect on ecosystems. For this reason water is carefully managed.

Rainfall adds to the amount of fresh water available in an area. Australia has a lower rainfall than Europe, Africa, North America, South America, and Asia (excluding Antarctica). Low rainfall leads to low surface water and seasonal river systems which affects water availability. Each year Australia's rainfall can

vary greatly - this is due to a phenomenon known as El Nino. The El Nino-Southern Oscillation is linked to ongoing seasonal anomalies in many parts of the Earth. Tropical cyclones, heat waves and bushfires are all associated with El Nino. Australia's low and variable rainfall causes environmental concern about the availability of and the use of fresh water.

Other countries and continents in the world have a larger fresh water supply than Australia, however, they also have much higher populations to sustain. Five hundred million people live in southern Asia alone. The challenge in Asia and countries like it, is not so much how much water they have, but how it is managed and who can access it. Millions of people die each year from contaminated water supplies in many parts of Asia.

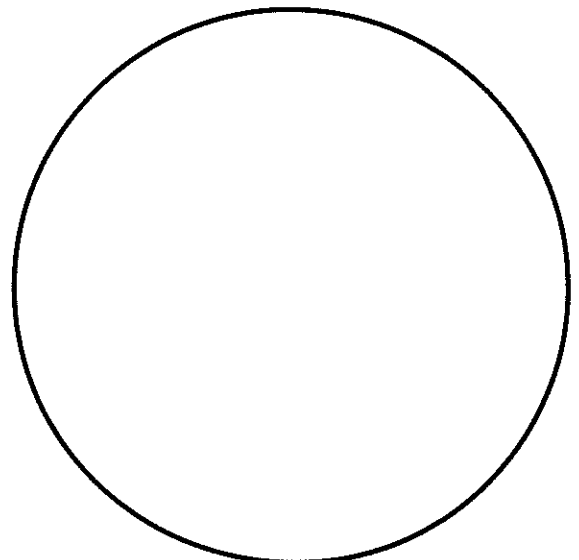
Australia is the driest inhabited continent in the world and also the largest. It has

many different climates and landscapes. Fresh water is a limited resource and is affected by the landscape and climate it is in. The natural environment in Australia includes arid inland tropical regions in the north, and cooler temperate climates in the south-east and south-west. Australia has been very successful in managing its water supply and building structures which allow water to reach mainly dry inland areas. This has meant that extensive rural industry, productive mining and tourist activities have flourished due to careful handling and legal restrictions.

Settlement and economic growth have been made possible due to large scale damming, diversion, pumping and drainage of surface waters, extraction of groundwater for domestic and industrial use and the reclamation of wetlands. Balancing the needs of our nation is a major task carefully undertaken by the Australian Government.

- A. The statistics below show how fresh water is used each year in Australia. Record the information as a pie chart.

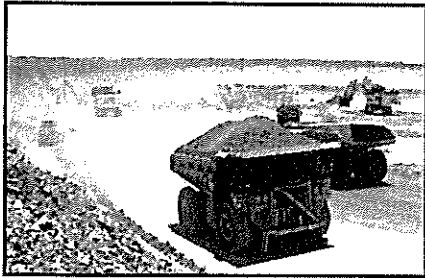
Fresh Water Consumed In Australia Each Year (Approx)	Gigalitres	%
Total	22186	100
Agriculture	15502	70
Households	1829	8
Water Supply, Sewerage And Drainage Services	1706	8
Electricity And Gas	1308	6
Manufacturing	725	4
Mining	570	4



Distribution Of Fresh Water

The information on page 19 together with your research skills will help you to complete the tasks on this page.

A. Analyse the following pictures to determine where fresh water is being used in each area of the Australian community.



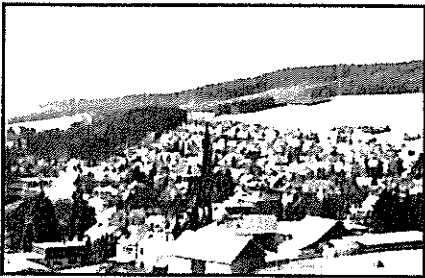
1.



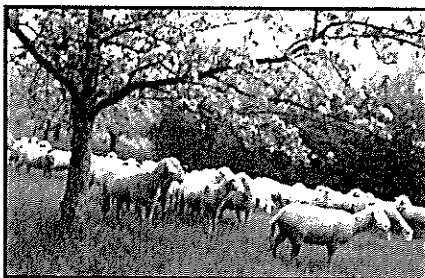
2.



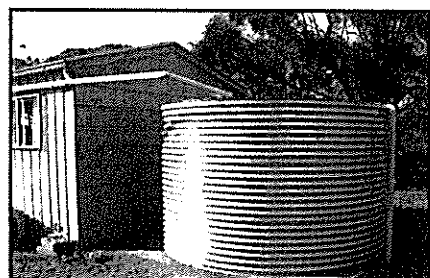
3.



4.



5.



6.

B. When there are only limited amounts of resources available for a community to use, who do you think is involved in making sure that the resources are used fairly? Write down a list of people who you think would be involved in monitoring this process and say why.

