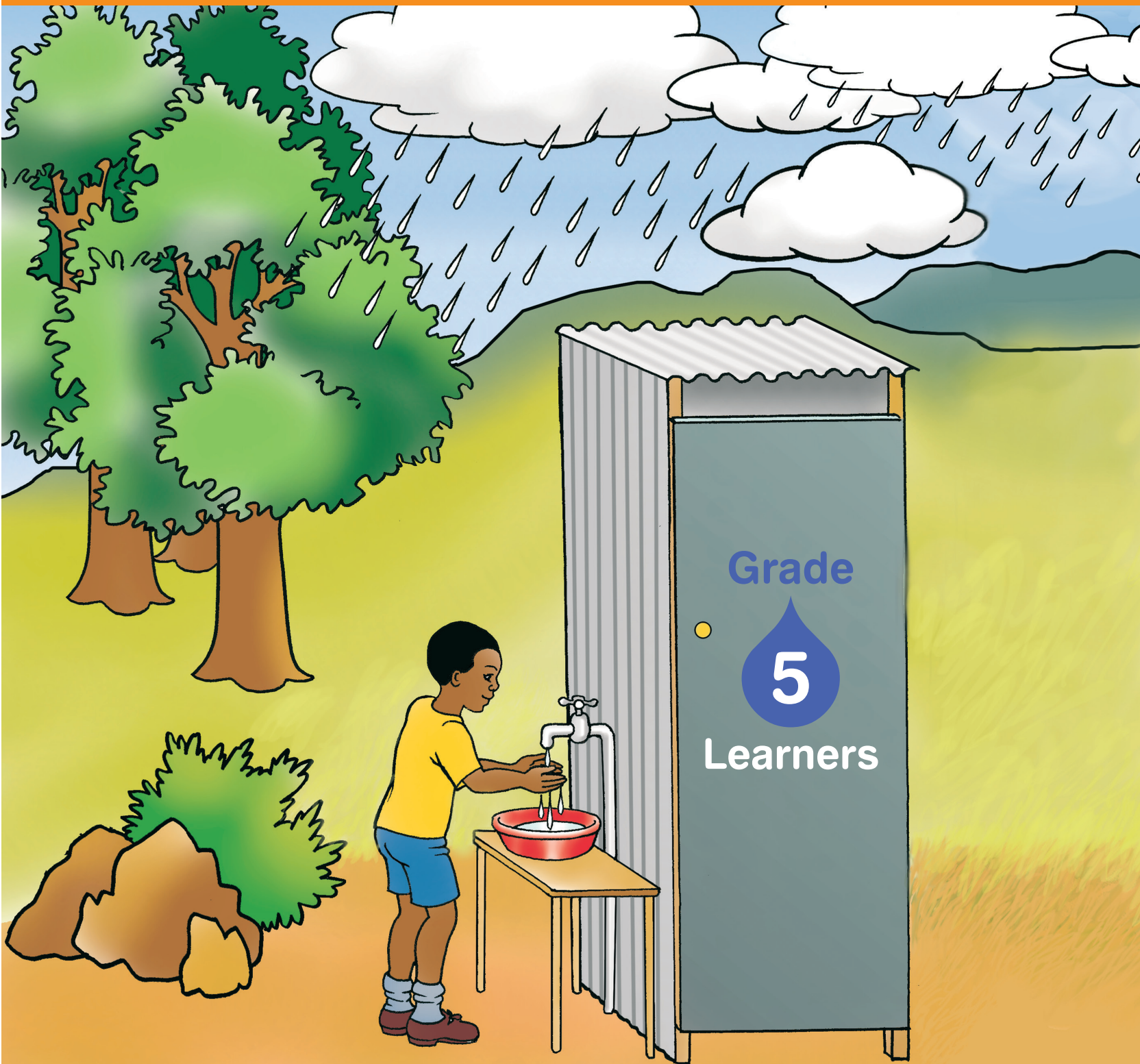


Water is Life

2020 Vision for Water and Sanitation Education Programme



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



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Water is Life

Name.....

Surname.....

Grade.....



Grade

5

Grade

5

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Water is Life

Activity

In this activity you will:

- ◆ Explore the ways to take salt out of water before using it
- ◆ Make a model of a desalination plant (factory)

Background Information

Water is humanity's second most precious resource after the air we breathe. Water covers 70% of the earth's surface, but only 1% is available as fresh water. The major portion of the earth is mainly oceans with salt water. Over 1.1 billion people on earth lack access to safe water and 2.6 billion live without proper sanitation. Water-related diseases result in over five million deaths annually, of whom most are children.

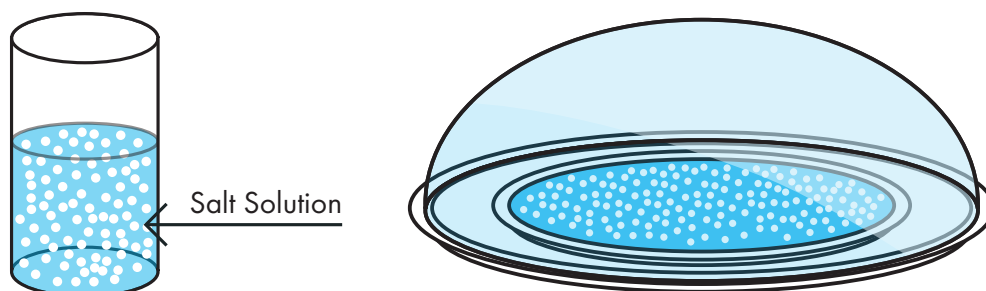
Activity 1a: Desalination: Removing salt from water

You will need:

- ◆ Glass bowl
- ◆ Dinner plate
- ◆ Saucer containing salt water



What to do



- 1 . Prepare a salt solution by dissolving about two teaspoons (10ml) of salt in one cup (250ml) of water. How does it look?
- 2 . Put the saucer on the dinner plate.
- 3 . Fill the saucer with salt water.
- 4 . Place the glass bowl over the saucer. Make sure that the glass bowl is dry.
- 5 . Leave the apparatus to stand in a sunny place.
- 6 . After some time observe what happens.
 - a . In the glass bowl.

.....

.....

.....

- b. On the saucer.

.....

.....

.....

- 7 . Turn the glass bowl back to its position and notice what happens.

Observations

.....

.....

.....

Questions

1 . What would you do to find out if the water droplets on the glass jar is fresh or salt water?

.....

.....

.....

.....

2 . What will you do to collect the drops of water on the glass bowl?

.....

.....

.....

.....

Explanation

This process you have demonstrated is used to remove salt from water. It is the process that water treatment plants follow to change salty water into fresh or drinkable water. The table salt we use in our houses for cooking is the by-product of this process.

Extension activity

Dudu's family lives in the island which is mainly surrounded by the sea. Look at the picture that shows Dudu's house and suggest ways in which Dudu's family could get access to fresh water.

- ◆ Brainstorm that with your partner.
- ◆ Present a plan to the classroom on how Dudu's family could access fresh water.



Activity 1b: Water purification by evaporation and condensation

Background information

Evaporation and condensation

In your lower grades you have studied how water is cleaned or purified through boiling and adding bleach. Fresh water is limited and its quality is under constant pressure. Preserving fresh water quality is important for drinking, water supply, food production and recreational water use. Evaporation and condensation are the main mechanisms that help to purify water from water-related diseases.

Activity

In this activity we will:

- ◆ Demonstrate methods of purifying water i.e. evaporation and condensation.
- ◆ Complete the quiz relating to water.

For this activity you will need:

- ◆ 4 cups of dirt / sand
- ◆ A 2 litre container of water
- ◆ A large glass bowl
- ◆ A short glass
- ◆ Clear plastic wrap / cling wrap
- ◆ Sun

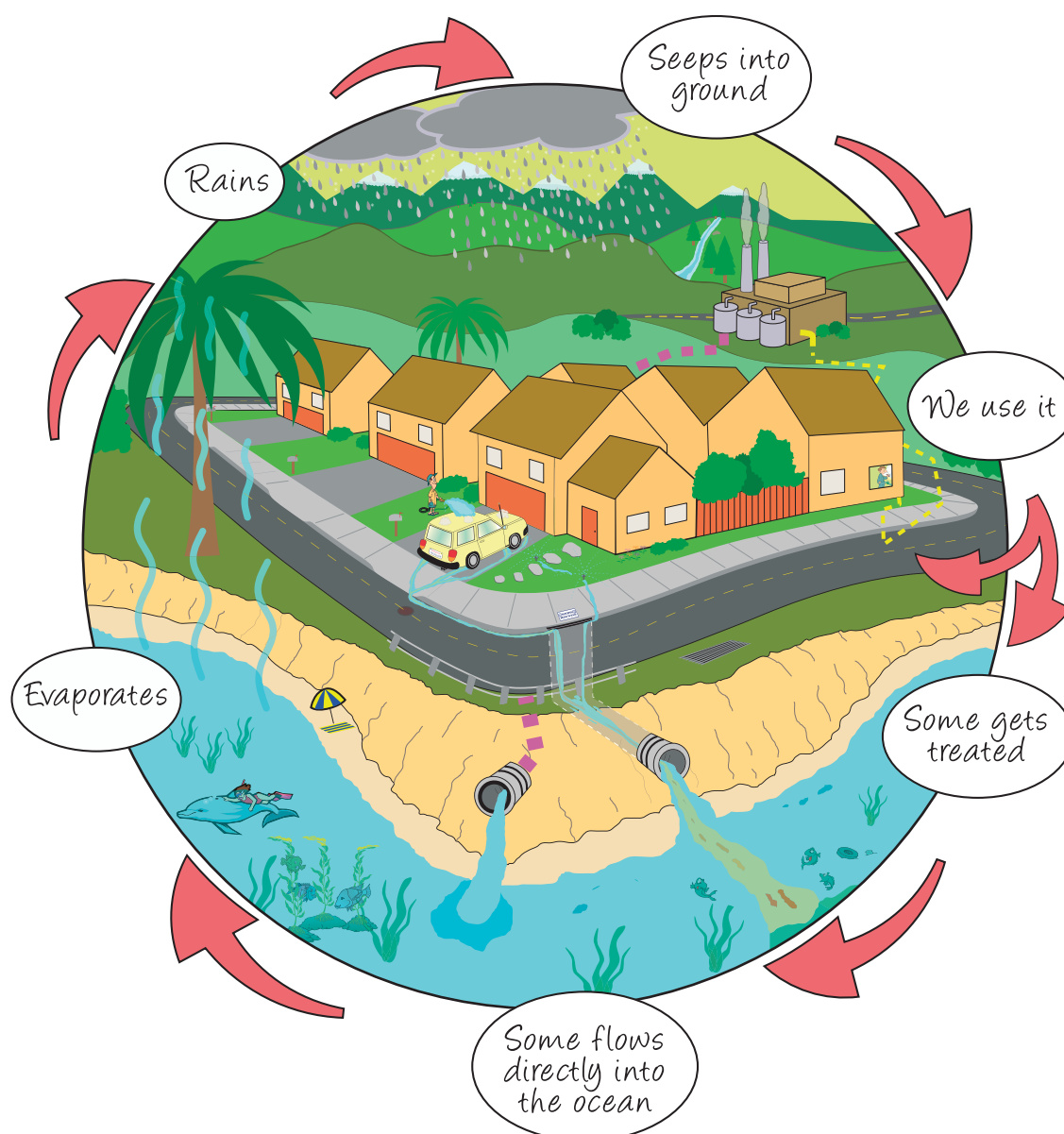
What to do:

1. Mix the dirt / sand and water in a bowl.
2. Put a clean and empty short glass in the centre of the bowl.
3. Place the bowl outside in the sun.
4. Cover the bowl with the plastic wrap.
5. Place a small stone on the plastic wrap directly over the cup.
6. Leave the bowl to stand for several hours.
7. Observe what happens.
 - a. In the glass.

You have a right to clean safe water: but use it sparingly.

b . In the bowl.

- Try to answer the following questions based on the experiment:
- Work with your partner for this activity.
- In the discussion remember the water cycle we did in Grade 4.





Water purification

Questions

- 1 . Which processes for water purification are demonstrated in the experiment?
- 2 . What does the plastic wrap represent?
- 3 . What do you think will happen if the plastic wrap was dirty?

Water quiz

Complete the following sentences by putting the letters in the right order.

E.g. Do not (etswa) water. Waste

- 1 . All living things need (tawer) to live.

.....

- 2 . When the sun heats the earth's surface, water will evaporate back into the air and become part of the (dlocu).

.....

- 3 . 1% of all water on earth is the (hefrs) water.

.....

- 4 . Water can be saved by taking a quick (howser).

.....

- 5 . Washing cars with a (kecbut) instead of a hosepipe will save water.

.....

- 6 . Ask your (mfaiyl) to always save water.

.....

Glossary of terms

Condensation: The process through which vapour becomes a liquid.

Evaporation: The process through which a liquid becomes vapour.

Water is Life

Activity 2a: What does the Water Act tell us?

- ◆ Together with your partner read the following fact sheet and note words and phrases that you do not understand.
- ◆ Use your dictionary to check their meaning and ask your educator to assist you.
- ◆ Answer the questions that follow.

Fact sheet: a brief look at the water act

The constitution of the Republic of South Africa in chapter 2 (Bill of rights) P. 24 states that everyone has the right to:

- a . An environment that is not harmful to their health and well-being; and
- b . To have the environment protected for the benefit of the present and future generations through reasonable legislative and other measures that -
 - (i) prevent pollution and ecological degradation.
 - (ii) promote conservation, and
 - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.



South Africa's law about water is contained in the National Water Act. This act specifies that government (through the Department of Water and Sanitation) as the public trustee of the nation's water resources, must make sure that water is protected, used and developed, managed and controlled in a sustainable way so that all persons can benefit.

The Act also recognises that all people have a basic need for water for drinking and hygiene and that these needs must, at all times, be satisfied.

The Department of Water Affairs and Forestry is thus responsible for water resource management for the following purposes:

- Social development: everybody should have equal access to water.
- Economic growth: water must support economic and social development.
- Ecological integrity: water resources must be protected so that the resource will continue to provide water in the future.

Complementing the Water Act is the Water Services Act (no. 108 of 1997). Its aim is to define roles and responsibilities of the different spheres of government like municipalities in order to ensure that everyone has access to basic water supply and basic sanitation. Various structures, from municipalities themselves, private companies, local people and businesses share this responsibility.

In September 2000, the Free Basic Water policy was announced by the Minister of Water Affairs and Forestry. It committed the government to providing 6 000 litres of free water per month, regarded as the basic human requirement of water, to each household.

