

# FOREWORD

Access to safe drinking water and hygienic sanitation facilities are enshrined in our Constitution as basic human rights. A failure to secure these basic human rights can mean the difference between life and death for the poorest of our communities. Ensuring safe drinking water is not simply a question of providing water infrastructure. Water and sanitation without the right health and hygiene practices may result in water that is not safe to drink, and sanitation that is a threat to our health. 'Water services' are therefore about providing water and sanitation services, which address the health of our communities as well as tackling the cycle of poverty and disease.

Central to safe drinking water, improved health, and poverty reduction is better-managed water, where our water resources are developed, protected, used, conserved and managed sustainably. A holistic approach is needed to avert the vicious cycle of water-related diseases, ill-health and poverty. Fundamental to this approach is developing a vision and understanding in society of sustainable water services and sustainable water resources. This vision of sustainability requires ensuring that our society is empowered with information, knowledge and skills to use water efficiently and wisely, to practice good hygiene habits for healthy living, and to protect our water resources so that they do not become contaminated.

A major initiative towards achieving this vision is the 2020 Vision for Water and Sanitation Education Programme (2020 VFWSEP), which targets learners at schools. This is a collaborative programme between the Department of Water Affairs and Forestry (DWAF) and the Department of Education (DoE). It encourages learners to participate in water resource management, to promote good health and hygiene practices and to identify problems related to water and sanitation in their schools and communities.

It is particularly significant that through the 2020 VFWSEP, water and sanitation issues have now become integrated into the school curriculum, thus ensuring continuity and sustainability of this initiative and ensuring that our children will now learn about these issues from an early stage. We also hope that this programme will stimulate the interest of learners to future career opportunities in the water sector thus addressing the skills shortage in this sector.

The integration of water and sanitation in the school curriculum necessitated the development of curriculum aligned educational resource materials for educators. Consequently, the Department of Water Affairs and Forestry in collaboration with other sector partners developed these resource materials for grades R – 9, and have been tested by 90 educators from the 9 provinces. I am confident that these materials provide excellent inputs for learners and communities about water resource management, water supply and sanitation related issues.

I would like to encourage all learners and educators to become involved in the 2020 Vision for water and Sanitation Education Programme and thereby become involved in critically important issues related to water supply, sanitation and water resource management. These are issues that have serious impacts in terms of health and well being for many communities and your involvement can make a significant difference to the quality of people's lives.

I urge all schools to identify water-and-sanitation related problems such as water leaks, blocked toilets, polluted water, and so on, and to bring these problems to the attention of their local municipalities or the Department of Water Affairs and Forestry in their respective areas.

In order to ensure continuity from Grade R to Grade 12, the Department of Water Affairs and Forestry will also develop educational resource materials for the Further Education and Training (FET) Band.

I would like to express my sincere appreciation to the team who developed the materials and to the educators who tested the resource materials. I have no doubt that your efforts will bear fruit, and instill principles of good water resource management and good hygiene, and ensure that our learners become ambassadors for sustainable water and sanitation services. This will mean better health, longer lives and greater dignity for the poorest of our people. Jointly we will work towards a better education and a better life for all.

**Mrs L. Hendricks**  
**MINISTER – DEPARTMENT of WATER AFFAIRS and FORESTRY**

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# Message and guidance to the educator

## INTRODUCTION

The purpose of this guide is to help educators to educate children to develop a healthy, mature and responsible attitude towards water and sanitation resource management and basic hygiene practices. The guide also aims to encourage the development of awareness to infections, so that communicable diseases do not infect people. The knowledge and skills gained from this resource pack, combined with values taught in the home, will enable and empower young children to lead healthy lives and become the ambassadors of good hygiene and water conservation. The content and teaching / learning activities are intended to be developmentally appropriate and sequential. It is appropriate that water conservation and sanitation information be infused into the established school curricula areas to ensure a comprehensive approach to health education.

This resource material, therefore, assists with the infusion mentioned above into the existing school curricula.

## BACKGROUND INFORMATION

In 1996 the Department of Water Affairs and Forestry Sub – Directorate for Community Development and Environmental Education commissioned the development of the first Resource Pack as part of its commitment to support Environmental Education and Water Conservation linking directly to Outcomes Based Education (OBE). Its ultimate goal was to integrate the 2020 Vision for Water Education and Sanitation Programme into the school curriculum and community development training and capacity building programmes.

However, with the advent of the Department of Education's National Curriculum Statement, it became imperative that the second edition be developed in order to make it easy for the educators to integrate water and sanitation into the school curriculum.

Yet again, the Department of Water Affairs and Forestry, in its pursuit to support all programmes that serve to improve the immediate environment of young children invite all its partners including learners to assist in taking up the challenge of ensuring a better environment through active participation in Environmental Education for sustainable development, so that by the year 2020 the state of the said environment, water conservation and sanitation in South Africa is positively sustained.

## ACRONYMS

<b>AC -</b>	<b>Arts and Culture</b>
<b>AL -</b>	<b>English – Home Language</b>
<b>AS -</b>	<b>Assessment Standards</b>
<b>CO -</b>	<b>Critical Outcomes</b>
<b>DO -</b>	<b>Developmental Outcomes</b>
<b>EMS -</b>	<b>Economic and Management Science</b>
<b>HL -</b>	<b>Home Language</b>
<b>IAP -</b>	<b>Invasive Alien Plants</b>
<b>LA -</b>	<b>Learning Area</b>
<b>LO -</b>	<b>Learning Outcomes</b>
<b>LO -</b>	<b>Life Orientation</b>
<b>MATHS -</b>	<b>Mathematics</b>
<b>NS -</b>	<b>Natural Sciences</b>
<b>SS -</b>	<b>Social Sciences</b>
<b>Tech -</b>	<b>Technology</b>

## SUMMARY OF MODULES

Topics	LO's (*Main and #integration)	Environmental learning focus
1. Precipitation	*NS LO2: AS1 SS (G) LO1: AS1 #AL LO5: AS3 LO3: AS4	In this activity learners will explain the different types of precipitation and describe different phase changes in water vapour.
2. Rainfall and human activity	*SS (G) LO1: AS2 LO2: AS2 #Maths LO5: AS8 NS LO2: AS3	In this chapter learners are made aware of the influence of the physical features of our country on the availability of resources. They will therefore understand that different areas may not have equal access to resources and that the people's standard of living depends on their access to resources like water. In order to improve the standard of living it is therefore essential that resources are used wisely and paid for.
3. Water audit in the school premises	*NS LO3: AS2 # Maths LO5: AS9	In this lesson learners actively participate in an audit of all uses of water around school premises, to ensure that the school's resources are managed more wisely.
4. Use water wisely	*SS (G) LO3: AS 1,3 #HL LO3: AS10 LO4: AS1 LO5: AS1	In this lesson learners will engage in a project that will bring awareness around water use efficiency.
5. Do not pollute water	*NS LO1 AS2, 3 #Maths LO5 AS 3 AL LO 5 :AS1,2,3	In this lesson learners will observe the river or the borehole / well and its surrounding areas to determine if there is a possibility of faecal contamination or not. They will sample water from the source for the purposes of testing it in order to take appropriate action to improve the quality of their water as well as their lives.
6. Wetlands	*AL LO3: AS4 # SS(G) LO1:AS1	In this activity learners will discuss how people benefit from the wetland and identify uses of wetlands from the pictures provided.
7. Exploring the wetland	*SS (G) LO1:AS1 # LO LO1: AS1	In this activity learners will design a poster that describes benefits that would be derived from a wetland. They will also undertake a wetland clean-up project.
8. We can act together to look after groundwater	*LO LO1: AS1 #NS LO1:AS1	In this activity learners will explain what groundwater is and how it is formed before they undertake an action project.
9. Good sanitation practices	*LO LO1: AS1 AL LO3: AS4	Learners will identify different types of toilets and engage in research on sanitation systems.
10. Water-related diseases	*LO LO1 AS2, 3 #AL LO3: AS4 HL LO2; AS4 LO4: AS2 LO5: AS2 SS (G) LO1: AS1 NS LO1: AS2 MATHS LO5: AS 3	In this lesson learners are engaged in research about water-related diseases. They acquire knowledge about how polluted water causes disease, and to break the cycle of water diseases there must be improvement in the quality of water that people use.
11. Protect water from faecal contamination	*LO LO1: AS4 #AL LO4:AS1, 5 AC LO2:AS3	This is a creative writing exercise that aims to spread awareness about how groundwater sources can be protected from faecal contamination.

Topics	LO's (*Main and #integration)	Environmental learning focus
12. Be water wise	*LO LO1: AS1 #HL LO4: AS1	This activity will instill in learners greater awareness of the dangers of ignorance when playing in water.
13. Invasive alien plants	*AL LO3: AS5 NS LO2: AS3 # Maths LO1: AS4	Learners will compare two pictures with IAPs. The first picture shows the river and surrounding vegetation before the plants had been cleared. The second picture shows the same picture after the IAPs had been cleared.
14. Indigenous and non-Indigenous trees	*NS LO2: AS2 # HL LO3:AS 3	In this activity learners will acquire knowledge about indigenous and non-indigenous trees.

# MESSAGE AND GUIDANCE TO THE TEACHER ON INVASIVE ALIEN PLANTS

## Introduction to the World of Invasive Alien Plants

Invasive alien plants have a damaging impact on our environment. It is causing billions of Rands of damage to South Africa's economy every year, and are the single biggest threat to our water and biological biodiversity. They intensify the impact of fires and floods and increase soil erosion. Of the estimated 9000 plants introduced to this country, 198 are currently classified as being invasive. It is estimated that these plants cover 10.1 million hectares or about 7 % of the country and the problem is growing at an exponential rate.

The inclusion of invasive alien plant content into the resource is to provide you as the educator with relevant information about the topic and to assist you in educating learners and others about this very serious environmental threat to especially our water sources. The lessons included will also assist you in taking action to adequately respond to the problem.

The lessons on invasive alien plants were developed and implemented by a diverse group of educators during a research project which focused on the development of curriculum aligned invasive alien plant resource materials. The educators were constituted from the three phases (GET band) and supported by curriculum advisors from the Western Cape (EMDC) South Metropole. Sixteen schools with 32 educators were involved in the project. The Working for Water Programme acknowledge the following schools for their contributions:

**Primary schools:** Hyacinth, Siyazingisa, Huguenot, Levana, St Mary's, Westville, Qingqa Mntwana, Edendale.

**Senior Schools:** Glendale, Grassdale, Oscar Mpetha, Cedar, Sopumelela, I.D. Mkize, Goodhope Campus, Grassy Park.

For additional information on invasive alien plants you can contact the Working for Water Programme offices. Toll free no. 0800 005376

## HOW TO USE THIS GUIDE:

### SCOPE AND SEQUENCE:

The scope of this resource pack includes:

- ▣ Water is life
- ▣ Water use efficiency
- ▣ Water quality management
- ▣ Sanitation, health and hygiene
- ▣ Water safety
- ▣ Forestry and invasive alien plants

The sequence of the activities contained in this Resource Pack is graded for **Grade 8** and is aligned to the National Curriculum Statements (NCS).

### LAYOUT OF EACH TOPIC:

At the beginning of each topic, learning area/s, learning outcomes and assessment standards attained in that chapter are outlined and are further interpreted in the activities that the learners will achieve in that lesson.

Mostly, each chapter begins with a tuning in activity, which serves to identify existing knowledge or gaps pertaining to the topic and to introduce the learners to the activities of the whole chapter. Please use results of these activities to inform the development of the structure of the main topic.

Finally, a suggestion of what can be assessed during the learning and teaching process has been made and linked to the learning outcomes and assessment standards in that chapter. Other aspects pertaining to assessment have been left entirely to the educators because developers of this module indicate that the choice of what assessment strategies to use is a subjective one. It is unique to each school, grade and depends on the educator's professional judgment as well as availability of space and resources.

Same applies to time allocation and other aspects such as linking the lessons to the previous or forthcoming lessons. Although there are some indications here and there, those aspects can best be catered for in the development of lesson plans, which will again be unique to different circumstances.

### TEACHING / LEARNING STRATEGIES:

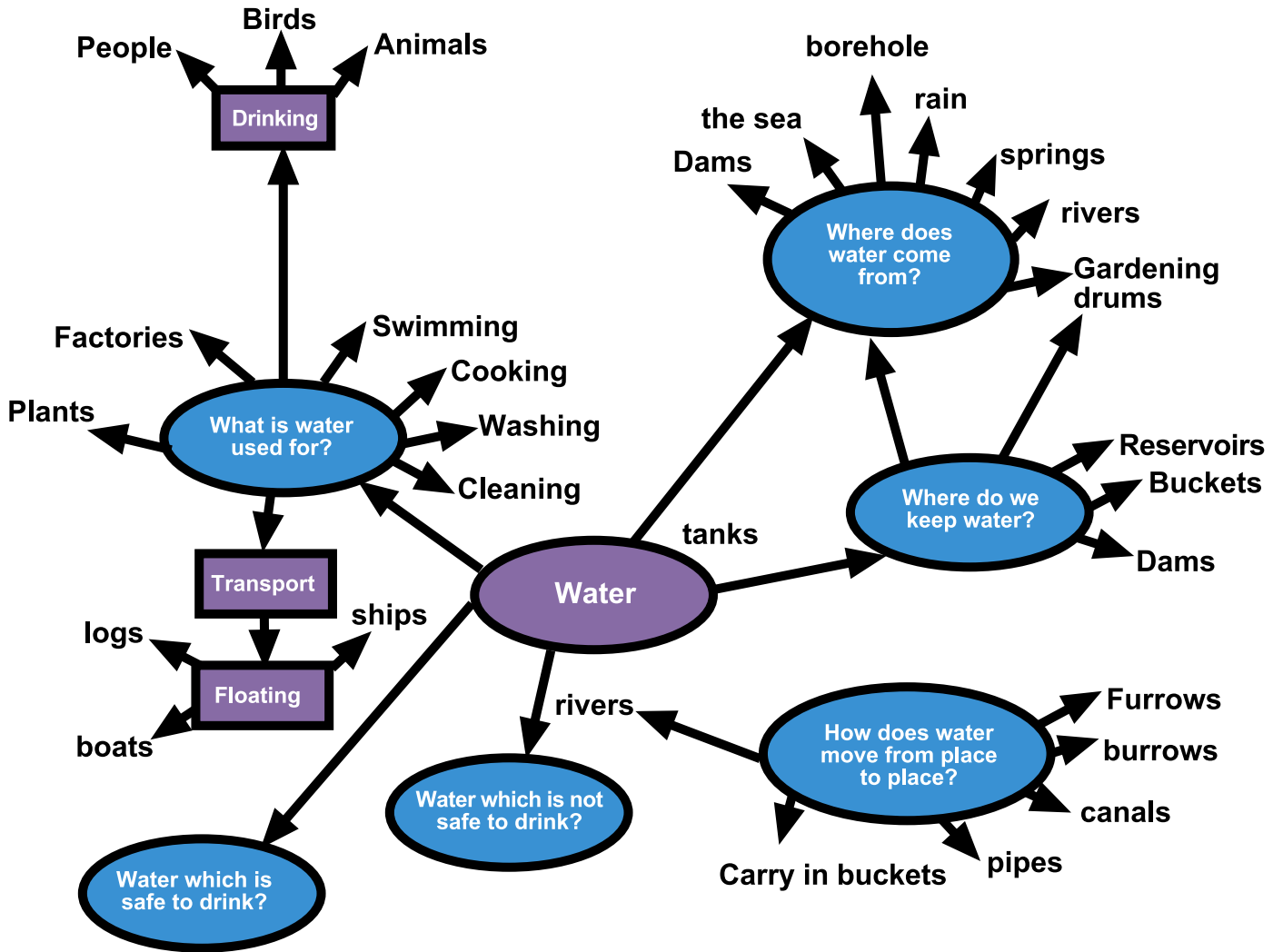
The teaching / learning suggestions in this guide are meant to serve as guidelines, not requirements. In many cases there are many suggestions for activities that will accomplish the same aspects of the outcome.