Person's Role	Why

C. Use the back of this sheet to plan a newspaper article entitled 'Australians Use More Than One Million Litres Of Fresh Water Per Person Each Year'. Write up the final copy in your workbook or use the computer to make it look like a real newspaper article.

Challenge

D. Write a persuasive piece of writing to convince someone that water will not always be classified as a renewable resource.

Limited Stocks Of Water 1

Complete the task and read the information.

A. Before reading the information below, complete the 'Before Reading' section of the Anticipation Guide. When you have read the information below, record how accurate you were by completing the 'After Reading' section of the Anticipation Guide.

ANTICIPATION GUIDE - GLOBAL WATER STOCKS

Selected Statements	Before Reading	After Reading
1. The world's population currently stands at four billion.	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False
2. The melting of polar ice caps will increase the world's fresh water supply.	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False
3. Fresh water stocks are readily available worldwide.	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False
4. Nine countries in the world hold half the world's water.	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False
5. A significant increase in the world's population will not affect fresh water availability.	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False	I think this statement is ... <input type="checkbox"/> True <input type="checkbox"/> False



GLOBAL STOCKS OF FRESH WATER

It is estimated that the world's population currently stands at six billion. It is thought by some scientists that in the next 40 years the world's population will double. This means that there will still be the same amount of water in the world but the human demand for it will be twice as much. Already, only 3% of the world's water can be used directly for human consumption.

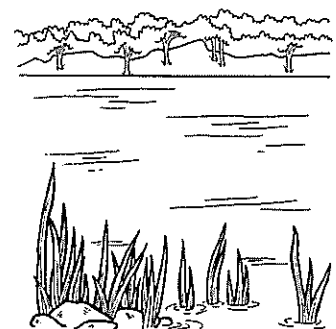
Fresh water is not evenly distributed throughout the world. Half of the world's water supply is located in just nine countries: the USA, Canada, Brazil, Colombia, the Democratic Republic of Congo, Russia, India, China and Indonesia. Even in these

countries some people go without clean drinking water due to a lack of sanitation. The amount of fresh water in the world is estimated at about 10 million cubic kilometres, it is mostly contained in polar ice caps and underground aquifers. The rest comes from the following four areas:

- rainfall: 119,000 cubic kilometres;
- lakes: 91,000 cubic kilometres;
- human-made reservoirs: 5,000 cubic kilometres;
- rivers: 2,120 cubic kilometres.

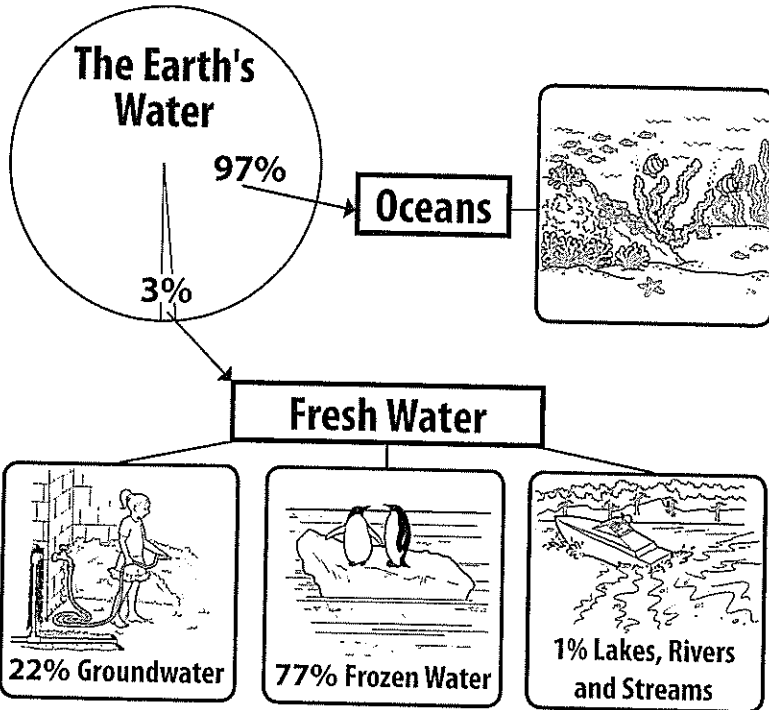
There is some concern that if global warming continues to melt glaciers in polar regions the amount of available fresh

water may actually decrease. The first threat comes from the fresh water in the glaciers melting and merging into the oceans' salt water. The second threat comes from an overall increase in the oceans' volume from the melted glaciers - two thirds of the world's fresh water is locked up in glaciers which could cause a rise in the sea level resulting in the contamination of fresh water sources along coastal regions.



Limited Stocks Of Water 2

☐ The information on this page and on page 21 will help you to complete the tasks below.



A. Use the information in the diagram to explain the current status of fresh water available in the world.

B. List the nine countries in the world that hold the most water.

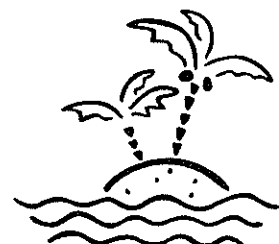
1.	4.	7.
2.	5.	8.
3.	6.	9.