Adapted from: Enviro Teach Vol 11, May 2004: Sharenet Project, p.11.

After discussing the above passage with your educator answer the following questions in your exercise books:

- 1 . Which government department has the responsibility of being a trustee of the nation's water resources?

.....

.....

- 2 . Which law deals with water related services in South Africa?

.....

.....

3 . By passing this law what is the government trying to achieve or ensure?

.....

.....

.....

.....

4 . What basic needs for water are mentioned in the fact sheet?

.....

.....

.....

.....

5 . According to the law, how many litres of free basic water must be obtained by each household?

.....

6 . Which other government structure is responsible for the supply of water and sanitation facilities to local communities?

.....

.....

7 . State whether the following statements are true or false. Water resource management aims to ensure that:

- a . Everybody gets water.
- b . Water is used for economic purposes.
- c . Water sources are protected.

8 . Does your household get this water? If not, why not?

.....

.....

.....

9 . If your household does get this free water find out from your water account / local municipality how much money do you save from this per month?

.....

.....

.....

Extension: stimulation exercise

- ◆ Pretend that you are a Minister of Water and Sanitation. Your group is in Parliament where there is a debate on how you can control water so that it can be used sustainably. Give three suggestions.
- ◆ In your group design a poster that will encourage people to RESERVE, RE-USE and RECYCLE water.
- ◆ Each group will display its poster and then a reporter/speaker from each group will present their reports as the Minister of Water and Sanitation.

Know your
rights! You
have the
right to safe
clean water.

Water use Efficiency

Activity

At the end of this activity you will be able to:

- ◆ Make a rain gauge following given instructions
- ◆ Use the rain gauge to record the average rainfall in your area
- ◆ Collect data and draw conclusions

Background information

South Africa is a dry country, where the major part of the country has very little rain and in the eastern half of the country where more rain does fall, it falls only during the rainy season and for half the year rain falls. This means we have to be very careful about using our rainwater and storing it for the dry season. We store water in dams. We also use rainwater tanks and reservoirs, but in the dry part of the country the most important source of water is groundwater.

Activity 3a: Making a rain gauge

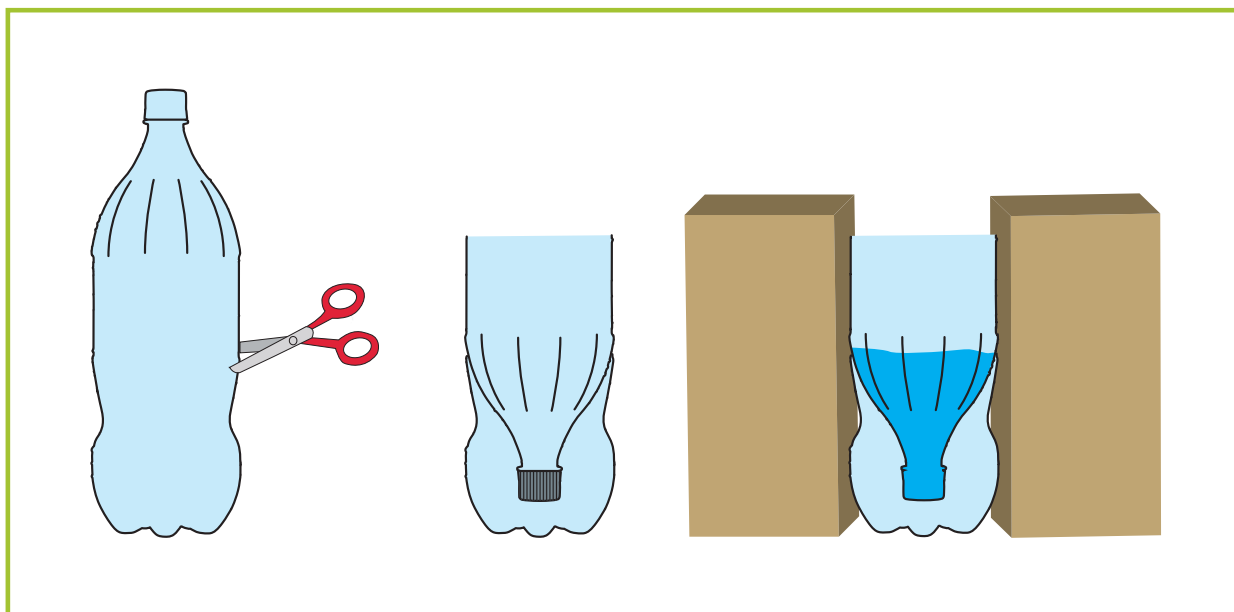
- ◆ Make a rain gauge that will help you to collect water when it rains so that you can record how much rain has fallen.

You will need:

- ◆ A two litre plastic bottle
- ◆ Sharp object to cut the bottle
- ◆ Two bricks

Method

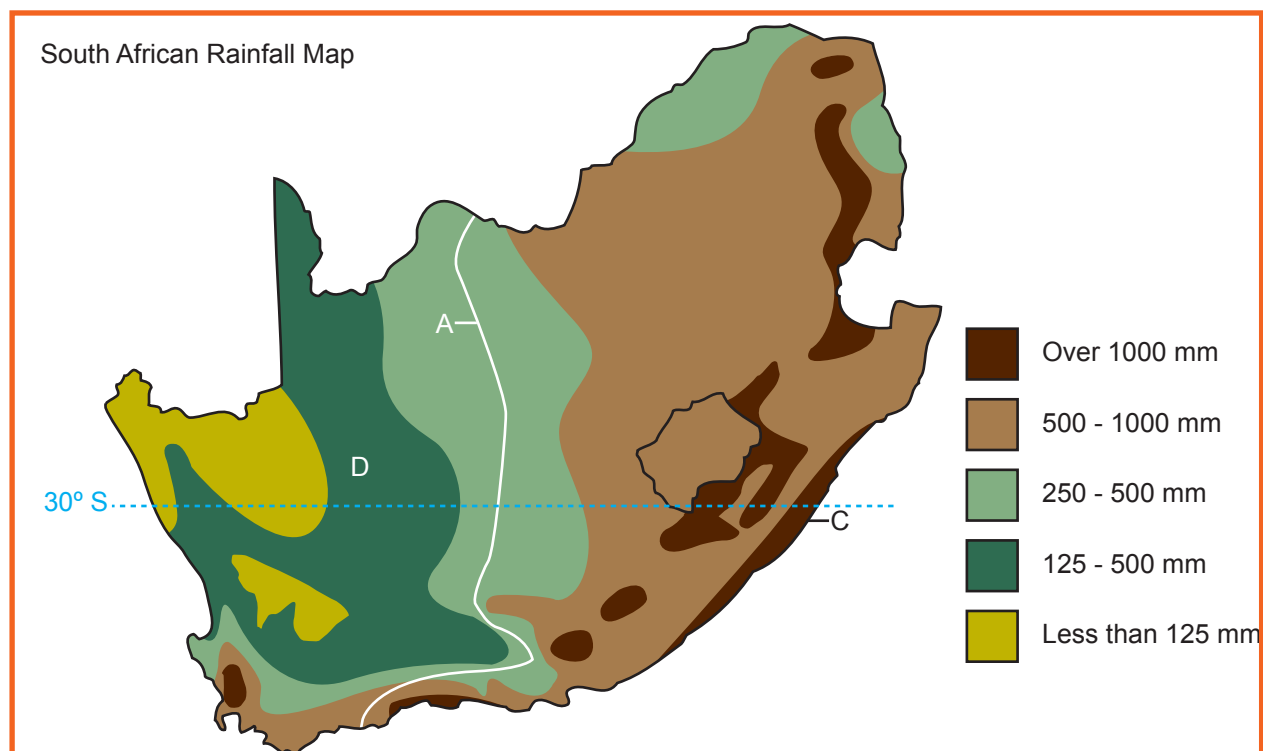
1. Cut off the top of a plastic two-litre cold drink bottle
2. Turn the top upside down inside the bottom half
3. Put it firmly between two bricks and leave it in the open
4. Make sure it has no water in it





Activity 3b: Rainfall in South Africa

- ◆ Keep a record of rainfall in your area for at least two months. It will be best to do this activity during the rainy season or you may get no rainwater at all!
- ◆ Record the rainfall daily.
- ◆ Calculate the average rainfall of your area from the data collected over the two months. Your teacher will give you the South African rain fall distribution map and take you through on how it is read. Does it more or less match the average illustrated in the rainfall distribution map?



Glossary of terms

- Groundwater:** Subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated.
- Reservoir:** It is a lake or dam that is used to store water before it is supplied.
- Average:** It is the result that you get when you add two or more numbers together and divide the total by the numbers you have added together.
- Rain Gauge:** A device that is used to measure the amount or quantity of rainfall.

Water use Efficiency

Activity

At the end of this activity you will be able to:

- ◆ Design and make a technological device that can be used to solve the problem of wasted rain water
- ◆ Select appropriate resources and develop products in a safe and waste free manner

You will need:

- ◆ Wood for supports
- ◆ A large tub - preferably metal
- ◆ A tap, if possible
- ◆ A sheet of wire mesh (with fine holes bigger than the open area at the top of the tub)
- ◆ Nails and screws
- ◆ Tools
- ◆ Silicone sealant

Preparation

NB: You may look through unwanted material at home, school etc. (Recycle) or ask your educator to help you write letters to request material from local business people.

Activity 4a: Build your own water catchment container

In your groups brainstorm and list materials you'll need to build a water catchment container that:

- ◆ Will catch rainwater
- ◆ Will not leak
- ◆ Will be installed out of reach of animals that might want to drink from it
- ◆ Will keep away small animals like rats, bats etc.

- Will allow you to drain some water
- Will be easy to clean
- Agree on the date on which the material should be brought to school
- Develop a plan that details a step-by-step process of building a water catchment container. The purpose of choosing each material or apparatus should be explained as well. These should relate especially to safety precautions.

Activity 4b: Every drop of water plays a role

Each group must evaluate the water catchment facility they have designed, making use of the following questions as a guide:

1. What could this water be used for?
2. What could you not use this water for?
3. What can be done to make this water suitable for those things mentioned in 2 above?
4. What would you suggest that the water in the water catchment container be used for?
5. Why is it necessary to keep away animals from water used for human consumption?
6. How would you improve or modify the water catchment container?

Assessment

Your design will be assessed on the following:

1. The ability to catch as much water as possible.
2. Free of leakages.
3. The safety of the design (hygiene).
4. Protection from potential damages etc.

every drop counts: Save as much as you can – we need it.

Glossary of terms

Recycling:	To process and re-use materials that has been used before.
Brainstorm:	A technique that involves thinking about a particular problem and writing down as many ideas about it as possible in a short period of time.
Safety precautions:	An action that is intended to prevent something unpleasant or dangerous from happening.

Water use Efficiency

Background information

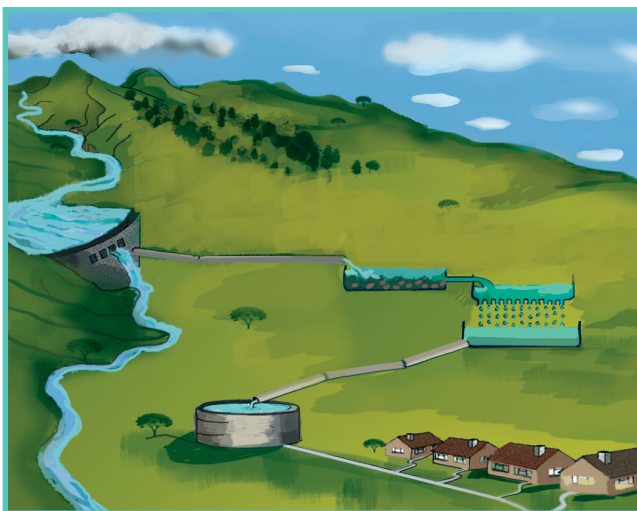
We have already looked at some resources and services provided by the government. Let us now look at the very important resource which the government of South Africa provides (water). The Department of Water and Sanitation is a department of the national government. It provides everyone with water. This is a very complicated and an expensive process.

Activity 5a: The price we pay for the use and misuse of water

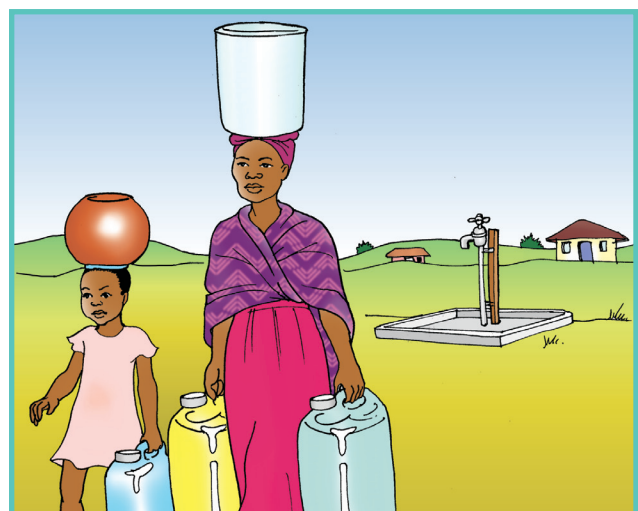
What to do

1. Your educator will assist you to interpret the two pictures that show different sources of water used by Paul's and Pinky's houses. You will learn about the source of water for each family, how it gets to the two homes as well as the cost involved.
2. Also, think about the method you use to collect water at your home?

A. How water gets to Paul's house



B. How water gets to Pinky's house



5 Use water wisely

Activity 5b: The use of water at home

Study the audit report illustrated in the table below and answer questions that follow with your partner.

Used For	Paul	Pinky
Bathing		
Washing clothes		
Drinking water		
Watering plants		
Washing cars		

Questions

1 . Which family gets its water easily? Give reasons for your answer.

.....

.....

.....

.....

2 . Which family uses more water? Give reasons for your answer.

.....

.....

.....

.....

3 . Which family uses less water? Give reasons for your answer.

.....

.....

.....

.....

4 . For the family that uses the most water suggest three changes that they can apply to save their water.

.....

.....

.....

.....

- 5 .

Looking at the amount of water used, where and how it is obtained and used as well as the cost of obtaining it, what would you say are the advantages and disadvantages of both families?
-

Write the advantages and disadvantages on the following worksheet.

Family	Paul	Pinky
Advantages		
Disadvantages		

Assessment

- You will now do a self assessment. Answer honestly.
- In your responses did you list the following?

	Yes	No
Saves time		
Uses clean water		
Easy to get		
Saves water		
Less labour		



Water Quality

Activity

At the end of this activity you will be able to:

- Identify the different ways in which society destroys the quality of water.
- Suggest some solutions to these problems as a means of reducing the risk of diseases.