It is, therefore, not intended that you use all the given strategies. Rather, one or more of the teaching/ learning strategies will be appropriate for a particular grade or situation.

The teaching/learning strategies used in this guide use the current Outcomes Based Education (OBE) methodologies such as:

## BRAINSTORMING:

Brainstorming is used to begin discussions or generate a variety of ideas. One of the examples of brainstorming methodology is the use of mind / concept map shown below.

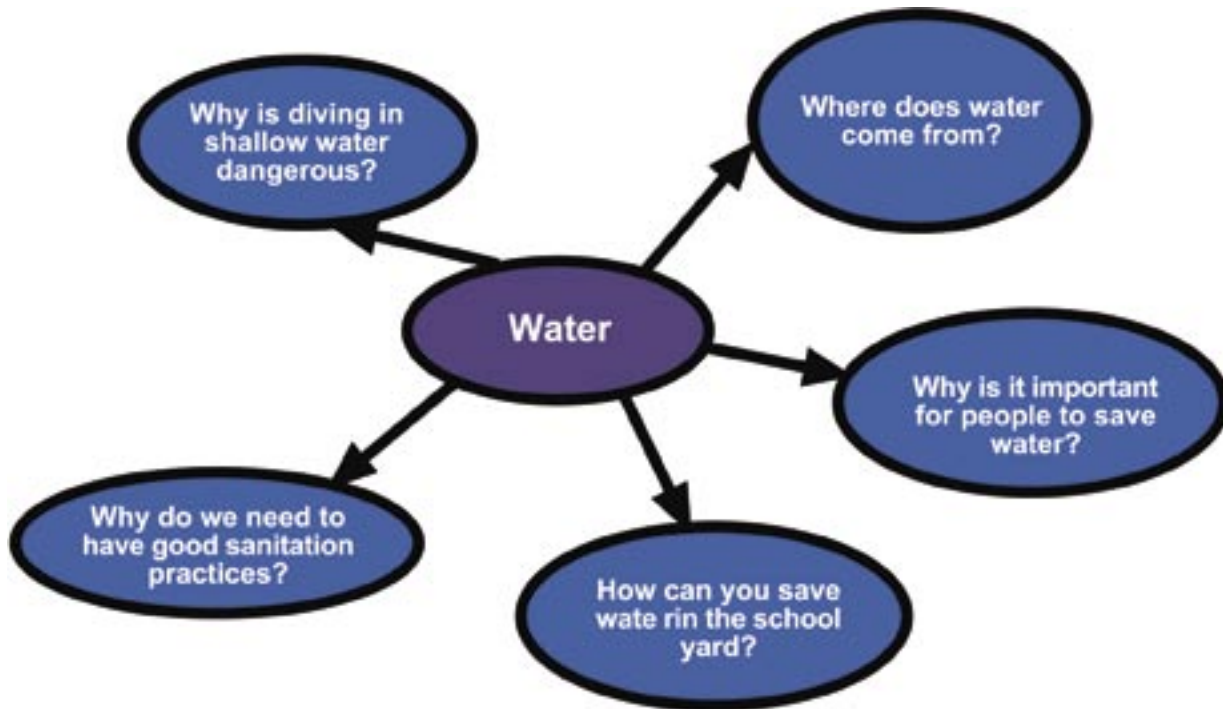




**CLASS DISCUSSION:**

It is used to begin a lesson, to review or to clarify information. For instance, you can use an incomplete mind map to begin a lesson, an example of which is shown below.

It is important to realise that there is not only one way to do mind maps. Different learners will know different things and you should accept these. If they are correct, even if they are not in your mind map.



## **GROUP DISCUSSION:**

This strategy can be used to produce information or to analyse ideas while encouraging interaction among learners in line with group dynamics principles.

## **ROLE PLAY:**

Role-play actively involves learners in learning concepts or practising behaviours in non-threatening situations by acting out an imaginary situation.

## **HANDS-ON ACTIVITIES:**

Use of worksheets, puzzles, and games or other types of written materials to test or review learner's knowledge of a particular topic are especially effective for foundation phase grades.

## **ASSESSMENT:**

In this guide assessment is integrated into the learning and teaching process.

An integrated approach, which assesses both the process of learning and the product of learning, is used here in order to assess holistic learning. This involves:

- ▣ Assessing learners against outcomes and assessment standards, whilst they are working on tasks and activities.
- ▣ Assess learner's investigative, problem solving and co-operative skills.
- ▣ Assessing at the end of learning cycles. This could be a product such as a project or a summative assessment.



**WATER IS  
LIFE**

## 1. PRECIPITATION

### MAIN LEARNING AREA

#### NS: LO2 CONSTRUCTING SCIENCE KNOWLEDGE

The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

**AS1: Recalls meaningful information: At the minimum, recalls procedures, processes and complex facts.**

#### SS (G) LO1 GEOGRAPHICAL ENQUIRY

The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes.

**AS1:** Identifies and selects a variety of geographical and environmental sources relevant to an enquiry (uses fieldwork and other enquiry methods) {finds sources}.

### INTEGRATION WITH OTHER LEARNING AREAS

#### AL LO5: THINKING AND REASONING

The learner will be able to use language to think and reason, as well as to access, process and use information for learning.

**AS3:** Collects and records information in different ways:

- Reads and synthesises information from two simple texts on the same topic.

#### AL LO3: READING AND VIEWING

The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.

**AS4: Reads for information:**

- Read diagrams, graphs, and charts of increasing complexity.

### ACTIVITY

The learner will be able to:

- Explain different types of precipitation.
- Describe the different phase changes of water vapour.

### Guidelines for the activity

Ask learners if they can think of anything that is similar to rain – they may suggest snow or dew or some other form of precipitation, which they get in their area. Ask them how it is different from rain.

Precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the earth in the form of rain, hail, sleet or snow.

Ask learners to look at the pictures. They all show types of precipitation.



These tiny droplets of water are called **dew**. Dew forms on grass, leaves and other surfaces, early in the morning.



Those of you who live on the highveld in Gauteng or the Free State will know about **frost** - crystals of ice outside in the early morning.



A **cloud** consists of water droplets and ice crystals held in the air. **Mist** and **fog** also consist of droplets of water hanging in the air. Mist and fog are really very low clouds.



**Rain** consists of water droplets which fall from clouds down to earth.



**Snow** consists of flakes of ice crystals which fall from clouds down to earth.

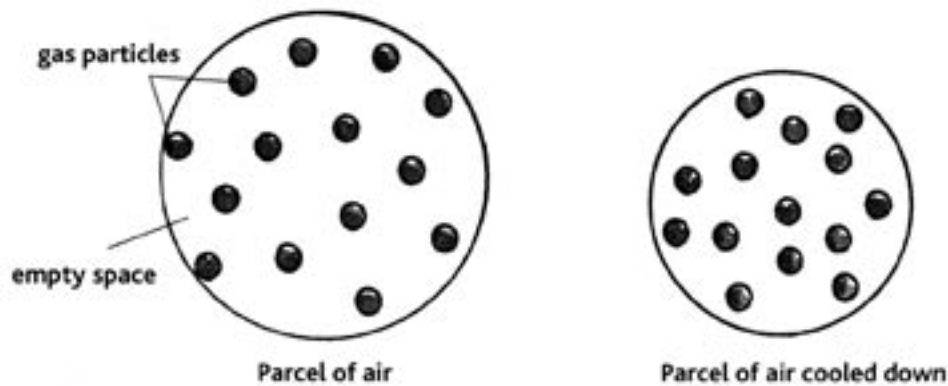
## ACTIVITY 1A: Recognise precipitation

Ask learners to answer these questions individually in their exercise books.

1. List the types of precipitation.
2. Does frost ever form in the area where you live? Explain why or why not.

How does precipitation happen?

Try to imagine a parcel of air magnified many times. It would look like this:



Read and discuss the text below with the class. When you are sure they understand the information given, ask pairs to answer the questions. Discuss the answers with the class.

Water vapour can occupy the empty space between the gas particles.  
Suppose we cool down our parcel of air. What will happen?

- The air will shrink into a smaller space. The gas particles will move closer together.
- There will not be as much space for the water vapour, so some of the water vapour changes or condenses into water. The water will appear as some kind of precipitation.

You can see that if we cool down air which contains water vapour we will get precipitation.

Every type of precipitation is the result of water going through a phase change. For example, dew represents the phase change from water vapour to liquid water and frost represents the phase change from water vapour to solid ice.

## ACTIVITY 1B: Phase changes

1. Describe the phase change which water goes through when water vapour in the air changes to:

- a. Clouds
- b. Snow
- c. Rain

2. Why do you think clouds often form at the top of the hills?

### Answers

1.
  - a. Clouds – water vapour to liquid water
  - b. Snow – water vapour to ice
  - c. Rain - water vapour to liquid water

2. Clouds often form at the top of hills because it is colder there. The air cools down and there is not as much space for water vapour, so some of it condenses into water droplets, which form a cloud.

## ASSESSMENT

Assess whether the learners were able to:

- Explain types of precipitation.
- Describe the different phase changes of water vapour.

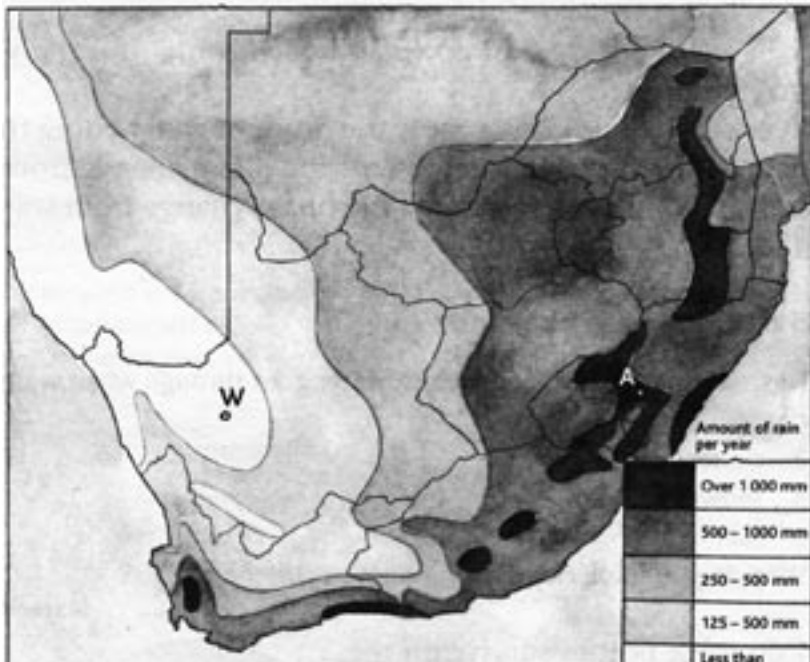
### Extended activity: How does rain fall?

Let learners read the text in the bubble speech.

### Guidelines for this activity

This activity offers learners another opportunity to understand the concept of phase changes in everyday life. It also partially explains why the eastern part of South Africa is wetter than the western part. You could begin the lesson by asking learners if they think their region gets enough rain or not.

Ask learners to look at the map below and answer the questions in pairs. Look at the key to the map. See where Wilson and Alice live. Notice that Alice lives in an area with more than 1000 mm rain per year. Wilson lives in area with less than 125mm rain per year.



### ACTIVITY1C: reading the rainfall map

1. How much rain does the area where you live receive in one year?
2. Which parts of South Africa receive the most rain – the mountainous parts or the flat parts?
3. Which side of South Africa receives the most rain – the east side or the west side?
4. In which direction does the rainfall decrease in South Africa – eastward or westwards?
5. On which side of South Africa do you think most people live? Why?