C. What Am I? Solve the riddles.

- I hold 77% of the Earth's fresh water but nobody can drink from me.
- I am under the ground but not everyone knows that I am there for them to drink.
- I currently have six billion inhabitants but that will double in the next 40 years.
- I flow on the Earth's surface for all to see but I hold only 1% of the world's fresh water.
- I hold 97% of the world's water but no matter how thirsty you are you can't drink me.

Challenge

D. A group of islands known as the Maldives have already been affected by rising sea levels. Find out how this group of islands has been affected. On the back of this sheet or in your workbook write down what they have done to adjust to this situation.



Direct, Indirect And Competing Water Usage

Read the information then complete the task.



Direct And Indirect Uses Of Water

Water can be used either directly or indirectly. Direct water use is when you turn on a tap to take a shower or to fill your glass with water, or flush the toilet. Indirect water use is when you use a service or product that requires water. For example, you swim in a public swimming pool or buy a soft drink which has water as an ingredient.

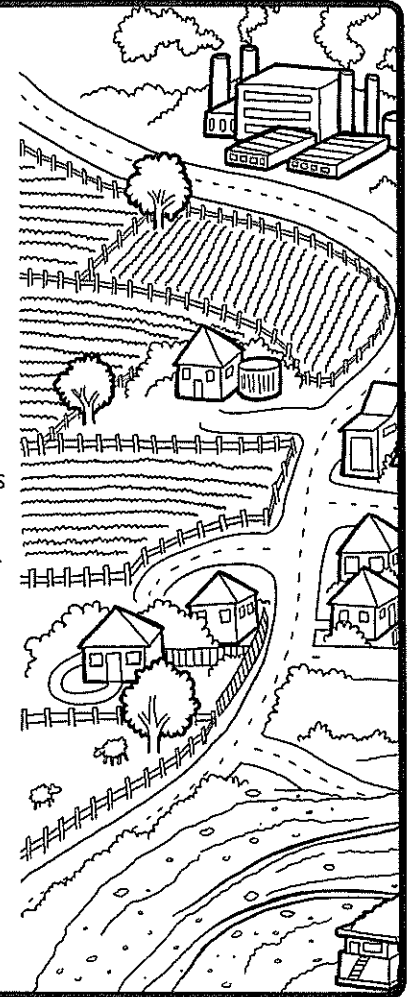
Competing Uses Of Water

In any given rural or semi-rural area, water is used for many reasons. In some rural towns companies are allowed to bottle the groundwater and sell it for a profit. In other towns bottle water has been banned in the shops as it is considered an unnecessary use of groundwater. This is an example of competing interests in water usage.

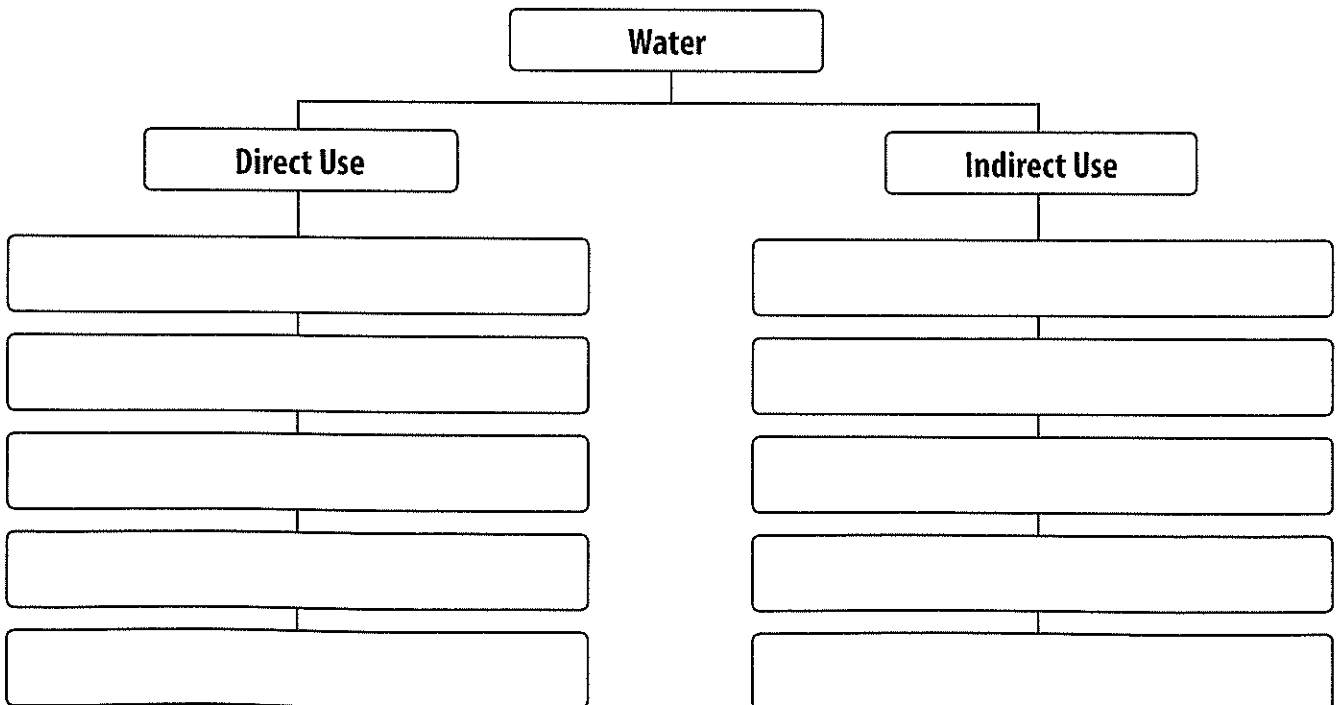
The three main areas which compete for water usage are: domestic, agricultural and industrial. In the past agriculture has taken up the majority of water usage each year, with approximately 65 % of water being used in this area. Industry is the second greatest user at 23 %, followed by domestic use at 12 %.