You will need:

- Pen/pencil
- Scribbler

Instructions

- In your groups read and discuss the fact sheet below.
- You will be allocated a certain section of the main picture.
- In the worksheet look at the section of the pictures allocated to your group and answer the questions that follow.
- You will be asked to make a presentation of your observations using the worksheet.
- You will be assessed on your ability to identify sources of pollution and actions taken to solve the problem.

Background information: Water pollution

Water pollution occurs when people dump waste, chemicals, metals and oil into the water. Polluted water is dirty, can smell bad and contain germs or chemicals that are harmful to people, animals and plants and grasses and can cause diseases. We need to look after our riverbank vegetation. The roots of plants and grass stop soil erosion. Some plants clean water and slow down floodwater.

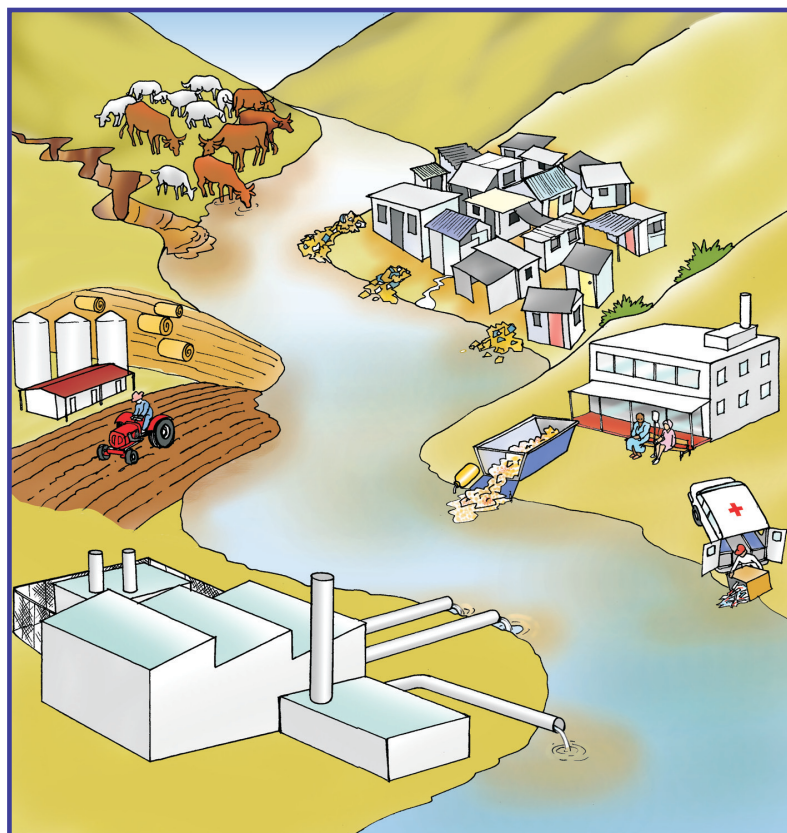
What to do

- Look at the following picture which shows different lifestyles. The main picture is divided into five different pictures showing different activities.
- Work with your allocated sub-picture either a, b, c, d or e.

Activity 6a: Water pollution

Look at picture A and answer the following questions:

Picture A: Before



- 1 . Use the following words to describe the condition of the environment in your picture. Also what impact does the activity in that environment have on the quality of water?

Smelly, polluted, murky, clear, good, not smelly, at risk, not polluted, bad, not at risk

This section of the river is, the water is probably..... and This means the quality of the water is..... and so the people using it are..... from diseases.

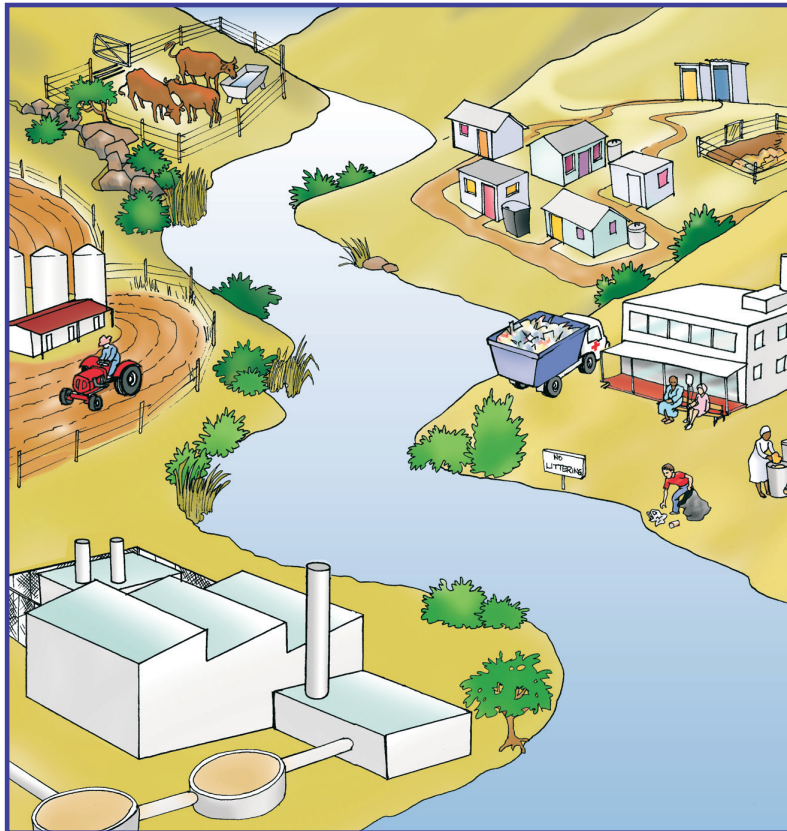
- 2 . The possible source of this pollution is / are:.

.....

6 Water pollution is bad

Now look at picture B and answer the following questions:

Picture B: After



1. Look at your group's section of the river and suggest what action can be taken to improve the quality of the water in your section of the river.

.....

.....

2. Choose the correct word / phrase from the list below and fill in the spaces left in the passage:

Smelly, polluted, murky, clear, good, not smelly, at risk, not polluted, bad, not at risk

This section of the river is now, the water is probably.....
and..... This means the quality of the water is..... and so the
people using it are..... of diseases.

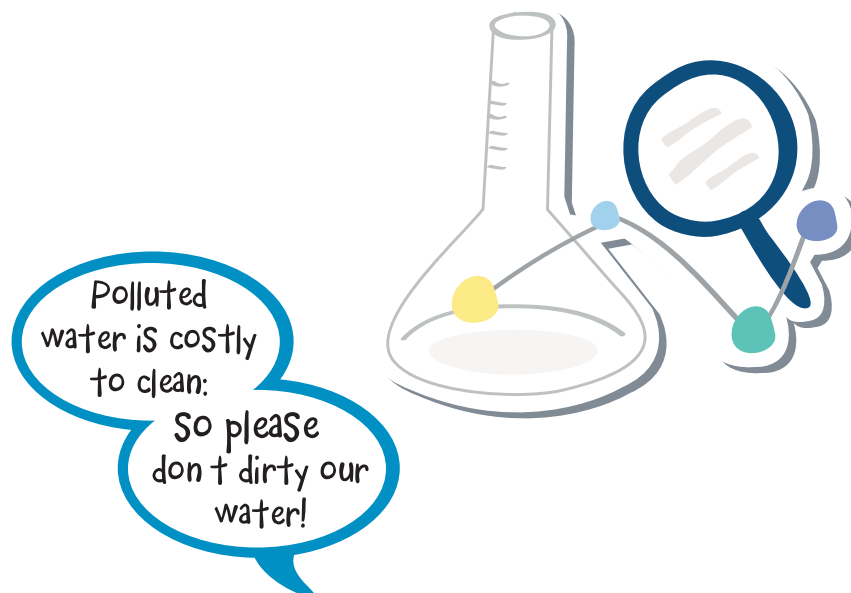
Activity 6b: Presentation of problems in the local environment

- Prepare a presentation of your discussion using your worksheet
- Also, suggest an information sharing action project or outreach programme to address similar problems in your local environment
- Present your discussion in class

Glossary of terms

Murky: Water that is so dark and dirty that you can not see through it.

Chemicals: A substance used in or resulting from a reaction involving changes to atoms or molecules.



Water Quality

Activity

In this activity you will:

- ◆ Demonstrate how an average storm drain collects water during a rainfall event.
- ◆ How the water from the storm drain can impact on water quality.

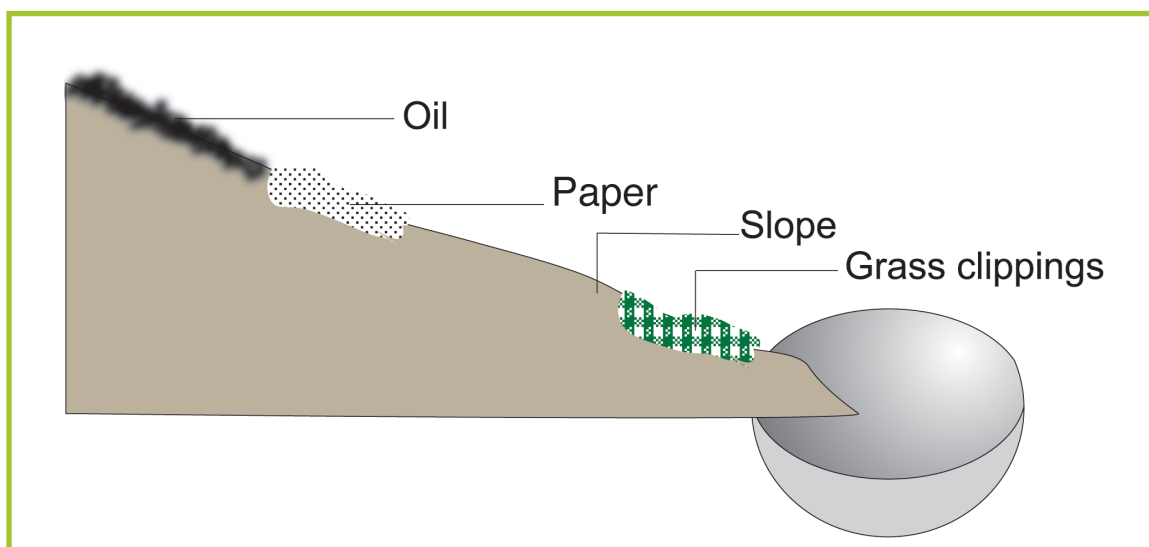
You will need:

- ◆ A watering can.
- ◆ A water bowl.
- ◆ Pollutants e.g. motor oil, fertiliser, soil, grass clippings, shredded paper.
- ◆ Water.
- ◆ Gentle slope.

Activity 7a: Remove the pollutants from water

What to do

1. Divide into groups. You need to work outside for this activity.
2. Select any pollutant you want to work with from the ones the teacher will give you.
3. Fill the watering can with water.
4. Place the water bowl at the foot of the gentle slope.
5. Spread the pollutants on the slope.
6. Vigorously pour water on the tip of the slope.
7. Observe what happens.



Questions

Answer the following questions in your workbook.

- 1 . What does water in the bowl look like before being mixed with pollutants?

.....

.....

- 2 . How do you think pollutants damage the environment?

.....

.....

- 3 . How do you feel about what happened?

.....

.....

- 4 . How can this type of pollution be stopped?

.....

.....

Extended Activity

- 1 . Share with other groups what happened in your group.

.....

.....

.....

.....

- 2 . Suggest ways in which we can remove the pollutants from water.

.....

.....

.....

.....

- 3 . Try some of the removal methods you have suggested.

.....

.....

.....

.....

- 4 . Which pollutants were easy to remove?

.....

.....

.....

.....

5 . Which ones were difficult to remove?

.....

.....

.....

.....

What have you learnt?

You have seen how damaging the pollutants in water are. They first decrease the quality of water, and if we drink it we might get sick. There are plants and animals that live in water. They are also affected by this pollution. Have you noticed how long it takes to try and remove the pollutants from water? Think about it on a bigger scale. If a dam, a river or a well we get our water from is polluted and needs to be cleaned, how expensive do you think the exercise will cost?

Activity 7b: The effects of water pollution

Water pollution is one of the dangerous things in the environment. It mainly disturbs the environment, particularly living things found in water. In this activity we shall:

- ◆ Discover the effects of water pollution
- ◆ Suggest ways to prevent water pollution

What to do

Study these pictures carefully and answer the questions that follow.



Questions

a . Explain what is happening in the picture.

.....

.....

.....

.....

b . Spot the dangers that result from this action.

.....

.....

.....

.....

c . Mention the things that could be damaged or destroyed by this situation.

.....

.....

.....

.....

Glossary of Terms

Pollutant: A substance that pollutes, usually the chemical waste of an industrial process.

Impact: The effect or impression made by something.

How to purify water

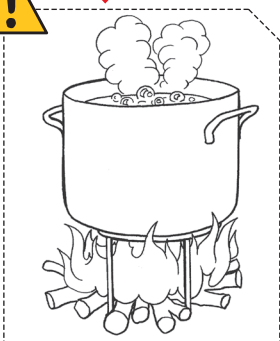
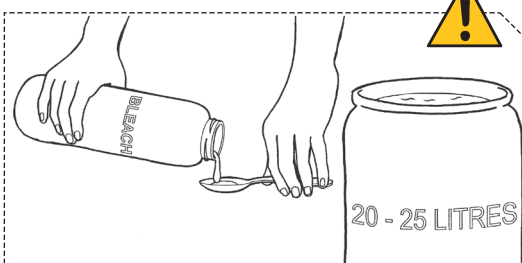


Collect fresh water every day.

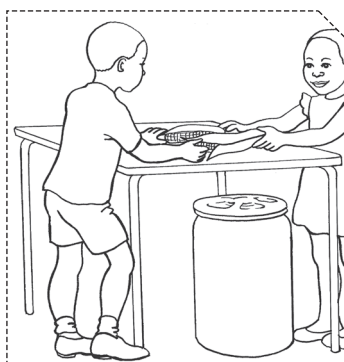


Pour (filter) the water through a clean cloth

Pour 1 teaspoon (5ml) of bleach into 20 - 25 litres of water, mix well and wait for at least 30 minutes (half an hour), before drinking.



Boil the water. Let the water bubble for one minute, before it is clean and safe to drink.



Safe water can easily get dirty. Store safe water in a clean, closed container.



Use a clean cup each time to scoop water out of the container.



Pour water from the container when you need to use it.