### Answers

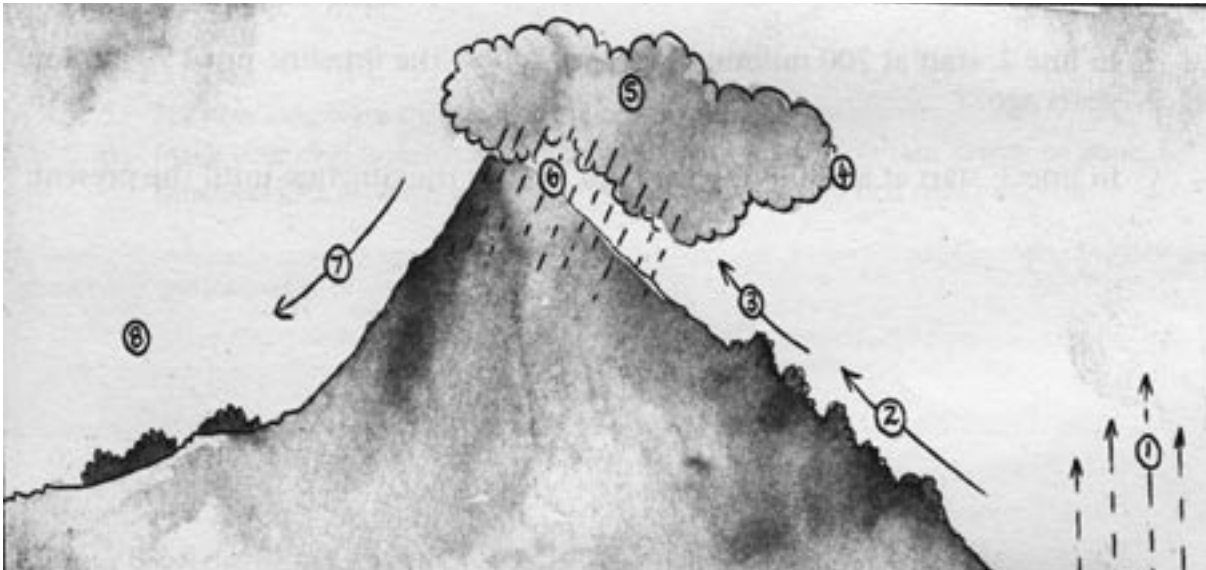
1. Learners must look at the map to distinguish this.
2. The mountainous parts of South Africa receive the most rain.
3. The east side of South Africa receives the most rain.
4. The rainfall decreases in a westward direction in South Africa.
5. Most people live on the eastern side, where there is more rain for farming, industry and households.



## What to do?

Ask the class to read the text and study the diagram. Discuss the illustrations with them and then, ask the class to answer the questions in pairs. Discuss the answers with the whole class.

Look at the map and note that the areas which get the most rain are the mountainous regions. Alice said there was lots of rain where she lived and she lives close to the Drakensberg mountain. Ask learners to look at the diagram to see why rain falls in mountainous regions.



1. Water vapour evaporates from the surface of the warm Indian Ocean.
2. Winds blow air containing water vapour to the KwaZulu-Natal coast.
3. The air rises to cross the mountains. As it rises it cools.
4. When the air cools some of the water vapour condenses to form water droplets.
5. The water droplets make a cloud.
6. Rain falls on the Drakensberg mountains.
7. Air blows down the other side of the mountains and warms up.
8. The warm air can hold all the water vapour so no water vapour condenses. There are no clouds and no rain falls.

### ACTIVITY1D: Why does rain fall on the mountains?

1. Where does the air pick up water vapour?
2. How does the moist air reach the KwaZulu-Natal coast?
3. Why does the air cool down?
4. What happens to the water vapour in the air when the air cools down?
5. Why is there no rain on the other side of the mountains?
6. Write down two important things which must happen before rain can fall.

### ANSWERS

1. Air picks up water vapour from the Indian Ocean.
2. The winds carry the moist air to the KwaZulu-Natal coast.
3. The air cools down because it has to rise to cross the Drakensberg.
4. When the air cools down, the water vapour in the air condenses into water droplets and forms a cloud.
5. There is no rain on the other side of the mountain because as the air comes down the mountainside it warms up. There is more space between the gas particles for water vapour so the water droplets evaporate into water vapour.
6. Two important things that must happen before rain can fall: Air must contain water vapour and the air must cool down.

### ASSESSMENT

#### Assess whether the learners were able to:

- Read a rainfall map.
- Explain why rain falls in mountainous regions.

# WATER USE EFFICIENCY

## 2. RAINFALL AND HUMAN ACTIVITY

### MAIN LEARNING AREA

#### SS (G) LO1 GEOGRAPHICAL INQUIRY

The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes.  
AS2: Interprets maps and atlas information, graphical and statistical sources works with sources.

#### SS (G) LO2 GEOGRAPHICAL KNOWLEDGE AND UNDERSTANDING

The learner will be able to demonstrate geographical and environmental knowledge and understanding.  
AS2: Identifies factors that influence the formation of settlement patterns (natural, economic, social/ political) {people and resources}

#### INTEGRATION WITH OTHER LEARNING AREAS

##### MATHS: LO5 DATA HANDLING

The learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.

AS8: Draws a variety of graphs by hand / technology to display and interpret data handling.

##### NS: LO2 CONSTRUCTING SCIENCE KNOWLEDGE

The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

AS3: Interprets information by translating tabulated data into graphs, by reading off graphs, and by making predictions from patterns.

### ACTIVITY

Learners will be able to:

- Identify the rainfall distribution pattern of South Africa including his/her home province so as to realise the importance of saving water.
- Answer questions to illustrate the importance the rainfall distribution on economic activities.

#### You will need:

- Rainfall distribution map of South Africa
- Map showing major crops produced in South Africa

### GUIDELINES FOR THE ACTIVITY:

This activity will help learners to understand that the physical features of our country influence the availability of resources such as water. The availability of such resources, in turn, influences the human and economic activities. They will therefore understand that people's standard of living depends on their access to resources such as water. In order to improve the standard of living it is therefore essential that resources be conserved.

The lesson also exposes learners to the skill of interpreting information represented in a form of maps and graphs.

### WHAT TO DO!

Assess the learner's knowledge of South Africa by asking them questions like:

- In which province do they live?
- Which other provinces do they know?
- How many provinces are there in SA?

Read the following fact sheet to the learners. Make sure that learners understand the passage by explaining words and phrases that they do not understand.

- Explain the maps. Interpret the information obtained from the maps.
- Ask them to refer to the fact sheet and maps to answer the exercise that follows.

### Fact Sheet

Of all the water we have in the world, 97% is salty seawater, 2% is frozen water in the poles and only 1% is fresh water suitable for use. South Africa is regarded as a semi-arid or water-scarce country. Our rainfall is unpredictable, distributed unevenly in time (frequent droughts alternate with periods of good rainfall) and space (the eastern half of the country is markedly wetter than the western half). Our average rainfall is less than 500 mm a year, much below that of the world, which is 860 mm per year. The driest part of the country receives 200 mm per year and the wettest 2 500 mm per year. Rain doesn't always fall where it is most needed, and some areas of high demand like Pretoria-

Witwatersrand-Vereeniging (PWV) receive less than they need. Most rain falls in the narrow belt along the eastern and southern coasts. The rest of the country receives only 27% of South Africa's total rainfall.

Common periods of drought limit our water resources even further whilst most rivers are dry or only flow during rainy seasons. To make things worse the limited water we have is polluted through a variety of human activities and thus cannot be used.

The water supply we have does not meet the needs of the growing population and the economy. Instead these factors increase the shortage of water.

Since we do not receive much rain, we need to protect our water and use it wisely. Large-scale engineering has been used to store water behind dam walls, and to distribute water from regions of plenty to regions of need. About half of South African rainfall is stored in dams in order to regulate the flow of a river, reducing flood damage and to keep the rivers flowing throughout the year rather than seasonally. However, South Africa's geomorphology (the way the land is formed) is not well suited for dams, and most dams are shallow. This, together with hot, dry conditions result in a high evaporation rate and again a shortage of water supply.

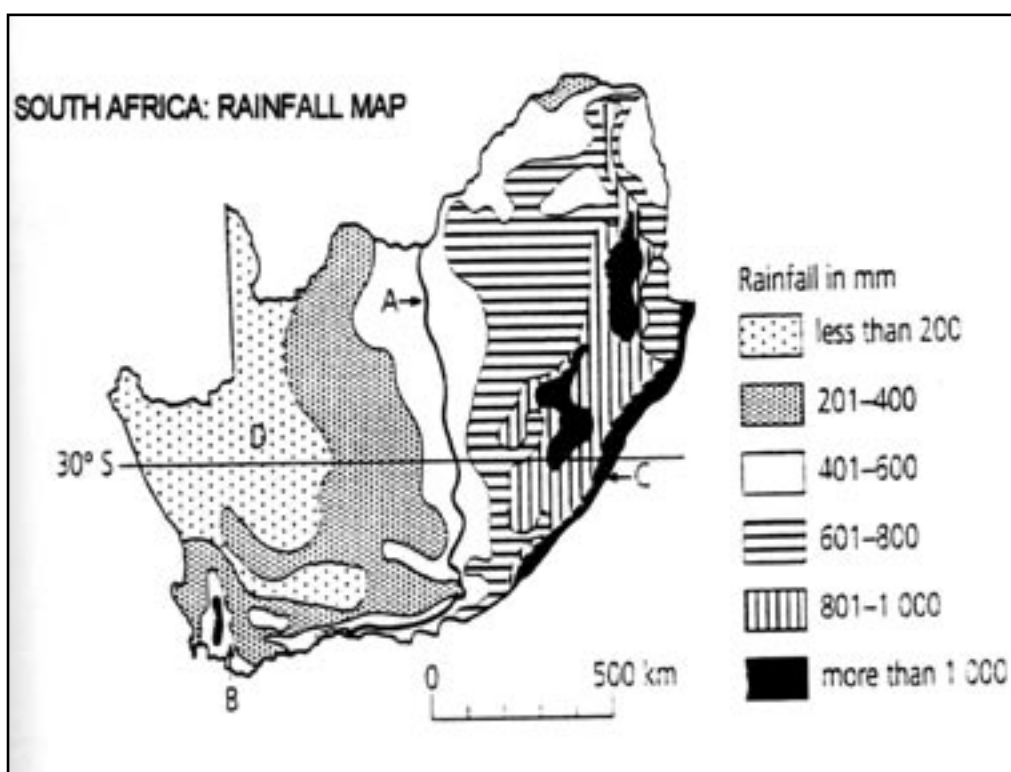
Another method of ensuring constant supply of water is through so-called inter-catchment transfers. This involves the movement of water from catchments drainage basins with good water supplies and low demand to those where demand is high and supply is poor. These transfers are not enough and so the problem of a shortage of water supply persists.

Other options to overcome the problem of the shortage of water supply are recycling and the desalination of seawater. Recycling of domestic wastewater and sewage is already done by some large industries and regional water suppliers. The option of desalination or turning seawater into fresh water is still under serious consideration as it is expensive.

The rapid population growth will result in a shortage of water as the rate at which we can build dams to store and supply water is not rapid enough to meet the needs of the growing population. The population is not likely to decrease, nor is the annual rainfall likely to increase, which means that there is a growing problem of a lack of water in South African rivers. We depend on rivers, dams and underground water for our water supply.

Various methods to overcome the problem of the shortage of water have been tried, but because of various problems, South Africa hasn't succeeded in overcoming this problem. The bottom line is that conservation of our limited water resources as well as improved management is a must for everyone! Let every drop count!

(Adapted from the Enviro-Facts Sheets series: Precious water, River Catchments, Water is Life! A handbook for teachers)



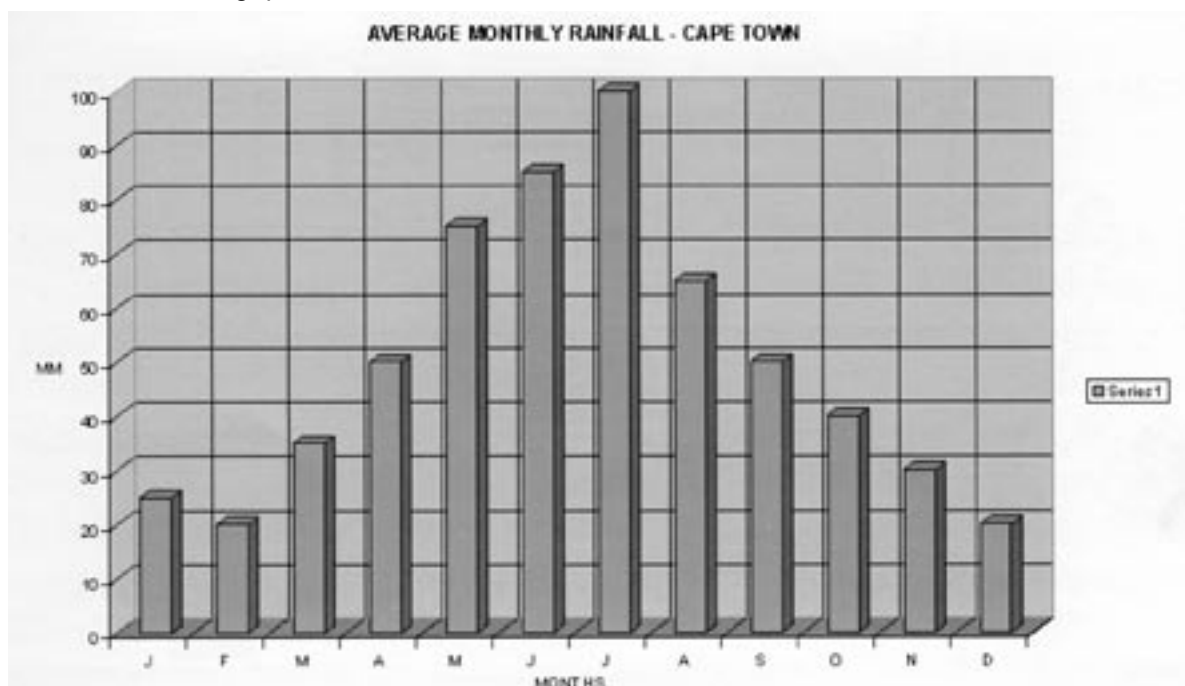
## ACTIVITY 2A: SOUTH AFRICA RAINFALL MAP (pair work activity)

Ask learners to refer to the fact sheet and the map provided to do the following exercise:

1. Roughly locate your province in the rainfall map by circling it with your pencil.
2. Study the rainfall map and answer the following questions:
  - (a) What is the average rainfall of your province per year?
  - (b) Comparing that with the average rainfall of 500mm would you classify your province as a high, medium or low rainfall area? Why
  - (c) Which part of South Africa receives more rain? (Western / Eastern)
3. Of the three forms of water supply mentioned in the fact sheet which one does your family use?
4. Name four methods of trying to ensure constant supply of water mentioned in the passage.
5. Which one is used in your area?

## ACTIVITY 2B: DATA HANDLING EXERCISE

This graph shows the rainfall distribution for Cape Town each month of the year. Let the learners view the graph and answer the following questions.