Urban and rural planning by the Australian Government manages these competing interests.

In many towns in Australia water has to be carefully managed. Pastoral farming would not be possible without viable access to groundwater. Similarly, many large-scale mining projects and much of the oil production industry are completely dependent on groundwater to run their projects. Much of this water is non-renewable.



A. Complete the tree diagram by showing how you use water both directly and indirectly on a typical day.

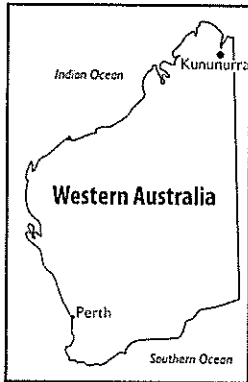


Irrigation

Read the case study then complete the task.



CASE STUDY: KUNUNURRA



Water needs to be shared by industries, agriculture and households. Kununurra is a town in the far north of Western Australia. The town was deliberately placed among the hills and ranges of the far north-east Kimberley region. This area had an abundance of fresh water conserved by the Ord River Diversion Dam and the main Ord River Dam.

Over time the area has harvested crops, (sugar cane, melons, sorghum seeds, chickpeas, pumpkins, mangoes, bananas and citrus), irrigated pasture and tropical forests. 134 kilometres of open channels carry water from Lake Kununurra to farms, while about 155 kilometres of open channels collect drainage water which discharges into the Ord River.

Tourism and mining have become important to the local economy as well as agriculture. The Ord River Irrigation Area makes it possible for many other communities to exist in the region.

- A. Kununurra and its surrounding communities have economies based on irrigation. Use the planning sheet below to research the area and find out how the irrigation system supports local agriculture, mining, industry and townships.

MY RESEARCH NOTES ABOUT: KUNUNURRA AND THE ORD RIVER IRRIGATION AREA			
NAME: _____		DATE: _____	
	Research Question 1	Research Question 2	Research Question 3
Research Source 1			
Research Source 2			
Research Source 3			

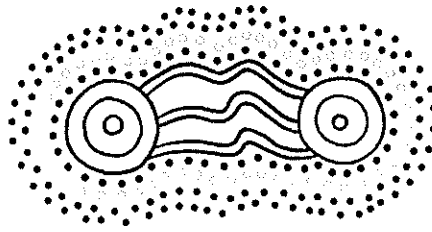
Indigenous Water Management 1

Read the information then complete the task.

Indigenous people's relationship with water, land and resources are interrelated. Inland water, rivers, wetlands, the sea, islands, reefs, sea grass beds and sandbars are all part of an inseparable understanding of the Earth.

Indigenous people have always understood how water is stored below the land and is part of river or creek systems. In the desert a 'soakage' or 'soak' is the non-indigenous name given to water sources. The indigenous people depend on these 'soakages' in times of drought. Indigenous people scoop out the mud or sand of groundwater by using a tool known as a coolamon. They often dig down for several metres until clean water appears at the base of the hole. These 'soaks' are also known as a native well.

Indigenous people cover wells with dead branches and uprooted trees to keep away dead animals. They can maintain wells up to fifteen feet deep by using the coolamon to throw peat against the wall -



this sets like cement and helps to hold the loose sand on the sides of the well.

For the Aboriginal people water is protected by Lore, a system of sustainable management which was misunderstood by the European settlers. To a certain extent there is still a poor representation of Aboriginal knowledge of water in government laws and regulations. For example, in Aboriginal traditions, water is never to be separated from the sky or the features of the landscape. Modern regulations have treated each of these as completely separate entities - however, with further recognition of Aboriginal ownership of the land more consultation now takes place with the traditional land owners of Australia.

There has been recent

consultation with the Aboriginal people regarding the Gnangara Mound in Western Australia. This groundwater supply extends from the Moore River and Gingin Brook in the north; Ellen Brook in the east; the Swan River in the south; and the Indian Ocean to the west. The mound is of vital importance to supporting population and economic growth in the region. Water from the mound supplies public ovals, recreation grounds, household gardens, horticultural centres, businesses and industries. Water from the mound needs to be carefully regulated. The Aboriginal people request that water flow and vitality are protected from development. Long-term strategies to manage the mound include consultation with the Aboriginal people as a part of the spirit of inclusion and co-operation. The Aboriginal Heritage Act of 1972 and the Native Title Act of 1993 ensure that sites of heritage or spiritual significance for the Aboriginal people are protected.