Sanitation, Health & Hygiene

Guidelines for this lesson

- ◆ This project / activity is divided into 3 activities, each with several steps
- ◆ The progress of each step will be monitored and properly supervised by your educator
- ◆ It will take a week or two to cover all the sub-activities of this project.
- ◆ The information gathered should give you insight and a basis for suggesting reasonable solutions to the health problems identified in certain types of settlements
- ◆ You will do this survey individually, but the results will be combined and reported as a group

You will need:

- ◆ Magazine to cut pictures of settlements
- ◆ A letter
- ◆ An environmental checklist

Activity 8a: Project on a healthy and clean environment

In this activity you will be conducting a research project to determine the environmental problem identified in a particular community by visiting the local clinic to gather the information about the frequency of cases referred or treated at the clinic.

What to do

Project

This project will be done in the following series of steps:

- Step 1:** Obtaining information from the local clinic or nurse
- Step 2:** Conducting interviews
- Step 3:** Survey on the use and care of toilet facilities
- Step 4:** Observation of environmental cleanliness and personal hygiene.

Step 1: Obtaining information from the local clinic or nurse

- ◆ Your educator will supply you with a photocopy of the letter to the nurse
- ◆ Fill in the details and take the letter to the clinic nearest to the area they are surveying
- ◆ You may leave the letter with a nurse and collect it on the date agreed upon as a class
- ◆ Analyse the result from the nurse
- ◆ Identify the problem caused by poor sanitation in your area



Dear nurse

The learners of
school are investigating the impact of poor sanitation practice
in your area. Would you kindly assist them by visiting our
school and provide the school with the following information?



1. Which group make up the majority of patients that visit your clinic each day?

Senior citizens

Middle aged

Young people

2. Which gender visits the clinic frequently?

Male

Female

3. How many young people visit the clinic for sanitation-related practice?

Cholera

Dysentery

Bilharzia

Date of submission:

Thank you for all your help.

Environmental checklist

Now you will have to find out the causes of the health problems identified in the local environment by doing the following survey. The survey should be conducted in the same type of settlement. Sample five families from the area.

Step 2: Conducting interviews

- You educator will explain the instructions for each question in the environmental checklist and give your suggestions on how you can go about doing your survey.
- Agree on the date of submitting this part of the checklist.
- **NB:** Ensure you are conducting interviews with a friend or an older sibling.

What to do

1 . Circle the type of settlement you are surveying:

- a . Township
- b . Informal settlement
- c . Village
- d . Suburb

Township

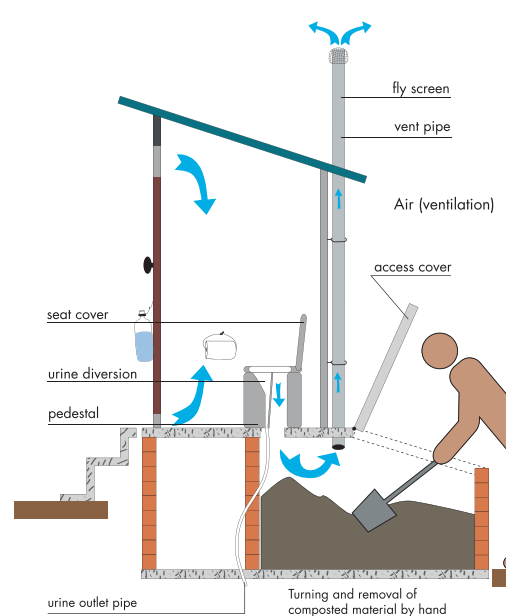
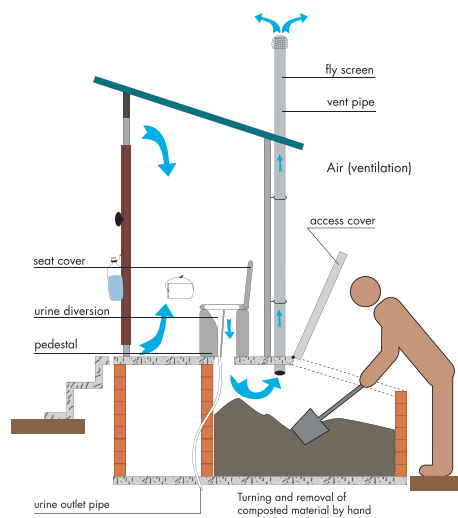
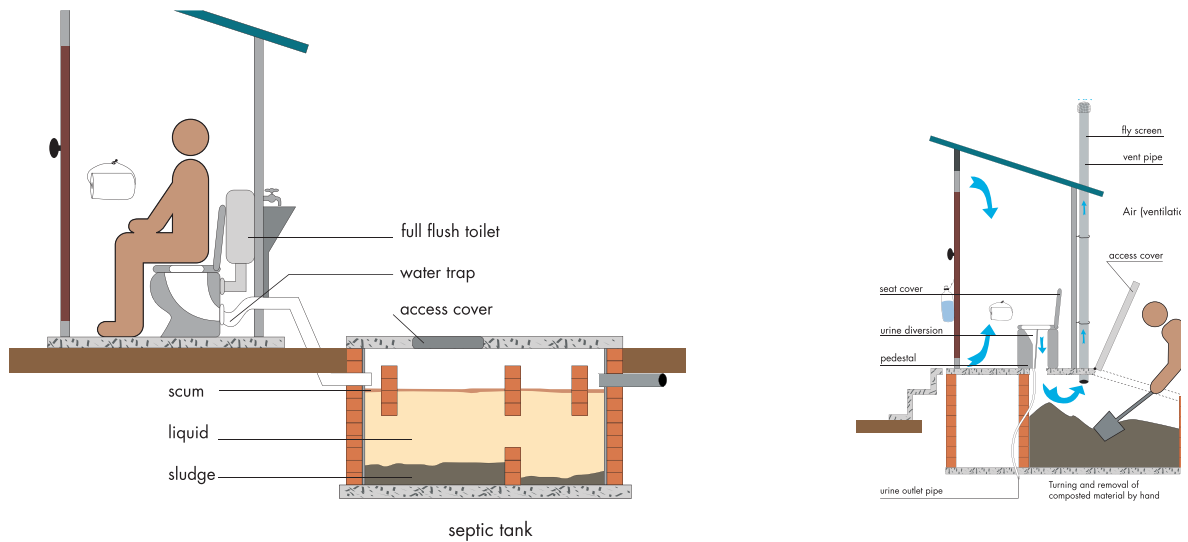
Informal settlement

Village

Suburb



- 2 . Which of the following toilets are used in the area you are surveying? Circle the appropriate alternative.



- 3 . Using the following tables, interview one person from each of the different families you are surveying to find out if they or members of their families have suffered from illnesses related to poor sanitation practices.

Family 1	Yes	No
1 . Has any member of the family suffered or is suffering from diarrhoea or food poisoning?		
2 . Does it happen more than twice a year?		
3 . Do your neighbours also suffer from these diseases?		

Family 2	Yes	No
1 . Has any member of the family suffered or is suffering from diarrhoea or food poisoning?		
2 . Does it happen more than twice a year?		
3 . Do your neighbours also suffer from these diseases?		

Family 3	Yes	No
1 . Has any member of the family suffered or is suffering from diarrhoea or food poisoning?		
2 . Does it happen more than twice a year?		
3 . Do your neighbours also suffer from these diseases?		

Family 4	Yes	No
1 . Has any member of the family suffered or is suffering from diarrhoea or food poisoning?		
2 . Does it happen more than twice a year?		
3 . Do your neighbours also suffer from these diseases?		

Family 5	Yes	No
1 . Has any member of the family suffered or is suffering from diarrhoea or food poisoning?		
2 . Does it happen more than twice a year?		
3 . Do your neighbours also suffer from these diseases?		

Step 3: Survey on the use and care of toilet facilities

- Your educator will explain the instructions for each question in the environmental checklist and give you suggestions on how you can go about doing your survey.
- Agree on the date of submitting this part of the checklist.
- This observation should be carried out in 5 toilets of the 5 families sampled.
- Of the 5 toilets you observed, write the number of toilets in which you observed the physical condition.
- Evaluate if you think the physical condition is positive (✓) or negative (x) by indicating in the appropriate column with either a tick or a cross.

No.	Physical condition	✓/ X
	Clean toilets	
	Dirty toilets	
	Smelly toilets	
	Broken toilets	
	Toilets with hand washing facilities	
	Toilets without toilet paper	
	Soap to wash hands available	
	Toilets with flies in or around them.	
	Rubbish bins available in the toilet	
	Privacy when using the toilet	
	Someone leaving the toilet without washing their hands	
	Toilet with litter inside (e.g. tins, plastic, food etc)	
Do you have more positive or negative?		

Step 4: Observation of environmental cleanliness and personal hygiene

- ◆ Your educator will explain the instructions for each question in the environmental checklist and give you suggestions on how you can go about doing your survey.
- ◆ Agree on the date of submitting this part of the checklist.
- ◆ Observe the environmental cleanliness and personal hygiene in the area around the houses you are surveying.
- ◆ As you observe each of the following, write in column 1 how many times you observed the physical condition. You do not necessarily have to observe five instances of these; it can be more or less five.
- ◆ Evaluate if you think the physical condition is positive (✓) or negative (x) by indicating in the appropriate column with either a tick or a cross.

No.	Physical condition	✓/ X
	Litter lying around	
	Uncollected rubbish	
	Dustbins covered with lid	
	Food left uncovered	
	Someone eating without washing their hands	
	Animals allowed to eat and or drink from human food and water supply	
	A dirty child / child with runny nose	
	Flies	
	Dead animals lying around	
	Patches of dirty stagnant water	
	Person urinating / defecating outside the toilet	
	Drinking water kept in a covered container	
Do you have more positives or negatives?		

Adapted from Eco-Schools Toolkit: Sharenet 2003



Activity 8c: Analysis of the results

Conduct the following activity with your learners in class.

- ◆ Collect your projects from the educator.
- ◆ Correct the second column of the environmental checklist indicating a bad or good physical condition.
- ◆ Divide learners into groups.
- ◆ Your educator will show you the group rating scale below and ask you to choose the average group rating for each step. For example: if 3 out of 5 group members have a positive rating then therefore a tick should be placed in the appropriate block.

How do you rate the:	Village	Informal settlement	Township	Suburb
Occurrence of diseases in the clinic. (Step 1 results)				
Use and care of sanitation facilities (Step 3 results)				
Environmental cleanliness and personal hygiene (Step 4 results)				

Extension activities

Discuss the following in your groups and present your discussion to the whole class:

- 1 . Is your settlement type at risk of contracting diseases? Yes / No.
- 2 . State the reasons why those people are / are not at risk of becoming ill.

.....

.....

.....

.....

.....

.....

3 . For those who are at risk, suggest what can they do to prevent themselves from becoming ill?

.....

.....

.....

.....

.....

Glossary of terms

Settlement:

A place where people have come to live and have built homes.

Survey:

To try to find out detailed information about a lot of different people or things, usually by asking a lot of people a series of questions.

Sanitation:

A process of keeping places clean and healthy, especially by providing sewerage systems and clean water supply.

Communicable diseases:

A contagious or infectious disease that can be passed from one person to another.

Diarrhoea:

It is a sickness, which makes one's body lose a lot of liquid in the form of liquid faeces.

Stagnant water:

Water that is not flowing, and therefore often smells unpleasant and is dirty.

Urinating:

Getting urine out of your body through genitals.

Defecating:

Getting faeces or stools out of your body.

Keep yourself
clean, and you will
stay healthy.

Sanitation, Health and Hygiene

Activity 9a: Keep away from germs

Activity

In this lesson you will be able to:

- ◆ Show understanding of oral text by responding appropriately to questions asked and connects the story to personal life.
- ◆ Explain and communicate to others, symptoms and causes of locally occurring disease as well as prevention strategies.

Background information

The human right to water entitles everyone to sufficiently and physically accessible, safe and acceptable water for personal and domestic uses. Inadequate water and sanitation are primary causes of diseases such as cholera, typhoid, malaria and dysentery and diarrhoea.

What to do

- ◆ Divide into groups. There may be 4 in the group
- ◆ Read article 1
- ◆ Discuss the article openly in class
- ◆ Read article 2 as a class and look up meanings of unfamiliar words and phrases in the dictionary

Article 1

Cholera is one of the common diseases that affects many people particularly children under the age of five. At least 1.8 million people die every year from diarrhoeal disease, including cholera. About 88% of diarrhoeal diseases can be attributed to unsafe water supply, inadequate sanitation and poor hygiene.

Unsafe water supply can be attributed to various sources like drinking water from the fountain, direct from rain, water from the drums. Swimming in dirty water is equally dangerous since it can cause a disease called dysentery. This is a disease that mainly affects boys. The symptoms are diarrhoea with blood. Blood can also be observed in the urine.

Improved water supply, sanitation, hygiene education and improvements in drinking water quality through household water treatment can help reduce diarrhoea.

Article 2: City Press, September 11th, 2005

Precautions to avert typhoid fever infection.

TYPHOID fever is a bacterial infection caused by *Salmonella typhi*. This bacterium infects only humans and does not come from animals. The bacterium is transmitted by the faecal-oral route and can also be found in urine. People can become infected by eating food contaminated by someone with typhoid fever, by ingesting water contaminated with human sewage or by direct contact with the faeces or urine of a person who is ill with typhoid fever or is a carrier of *Salmonella typhi* in their gut.

Symptoms of typhoid fever can be mild or severe. These include a flu-like illness with fever, malaise, loss of appetite, headache, constipation or diarrhoea. Most people will show symptoms within one to three weeks after they have been exposed. Typhoid fever can be effectively treated using specific antibiotics and the fatality rate is low with effective treatment. To prevent infection use safe water and wash hands after using the toilet and before handling food.

Source: *The Epidemiology and Outbreak Unit, National Institute for Communicable Diseases.*

Keep away from
germs: but how do
we keep our water
germ-free?

Extended activity

Learners must write all the unfamiliar words and their meanings in the table provided.

Unfamiliar Word	Meaning

As a group, discuss the symptoms of each of the diseases you read about.

Disease	Meaning

Activity 9b: Dramatisation

Your educator will read and explain the background information about communicable diseases.

Background information**“Invisible theatre”**

A Brazilian dramatist, Augusto Boal invented one of the most effective ways of dramatizing a situation called “Invisible Theatre”. Invisible theatre, of course, is anything but invisible. Its central principle is that the audience does not know that it is watching theatre - it believes what it is seeing is a real life experience with the result that they become involved without even knowing it. Its purpose is to educate and to raise awareness about issues which people find uncomfortable about.