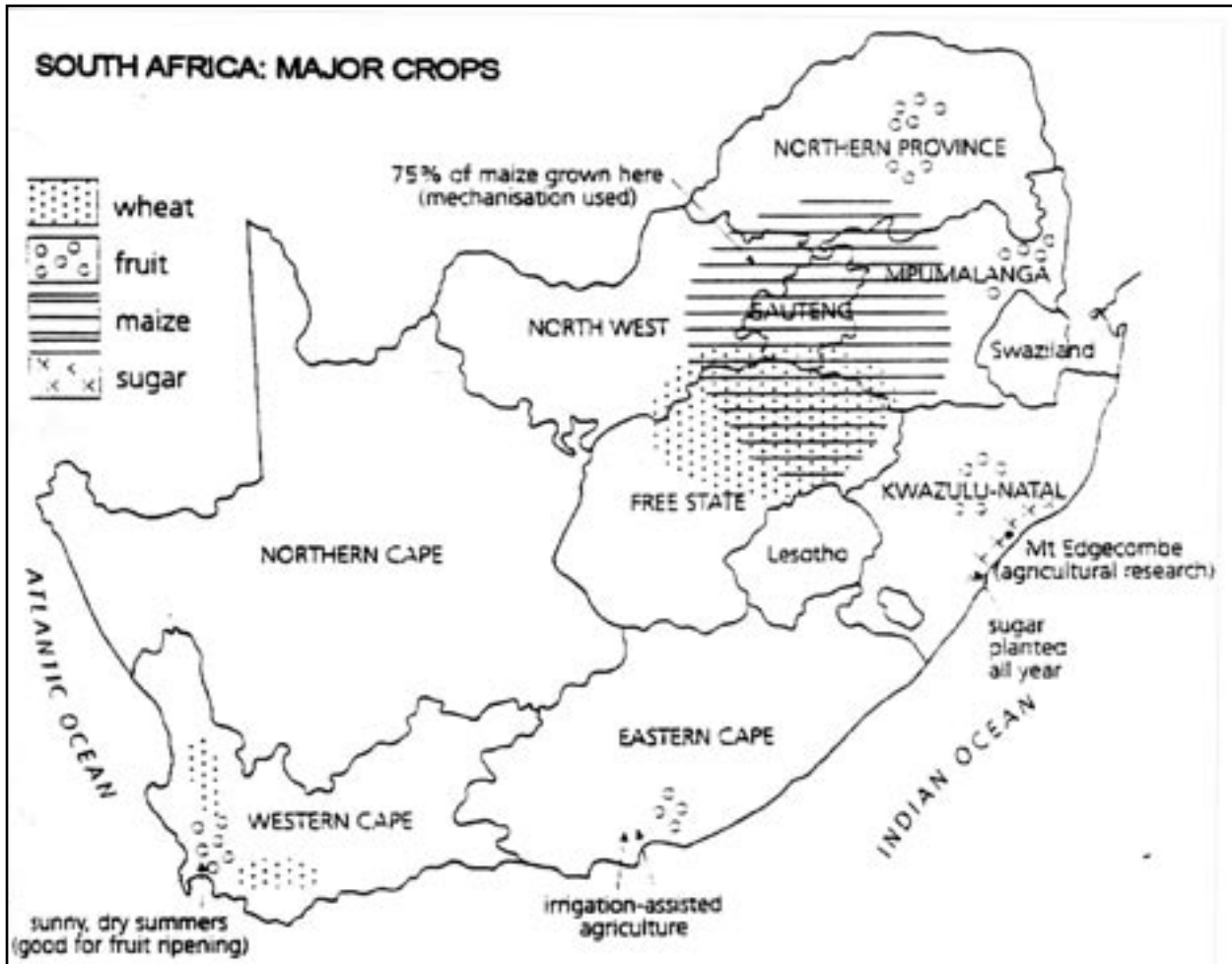
1. During which month did the least rain fall?
2. During which month did the most rain fall?
3. Which months received the same amount of rain?
4. During which season does Cape Town receive most rain? Chose one
  - (a) Summer
  - (b) Autumn
  - (c) Winter
  - (d) Spring

B. Study the table carefully. It shows the annual amount of rainfall received by these cities. Ask learners to draw a bar graph similar to the one above, showing the amount of rainfall received by these cities. Replace the months in the Y-axis with names of cities.

CITY	RAINFALL in mm
Bloemfontein	680
Johannesburg	700
Cape Town	550
Pretoria	720
Durban	1200
George	850
Port Elizabeth	750

Ask learners to use this map to answer the following questions. Also refer to the map used in activity 2a.

**THEMATIC MAPS:** These maps compare regional characteristics by way of theme e.g. rainfall map, climatic, major crops, natural vegetation etc.



1. Looking at the map showing major crops grown in South Africa.

- (a) Which province produces a wide variety of crops?
- (b) Is that province a high, medium or low rainfall area?
- (c) Which province does not produce any crops?
- (d) Can this be associated with the amount of rainfall they have? Support your answer.
- (e) What type of farming do you think is practiced here if there is no crop farming?

**ASSESSMENT:**

For activity 2A prepare a memorandum that is suitable for your region so as to assess whether learners:

- Can identify and name the physical features of South Africa, including those of their provinces.
- Can associate the type of economic activity with the rainfall distribution pattern.
- Can interpret and represent data in various forms.

**Answers**

Activity 2B Data handling exercise

1. February
2. July
3. April and September
4. Winter

## Activity 2C – Human Activities

- (i). Mpumalanga
- (ii). High rainfall area
- (iii). Northern Cape
- (iv). Yes, crops need water; they cannot thrive in a dry, semi – arid area.
- (v). Livestock farming

## GLOSSARY OF TERMS

**Pole:** The two opposite ends of the Earth's axis. Its northern and southern points.

**Semi – Arid:** A land that is almost dry where few plants can grow.

**Engineering:** It is the work that is involved in designing and constructing engines and machinery, or structures such as roads and bridges.

**Catchment:** The total the land area from the mountain top to the sea shore which is drained by a single river and its tributaries.

**3. WATER AUDIT ON THE SCHOOL PREMISES**

**MAIN LEARNING AREA**

**NS: LO3 SCIENCE, SOCIETY AND THE ENVIRONMENT**

**The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.**

**AS2:** Understands sustainable use of the Earth’s resources: Identifies information required to make a judgment about resource use.

-plans and carries out an audit of all uses of water around the school premises, and develops an implementation plan to improve water management in the school.

**INTEGRATION WITH OTHER LEARNING AREAS**

**MATHS: LO5 DATA HANDLING**

**The learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.**

**AS9:** Critically reads and interprets data presented in a variety of ways in order to draw conclusions and make predictions sensitive to the role of; context (e.g. rural or urban, national or provincial)

**ACTIVITY**

Learners will be able to:

- Explain the importance of saving water in the schoolyard.
- Carry out the water audit at their own school.
- Record findings accurately in the audit record sheet.
- Develop an action plan to save water at their school.
- Calculate the results of the audit.
- Communicate their findings to the school management.

**You will need:**

- Water audit sheet
- Activity guide for educators

**GUIDELINES FOR THE CHAPTER**

In this chapter learners have the opportunity to auditing the amount of water used in their school to ensure more efficient use of water. They will identify where most water is used and implement measures to start saving water.

**WHAT TO DO:**

- Ask learners why it is important for people to save water.
- Highlight the importance of saving water to the learners.
- Tell the learners that they are going to do an audit of all uses of water around the school premises.
- Divide them into groups and give each group an audit sheet to record information.
- Follow the steps as in the following activity guide for educators.



<b>SCHOOL WITH WATER FACILITIES</b>	<b>SCHOOL WITHOUT WATER FACILITIES</b>
1. Locate the water meter for the school.	1. Educator forms a water team.
2. Educator to explain how to read the water meter.	2. Water team finds out: (a) How much water comes onto the school everyday. (b) How water is used at the school.
3. Read the water meter over a period of 7 days and record the readings.	3. Water team finds out: (a) Status of all water points at the school. (b) Good and bad water practices at the school.
4. Day before the audit: (a) Follow up if water meter reading has been recorded. (b) Remind the learners and audit team of their responsibilities on the audit day.	4. Day before the audit: (a) Remind the learners and audit team of their responsibilities on the audit day.
5. The water audit day: (a) Distribute “class water audit table” to water audit team. (b) If approach involves all classes, audit teams distribute the table to each class. If approach is “hands-on”, audit team is distributed to different water points to monitor water use for the whole day. (c) Depending on the approach, water team will collect all “Class water audit tables” and hand them over to the educator.	5. The water audit day: (a) Determine total of water brought onto the school. (b) Distribute “Class water audit table” to water audit team. (c) If the approach involves all the classes, audit teams distribute the table to each class. If approach is “hands-on”, audit team is distributed to different water points to monitor water use for the whole day. (d) Depending on the approach, water team will collect all “class water audit tables” and hand them over to the educator.
6. After the audit day: (a) Facilitator collects “class water audit tables” and school record sheet from the educator. (b) Check and compile school record sheet with the audit team.	6. After the audit day: (a) Facilitator collects “Class water audit tables” and school record sheet from the educator.
7. Assist audit team to develop the graph and make the school poster.	7. Assist audit team to develop the graph and make the school poster.
8. (a) Facilitate a meeting with school management that will involve local structures, relevant govt. depts. such as DWAF, Dept. Health, Env. Affairs, DoE, local authority, councilor/s, media.  (b) Purpose of meeting is to present the findings. To agree on action plan / Way forward.  (c) Learners should do the presentation if possible.	8. (a) Facilitate a meeting with school management that will involve local structures, relevant govt. depts. such as DWAF, Dept. Health, Env. Affairs, DoE, local authority, councilor/s, media.  (b) Purpose of meeting is to present the findings. To agree on action plan / Way forward.  (c) Learners should do the presentation if possible.
9. (a) Publish findings in local newspapers with photos. (b) Compile final report/s and send them to the district coordinator of DWAF.	9. (a) Publish findings in local newspapers with photos. (b) Compile final report/s and send them to the district coordinator of DWAF.

### ACTIVITY 3A: WATER USE AUDIT AT SCHOOL

Ask them to investigate the following:

- How water is used at the school over a day?
- Do an assessment of all water points at the school.
- Make a list of all good water practices at school.
- Make a list of all the bad water practices at the school.

Ask learners to:

- o Place a tick next to the use(s) every time they observe water being used in that purpose.
- o Count the number of ticks and record the total.
- o Use the information and plot the bar graph to represent the information. (Ask them if they still remember how to draw a graph)

### WATER AUDIT WORK SHEET

NAME OF GROUP:.....

DATE:.....

Place a tick on the block of each water use per time interval.

Water use activity	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	Totals
Drinking								
Washing hands								
Toilets								
Cleaning								
Kitchen								
Garden								
Washing cars								
Others (specify)								
Total								

### ACTIVITY 3B: MAKE A DIFFERENCE: SAFE WATER AT SCHOOL

Using the findings recorded above learners should:

- Determine which activity uses more water.
- Which water use activity is not practiced at school at all?
- Design an action plan to save water at school.

Your water saving action plan should be represented in a poster.

### ASSESSMENT

Design an assessment rubric and assess the learner's ability to:

- Explain the importance of saving water at their school.
- Carry out the water audit at their own school.
- Record the findings accurately in the audit record sheet.
- Develop an action plan to save water at their school.
- Calculate the results of the audit.
- Communicate their findings to the school management.

### GLOSSARY OF TERMS

**Water Quantity Audit** – process of determining the amount of water used and wasted.

## 4. USE WATER WISELY

### MAIN LEARNING AREA

#### SS (G): LO3 EXPLORING ISSUES

The learner will be able to make informed decisions about social and environmental issues and problems.

**AS1:** Identify challenges to societies and settlements associated with the use and abuse of people and natural resources {identifies the issue}.

**AS3:** Investigates possible ways of reducing resource consumption {makes choices}.

### INTEGRATION WITH OTHER LEARNING AREAS

#### HL: LO3 READING AND VIEWING

The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.

**AS10:** Reflects on and discusses own skills as a reader.

#### HL: LO4 WRITING

The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.

**AS1:** Writes a range of imaginative texts: to explore the creative, critical and playful use of language by means of narrative and descriptive compositions, dialogues, poems, songs and letters.

#### HL: LO5 THINKING AND REASONING

The learner will be able to use language to think and reason, as well as to assess, process and use information for learning.

**AS1:** Visualises, predicts, fantasises and emphasises with sensitivity to make meaning and solve problems.

### ACTIVITY 4A: INCREASING AWARENESS ABOUT WATER RESOURCE MANAGEMENT

In this activity learners will engage in a project that will:

- Increase awareness about integrated water resource management.
- Participate in a competition that will send a message to the community about water.

#### Facts about water

Did you know?

- Water is reusable.
- The human body is made up of 80% water.
- 70% of your skin is water.
- The average rainfall in South Africa is 500mm, well below the world average of 860mm.
- Only 1% of the Earth's water is available for drinking.
- You can survive about a month without food, but only 5 to 7 days without water.
- We have 550 government dams in South Africa with a total of 37000 million square metres.

#### WHAT WILL LEARNERS HAVE TO DO:

Learners will have to work in pairs for this activity.

- Learners must read and understand the facts about water
- They have to do research about water and its use.
- Using the theme "Water Wise" learners need to decide on which ways they are to use to bring about water awareness.
- Learners may choose to engage in:
  - Drama
  - Poem
  - Traditional music
  - Poster.

Learners will have to compete with fellow learners in presenting their project through: drama, a poem, traditional music and a poster.

#### Hint to do your project

1. Observe carefully how water is used at home, school and in the community.
2. Identify the problems in the way water is being used in each of the places mentioned.
3. Write all the problems down.
4. Share them with your partner.
5. Agree on the solutions to the problem of water misuse.
6. Then send a message.

## ASSESSMENT

You can assess the learners in the following:

	<b>Level Descriptors</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Understanding	The learner demonstrated little understanding of the subject	The learner demonstrated some understanding of the subject	The learner demonstrated some understanding of the subject	The understanding of the subject was beyond conceptual level
Relevance	The message is irrelevant to the topic	The message shows some relevance to the topic	The message is relevant to the topic	The message was conceptualised very well
Creativity	No creativity shown	The plan appears to be theoretical	Creative ideas shown in the plan	The learner was excellent in creativity
Presentation	Presentation is not good at all	Presentation is not good enough	Able to do presentation	Good presentation

# WATER QUALITY

## 5. DO NOT POLLUTE WATER

### MAIN LEARNING AREA

#### LO: LO1 HEALTH PROMOTION

The learner will be able to make informed decisions regarding personal, community and environmental health.

AS1: Plans an action in which laws and / or policies for protecting environmental health are applied to address an environmental health issue.