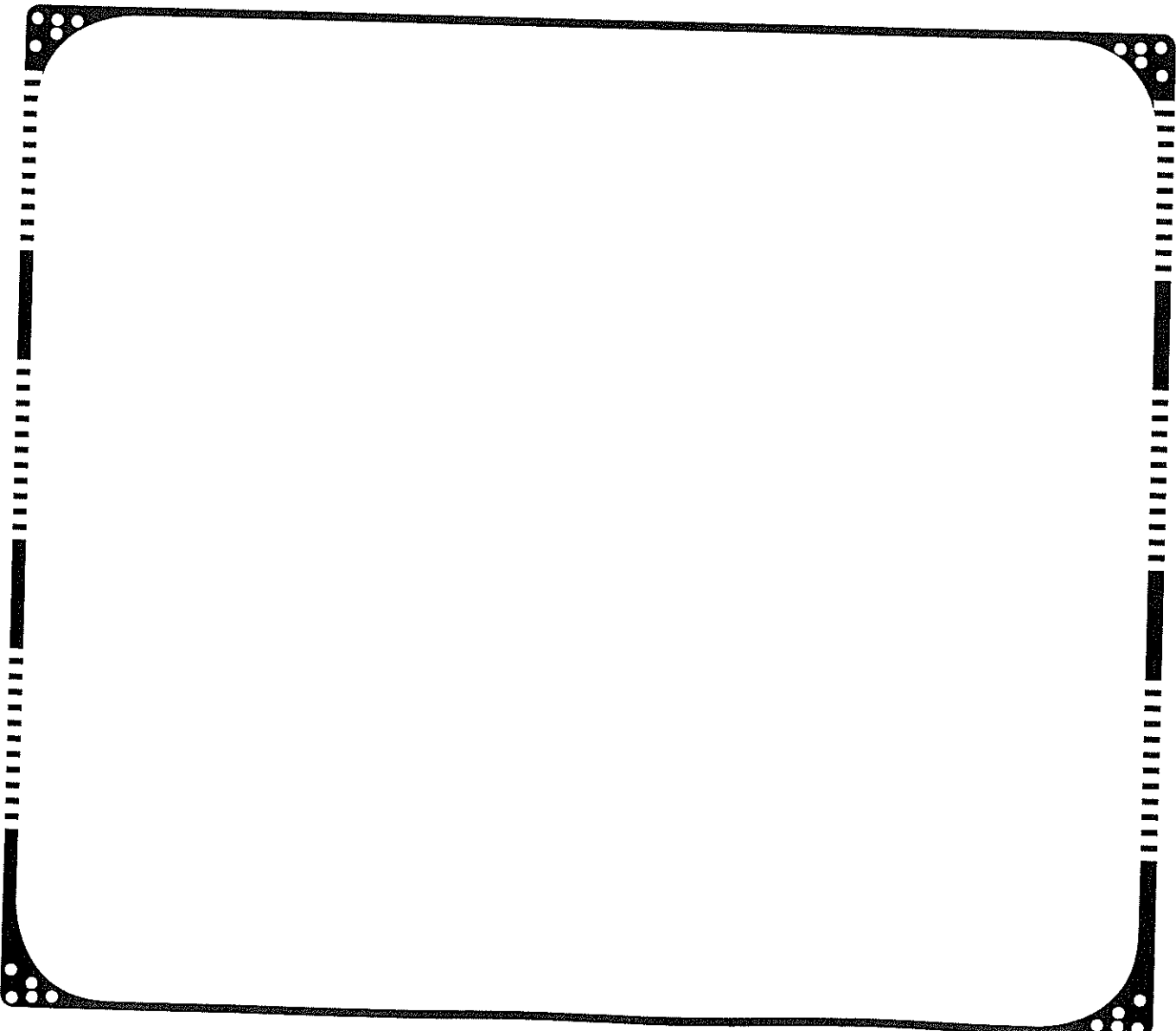
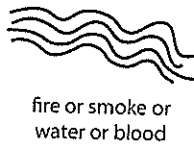
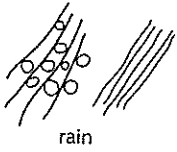
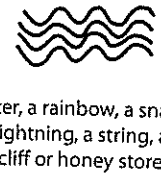
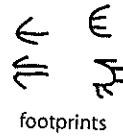
Challenge

Why is it important that Aborigines and Torres Strait Islanders of Australia are consulted about the use of water in Australia today?

Indigenous Water Management 2

Read the information on page 25 then complete the task below.

A. Use the traditional Aboriginal art symbols below to create a drawing or painting which shows the importance of water to the Aboriginal people. Use the box provided to practise drawing the symbols and then create your art design in your workbook.



Indigenous Water Knowledge 1

The Aboriginal people of Australia believe in oneness with nature. Rocks, canyons, waterfalls, rivers, islands, beaches and other natural features such as the Sun, Moon, visible stars and animals all have their own stories of creation and inter-connectedness. To the traditional Aborigine they are all sacred. The knowledge that Aborigines have about water is an important part of the government consultation process today. It is important that in a country such as Australia where traditional land owners believe in the inter-connectedness of humans and resources, that consultation continues for a long time to come.