Invisible theatre is about acting out or role-playing an improvised conversation about what you want to educate the people about. The best style is to use an argument. Arguments are spontaneous. They are often noisy and they attract attention – even the most discreet people love to watch public disagreement! Arguments are even likely to draw other people in, which is one of the aims of invisible theatre. Just ensure that you keep your argument believable and, just like all drama, have conflict. Characters should understand staying in character once they enter the public arena. What is important is that the audience must believe that what they are seeing is real.

Another important aspect is that role-playing must, as normal conversation not be too loud at first. Gradually the discussion becomes heated as bystanders begin to notice and, hopefully some join in the discussion. It is then that relevant issues are brought up as characters are contradicting each other. Hopefully by then, bystanders would have taken sides and get involved in the play. Actors should have the skill of incorporating the new fellow actors in their play.

What to do

1. In pairs, select one of the water diseases and write a summary on the following sub topics.
 - a. What is that disease?
 - b. What are its causes?
 - c. What are its symptoms?
 - d. How can it be prevented?
2. Together with your partner improvise (make up) a conversation, role-playing a scenario about one of your school mates being absent from school and is suspected of suffering from the disease chosen. In your conversation you must cover all points covered in the summary.
3. Present your role-play to the class while your classmates assess your performance.
4. The best role-play will be chosen and used to take the message to the public.
5. Discuss the best venue/s to act out your play. It should be a place where there are lots of people (e.g. a queue in a local supermarket, clinic, public tap, spaza shop, etc.)
6. Your educator will give you instructions on how to act your drama.

Extended activity

1. Brainstorm with your group members on the methods that could be used to clean water from:
 - a. The fountain.

.....

.....

- b. Rain.

.....

.....

- c. Drums.

.....

.....

d . Dirty water.

2 . Leaving water for more than 3 weeks can cause water to have tadpoles.
Can that water still be used? Suggest ways to purify it.



Water Safety

Activity

In this activity you will be able to:

- Demonstrate knowledge of safety measures in and around water
- Practice some important water safety skills

You will need:

- Paper
- Koki pens
- Scissors
- Old doll
- Stopwatch

Background Information

Your educator will read the following background information to you.

Drowning

Children can accidentally drown very easily. It usually happens very quickly. According to Aqua-Net, the pool safety specialist since 1972, drowning is the second leading cause of accidental child death in South Africa. They say that drowning is a silent killer. It can happen within 30 seconds in only 4 cm of water. Most drownings could have been prevented if caution was practiced.

Buckets

- Never leave any bucket of water or other liquid unattended.
- When finished with the liquid in the bucket, empty it immediately.
- If you need to keep the liquid in the bucket (if you are mopping), move it to a safe place out of reach of children.
- Store buckets upside down, especially outdoors because rain water can collect in the bucket and become a drowning hazard.

Bathtubs

- ◆ Never leave children unattended in the bathtub for any reason.
- ◆ Do not leave children to be watched by an older sibling.
- ◆ Get supplies (soap, towel, face cloth etc.) ready first, even before you run the bath water.
- ◆ Always drain the bath tub when you are finished and before you leave the bathroom.
- ◆ To prevent slipping, place a rubber mat in the tub.
- ◆ Keep electrical devices well away from the tub.

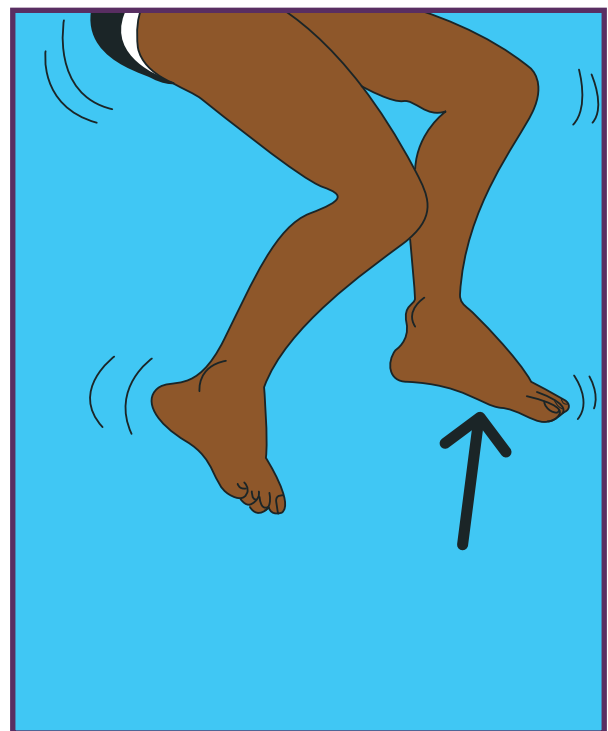
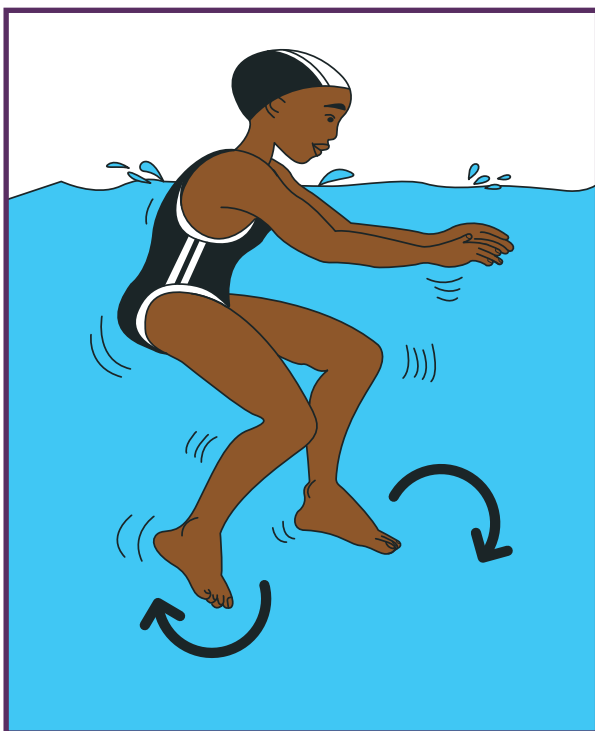
Toilets

- ◆ Always close the toilet lid.

Adapted from: (Real magazine pg 58 December 2006)

How to tread water

If you are able to swim, practise the following skills with a friend. If you cannot swim ask a teacher or lifeguard at a public swimming pool to help you. (Show him / her the pictures in this book). If you become tired when swimming or playing a water sport you can tread water to conserve energy. Practise this skill so that you can do it with minimum effort. This is what you do:



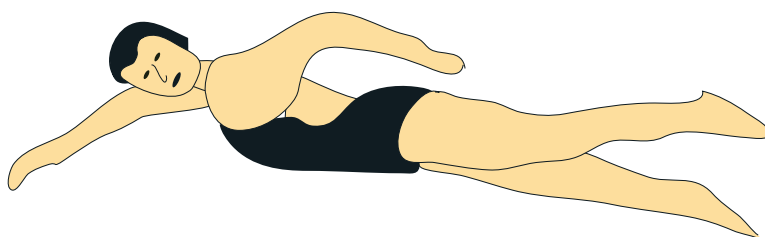
The cycling method

- 1 . Get into the water. Educator / lifeguard to stay close to the side of the pool.
- 2 . Hold out your hands. They should be 15 to 22 cm beneath the water.
Hold your palms down, with your hands in a cupped position.
- 3 . Your hands should be extended a little bit beyond each shoulder, in front of her chest.
(Imagine that you are stroking a dog). You will feel pressure on your hands.
- 4 . Practise treading water continuously but slowly.
- 5 . Remember to keep your head in a relaxed position above the water.
- 6 . To do the leg movements, pretend that you are riding a bicycle by moving your hands in a circular motion beneath the water.
- 7 . Keep your feet at an angle of 90 degrees to your body.
- 8 . Keep the movement slow.
- 9 . Now practise doing the arm and leg movements together.
- 10 . Ask the life guard to help you as you practise.

Activity 10a: Practising treading water: The cycling method

Learners should work in pairs for this activity. Only do this activity if you have access to a swimming pool and if adults are present to help.

- 1 . Practise treading water with your partner.
 - a . Observe your partner treading water. Use the previously provided pictures to make sure he / she is doing it correctly.
 - b . Now let your partner observe you as you tread water.
- 2 . For a bit of fun, use a stop watch to see who can tread water the longest.



Some basic rescue skills

Read through the text with the class. This is a valuable skill for learners to know. Even if the learner cannot swim, they can help someone.

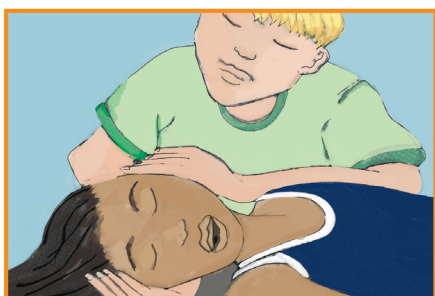
- ◆ If you ever go swimming and someone seems to be at risk of drowning, this is what you can do to help:
 - ◆ If the person is close to the water's edge, find a pole or stick which the person can grab onto to pull themselves to safety.
 - ◆ Before you do this, attract the person's attention by waving your hands and shouting out. Make sure the person looks at you and keeps their head above water.
 - ◆ Decide quickly what you are going to use to reach to the person, like a strong stick or pole.
 - ◆ Lie on your tummy at the edge of the water with your legs slightly apart. If someone is with you, get him / her to hold onto your feet and to place their weight over your legs.
 - ◆ Give clear instructions to the person in the water. As soon as the person has taken hold of the pole, pull it gently towards the side. If you need to help him out, wait until he is close to the edge shore and then grab the back of his wrist.



How to resuscitate a person

Resuscitate (re-sus-ci-tait) means to revive or 'restore to life' an unconscious person. If someone unconscious is pulled out of the water, this is the skill that could save his / her life. Read through the steps with the class and discuss the pictures. It has to be done carefully, so it would be best if you could get a nurse or someone with a first aid certificate to demonstrate and explain the technique to the class.

One day, you might be required to resuscitate an unconscious person so it is useful to know what to do and how to do it properly.



Step 1

Lie the person on their back. Tilt their head sideways and clear the mouth.



Step 2

Tilt the head back.



Step 3

Pinch the nose and cover the mouth completely, sealing it with your mouth. Now blow out.



Step 4

Watch for the rise of the chest and, as you remove your mouth, listen for the air being expelled (breathed out). Repeat the blowing in for as long as is necessary. Never give up. Keep the person warm and watch them all the time until medical help arrives. Practise the resuscitation technique with a friend or partner until you feel comfortable with it. Remember that this technique could help you save someone's life.

Activity 10b: Practising resuscitation

Here learners will test their knowledge of the resuscitation steps. They should be able to explain the steps in the correct order.

What to do

- ◆ Divide learners into pairs.
- ◆ Ask them to draw pictures of each step in the resuscitation technique on separate pieces of paper.
- ◆ Cut out each drawing and paste on small cards.
- ◆ Ask learners to write the description on a further 4 cards.
- ◆ Ask learners to jumble the pictures and the descriptions up.
- ◆ Each learner should get a turn placing the pictures with their descriptions in the correct order. Use a stop watch to see how fast and accurately they do all four steps.

Safety tips

Read the following safety tips to the learners.

- 1 . Keep calm.
- 2 . Unless you are close to trained help (nurse, doctor, hospital, clinic, etc.) direct the lifeguard to the person in need and phone for help.
- 3 . If you are alone, try to reach the person from the shore by pulling him / her to safety without letting yourself being pulled in.
- 4 . To help a lifesaver in a rescue situation, stand on the shore as a marker, constantly pointing to the person in distress.
- 5 . Realise your own limitations. Don't try to do things you are unable to do.

Be water-wise;
learn to swim and
learn CPR to
save lives.

Forestry & IAP's

Activity

In this activity you will:

- ◆ Look at the classification of trees according to the origin, season and botanical classification
- ◆ Discuss the characteristics of different kinds of trees

You will need

- ◆ Pictures of different kinds of trees
- ◆ Information brochure

Activity 11a: Classification of trees

What to do

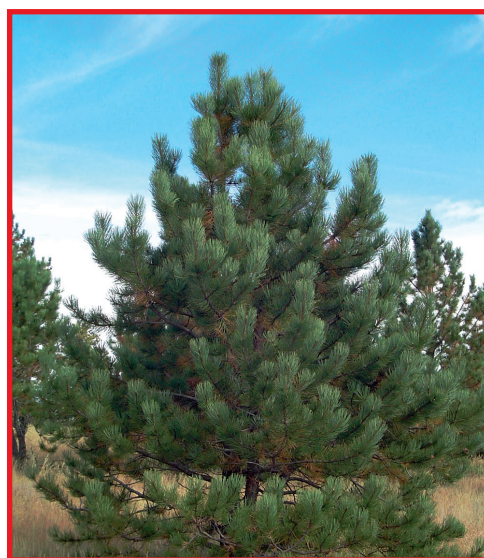
Read the following information about the types of trees.

Seasonal classification

Some trees are evergreen and some are deciduous, which means that some trees keep their leaves in winter, while other trees lose their leaves.



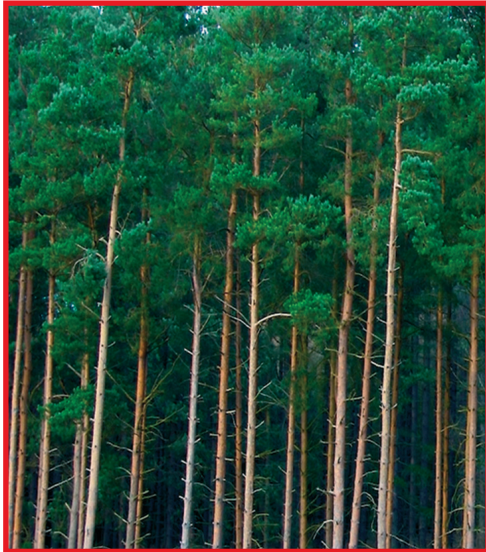
Deciduous tree



Evergreen tree

Botanical classification

Two main groups are relevant here, namely trees that produce flowers and fruits (also called broad leaved or hardwoods) and secondly, trees that do not produce flowers, such as conifers (also called softwoods).