AS2: Critically analyses the causes of common diseases in relation to socio- economic and environmental factors.

#### NS: LO1: SCIENTIFIC INVESTIGATIONS

**The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.**

AS: 2 Conducts investigations and collects data: Collects and records information as accurately as equipment permits and investigation purposes require.

- reviews data-collecting procedures during the investigation
- sees the need to use measuring instruments and does so with reasonable accuracy.

AS 3: Evaluates data and communicates findings: Considers the extent to which the conclusions reached are reasonable answers to the focus question of the investigation.

### INTEGRATION WITH OTHER LEARNING AREAS

#### MATHS: LO5: DATA HANDLING

**The learner will be able to collect, summaries, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.**

AS 3: Designs and uses questionnaires with a variety of possible responses in order to collect data (alone and or as a member of a group or team) to answer questions.

#### AL: LO5 THINKING AND REASONING

**The learner will be able to use the language to think and reason, as well as to access, process and use information for learning.**

AS 1: Uses language and literacy across the curriculum:

- Understands and produces text used in other Learning Areas.

AS 2: Uses language for thinking.

AS 3: Collects and records information in different ways:

### ACTIVITY

Learners will be able to:

- Complete the E.Coli test step by step.
- Interpret their findings.
- Make recommendations for a) immediate and b) long term monitoring solutions.
- Communicate their findings using appropriate communication strategies and media.

#### You will need:

- E-coli kit (10ml tubes with powder for growing bacteria)
- Recording table
- River
- Test tubes
- Incubator

### GUIDELINES FOR THE CHAPTER:

In this lesson learners will observe the river or the borehole / well and its surrounding areas to determine if there is a possibility of faecal contamination or not. They will sample water from the source for the purposes of testing it in order to take appropriate action to improve the quality of their water as well as their lives.

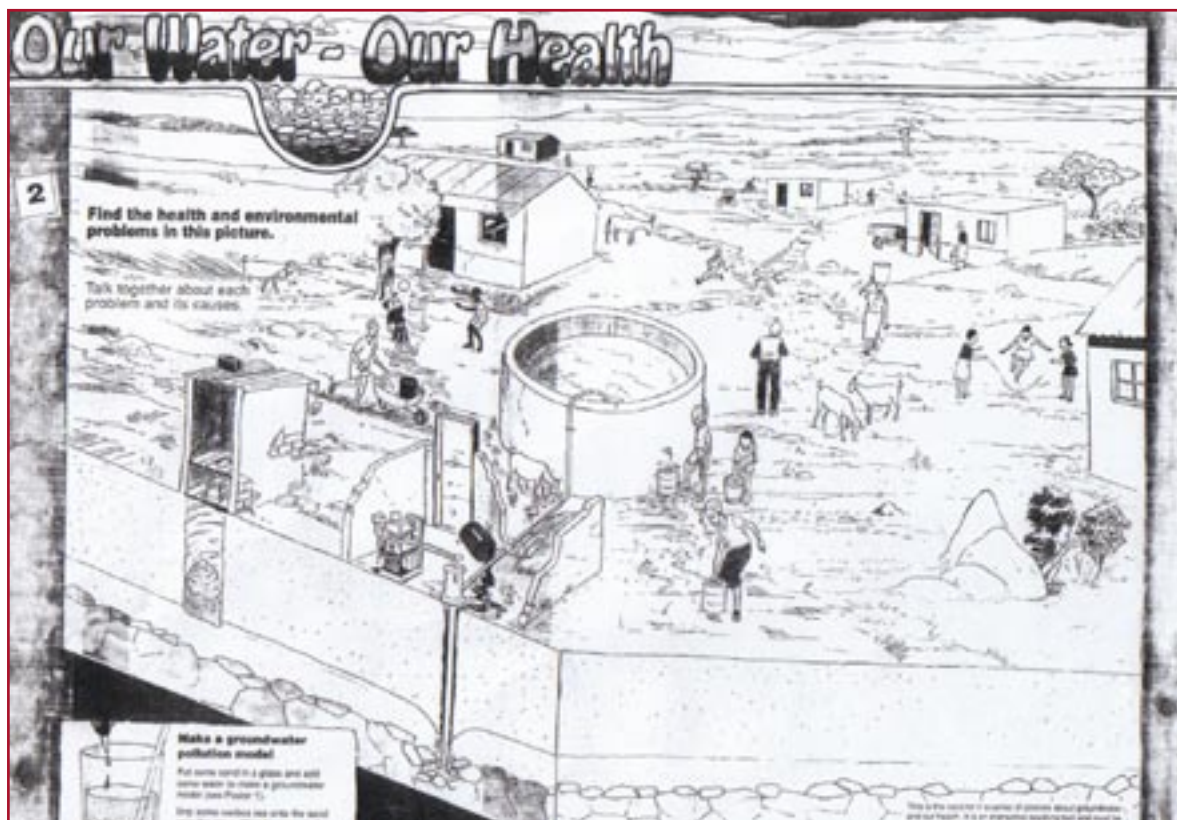
### BACKGROUND INFORMATION:

Escherichia coli (E-Coli) and Faecal Coliforms (FC) are bacteria which are indicate faecal contamination in fresh waters. They are important for digesting food and therefore are present in high numbers in the gastrointestinal tracts of vertebrates. that is why they provide a sensitive measure of **faecal** pollution. These bacteria can enter the water directly from mammals (including humans) and birds, from farm lands, from storm run-off and from sewage discharge into rivers.

If the presence of these bacteria is high owing to sewage contamination, it is likely that **pathogenic** micro organisms

are also there in numbers to cause water borne diseases in people who drink or swim in the water. Diseases such as **typhoid, hepatitis, gastroenteritis, dysentery** and **throat and ear infections** can be contracted from that rivers water.

It is important to do faecal contamination testing in our fresh water sources because contaminated water poses a serious health hazard to the people who use that water. A test to determine the quality of drinking water and river water used in a community will assist in identifying the pollutants in the water, raise awareness among people about water quality and health issues, and assist people in taking action to improve the quality of their water resources.



### ACTIVITY 5A - IDENTIFICATION OF WATER POLLUTION PROBLEMS

In this activity learners will:

- Carry out an experiment to determine the possibility of faecal contamination in borehole / well and its surroundings.

This is an experiment in which learners will observe the river or borehole/well and its surrounding areas to determine if there is a possibility of faecal contamination or not.

#### WHAT TO DO:

- Start a class discussion by asking learners questions to:
  - (i) Find out the sources of water that they know and use.
  - (ii) Establish what they know about water pollution problems that may affect those water sources.
  - (iii) Determine whether they understand the health risks involved in consuming polluted water.
  - (iv) Establish short-and long-term solutions that they can suggest to ensure that their water source is not polluted.
- Read and explain the background information to the learners.
- Ask them if they think it's true to say that only river water can be exposed to faecal contamination?
- Ask them to look at the picture above and add a small paragraph to this background information as a response to the above question.

## ACTIVITY 5B: E-COLI TESTING

- Divide learners into 3 groups so that each group can collect samples from one site. (If there is a borehole close to your area you can form a 4<sup>th</sup> group for that borehole,
- Assist the learners to carry out the following steps to conduct an E-Coli test making use of the kit provided. Make sure that you do not move to the next step without making sure that each group understands what has to be done.

This is what learners have to do:

**STEP 1:** Identify closest water source (river) in your community.

**STEP 2:** Choose a 50m river section.

**STEP 3:** Mark off the start (10m); middle (25m); and end (50m). NB: Make sure that you wear gumboots before getting into the water.

**STEP 4:** Take your samples into the cubes at these three points i.e. 3 samples each at point: 10m, 25m, and 50m. You will have 9 samples.

**STEP 5:** Fill the tubes with the water sample to the first water line.

**STEP 6:** Screw lids tightly on tubes and label the tubes.

**STEP 7:** Shake tubes to dissolve powder. Record the colour of water after shaking it.

**STEP 8:** Put it in an incubator or warm place and leave for 24 hours (specimens must be kept warm for bacteria to multiply).

### 2. INTERPRETATION OF RESULTS

In interpreting the results of their observations, learners must:

- (v) Carefully follow the steps 9 to 10 to interpret the results.
- (vi) After 24 hours, take out the tubes and observe what has happened.
- (vii) Use the table below as a guide to interpret the results.
- (viii) Record the colour changes (if any) in each sample.

**STEP 9:** Circle the result of each sample at the different sites in the table below.

**STEP 10:** Read the key below the table for colour change results, compare the colour of each sample with the E- Coli test record sheet.

**STEP 11:** Would you say your drinking water is generally safe?

### 3. DISCUSSION

Learners should then discuss with their partners what the implications of the results are in relation to:

- The effects this water would have on their community's health.
  - Report their group results orally.
- Allow each group to share its findings with the whole class orally.

E-COLI TEST RECORD SHEET						
GROUP NUMBER / NAME:.....						
DATE.....						
	SITE 1		SITE 2		SITE 3	
SAMPLE 1 (10m)	Yellow	not yellow	Yellow	not yellow	Yellow	not yellow
SAMPLE 2 ( 25m)	Yellow	not yellow	Yellow	not yellow	Yellow	not yellow
SAMPLE 3 ( 50m )	Yellow	not yellow	Yellow	not yellow	Yellow	not yellow
<b>Key:</b> Yellow= bad                      not yellow= good						



## ACTIVITY 5C: TAKE ACTION: ADDRESS THE PROBLEM OF WATER CONTAMINATION

Depending on the results of the test, you can let your learners proceed to the following task:

- If the water quality is contaminated learners must come up with suggestions on how to address the problem.
- They must group their suggestions into Do-It-Yourself Action Projects for the class or Enviro-Club or Raise the **Red Flag** Actions for the relevant government department official, local community or the media.
- They must discuss and formulate a plan of action as a group.
- Finally, they must present their implementation plan to the whole class.

NB: Remember the plan the learners present can contribute towards the implementation of the resource management or health and safety focus area of the school environmental policy, so it can also be presented to the environmental club.

### ASSESSMENT:

Assess the accuracy with which learners have:

- Completed the E.Coli test step by step.
- Collected and recorded the data.
- Interpreted and evaluated their findings.
- Reported and evaluated their findings.
- Made recommendations for a) immediate b) long-term monitoring solutions.
- Communicated their findings using appropriate communication strategies and media.

### GLOSSARY OF TERMS

**Dysentery** - Infection of the intestine which causes severe diarrhoea.

**E-COLI** - Escherichia Coli.

**Faecal** - Body waste

**FC** - Faecal Coliform.

**Gastroenteritis** - Inflammation of the lining of the stomach and intestine causing vomiting and diarrhoea.

**Hepatitis** - Inflammation of the liver, causing fever, jaundice and weakness.

**Pathogen** - Any agent, such as a bacterium that can cause disease.

**Red Flag** - For issues that the learners cannot provide any solutions, they can take up the matter with the relevant authorities, e.g. government departments, local authorities, communities media structures etc.

**Typhoid fever** - An acute infectious disease characterized by high fever, spots, abdominal pain etc. It is spread by contaminated food or water.

## 6. WETLANDS

### MAIN LEARNING AREA

#### AL: LO3 READING AND VIEWING

The learner will be able to read and view for information and respond critically to the aesthetic, cultural and emotional values in texts.

AS4: Reads for information – follows information texts, summarises information.

### INTEGRATION WITH OTHER LEARNING AREAS

#### SS (G) LO1 GEOGRAPHICAL ENQUIRY

The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes.

AS1: Identifies and selects a variety of geographical and environmental sources relevant to an enquiry (uses fieldwork and other enquiry methods) {finds sources}.

### ACTIVITY

The learners will be able to:

- Discuss how people benefit from wetlands.
- Identify uses of wetlands as shown in the pictures.

### SAVE OUR WETLANDS

#### Guidelines for this activity.

If learners have any prior understanding of wetlands, let them share their knowledge and experience with the whole class. Are there any wetlands in or near the learners' area or province? Go through the text and ask confident learners to read out the captions and the items in the bulleted list. Encourage learners to ask questions about anything they do not understand. Then let learners work through the activity in pairs. Go over the answers with the whole class.

#### Why are wetlands important?

A wetland is a place covered with shallow water. Marshy areas, vleis, lakes and estuaries are also called wetlands. Areas where rivers start are wetlands. Some wetlands are always under water, but others are only wet during the wet season.

About 6% of the Earth 's surface is covered by wetlands. Wetlands have great biodiversity. Many species of plants and animals only live in wetlands, so it is important that we conserve these areas. But they are disappearing because of farming, tree planting and the development of housing.

#### Wetlands provide:

- Grazing for wild and domestic animals
- Raw materials for making crafts. There are many species of reeds, rushes and grasses that people use to weave mats and baskets, and thatch their houses.
- A place for fishing. Floodplain wetlands such as the Pongola flood plain in Kwazulu – Natal and estuaries such as Kosi Bay estuary in Kwazulu – Natal are good sources of fish.
- A place for crops. Most crops will not grow under water. But rice is a very important crop in many parts of the world and this crop only grows underwater.
- A source of water. Water is stored in wetlands so wetlands can be sources of water for people, livestock and for irrigation.
- A water purification system. Wetlands are natural filters that trap things that pollute water. Water flowing out of a wetland is cleaner than when it went in.
- A place for recreation and tourism. Wetlands are very attractive areas with a wide variety of plants and animals to look at. Bird - watchers especially like wetlands.



Picture A



Picture B



Picture C



Picture D

## ACTIVITY 6A: SAVE OUR WETLANDS

### Questions

Learners can work in pairs for this activity.

- Discuss how people benefit from wetlands.
- Identify the uses of wetlands shown in pictures A-D.
- Find out if there is a wetland near where you live. If there is, describe what the wetland is being used for. Has your local council educated the community about wetlands? How does the local council make sure that people do not harm the wetland?

Answers for (b)

- A. Reeds for making baskets
- B. Recreation and relaxation for nature – lovers
- C. Enjoying bird life
- D. Rice - growing

### ACTIVITY 6B: NEWSPAPER ARTICLE

Ask learners to read the following newspaper article, and answer the questions that follow.

1. Where is the newspaper article?
  - a) What is the issue being discussed in this article?
  - b) What is considered to be an 'equal share' of the Earth's natural resources?
  - c) Which countries of the world get more than their fair share of the world's resources?  
Why do you think this is so?
  - d) Which countries get less than their equal share of the world's resources? Why do you think this is so?
2. Which sentences in the article tell us that people are not using resources in a sustainable way?
3. What suggestion is made by W W F to help to share resources and reduce poverty? Do you agree with this suggestion? Explain why or not. Can you suggest another possible solution to the problem?
4. What does WWF mean?