- ❑ Read the Dreamtime story entitled *The Origin of Water* then complete the task on page 28.

The Origin of Water

(adapted by Fiona Back)

In the beginning the land had no water, or so the animals thought. The only way to get a drink or quench their thirst was to chew 'Gulbirra', kangaroo grass or to lick the dew from the plants.

One day the short-nosed bandicoot Gudjilla saw Bangarra the blue-tongued lizard drying himself out of sight behind a rock. When the other animals heard about it they were very angry and they said to Bangarra, "You must have some water hidden away! Where have you hidden it?"

Bangarra would not tell them because he wanted the water for himself.

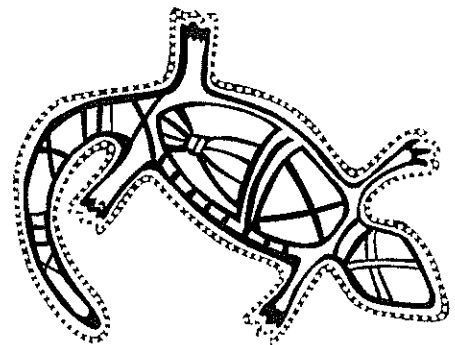
The animals called a meeting and they chose Gudjilla the bandicoot to follow Bangarra wherever he went. But Bangarra was very smart and could see Gudjilla out of the corner of his eye. He never revealed where the water was hidden.

The animals did not know what to do. Bangarra was too clever. Then Gula, the rat, the smallest of the animals said that he could follow Bangarra but all the other animals laughed at him, and Midin, the ring-tailed possum came forward and told Gula that he was too small and they would not listen to him.

Gula was very hurt, but he decided to follow Bangarra anyway and he crept up very close behind Bangarra, the blue-tongued lizard. Now and then Bangarra thought someone was following him, he would look to the left and then jump to the right but he couldn't see anybody. So the little rat Gula followed the blue-tongued lizard Bangarra to a spring that was hidden under a big flat rock. When Bangarra lifted the rock to let the spring flow, Gula jumped out from where he was hiding and frightened Bangarra away, and all the other animals praised Gula for what he had done.

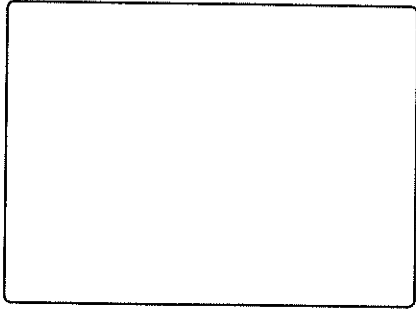
The animals were so happy because now they all had bubbling water from the spring. They all jumped in and began to splash water everywhere and the kingfisher was so glad, he swam to and fro, and with his beak made drains and gullies in front of the running water all the way down to the sea. That is how the small creeks and gullies were made.

The moral of this story: water is a resource that should be shared.

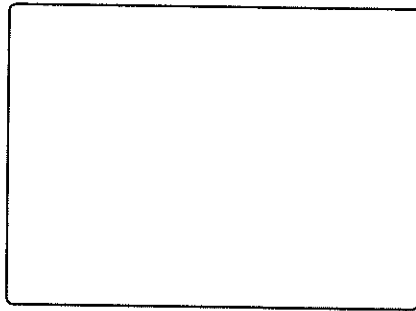


Indigenous Water Knowledge 2

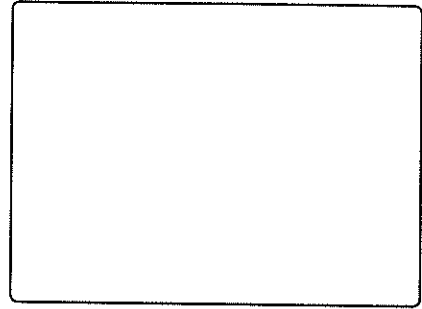
- Read the Dreamtime story entitled *The Origin of Water* on page 27 and recreate the story as a storyboard below.



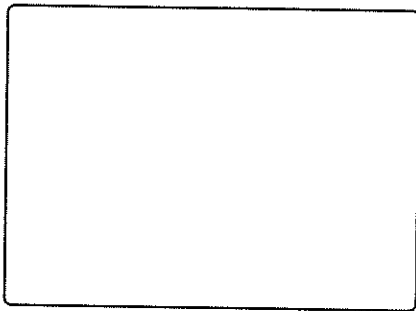
A large empty rectangular box for drawing the first scene of the story.



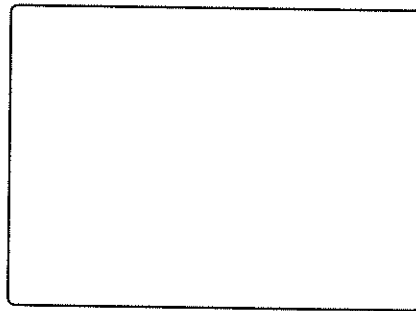
A large empty rectangular box for drawing the second scene of the story.