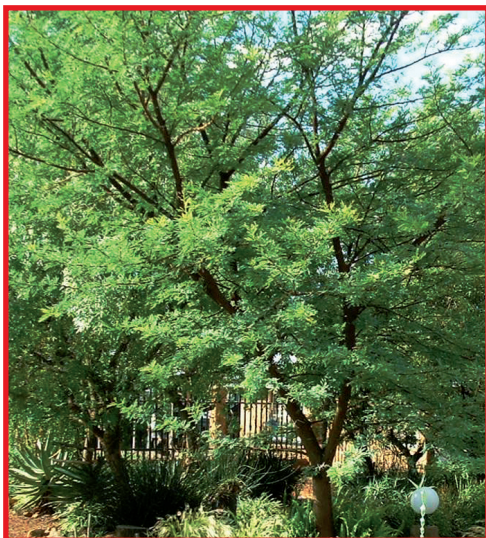
Softwoods



Hardwoods

Origin

With regards to origin, trees can be classified as either indigenous or exotic. Indigenous trees occur naturally in South Africa e.g. Acacia Karoo, also known as the Sweet Thorn Tree. The exotic species do not occur naturally in South Africa, but are introduced from other countries.



Indigenous
(Acacia Karoo Tree)



Exotic
(Blue Gum Tree)

Complete the following table to summarise the classification of trees.

Classification	Origin	Seasonal	Botanical
Main Groups	1	1	1

	2	2	2

Description (What are they)	1	1	1

Classification	Origin	Seasonal	Botanical
Examples			

Activity 11b: Poster about classification of trees.

- 1 . Collect as many pictures of tree cuttings as you can.
- 2 . You may obtain your pictures from the newspapers, Department of Water and Sanitation or you may even take photos of trees.
- 3 . Your poster must show the following:
 - ◆ Classification
 - ◆ Main groups of the trees
 - ◆ Description
 - ◆ Examples

Assessment

Your poster will be assessed based on the following:

- ◆ Classification
- ◆ Main groups
- ◆ Descriptions
- ◆ Examples
- ◆ Legibility
- ◆ Attractiveness

Know your plants:
They affect your
environment.

Forestry & IAP's

Activity 12a: Threats posed by invasive alien plants

Read the following information with regard to the threats these invasive alien plants pose.

Role play

Find solutions to the problems posed by IAP's from the perspective of various role players.

What to do

- ◆ Divide yourselves into seven groups.
- ◆ Write the identities on the leaves of a branch taken from an invasive alien plant / tree, and a member from each group has to pick one leaf (i.e. an identity).

What threats do these invasive alien plants pose?

Invasive alien plants pose one of the greatest threats to the natural ecosystems of the Cape Peninsula. These plants are disrupting the ecology of natural ecosystems, displacing indigenous plants and animal species, and degrading the Peninsula's unique and diverse biological resources. Aggressive invaders reduce the amount of light, water, nutrients and space available to indigenous species, alter hydrological patterns, soil chemistry, moisture-holding capacity and erodibility, and change fire regimes. Some invasive alien plants contain toxins that may be lethal to certain animals. In some cases, invasive alien plant invaders are driving our rarest species closer to extinction. Effects such as these have direct and indirect economic costs. For example, alien invasions not only reduce the ecotourism potential of Fynbos landscapes and the land available for agricultural purposes, but also deplete the potentially exploitable genetic stock of wildflowers and medicinal plants. And management of these species is expensive. Invasive plants cause great economic losses and expenditure each year, measured in billions of rands, for agriculture, forestry, grazing and roadways management.

The Peninsula fires of March 2015 - a devastating fire in Cape Town southern areas provided dramatic evidence of the destructive effects of invasive alien plants. If it wasn't for the invasive alien plants, the fire would have been more manageable. It has been clearly demonstrated that all houses damaged and destroyed during these fires were as a direct consequence of dense stands of invasive alien plants surrounding properties. In addition, the intensity of fires is significantly higher in alien invaded areas and causes substantial environmental damage. As a result, soil alters in such a way that it actually repels water and becomes prone to erosion by wind and water.

Roots and seeds of indigenous vegetation and other organisms in the soil are destroyed and damaged, and the landscape battles to recover. In the first major downpour after a fire, tons of soil from the burned areas pours like muddy soup into streets and homes surrounding the mountain slope. Many homes suffer thousands of rands worth of damage. In uninvaded fynbos however, erosion seldom occurs after fires because the natural landscapes have had thousands, if not millions, of years to co-evolve with fire.

Perhaps the most important threat of all is that of alien plants on the water yield from mountain catchments, springs and vleis. Dense stands of invaders may not reduce water yield in these areas by as much as 50% in extreme cases. In the water-starved lowlands of the Cape Metropolitan area, this is a serious matter and it affects our socio-economic well-being.

Our role in the fight against invasive alien plants

The Cape Peninsula, some 470 km² in extent, is recognized as one of the world's most prominent "hotspots" of plant diversity. The Peninsula has more than 2 285 species of plants – more than the entire British Isle (1 492 species) and New Zealand (1 996 species). Of these, 90 are considered endemic (i.e. occur nowhere else in the world). This natural trove is threatened by the persistent spread of invasive alien plants.

Why are invasive alien plants a problem?

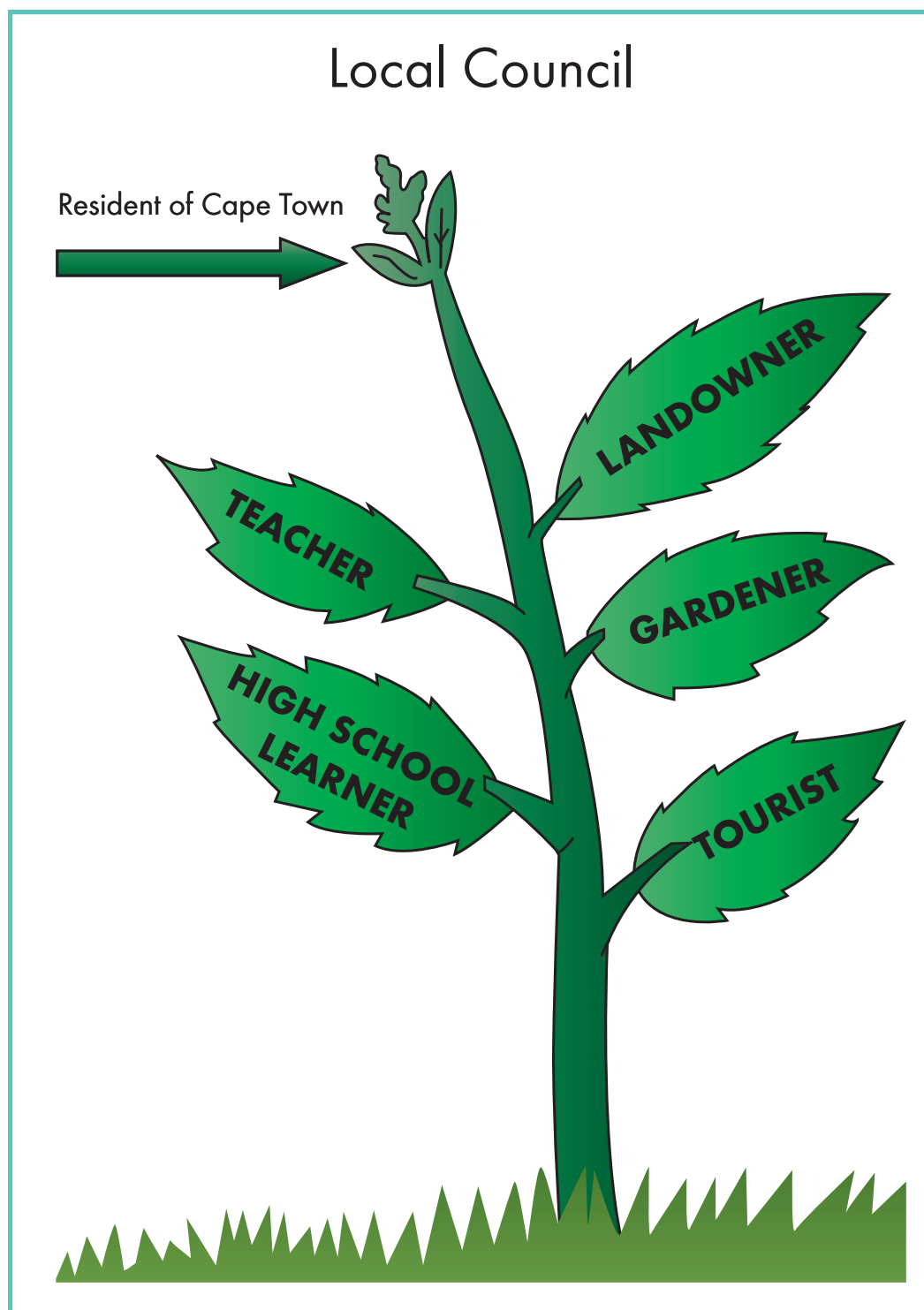
Invasive alien plants are highly adaptable, vigorous growers that easily invade a wide range of habitats. Thus, invasive alien plants are a major threat to the biodiversity and economy of the Western Cape, as they:

- ◆ Increase the intensity of wild fires by greatly increasing the fuel to burn
- ◆ Consume large amounts of water (3.3 billion cubic meters more than indigenous plants)
- ◆ Displace indigenous fynbos species and impact on biological diversity
- ◆ Invade land better used for crops and livestock grazing, and
- ◆ Increase the speed of water run-off which can lead to erosion and flooding

Know your plants:
They affect your
environment.

Role-play activity

Question: *I live on the Cape Peninsula – what can I do to curb the threat posed by invasive alien plants?*



Your group is assigned an identity (a landowner, a gardener, a high school student, a teacher, a tourist, the local council, or a resident of Cape Town) and you need to compose an answer to the above question from your perspective (the role you chose).

Climate Change

Activity

- ◆ You will read about how greenhouse gases impact on earth and how to contribute to the reducing of greenhouse gases
- ◆ You will also try to find solutions to the effects that greenhouse gases have had on the environment

Background information

Floods

A flood is an overflow of an expanse (large area) of water, such as a river or lake, that submerges (fills or covers completely) land. Floods are caused by events such as **heavy rainstorms, earthquakes, broken dams, underwater volcanic eruptions, tsunamis, or hurricanes.**

Flash floods are far more dangerous than regular slow-flowing floods because they happen suddenly and usually involve a huge mass of water that rushes in a certain direction at high speed. They are normally brought on by heavy rain or when the walls of a dam collapse.



Water is very heavy (a single bath-tub full weighs about 680 kilograms). During the course of a flash flood, the immensely powerful mass of water takes with it just about everything in its path, such as mud, rocks, trees and other debris.

When it rushes through a town or village, it can destroy or severely damage things such as buildings, railroads, power and telephone lines, bridges and roads. Things such as cars, as well as animals and humans, can also get swept away by the sudden onrush of water.

Furthermore, mud mixed with the water will clog roads, block drains and bury possessions. People who live close to rivers or in valleys or on flood plains next to earthen dams (dams made of clay) or levees (barriers constructed to contain the flow of water) are at risk of sudden flooding.

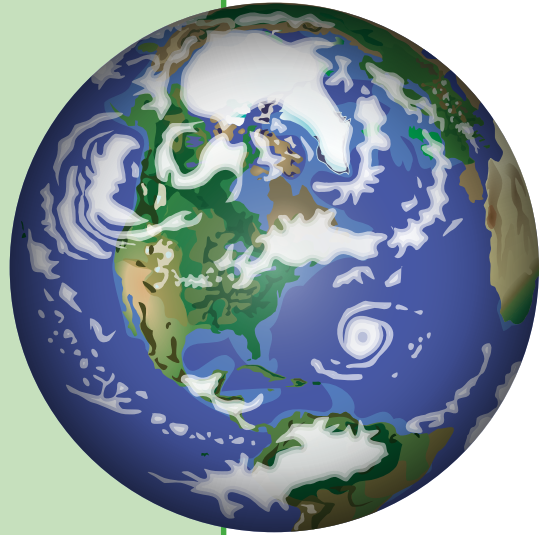
Earthen dams are usually built across rivers to dam them up. Levees, on the other hand, are built alongside rivers to keep them from spilling over. However, both can cave in because of events such as an earthquake, internal erosion, and poor engineering or construction. Ultimately the most common cause of collapse is because of too much rain.



Aerial view of some of the damage related to Hurricane Katrina the day after the hurricane hit- August 29, 2005. This is the **levee** that has been damaged by the hurricane storm surge.

When a region experiences heavy rainfall, the water behind a dam or levee builds up and spills over the top. This can wash away the upper part of the barrier and erode the rest of the structure. The dam or levee will eventually weaken to such an extent that the force of the water behind it will cause it to collapse. This will result in a sudden release of tons of water.

Human made satellites that orbit thousands of kilometres above our planet are able to send images of clouds back to computers at weather stations every half hour. These pictures are studied by scientist who look for changes in cloud growth and temperatures. This information is passed on to weather forecasters who then keep the public informed about weather patterns. When there's exceptionally heavy rainfall in your area, listen to weather reports for flood warnings. If the area you live in is at risk, be prepared and make plans to keep yourself, your family, pets and valuables safe. Moving to higher ground before flooding happens, is a good safety measure.



Safety tips

- ◆ People shouldn't drive through a flooding area. A car that stalls in about half a metre of water can be washed away.
- ◆ If you are indoors, turn off electricity when flooding is about to happen, and don't turn it on until everything has dried out because you could get electrocuted.
- ◆ Don't walk in floodwater as it contains sewage waste matter carried away in sewers or drains) that could make you ill. Wash your hands often with clean water and soap.
- ◆ Don't use food that has been in contact with floodwater.
- ◆ Store as much fresh water as you can in bottles, fill up the bath-tub and basins.
- ◆ Don't walk through streams or rivers as the currents could be strong.
- ◆ Keep important documents and other valuables in a safe and dry place.

Droughts

- ◆ Rain is vital for the survival of humans, plants and animals.
- ◆ While too much rain (that causes floods) can be devastating, too little or no rain can have even worse consequences.
- ◆ Droughts are caused by lack of or too little rain over a long period of time. Most droughts tend to occur during spring and summer (the expected rainfall season in most temperate regions).
- ◆ When it does rain, it's usually not enough for the ground to absorb because the weather is very hot and water is quickly evaporated.
- ◆ Water vapour condenses (changes from a gaseous to a liquid state and falls in drops) only if air rises into the colder parts of the atmosphere. If the air doesn't rise, no rain will form.

- When there is high air pressure, air falls instead of rising. With the air pressing down in a high pressure zone, no currents of water vapour are carried upward. As a result, no condensation occurs, and little rain falls to Earth.
- In addition, high-pressure areas push clouds and air currents downwards and away, and this results in sunny, cloudless weather. Low pressure systems provide more cloudy stormy weather.
- During a dry spell, grass begins to turn brown. Plants need to be watered more often. The ground turns dusty and cracks form across its surface. After many weeks of such weather plants die out and rivers, streams and dams dry up. The roots of the plants which previously held the soil together, can no longer keep the soil from eroding.