### Answers

1. a) The Earth's natural resources are being used up too quickly.  
b) 1, 9 hectares of natural resources.  
c) West European countries and the USA and Canada.  
They are rich countries and have better access to resources.  
d) Asian and African countries.  
They are poor countries and do not have access to resources.
2. The heading: Resources will be used in 150 years. (Or a similar sentence in the article)
3. To promote education and health care, to control population growth.  
(Personal opinion, supported by valid reason and practical suggestion)
4. World Wildlife fund.

### ASSESSMENT

Assess whether the learners were able to:

- Discuss how people benefit from wetlands
- Identify uses of wetlands as shown in the pictures.
- Answer all the questions from the newspaper article.

## 7. EXPLORING A WETLAND - PROJECT

### MAIN LEARNING AREA

#### SS (G) LO3: EXPLORING ISSUES

The learner will be able to make informed decisions about social and environmental issues and problems.

**AS1:** Identifies challenges to societies and settlements associated with the use and abuse of people and natural resources {identifies the issue}.

### INTEGRATION WITH OTHER LEARNING AREAS

#### LO: LO1 HEALTH PROMOTION

The learner will be able to make information decisions regarding personal, community and environmental health.

**AS1:** Plans an action in which laws and/or policies for protecting environmental health are applied to address an environmental health issue.

### ACTIVITY

In this activity learners will:

- Explore wetlands.
- Design a poster that describes the benefits that can be derived from wetlands, and also threats to wetlands.

#### You will need:

- Gum boots / strong shoes
- Rain suite
- Exercise book and pencil/ pen

### ACTIVITY 7A: WETLANDS CLEAN UP

A wetland means land which is transitional between terrestrial and aquatic systems where water table is usually at or near the surface, or the land is periodically covered with shallow water, and land, in normal circumstances, supports or would support vegetation typically adapted to life in saturated soil.

Ask the learners to:

1. Take a field trip to the school or the community nearby.
2. Identify the is a wetland area.
3. Study the wetland carefully and record what they observe in that wetland.
4. Use the following worksheet as a guide. Place a tick (√) where applicable.

Item	Yes	No	Is it a threat to the wetland?	
			Yes	No
• Plants				
• Animals				
• Water				
• Plastics				
• Papers				
• Wood				
• Dead				
• Organism				
• Alien Plants				
• Other				

5. List all the items that are not supposed to be in that wetland.
6. Let the learners discuss with their partners what should be done to save the wetland.
7. They should design a poster that will show the importance of wetland.
8. Ask learners to highlight the responsibility of not polluting a wetland.

### ACTIVITY 7B: ADOPT THE WETLAND

- After the learners have identified the problem in a school environment, they should visit a wetland in the nearby community.
- Identify the problems in that wetland.

- Design a plan that they can use to care for the wetland.
  - Adopt a wetland and make it their own responsibility.
  - They may need to be involved in the following activities to secure their wetland.
- Educational activities – educate the community about:
- (a) What wetlands are?
  - (b) Their functions and importance.
  - (c) Threats to wetlands
  - (d) Alien plants clearing.
  - (e) Planting of South African trees.

### **ASSESSMENT**

Assess the learners on the following:

- Plan to secure the wetland.
- The cleanliness of the wetland.
- checking the quality of water.
- the number of alien plants around.
- the pollution level around your wetland.

# SANITATION, HEALTH AND HYGIENE

## 8. WE CAN ACT TOGETHER TO LOOK AFTER GROUNDWATER

### MAIN LEARNING AREA

#### LO LO1 HEALTH PROMOTION

The learner will be able to make informed decisions regarding personal, community and environmental health.

**AS1: Plans an action in which laws and/or policies for protecting environmental health are applied to address an environmental health issue.**

#### INTEGRATION WITH OTHER LEARNING AREAS

#### NS: LO1 SCIENTIFIC INVESTIGATION

The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

**AS1: Plans investigation; Identifies factors to be considered in investigations and plans ways to collect data on them, across a range of values.**

- Identifies factors which may be important to the investigation.

### ACTIVITY

**Learners will be able to:**

- Explain what groundwater is, how it is formed, how it can be polluted and how we can keep it clean.
- Plan and undertake an action project.

#### What to do!

Let learners read the information about groundwater before they undertake the action project.

### BACKGROUND INFORMATION ABOUT GROUNDWATER

#### What is groundwater?

People often think that groundwater occurs in large underground dams or lakes or in streams under the ground. Groundwater is, however, only water that fills the natural openings that are in rocks or sand under the ground. These openings can take many forms, for instance, the cracks or joints between rocks, the openings between small sand or mineral particles in the soil, or the openings between sand particles in dunes or river sand-filled riverbeds. Groundwater comes from rain. A small percentage of rain that falls as part of the water cycle soaks into the ground and fills the openings in the rocks and into the sand below the surface of the ground.

#### How do we access groundwater?

We can drill down to the water underground and pump it up so we can use it. Water can be pumped to the surface with a pump. There are many different kinds of pumps.

#### Why do we need to look after groundwater?

**There are two key issues that your learners need to understand:**

- Groundwater is a precious resource so we need to use it carefully.
- If groundwater is contaminated by pollution it can affect our health.

**Groundwater is replaced only when it rains so learners need to understand how to conserve water.**

**Groundwater can be polluted by a number of different things:**

- Dirty water around a pump site can soak into the groundwater.
- Toilets that are built too close to a borehole or downhill from a borehole can pollute water ground .
- Dumping of chemicals such as pesticides, chemicals and batteries allows pollution to soak into the groundwater.

**Guidelines for this activity:**

- In some schools around South Africa young people have started action groups to make their area healthier and safer.
- Learners can take action for health too!
- They can work together to educate their community about protecting groundwater.
- They can also start a group to look at general water and health even if they do not use groundwater.



## ACTIVITY 8A: PLAN AND UNDERTAKE AN ACTION PROJECT

Ask learners to follow the procedure below to go about doing their action project.

### 1 Get a project group together

Most effective action groups begin when someone feels very strongly about an issue. If they have found the work they have done on water interesting and have noticed that their community could do something to make their groundwater resource safer then why not start a group to do something about it?

As a group they should write a problem statement saying something like this: "Our problem is that the community is not taking care of our groundwater."

### 2 Research the problem

Now learners will need to find out more about the problem.

Speak to a clinic sister. Ask her about water-related diseases.

Speak to people in your community about water. Where do they get water? What problems do they have? Do they have health problems related to water? Ask them what they think could be done to solve the problem.

### 3 Analyse the research and choose a project

They may find that the water they use is clean, but that people are getting sick because they are not covering their water containers or they don't have proper toilets.

Some of the problems they may not be able to solve themselves. Learners must see if they can speak to an expert (clinic sister or someone at the local Department of Water Affairs office).

A good kind of community project is an education project.

Perhaps they can think of some ways to educate their community about groundwater and how to stay healthy?

### 4 Draw up an action plan

Learners need to know what they would like to achieve.

Be clear on what needs to be done and how.

Decide who will do the different tasks, and make sure that everyone is taking part.

By when? Have timeframes for all tasks.

### 5 Take action

They must undertake their tasks.

Report back to the group regularly on progress they are making.

Write up a group report when they are finished.

Present their report in class.

Ask them to make their report available to the educator, principal, clinic (if it is about health), municipality and anyone else who may be interested.

### Extension activity

• Let learners read the ideas for educating their community about groundwater. In groups they can choose and implement one of the ideas listed below, and monitor them so that they do not choose the same idea.

Ideas for educating your community about groundwater:

### **Posters**

Make posters and display them at local shops.

### **Have a concert**

Collect songs about water and rain like the one in this Guide. Ask old people if they know any old songs.

Choose some facts that you want to teach people about groundwater. Make up a drama that includes these facts.

Use the songs and drama to make up a concert. You could ask the local clinic sister to talk about water and health after your concert.

Make small pamphlets that tell people about how to keep groundwater safe or about water and health. Distribute these at your concert.

### **Organise a 'kill the fly' campaign**

Invite people to come up with ideas for killing flies. Give small sponsored prizes to the more useful and most fun ideas.

### **School projects**

Make sure there is water for washing hands at school. There could be a bucket outside each classroom.

### **Make a set of school health rules and display them**

If you do not have good toilets at school talk to the educators and principal about contacting your municipality or the Department of Health to help you get healthy toilets.

When you have these, set up a system for monitoring them and keeping them clean.

### **Make a groundwater and health model**

Take all the information you can from the pictures in this Guide and make a model that shows how important it is to keep groundwater clean. Display the model at school or in the community.

### **Have a competition**

Hold an essay or a drawing competition around groundwater and then give prizes. At the prize giving talk about how important it is to keep groundwater clean.

### **Radio**

Do you have a community radio station? Ask if you can bring some friends and then prepare a discussion about groundwater for the radio.

## **ASSESSMENT**

You can use the following rubric in assessing the learners

	<b>Excellent</b>	<b>Satisfactory</b>	<b>Need attention</b>	<b>Not done at all</b>
<b>Get a project group together</b>				
<b>Research the problem</b>				
<b>Analyse the research and choose a project</b>				
<b>Draw up an action plan</b>				
<b>Take action</b>				

## 9. GOOD SANITATION PRACTICES

### MAIN LEARNING AREA

#### AL LO3: READING AND VIEWING

The learner will be able to read and view for information and respond critically to the aesthetic, cultural and emotional values in texts.

**AS4:** Reads for information: follows information texts,  
-summarises information.

#### INTEGRATION WITH OTHER LEARNING AREAS

##### LO: LO1 HEALTH PROMOTION

The learner will be able to make information decisions regarding personal, community and environmental health.

**AS1:** Plans an action in which laws and/or policies for protecting environmental health are applied to address an environmental health issue.

### ACTIVITY

Learners will be able to:

- Identify different types of toilets.
- Research on sanitation systems.

### BACKGROUND INFORMATION

What does 'sanitation' mean?

Sanitation means collecting and disposing – in a hygienic manner – of waste, including human excreta, household's waste water and rubbish. If this is not done, neighbourhoods become dirty and people get sick. In South Africa we already have 1,5 million cases of diarrhoea (runny stomach) each year in children under the age of 5, as well as outbreaks of cholera. This must be changed through by good hygienic behavioural practices.

Sanitation is vital for good health. Health problems associated with poor sanitation include diarrhoea, dysentery, typhoid, cholera, malaria, bilharzia, worm infestations, eye infections, skin diseases and increased infections in HIV - positive people. Good sanitation leads to increased life expectancy.

Many schools use pit latrines that are inadequate, dirty and unsafe. This all adds up to a potential health time bomb. The government will therefore support communities and households in wiping out the sanitation backlog by 2010.

((a) The Ventilated Improved Pit (VIP) latrine

Although many still consider the VIP toilet to be second rate or inferior, the advantages of well constructed VIP toilets have been proved in many other countries besides South Africa including Zimbabwe, Botswana, Ghana, Tanzania and Lesotho where national and regional sanitation programmes using this technology have been launched and implemented. The VIP is a pit latrine which has been improved by providing a dark sealed pit, a ventilation pipe with a fly screen and a seat cover.

The advantages of a properly built VIP are:

- (a) Eliminates the smell of faeces in the superstructure.
- (b) Prevents the flies from entering and breeding in the pit.
- (c) Prevents insects that have managed to enter the pit from escaping.
- (d) Is adaptable to most situation, including some urban areas.

The disadvantages are:

- (a) It cannot be emptied easily when full.
- (b) Needs relatively costly modification in areas with hard rock, high water table or collapsing sands.

(b) The bucket toilet

bucket is provided for collection of both faeces and urine. For the system to work properly, buckets have to be emptied once a day by ten o'clock in the morning. If this does not happen the bucket attracts many flies and becomes unhygienic and smelly. This system is being eradicated from the country and should not exist beyond 2007/8.

The advantages are:

- (a) Very low set-up cost.
- (b) Can be set up quickly.

The disadvantages are:

1. The system is unhygienic and can attract flies.
2. It is smelly.
- (c) Regular collection of waste needed.
- (d) Off-site treatment necessary.
- (e) Social stigma for the workers.
- (f) High running costs.

(c) Waterborne Flush toilet

The waterborne flush toilet use water for flushing. Both urine and faeces are flushed down the toilet to a sewer which takes the waste to a treatment plant. For proper use the household should have a water connection to the site and should be able to afford the water that is required to flush the toilet every time it is used as well as toilet paper in order to avoid blockage. This is the most convenient system if used and maintained properly by both the householder and the local authority. Unmaintained sewers can be a public nuisance and can be more harmful than pit latrines.

The advantages are:

(a) They can be put inside houses.

The disadvantages are:

- (a) They need a constant supply of water to a yard or a home.
- (b) They need well maintained infrastructure, such as sewers.
- (c) They are expensive to set up in low - density areas.

**Septic tanks**

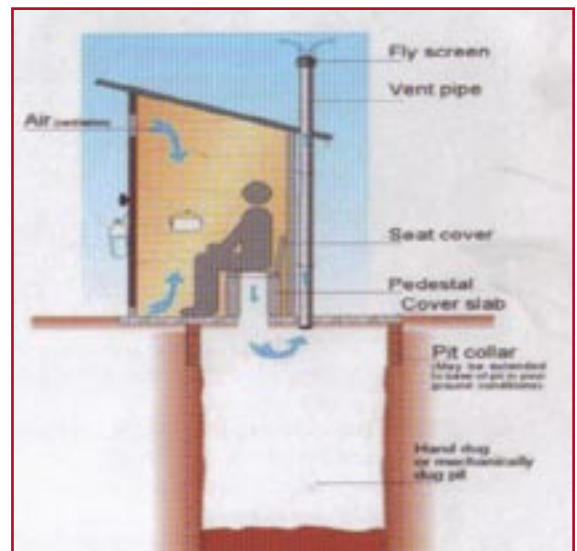
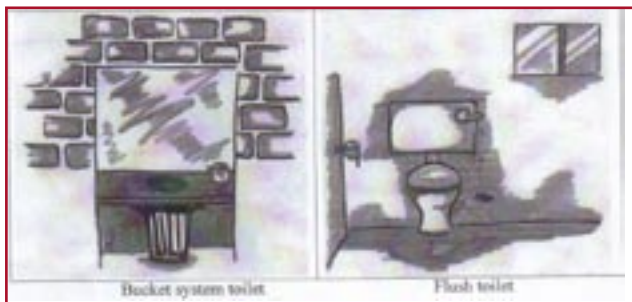
A septic tank is designed for bacteria to degrade (digest) sewage up to a point where the outflow is almost clean water. If this outflow is allowed to soak away in the ground sustainable sewage disposal can be obtained with a very little chance of pollution. Zero pollution can be achieved if rules are followed. Waterborne flush toilets can be used with septic tanks. Waste born flush toilets connected to a municipal water care works also cause pollution when the capacity of the works is exceeded and raw sewage is dumped or spilled into water resources. A broken pipeline also makes for heavy pollution because of volumes.