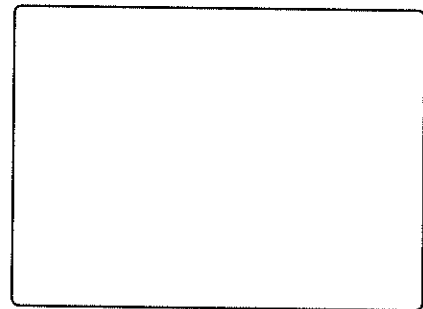
A large empty rectangular box for drawing the third scene of the story.



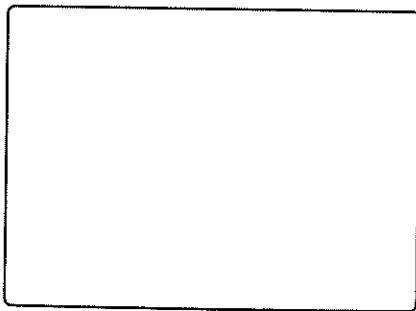
A large empty rectangular box for drawing the fourth scene of the story.



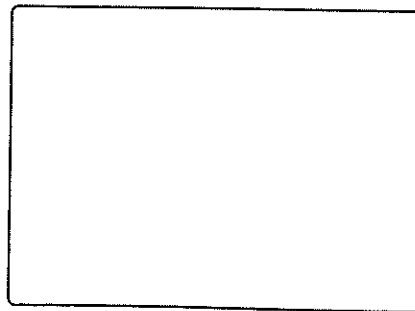
A large empty rectangular box for drawing the fifth scene of the story.



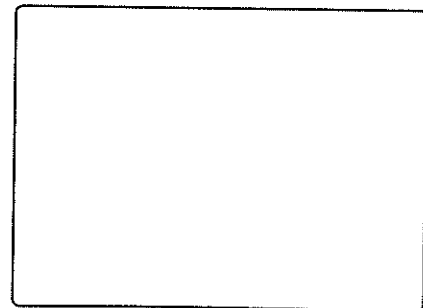
A large empty rectangular box for drawing the sixth scene of the story.



A large empty rectangular box for drawing the seventh scene of the story.



A large empty rectangular box for drawing the eighth scene of the story.



A large empty rectangular box for drawing the ninth scene of the story.

Water Management Strategies 1

- ☐ Read the following case studies about how Australia and overseas countries are managing their water, then complete the Find-A-Fact tables.



CASE STUDY 1: KURNELL DESALINATION PLANT, SYDNEY, AUSTRALIA

The Kurnell Desalination Plant was built in 2010 and is located in Kurnell, New South Wales. It generates 250 megalitres of water per day and was built at a cost of \$1.896

billion dollars. Desalination is the process of using reverse osmosis to convert ocean water to fresh water. The plant is generated by 100% renewable energy.



Find-A-Fact

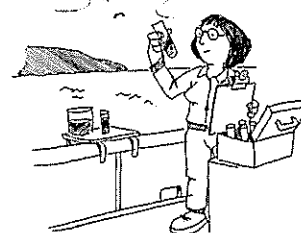
1. Find out how much of Sydney's water supply the Kurnell Desalination Plant currently supplies.	
2. Which three areas in New South Wales does Kurnell supply water to?	



CASE STUDY 2: THE WARRAGAMBA DAM, SYDNEY, AUSTRALIA

The Warragamba Dam supplies 80% of Sydney's water supply. The dam took 12 years to build and was completed in 1960.

Warragamba is the largest concrete dam in Australia and is used specifically to supply water to urban areas.

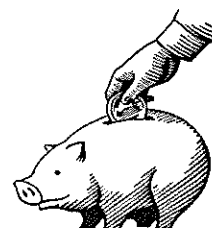


Find-A-Fact

1. Find out what the name Warragamba means in the traditional Aboriginal language.	
2. How is the dam used to combine recreation and water supply?	

CASE STUDY 3: Increasing The Cost Of Water

Increasing the cost of water for consumers can be an effective tool for getting people to reduce their use of water. Discuss with your class whether this is an effective strategy.



Water Management Strategies 2

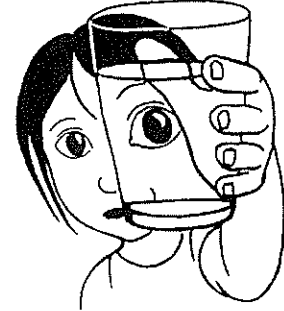
- ❑ Read the following case studies about how Australia and overseas countries are managing their water. Complete the Find-A-Fact tables.



CASE STUDY 4: RECLAIMED WATER FOR DRINKING

In 2006 the town of Toowoomba in Queensland faced severe water restrictions due to long term drought conditions. The community was encouraged to back a plan to pump purified sewage water back into their dams for drinking. There was so much

public outcry that a referendum took place. The scheme failed with 62% of the residents rejecting the proposal. The project had an estimated cost of \$73 million and would have put Australia onto the worldwide map of countries using the scheme to generate fresh water.



Find-A-Fact

1. What needs to be removed from reclaimed water before it reaches the public?	
2. The WHO has approved reclaimed water. What does WHO stand for?	