Impact of droughts

Environmental

Droughts create windblown dust bowls which erode the landscape. They're also responsible for the loss or destruction of fish and wildlife habitat. The lack of food and drinking water for wild animals cause death, increase disease and also cause migration (which leads to a loss of wildlife in drought stricken areas, and too much wildlife in other areas not affected by drought).

Agricultural

Farmers may lose money if a drought destroys or stunts the growth of their crops, causing lower yields and poor crop quality. The loss of livestock is also likely and farmers may have to spend more money on feed and water for their animals.

Health, Economics & Social

In drought situations, malnutrition, dehydration and related diseases are common. Unemployment, bankruptcy as well as famine can result, and this could lead to social unrest. Droughts can reduce water quality, because low water flows don't dilute pollutants sufficiently. As such contamination of remaining water sources increases. Furthermore droughts can cause changes in lifestyles (e.g. imposed water restrictions by municipalities and fewer water sport activities). Finally there could also be food shortages and a big increase in food prices.

Lessening the impact of droughts

- ◆ Clear invasive alien plants on your property as they use up a lot of water.
- ◆ Focus on indigenous plants (the types that originate naturally in a region) - especially those that do not require a lot of water.
- ◆ Someone at your local nursery should be able to tell you which plants are alien, and which ones are indigenous.
- ◆ Carefully planned crop rotation can help to minimize erosion and allow farmers to plant less water-dependent crops in drier years.
- ◆ Rainwater harvesting is the collection and storage of rainwater from roofs, metal or plastic drums etc.
- ◆ Recycled water which is former waste-water (sewage) that has been -treated and purified for reuse, as well as 'grey' water from baths, showers and washing machines can be used to water the garden.
- ◆ Building canals or redirecting rivers will help farmers in drought-prone areas to irrigate (supply with water) their crops.



Use water sparingly

- ◆ Shredded newspapers can be used as mulch in the garden. Spread this around plants to create a protective covering that will help reduce water evaporation by up to 70%, and also prevent soil erosion.
- ◆ Saving water begins with you. The best places to save water are wherever you use it - in the kitchen, bathroom, laundry, yard and your school. Try to re-use water where possible.
- ◆ Taking a five-minute shower a day, instead of a bath, could save up to 400 litres of water a week. If you prefer to bath, don't make it as full.
- ◆ Taking a bath could use between 80 and 150 litres of water.
- ◆ Brushing your teeth with the tap running wastes almost nine litres a minute. Rather use a tumbler to rinse your mouth.
- ◆ Water evaporates. As such, kettles should be filled with just enough water for your needs, but not to the brim. Instead of over-filling cooking pots, use less water and cook food at a lower heat. This will save water, electricity and money.
- ◆ Avoid flushing the toilet unnecessarily. With every flush, 12 litres of water is used. Dispose of tissues, hair and other waste in the rubbish bin rather than the toilet.
- ◆ Watering plants should be done during the early morning hours or in the evening, when temperatures are cooler. If you do it when it's hot you can lose up to 90% of water to evaporation.
- ◆ Use "grey water" from baths and washing machines to water the garden or flush the toilet.

- Roof water (rainwater that runs down gutters) that's been collected and stored in a tank is also ideal for watering gardens.
- Fix leaks and tighten taps! A dripping tap could waste as much as 90 litres of water a week, and a leaking toilet can waste up to 100 000 litres of water in one year.

Activity 13a: Complete the word block

Having read the information on floods and droughts, now complete the following word block.

1		2	flash floods are... more dangerous (much)	3	droughts can lead to a... in food prices	4	5		6
	another word for atmosphere	7			dams can collapse because of... earthquake	8			
			when there's no rain, the soil becomes...				don't walk... floodwater		
9			10	another word for ground	plants... more watering during a dry spell	11			
	earthen... are built across rivers	12			13	... is vital for the survival of all living things			
a... flood happens suddenly	14	another word for "fast" or "speedy"		a body of water surrounded by land			water evaporates quickly when it's... hot	15	this word means "wear away"
droughts can lead to... loss of income	16			a large, natural stream of water	17		18		
19	important to listen to weather-forecasts		the roots ... plants prevent soil erosion	20				newspapers can... shredded and used as mulch	famine means there's a shortage of...
	floods... droughts can cause food shortages	21	22	cars travelling on a... could get swept away					23
				orbiting satellites send pictures back... earth					
	during a drought, ... should be used sparingly	24		25					
	water is very... (not light)	floods can... a lot of damage	26		the... of the earth cracks when it's too dry (top part)	soft, wet earth	27		

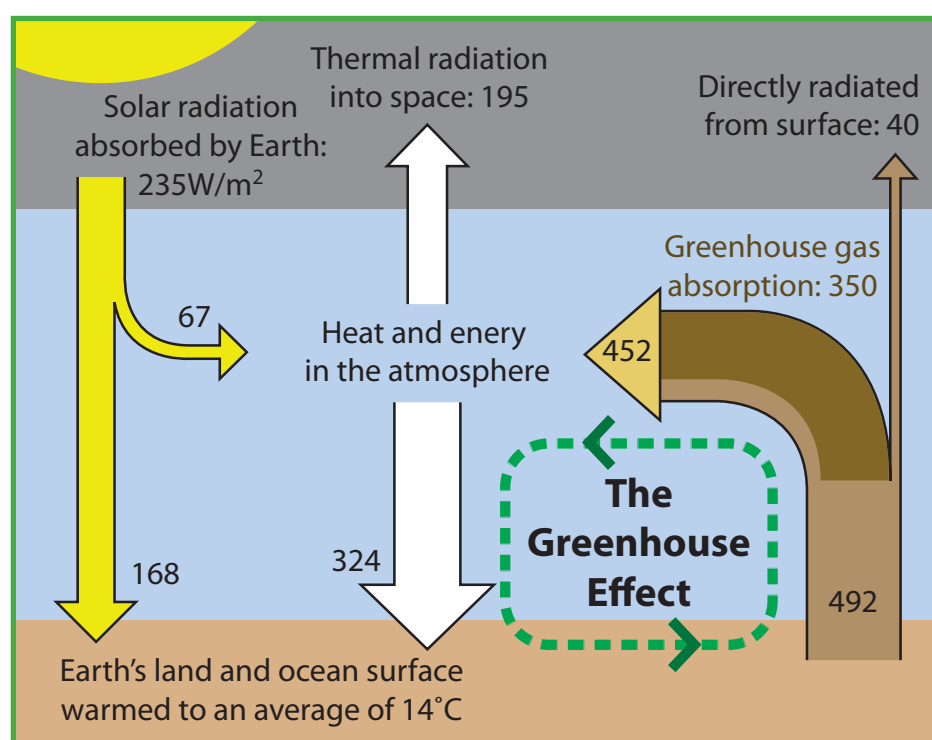
Background information

Greenhouse effect

Global warming refers to the average increase in temperature of the earth's surface due to what scientists call the "greenhouse effect". Just like we need food to stay alive, so does life on Earth depend on this "greenhouse effect". Without it Earth's average surface temperature will drop to about -18°C , and this would be far too cold to sustain our current ecosystems.

Confusing? Think of it this way: food is necessary for our survival, but if we overeat or eat unhealthy food, we could become obese or develop all kinds of health-related problems such as diabetes, high cholesterol, etc. So, while our planet needs greenhouse gases such as carbon dioxide to help regulate the climate, too much of it can cause over-heating. This is the situation our planet is currently facing. According to some scientists, the average global temperature has risen by about 0.6 to 0.8°C during the past few decades, and they have estimated that by the year 2100, the average global temperature will increase by 1.4 to 5.8°C .

The greenhouse effect is produced in the following way: the lower part of Earth's atmosphere is called the troposphere, and it contains gases called greenhouse gases. When sunlight reaches the earth, some of this light is converted to heat. Greenhouse gases absorb some of this heat and trap it near the earth's surface, thus keeping the planet warm enough to support life (the greenhouse effect). The amount of heat that gets trapped in the troposphere is determined by the concentrations (amounts) of greenhouse gases, as well as the length of time these gases remain in the atmosphere. The more gases there are, the more heat is trapped, and the warmer it becomes. Greenhouse gases include carbon dioxide (CO_2), Chlorofluorocarbons (CFCs), methane and nitrogen.



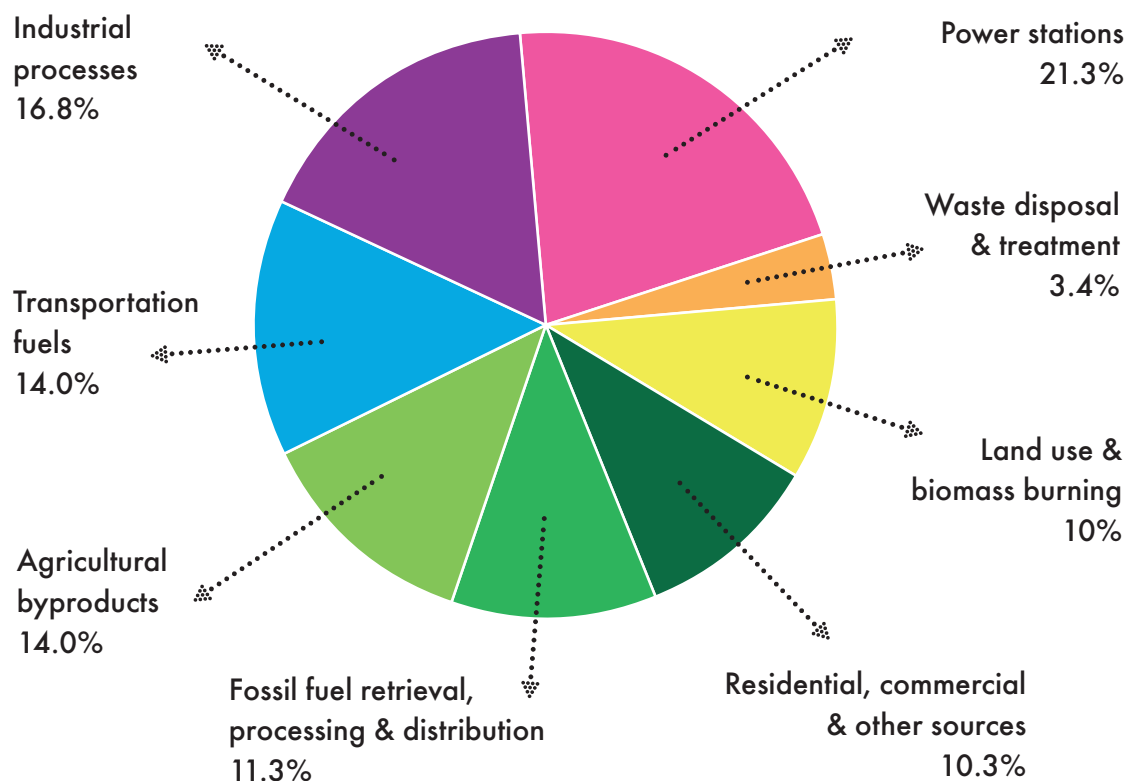
Carbon Dioxide (CO₂)

Carbon dioxide is an atmospheric gas that's produced through natural processes. It's odourless, colourless, slightly acidic and non-flammable. It's one of the most abundant gases in the atmosphere and plays an important part in plant, human and animal processes. For instance, green plants convert carbon dioxide and water into food compounds and oxygen. This process is called photosynthesis. In humans, CO₂ is essential for internal respiration. This is a process in which oxygen is transported to our body's organs, while carbon dioxide is carried away from them.

Humans use carbon dioxide in many different ways, for example in soft drinks to make them fizzy. However, since the Industrial Revolution which started around 1850, human activities such as the burning of fossil fuels to produce electricity, have caused a huge and unnatural increase in the emission of CFCs and CO₂. As a result, the earth's temperatures are rising.

Causes

ANNUAL GREENHOUSE GAS EMISSIONS BY SECTOR



Local temperatures fluctuate naturally, however, according to a recent scientific report, the average global temperature has increased at the fastest rate over the past 50 years. The 10 hottest years on record have all occurred since 1990, and this trend is continuing more rapidly than most people realise.

According to the Carbon Dioxide Information Analysis Centre (CDIAC) in the USA, the United States was (in 2004) the largest emitter of CO₂ in the world (despite the fact that they make up only four percent of the world's population). However, since 2006 China has been listed as the top emitter, followed by the USA. South Africa is apparently listed as being the 12th largest emitter of CO₂ in the world – quite staggering considering the small size of our population.

Fossil fuels

These are natural substances found deep within the earth. The word 'fossil' means 'the remains (or an impression) of plants or animals that existed in a past geological age. These remains, or fossil fuels, contain carbon - as is the case with all living things. When these things died, they decomposed (broke down), and the carbon that was within them whilst they were alive, didn't disappear. It got stored together with their remains. Heat, pressure and time remains into fuels. The three main fossil fuels are coal, oil and natural gas.

Carbon dioxide is emitted from a wide variety of sources, but mostly from burning fossil fuels. Anything that is powered by fuel such as petrol, diesel, coal or even wood, releases CO₂.

Most power (electricity) plants around the world depend on fossil fuels (coal, natural gas, oil) as their sources of energy. The burning of coal does not only release huge quantities of carbon dioxide and methane, but also other waste products such as heavy metals (including arsenic, lead, mercury etc), all of which pollute the environment and result in radioactive waste. Power generation, which includes public electricity and heat production, emits the most greenhouse gases (specifically CO₂).

According to a scientific report, road transportation (cars, busses and trucks) emit vast amounts of greenhouse gases which includes CO₂, methane, and others. Aeroplanes emit a lot of carbon dioxide as well, and account for about 3% of CO₂ emissions. Experts predict that by 2050, aircraft emissions will account for over 5% of total global warming.

The agricultural sector is the single biggest contributor of both methane and nitrous oxide greenhouse gases. Enteric (intestinal) fermentation by farm animals (such as cattle, sheep, goats etc) is a process through which animals produce methane in their digestive tract and then either belch or pass it out as gas. It's one of the reasons why there are now global calls to reduce meat consumption in favour of poultry, fish etc. The widespread use of artificial fertilisers in agricultural production emits



significant amounts of nitrous oxide.

Industrial activities or processes also emit large amounts of greenhouse gases such as fluorocarbons and small amounts of methane and nitrous oxide (especially manufacturers of cement, minerals, chemicals, and metals). Many industries use lots of energy (electricity) and thus produce significant amounts of CO₂. The main gas emitted by the waste management sector is methane.