In this activity learners are given pictures showing different types of toilets i.e. flush toilets, VIP toilet and a bucket system toilet. They need to study them and, working in pairs, discuss the advantages and disadvantages of these toilet systems.

**ACTIVITY 9A: THE ADVANTAGES AND DISADVANTAGES OF THESE TOILET SYSTEMS**

In this activity learners are given pictures showing different types of toilets i.e. flush toilets, VIP toilet and a bucket system toilet. They need to study them and, working with partners, discuss the advantages and disadvantages of these toilet systems.

Learners need to use the following worksheet to tabulate the advantages and disadvantages of these toilet systems.



Toilet systems	Bucket systems	Flushing systems	Ventilated Improved pipe / (VIP) systems
Advantages			
Disadvantages			

In recommending the best toilet system to be used for the particular household, learners would need (after tabulating the advantages and disadvantages) to:

- List the number of advantages in each system.
- List the number of disadvantages.
- Choose which one of the three toilet systems is better for their household/school?

You may discover that learners from rural areas who use homemade pit toilets may not identify themselves with any of the systems identified above. It is essential that the choice of the toilet system is based on the functioning of the system and the number of health risks which that system carries.

### ACTIVITY 9B: RESEARCH ON SANITATION SYSTEMS

This activity aims to broaden the understanding of learners on different types of toilet systems and their functioning. In this activity learners are required to conduct research on these three types of toilet systems that are commonly used and present their research to class. This research should be conducted in the library. If there is no library nearby make sure that you provide them with relevant information about sanitation facilities which can be obtained from a nearby municipality sanitation unit.

- Learners will have to conduct research on the following aspects of the sanitation systems:
  1. The management of waterborne systems.
  2. The management of flushing toilet system.
  3. The management of a Ventilated Improved Pipe (VIP).

You may orientate learners on the structure of their presentation. When assessing their work consider the following aspects, which you will use as the focus of your assessment:

- (a) Topic: Did the learner write the topic? (2)
- (b) Introduction (5)
  - Short
  - Orientate the reader
  - Indicate the scope of the research
- (a) Body of the assignment – is it organised into the following: (30)
  - Topic
  - Subtopics
  - Content – is it enough, is it correct?
  - Did the learner follow the following pattern:
    - o Management of waterborne systems
    - o What is waterborne system
    - o Structure
    - o Functioning of the waterborne system
    - o Advantages and disadvantages
- (b) Recommendations (10)

- Did the learner make concrete recommendations on the types of system which s user-friendly, cost effective and is not posing risk on the lives of people.

(e) Conclusion  
**Total**

(3)  
**{50}**

**You may like to treat this activity as a competition and the learners who presented the best task can win something.**

## 10. WATER RELATED DISEASES

**MAIN LEARNING AREA****LO: LO1 HEALTH PROMOTION**

The learner will be able to make informed decisions regarding personal, community and environmental health.

**AS 2:** Critically analyses the causes of common diseases in relation to socio-economic and environmental factors.

**AS 3:** Describes what a healthy lifestyle is in own personal situation, as a way to prevent disease.

**INTEGRATION WITH OTHER LEARNING AREAS****AL LO3: READING AND VIEWING**

The learner will be able to read and view for information and respond critically to the aesthetic, cultural and emotional values in texts.

**AS4:** Reads for information: -follows information texts, summarises information

**HL LO2: SPEAKING**

The learner will be able to communicate to confidently and effectively in spoken language in wide range of situation.

**AS4:** Demonstrates a range of interaction skills by participating actively in group discussions, motivates point of view.

**HL LO4 WRITING**

The learner will be able to write different kinds factual and imaginative texts for a wide range of purposes.

**AS2:** Produces a range of factual written and multi-modal text for various purposes, using a range of visual and design elements where appropriate by means of recount events, research projects reports, pamphlets, posters and book reviews.

**HL LO5: THINKING AND REASONING**

The learner will be able to use the language to think and reason, as well as to access, process and use information for learning.

**AS2:** Uses language to investigate and explore: locates and assesses information from wide variety of sources.

**SS (G) LO1: GEOGRAPHICAL INQUIRY**

The learners will be able to use enquiry skills to investigate geographical and environmental concepts and processes.

**AS1:** Identifies and selects a variety of geographical and environmental sources relevant to an inquiry. (uses fieldwork and other enquiry methods).

**MATHS LO5: DATA HANDLING**

The learner will be able to collect, summaries, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.

**AS3:** Designs and uses questionnaires with a variety of possible responses in order to collect data (alone and/or as a member of a group or team) to answer questions.

**NS LO1: SCIENTIFIC INVESTIGATIONS**

The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

**AS2:** Conducts investigations and collects data: Collects and records information as accurately as equipment permits and investigation purposes require. Reviews data-collecting procedures during the investigation.

**ACTIVITIES**

Learners will be able to:

- Research different water-related diseases.
- Learn how polluted water causes diseases and what action they can take to decrease the risk of disease.

**You will need:**

- Worksheets for the learners

**GUIDELINES FOR THE CHAPTER**

This chapter provides an opportunity to learners to research water-related diseases, their causes and symptoms.

Learners will know the value of clean water in the prevention of **communicable diseases** and the importance of good hygienic practices. Co-operation is needed to avoid water pollution either through dumping poisonous waste and using rivers as toilets. This exercise teaches the learners and the community that water pollution is detrimental to the quality of life.

**BACKGROUND INFORMATION**

Waterborne diseases are any illnesses caused by drinking contaminated water. Diseases can include infection from bacteria (Salmonella), viruses, through small parasites (Cryptosporida, Giardia, and Toxoplasma). These organisms or

viruses cause diseases like cholera, typhoid fever, malaria, botulism, polio, dysentery, giardia, and hepatitis A. One of the symptoms of these diseases is diarrhoea, which causes about three million deaths throughout the world. The most well known waterborne diseases such as cholera, dysentery and typhoid are leading causes of morbidity and mortality. Sewage is sometimes discharged into rivers where children downstream might be taking a bath or using the water to drink. The simplest water treatment method is boiling. Just bring the water to a boil for at least 1 minute then allow it to cool. But this is not always effective in heavily chemically polluted water supplies.

Since our interest here is drinking water, the road of exposure we will consider is ingestion. Illnesses in the digestive tract (sometimes caused the alimentary canal) are called gastrointestinal diseases. Common symptoms of gastrointestinal diseases are vomiting and diarrhoea. Prolonged and severe diarrhoea is a major cause of death in many parts of the world, and contaminated, untreated drinking water is the principal cause of those afflictions. Think about your symptoms: did you throw up, have a fever, go to the bathroom frequently? How long did your illness last? Did you go to the doctor? Did anyone suggest what made you sick? Chances are very high that there were germs involved.

Germs are everywhere and on us, in us, and around us. Some of them can make us sick, by causing infections, so doctors and scientists work hard to learn as much as they can about them. Water suppliers need to understand germs too, because it is their job to keep drinking water safe.

**ACTIVITY 10A: CONCEPT OF WATERBORNE DISEASES**

- Ask learners to name water related diseases that they know.

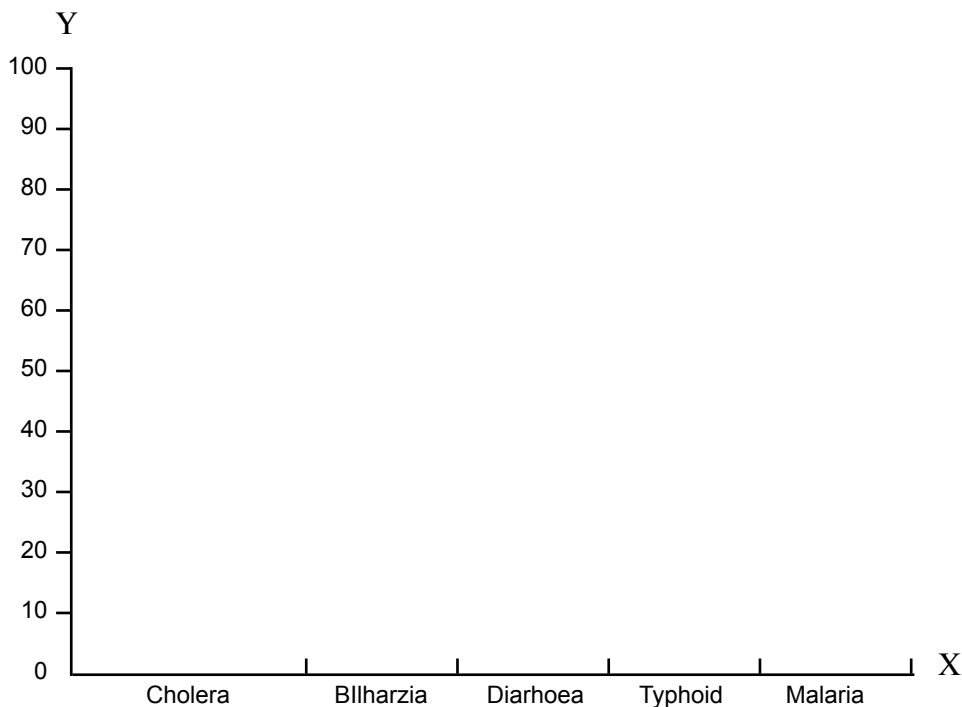
**Read the following fact file to the learners.**

Most diseases in the world are related to water and sanitation. Most rural areas in South Africa have no access to running water; toilets or latrines and more often than not they use watercourses for **defecation** and urination. To break the cycle of diseases there must be improvement in the quality of water that people use. Water related diseases can be spread in other ways which also affect urban communities, such as insect bites and poor hygiene.

- Ask learners to visit the local clinic and find out about the water related diseases that young people visit the clinic to be treated for.
- Use the following worksheet to gather the information.

		Gender		Is this disease familiar to you	
Diseases	No. of cases per month	Boys	Girls	Yes	No
Cholera					
Bilharzia					
Diarrhoea					
Typhoid					
Malaria					
Total					





Ask learners to:

- Use the X and Y axis to plot the graph showing the number of cases for each disease.
- Find out what kind of environment the affected children live in.
- Write the description of the environment on their answer sheet.
- Share the information with the other learners and form a group of at least 5 learners.
- Compare their information by answering the following check list:

(a) Are there any learners that have chosen the same disease as yours?	Yes	No
(b) Does any learner describe the environment the same as you?	Yes	No
(c) Which sex is mostly affected?	Boys	Girls

### ASSESSMENT

Assess the learners on their ability to:

- Gather enough and relevant information.
- Complete all the information required on the worksheet.
- Ability to plot the graph.
- Share their information with the other members of class.

### ACTIVITY 10B: TAKE ACTION

In this activity learners will:

- Choose a water related disease.
- Find out more about the disease they have chosen to study.
- Present their findings orally to class.

### WHAT TO DO

- Tell the learners to visit the library and source information about the water related diseases such as cholera, bilharzia, malaria or typhoid etc.
- Divide learners into groups.
- Allocate a disease to each group.
- Each group should research the causes and symptoms of that particular disease.
- Make sure that the learners consult other members about the disease to avoid duplication.
- Ask learners to record the researched information on the worksheet below.
- Each group needs to make an oral presentation. It can be dramatised/ an interview or role playing etc.

NB: The following information might assist learners that do not have access to the library. Make copies for them to research the disease of their choice.

### **Water pollution and disease**

Most diseases in the world are related to water and sanitation. To break the cycle of disease, there must be improvements in the quality of water that people use. Most rural communities in South Africa do not have access to running water, toilets or latrines and they use watercourses for defecation and urination. In many cases, faecal pollution of water increases the risk of infection of various diseases to those using these courses as their life supporting water source. Groundwater, which is another water source, can become contaminated through unclean irrigation water. Water-related diseases could be spread in other ways which also affect urban communities, such as insect bites and poor hygiene.

Although there are many more, these are some of the most common water-related diseases in South Africa.

### **BILHARZIA**

This occurs, like most diseases, in a cycle with a parasite and different hosts. Bilharzia only occurs in areas where conditions are right for the parasite to complete its lifecycle. The adult parasite is a worm that lives in the bladder or intestine of humans (the main host). They mate inside the body and eggs are released in the urine or faeces of the host. If an infected person defecates and urinates into the water the eggs hatch into the swimming form of the parasite. It then burrows into the body of a snail (the intermediate host). The snails favour slow moving water with plenty of vegetation. Here the parasite changes form and exits out into the water again. This is the stage where it infects humans. If a person contact with contaminated water the parasite will penetrate their skin and move through their body causing illness. Some symptoms of bilharzia include: an itchy rash, headaches, abdominal pain, diarrhoea, bladder infection, fever, enlarged liver and swollen veins. Within South Africa, bilharzia is most common in the Limpopo, the Lowveld and KwaZulu – Natal.

### **MALARIA**

In South Africa Malaria is given very high priority. This disease, which also occurs as a cycle, is caused by a parasite that is transmitted by some species of the female mosquitoes. Mosquitoes breed in water, especially dams, ponds, water tanks, old car tyres, and other hollow objects that can hold water, like this. The best way to protect yourself from Malaria is not leave liter lying around, and to prevent getting bitten by wearing long sleeve clothing and by applying insect repellent to your skin, especially at night. Some symptoms of Malaria: fever, headache, diarrhea, nausea, joint and muscular pains, shivering, sweating and fatigue. Malaria is distributed in the Northern Province, Mpumalanga, Northern KwaZulu- Natal and parts of the Northern Cape.