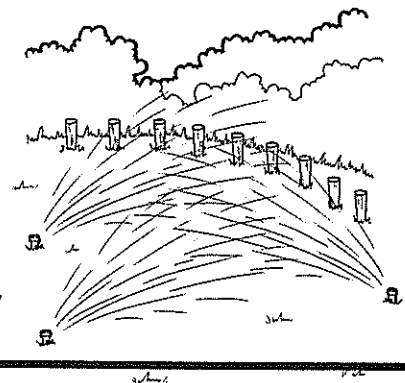


CASE STUDY 5: RECYCLING TREATED WASTEWATER

By 2015, the New South Wales Government aims to recycle about 70 billion litres of water a year to reuse in homes, industry and irrigation. Nearly 50 billion litres of recycled water was used in Sydney and the Illawarra between 2010-2011. This water would have been used previously in bathrooms, laundries, kitchens, and in businesses. It is treated to a high

standard so that it is safe to use. Recycled water can be used for the following purposes: for the irrigation of sports grounds, golf courses and public open spaces; industrial processing; groundwater replenishment; toilet flushing; clothes washing; garden watering; maintaining wetlands; irrigation for food crops; irrigation for trees, flowers, turfs, building construction; dust

suppression and fire fighting.



Find-A-Fact

1. Look up your local council and find out what facilities in your area use recycled water.	
2. Find out how many billions of litres of recycled water have been used by your council.	

Water Management Strategies 3

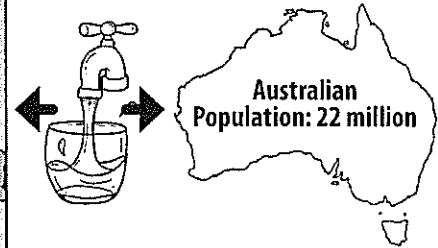
- ☐ Read the following case study about how Indonesia is managing its water. Complete the tasks below.



OVERSEAS CASE STUDY: WATER SUPPLY AND SANITATION IN INDONESIA

In comparison to Australia's population of 22 million, Indonesia has 220 million people. Indonesia is one of the nine countries in the world that holds half of the world's water. Indonesia has enormous amounts of water at its disposal, however, Australia is far more efficient in delivering its limited water to the entire country and meeting the specific requirements of each region. This is due to the efficiency of the Australian Government, both at a state and federal level.

In 2001 Indonesia's Government was decentralised. This resulted in a backward step in providing safe drinking water to the people



of Indonesia, as provincial governments lacked the funds and mechanisms to carry out the vast infrastructures required to supply water. Indonesia has now undertaken Millennium Development Goal Planning which should greatly improve the conditions of people by the year 2015.

As part of the Indonesian Government's planning - pollution, domestic waste and industrial waste are all

being considered. Sanitation systems need to be upgraded in order to cope with all of the waste. Indonesia has a high industrial waste output as they are huge producers of goods for worldwide consumption. Waste from agriculture, textiles, pulp and paper, petrochemical, mining and gas and small scale industry all contribute to the pollution of Indonesian water supplies.

- A. Complete the Retrieval Chart below to show the current water supply and sanitation situation in Indonesia. Suggest some possible solutions.

Problems	Solutions

- B. Research what Indonesia will need to do in order to change their current water resource management issues. Use the key words below to conduct your research. Present your findings to the class as a PowerPoint, written report or oral presentation.

POLLUTION SEWAGE TREATMENT GOVERNMENT WASTE PLANNING INFRASTRUCTURE

Trading In Virtual Water

Read the information and study Table A and Table B to help you to complete the questions.



If something is 'virtual' it means that it does not actually exist in the form you may expect. Virtual water is water used in the production process of food or other commodities such as electricity. For example, in order to produce one kilogram of wheat it takes approximately

1,000 litres of water. This gives the wheat produced a virtual water content of 1,000 litres. A way in which water can be spatially redistributed is by measuring the amount of virtual water in products traded with other countries.

Countries with significant

amounts of water can produce products which require large amounts of water and export those products to countries which lack the water to produce those goods. This relieves pressure on the water resources of different countries. This is how 'virtual water trade' occurs.

TABLE A

Product	Quantity	Virtual Content Per Litre
glass of milk	250 ml	250
cup of coffee	125 ml	140
cup of tea	125 ml	20
slice of bread	30 g	40
slice of bread with cheese	30 g + 10 g	90
glass of orange juice	200 ml	170
hamburger	150 g	2400
beef	1 kg	15500
cheese	1 kg	4400
butter	1 kg	18000

TABLE B

Product	Quantity	Virtual Content Per Litre
car	1100 kg	400000
cotton t-shirt	75 g	810
jeans	1 pair 1 kg	10850

A. Use Table A above to work out how much virtual water is needed to make the following meals.

1. A glass of milk with a slice of bread and cheese.
2. A hamburger and glass of orange juice.
3. A cup of coffee and two slices of toast.

B. How much virtual water is used to make the following everyday products that you own?

1. How many cars do your family own? How many litres of virtual water was used to manufacture them?
2. How many pairs of jeans do you own? How many litres of virtual water was used to make them?
3. How many t-shirts do you own? How many litres of virtual water was used to make them?

C. Explain the term 'virtual water trade' in your own words.