Deforestation also contributes to global warming. Trees use carbon dioxide to make oxygen, which helps to create an optimal balance of gases in the atmosphere. However, forests are cleared for various reasons such as making provision of grazing land or planting crops, housing, firewood, building materials, commercial timber harvesting, road and river projects. At the same time, when timber is burned or allowed to rot, the carbon that's stored in them is released back into the atmosphere as carbon dioxide.

Population growth plays a big role in global warming. The more people there are, the more fossil fuels are needed and used for electricity, transportation and manufacturing. Also, more farming occurs to feed the millions of new people, and as such, more greenhouse gases are emitted.

Effects

Polar ice caps

These are two large areas of ice, formed from seawater. They are situated in the earth's polar (opposite) regions, namely the Arctic (North Pole) and the Antarctic. The Arctic includes the Arctic Ocean and parts of Canada, Greenland, Russia, the United States (Alaska), Iceland, Norway, Sweden and Finland. The native people who live in the Arctic are called Eskimos. The Arctic is also home to a variety of animal species such as the polar bear, the Arctic fox and wolf (see picture on right).



The Antarctic, on the other hand, has no permanent residents, probably because it's the coldest and windiest place on Earth. People who do go there are mainly researchers from various countries. Only cold-adapted plants and animals survive there, such as the Emperor Penguin, fur seals, mosses, lichen, and algae.

Melting

A team from NASA and university scientists have found clear evidence that extensive areas of snow have melted in Antarctica in response to warmer temperatures. Melting occurred in multiple distinct regions, including far inland, at high latitudes and high elevations.

With a surface area of about 1.5 times the size of United states , the Antarctic contains about 90 % of the world's ice (and about 70 % of the world's fresh water). If all this ice had to melt, sea levels

would rise with 60 metres, making it the largest potential source of sea level rise.

As for the Arctic, scientific research has shown that average temperatures in this region are rising twice as fast as anywhere else in the world. As a result, Arctic ice is getting thinner, is melting and rupturing. For example, the largest single block of ice in the Arctic, called the Ward Hunt Ice Shelf, had been around for over 3,000 years before it started cracking in 2000. Since then it had split all the way through and has broken into pieces. The freshwater lake it once enclosed, along with its unique ecosystem, slid into the ocean.

As a consequence of the melting ice, polar bears, whales, walruses and seals are forced to change their feeding and migration patterns, which makes it harder for the native people, who are mainly hunters, to survive. Images from NASA satellites show that the Arctic's ice cover is disappearing at a rate of 9% each decade. If this trend continues, summers in this region could become ice-free by the end of the century.

Polar bears

They are among the first animals to become endangered due to climate change. As the ice in the Arctic continues to melt, polar bears and their cubs are forced to swim longer distances to find food and habitat. Many of them are drowning in the process.

Rising sea levels

Scientific data from tide gauges and satellites show that sea levels have been rising by two to three millimetres a year between 1993 and 2003. With the gradual melting of the ice caps and glaciers (slow-moving rivers of snow and ice), scientists anticipate a more drastic rise in sea levels during the next few years. This could lead to the loss of coastal wetlands and barrier islands, as well as the increased risk of flooding in coastal regions. Furthermore, rising temperatures affect the ocean's ability to absorb CO₂ from the atmosphere and this increases the acidity (sourness) of the ocean waters. This has a harmful effect on coral reefs and the numerous creatures they sustain, such as shellfish. The life cycles of certain fish and other marine life are also badly affected by a warmer ocean since many species depend on cold water to reproduce and grow.



Weather

Due to global warming, extreme weather conditions are taking place more frequently. Changes in rainfall patterns are causing both flooding and drought in some areas. Severe drought conditions

also increase the risk of wildfires, among other things. More hurricanes and other tropical storms are occurring worldwide, and they are becoming more powerful. Warmer water in the oceans pumps more energy into tropical storms, making them stronger and potentially more destructive. Some regions are getting warmer, while others are getting colder, and this too, could have a significant impact on food production globally.

Human health



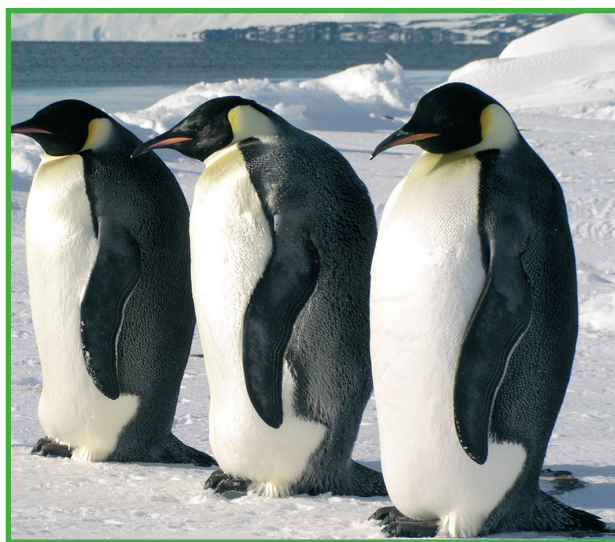
Tropical diseases such as malaria and dengue (an infectious disease of the tropics transmitted by mosquitoes), could spread to larger regions. Long-lasting droughts lead to severe water and food shortages. Floods and droughts could increase hunger and malnutrition, as well as diseases such as cholera (an acute intestinal infection caused by contaminated water or food). As a result, this could lead to large-scale unemployment, poverty and social unrest. Smog pollution in some areas are intensifying pollen allergies and asthma. People living in poverty are particularly at high risk of infectious diseases.

Ecosystems and changes of habit

Increasing global temperatures are expected to disrupt ecosystems, pushing to extinction those species that cannot adapt. Widespread shifts might occur in the natural habitats of animals and plants. Many species are battling to survive in the areas they currently live in.



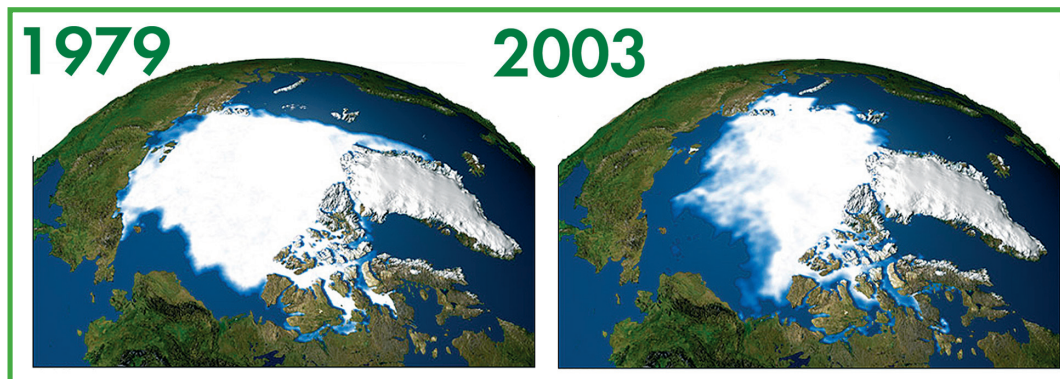
Melting polar ice caps and glaciers could warm the ocean water and raise the sea level significantly.



The population of the Emperor Penguin in the Antarctic has been reduced by over 30% due to the shrinking of the region.



Due to decreasing ice floes (sheets of floating ice), polar bears are forced to swim longer distances, and may drown as a result.



Arctic perennial sea ice has been decreasing at a rate of 9% per decade. The first image shows the minimum sea ice concentration for the year 1979, and the second image shows the minimum sea ice concentration in 2003. The data used to create these images were collected by NASA's Defence Meteorological Satellite Program (DMSP).



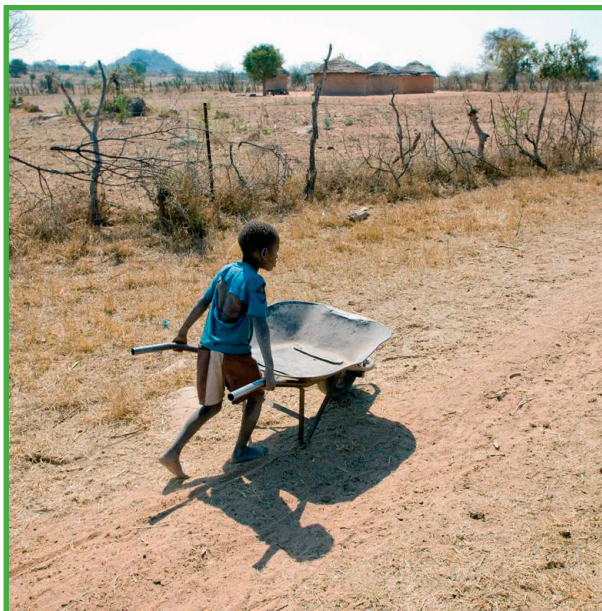
Long-lasting droughts lead to severe water and food shortages.



More hurricanes and other tropical storms are occurring, and they're getting stronger.



When ocean temperatures rise, the coral turns white and dies. This is known as "bleaching". So global warming has a harmful effect on coral reefs and the numerous creatures they sustain.



Severe droughts are causing crops to fail, water, food shortages, related illnesses and poverty.



Tropical diseases caused by mosquitoes could spread to larger regions that are warming up.

Solutions

To reduce global warming, we need to start changing our lifestyles. Here are some steps we can take to reduce our carbon footprint:

REDUCE, RE-USE, RE-CYCLE



Recycling goes far beyond reducing piles of garbage. It protects the environment and biodiversity (which is the variety of plant and animal life in a particular area). It saves energy and water, as well as resources such as trees and metal ores. Most environmental damage associated with the products we buy happens before we even open the package (greenhouse gases are emitted during manufacturing of packaging etc.). As such, choose products with minimal packaging or wrapping. Reduce waste by choosing reusable products instead of disposables (e.g. shopping bags made of material that can be reused as opposed to plastic ones that tear and must be thrown away). Try to buy paper and other products for school and your home that are made from recycled content and biodegradable (capable of being decomposed) materials.

Buy in bulk when you can to reduce the amount of packaging that gets thrown away. For every kilogram of recycled paper, four kilograms of CO₂ is prevented. Plastic bags are not biodegradable. They clog waterways, spoil the landscape, and end up in landfills where they may take 1,000 years or more to break down into small particles that continue to pollute the soil and water.

Furthermore, producing plastic bags requires millions of litres of petroleum that could be used for transportation or heating. When plastic is burnt, greenhouse gases are emitted.

Recyclable materials include paper, plastic, glass and aluminium cans. Set your friends, teachers, neighbours and family members involved. If there isn't a recycling programme at your school, or in your community, ask about starting one. By recycling half of your household waste, about 1,090kg of CO₂ will be reduced annually.

Plant trees

Trees not only make the environment more beautiful, and provide shade, but they also act as the 'lungs' of our planet. During photosynthesis, trees absorb CO₂ and give off oxygen. Unfortunately

13 Climate change and us

there are too few of them around to absorb the vast amounts of CO₂ emitted by vehicles, manufacturing etc. A single tree will absorb approximately one ton of CO₂ during its lifetime. Get involved in planting indigenous trees in your area.

Activity 13b: Climate change - Q&A

Read the above paragraphs and answer the questions that follow :

- 1 . Antarctica is a
- 2 . The Ward Hunt Ice Shelf started cracking in.....
- 3 . Polar bears are drowning because.....
.....
- 4 . NASA obtains images from
- 5 . The native people of the Arctic are called
- 6 . A glacier is
- 7 . Due to global warming , the ocean water is becoming
- 8 . Scientists can tell that sea levels are rising because
-
- 9 . Trees absorb
10. Changes in rainfall patterns are causing
-
11. Alternatives to using your own car is.....
.....
12. The three main fossil fuels are
-
13. Fossil fuels are
-

13 Climate change and us

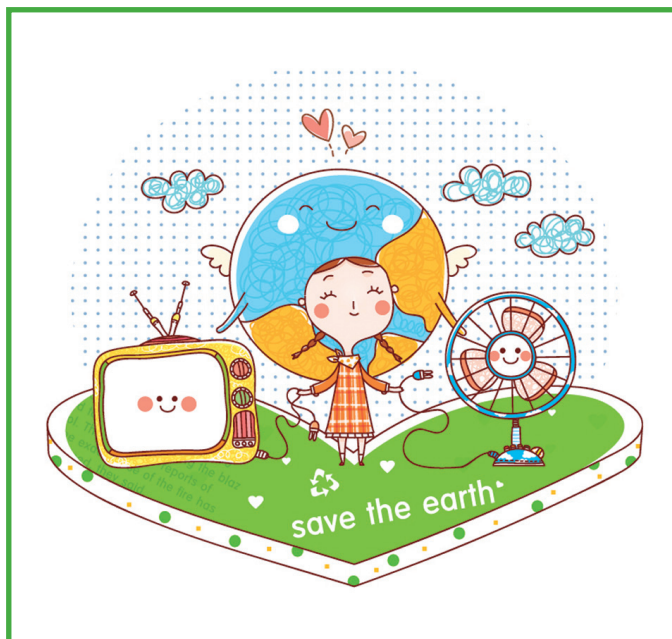
- 1 4. The sector that emits the most CO₂ is
- 1 5. The 10 hottest years have all occurred since
- 1 6. When leaving a room remember to
- 1 7. Forests are cleared for such reasons as
-

Activity 13c: Global warming poster

What to do

Develop a poster in which you show the causes , effects and solutions to global warming. Use a big sheet of paper if you can, and then stick them up in your school to educate the other learners about climate change.

Have fun and remember, we can all save the planet together!





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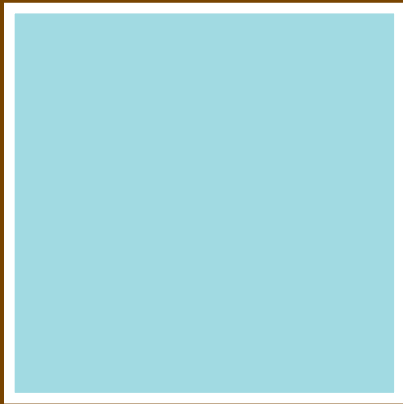


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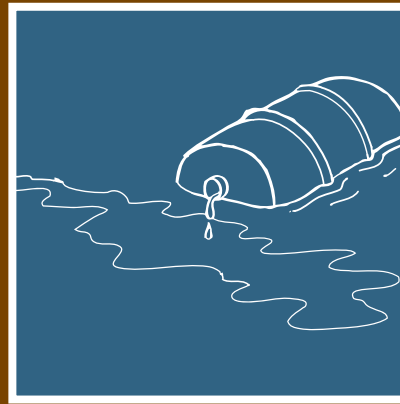
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