### **CHOLERA**

Cholera is a disease that is caused by bacteria (*Vibrio cholerae*) that is spread through water contaminated by faeces from an infected person. The bacteria produces a toxin that causes the small intestine to secrete large amounts of fluid, which leads to fluid loss, i.e. diarrhoea and vomiting. People who do not wash their hands after using the toilet can spread the disease. It can also be spread when human faeces is used as a fertiliser for vegetable crops. It is important to remember that even if the person does not show the symptoms of the disease, they could still be infected and spread the disease. Cholera can be found in most places where there is poor sanitation. Some symptoms of cholera: diarrhoea and vomiting. People who have the disease should drink plenty of clean water to prevent dehydration.

**WORKSHEET FOR CAUSES AND SYMPTOMS OF WATER-RELATED DISEASES**

**GROUP NAME /NUMBER.....**

**DATE.....**

**PART 1**

**NAME OF DISEASE**

**CAUSE**

**SYMPTOM**

Cholera

Bilharzia

Diarrhoea

Typhoid

Malaria

**PART 2**

Ask learners to individually complete the following sentences and write the answers in their workbook.

1. How can I change my behavior towards streams and rivers to avoid and prevent the spread of these diseases?-----

-----  
-----  
-----  
-----

2. Describe what a healthy lifestyle is in your own personal view-----

-----  
-----

**ASSESSMENT**

Design an assessment tool to assess the learner's ability to:

- Ability to research all the water related diseases
- Collecting relevant data.
- Learners' presentation will be assessed on:
  - The accuracy of information
  - Their audibility

- Their confidence
- The ability to communicate the information.

### **Glossary of Terms**

**Communicable disease** – A disease that is capable of being passed on easily.

**Defecate**- To discharge waste from the body through the anus.

**VIP**-Ventilated Improved Pit.

**Bilharzia**- A disease caused by infestation of the body with blood flukes.

**Groundwater** – This is water that occurs in the spaces and cracks of rocks and soils such as sand, gravel, clay and silt, below the surface of the land

## 11. PROTECT WATER FROM FAECAL CONTAMINATION

### MAIN LEARNING AREA

#### LO: LO1: HEALTH PROMOTION

The learner will be able to make informed decisions regarding personal, community and environmental health.

**AS 4:** Demonstrates informed, responsible decision making about health and safety.

#### INTEGRATION WITH OTHER LEARNING AREAS

#### AL: LO 4: WRITING

The learner will be able to write different kinds factual and imaginative texts for a wide range of purposes.

**AS 1:** Writes to communicate information: Writes short explanations of how and why something happens

**AS 5:** Design media texts.

#### A&C: LO 2: REFLECTING

The learner will be able to reflect critically and creatively on artistic and cultural processes, products and styles in past and present contexts.

**AS 3:** Composite: Uses art to demonstrate an awareness of environmental concerns.

### ACTIVITY

Learners will be able to:

- Design and produce a poster/ brochure / pamphlet that effectively communicates information.
- Illustrate the text, by means of diagrams.

#### You will need:

- Drawing paper or board
- Crayons
- Pens/ pencils
- Information booklet

### GUIDELINES FOR THE CHAPTER:

This is a creative writing exercise that is a follow up of the previous two exercises in this module. It is an example of an awareness creation activity that can be used in action projects, campaigns and competitions. The purpose of this one in particular, is to spread awareness about how groundwater sources can be protected from faecal contamination.

The learners will produce an information brochure / flyer that best expresses the issue of protecting ground water sources. Emphasis is not on the artistic talent or decorative value, but rather on its educational power - the power to raise awareness and effectively get the message across.

### BACKGROUND INFORMATION:

Most rural communities rely on natural water supplies like groundwater, rivers, streams and springs. These are open to all kinds of pollution and are then a threat to the health of the communities using that water. Pollution mostly happens when human and animal waste seep into these water sources. If the water is polluted it can carry living organisms that cause diseases. It can taste bad. **Water should be protected from faecal contamination** as people and livestock need clean water as a way of combating diseases and death.

As a means of raising awareness about the issue of protecting ground water sources from fecal contamination learners can be engaged in activities like designing information brochures that inform as well as demonstrates how ground water sources can be protected.

#### Important things that you can do to decrease the risk of diseases:

- Do not defecate or urinate near water sources.
- Wash your hands with soap and water after going to the toilet.
- Do not drink water that you think might be unclean – boil it if you are unsure.
- Wash all fruit and vegetables well before eating them and do not cook with unclean water.
- Do not leave empty containers or any litter lying around for disease transmitting insects to breed in.
- If you have access to VIP toilets, ensure that they are away from the water source that is used for drinking and bathing. The VIP toilet should not penetrate the groundwater table.

#### WHAT TO DO:

- Open a class discussion based on the previous two exercises about the causes and effects of contaminated water.
- The outcome of this discussion must be to lead learners to the problem statement for the information brochure

they are going to design.

### **ACTIVITY 11A: SPREAD THE MESSAGE ABOUT THE RISK OF WATER RELATED DISEASES**

- Divide learners into groups.
- Put folded pieces of the pictures below on the table and let each group choose a picture.
- Ask each group to design an information brochure/ flyer for the community outreach programme of their choice.
- The picture is a guide to the key message of their brochures. They may use the picture as an illustration in their brochure (optional) or make their own drawings.
- The following aspects should be covered in their flyer:
  1. The problem statement
  2. Action taken: Explanation of action as it is depicted in the picture.
  3. How will that action contribute towards solving a problem?
  4. Justification of whether your flyer demonstrates a reasonable answer to the problem identified.
- Allow them enough time to draft and complete their work, even if it is taken home as homework.






### **ACTIVITY 11B: SOLVING THE PROBLEM OF FAECAL CONTAMINATION**

In this activity learners will:

- Explore possible ways of solving the problem of faecal contamination.
- Discuss how each way contributes to clean health.
- Suggest other ways of solving the problem.
- In their groups let them design an action plan of how they are going to distribute the flyers to the community. (They can do that via their environmental club's community outreach programmes, the school's open day etc.)
- Refer to the information brochure for guidelines on how to design an action plan.
- Let each group present its brochure and action plan to the class.

NB: Remember these presentations can contribute toward the implementation of the health and safety focus area of your school environmental policy, so it can also be presented to the environmental club.

Each of the following pictures demonstrates a possible way to solve the problem of faecal contamination.

 <p>Pit latrines built on a slope at least 20cm below the borehole</p>	 <p>Double pit latrine</p>
 <p>Pit latrines lined with concrete</p>	 <p>Covered tanks</p>
 <p>Fenced-off water sources</p>	

- Ask learners to redraw the following table in their answer sheet.

Possible Way	Possible Problem	How does it solve the problem
1. Pit latrine on a slope at least 20cm below the borehole.		
2. Double pit latrine.		
3. Pit latrine lined with concrete.		
4. Covered tanks.		
5. Fenced-off water sources.		

Then they must:

- Look carefully at the above picture.
- Discuss with their partners how do the pictures contribute to solving the problem of faecal contamination.
- Write their points next to the third column.
- Learners may suggest other ways to solve the problem.

### ASSESSMENT:

Design an assessment tool to assess the learners' ability to:

- Design and produce a brochure/ pamphlet that effectively communicates information.
- Exploit the pictures for the development of an action plan.
- Explain how the action plan developed contributes towards solving the problem at hand.
- Justify how the flyer demonstrates a reasonable answer to the problem identified.
- Apply creative writing skills to educate others about environmental health issues.

- In designing multi-modal texts like posters, flyers, brochures, book reviews etc the following concepts need to be considered:

**Shock value:**

If it shocks its viewer it will stick in their mind and be remembered for some time. However, beware of alienating your audience. Ensure that it will have a positive effect.

**Comic value:**

A humorous way of getting the message through is very effective. People remember jokes more than they remember most things, and a funny piece may catch the viewer's attention and stick in their minds more effectively. However, be careful not to get so caught up in entertaining your audience that you don't get the message across strongly enough.

**Information overload:**

Each word must be relevant. Economy of expression is the key to creating posters and flyers - the message must be short and to the point. Beware of overloading your viewer so that they stop reading before they've got the message. Your message must be understandable and memorable to everyone who sees it, even if they cannot read very well.

**Attention grabbing:**

To make your piece noticeable and memorable, use colour, large words and big pictures - draw things people can easily recognise and grab their attention.

**GLOSSARY OF TERMS**

**Water quantity audit** – A process of determining the amount of water used and wasted.



# WATER SAFETY

## 12. BE WATER WISE

### MAIN LEARNING AREA

#### LO: LO1 HEALTH PROMOTION

The learner will be able to make informed decisions regarding personal, community and environmental health.

**AS4:** Demonstrates informed, responsible decision making about health and safety.

### INTEGRATION WITH OTHER LEARNING AREAS

#### HL: LO4 WRITING

The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.

**AS1:** Writes and communicate information.

### ACTIVITY

In this activity we learners will:

- Study general water safety tips.
- Learn the basic water safety tips applicable to different water-related environments.
- Read more about the safety tips in other aquatic environments.
- Design posters that will be used to educate other learners and children about water safety.

### BACKGROUND INFORMATION

Many children, mainly between the ages 15 – 18 view a river, pool or ocean as a tempting means of cooling off during hot conditions. Beaches, community pools and rivers and dams are always packed during summer times. Children usually enjoy water, but neglect the harmful effects that the cold water can have on their strength to sustain in water. Staying in water too long can lead to fatigue, which might eventually lead to drowning. Most of the young people who drown are often the victims of their own judgement of their swimming ability. Knowing how to swim would minimise the dangers of drowning which is considered the third most common cause of death among young people.

### GUIDELINES FOR THIS CHAPTER

This chapter is an extension of the activities that will make learners more aware of the dangers of ignorance when playing in water. In grade 7, learners were introduced to the general water safety basics in few of the many aquatic environments. In this chapter learners will be introduced to the precise safety signs that alert learners about the dangers of swimming in certain types of aquatic environments.

### ACTIVITY 12A: GENERAL WATER SAFETY TIPS

1. Start your lesson by asking learners if they remember the following safety tips:
  - The best thing to do to stay safe is to learn how to swim.
  - Always swim in the company of adults or in areas supervised by a lifeguard.
  - Read and obey all rules and posted signs.
  - Adults should ensure that children or inexperienced swimmers swim in shallow water and wear approved personal flotation devices (PFDS) when around the water.
  - Do not swim when too tired, too cold, too far from safety, having had too much sun, or after you have done too much strenuous activity.
  - Know the local weather conditions and forecasts. No swimming if the weather is bad or if there are signs of bad weather.
  - Enter feet first when entering the water.
  - Enter headfirst only when the area is clearly marked for diving and has no obstructions.
  - Do not mix alcohol with swimming, diving or boating.
  - Know how to prevent, recognise, and respond to emergencies.
  - Select and mark a supervised safe swimming area.
  - Never enter head first into a river, lake or dam.
2. Ask the learners to indicate which of the safety tips they have been introduced to or they know.
3. Ask them which type of aquatic environment they have swam in and what dangers

they have observed when swimming in that type of the environment.

### **What do learners have to do?**

The following are some of the general tips that learners need to know when playing in different types of aquatic environments. Learners should read the tips and complete the quiz.

#### **Beach safety**

- Protect your skin from direct sunlight between 10:00 a.m. and 4:00 p.m. and wear sunscreen.
- Drink plenty of water and even if you do not feel thirsty. .
- Watch for signs of heat stroke: heat stroke is life-threatening.
- Wear eye protection.
- Wear foot protection.

#### **Lakes and Rivers**

- Learn how to swim.
- Select a supervised area. A trained lifeguard who can help in an emergency is the best safety factor. Even good swimmers can have an unexpected medical emergency in the water. Never swim alone.
- Select an area that is clean and well maintained.
- Select an area that has good water quality and safe natural conditions.
- Make sure the water is deep enough before entering headfirst. A feet first entry is much safer than diving.

#### **Ocean safety**

- Learn how to swim.
- Stay within the designated swimming area, ideally within the visibility of a lifeguard.
- **Never** swim alone.
- Check the surf conditions **before** you enter the water. Check to see if a warning flag is up or check with a lifeguard for water conditions, beach conditions, or any potential hazards.
- Stay away from piers, pilings, and diving platforms when in the water.
- Keep a lookout for aquatic life. Water plants and animals may be dangerous. Avoid patches of plants. Leave animals alone.
- Make sure you always have enough energy to swim back to shore. Don't try to swim against a current if caught in one. Swim out using the flow of the current.

#### **Home pools**

- Learn to swim. The best thing anyone can do to stay safe in and around the water is to learn to swim - this includes adults and children.
- Never leave a child unobserved around water. Your eyes must be on the child at all times. Adult supervision is recommended.
- Enclose the pool completely with a self-locking, self-closing fence with vertical bars.
- Never leave furniture near the fence that would enable a child to climb over the fence.
- Always keep basic lifesaving equipment like a pole, rope, and personal flotation devices (PFDs) by the pool and know how to use it.
- Keep toys away from the pool when it is not in use. Toys can attract young children into the pool.

#### **Keeping children safe in, on, and around the water**

- Maintain constant supervision. Watch children around any water environment (pool, stream, lake, tub, toilet, bucket of water), no matter what skills your child has acquired and no matter how shallow the water. For

younger children, practice "reach supervision" by staying within an arm's length reach.

- Don't rely on substitutes. The use of flotation devices and inflatable toys **cannot** replace parental supervision.
- Enroll children in a water safety course or [Learn-to-Swim classes](#).

**QUIZ**

Learners will have to use the above general safety tips to answer the following quiz:

1. What is a common general water safety tip applicable to the above aquatic environments.
2. Why is open water so dangerous to swim in? Give at least three reasons.
3. In which aquatic environment, a river or a pool is it safer to swim? Give at least three reasons.
4. How can cold water affect your swimming ability?
5. Why is diving into shallow water dangerous?
6. Say you find your friend drowning, what are the things that you can use to rescue him/her? Name three things.
7. Why is it a bad idea to jump in to try to save someone?






**ACTIVITY 12B: Understanding signs**

To keep yourself safe, always look for the signs that will warn you of the dangers in an aquatic environment.

In this activity learners are learning the signs that warn them about the dangers of water. The following sheet indicates the general signs used across the world. Some of these signs are available in most of the controlled communal pools or beaches.

Learner should study the following sheet with water safety signs and use it to answer the quiz.

2.1. What do these signs mean?

		
(a)	(b)	(c)
		
(d)	(e)	

2.2. Have you seen any of these signs in your area?

2.3. Give a brief description of the area in which you normally see any of these signs.

## Extension

In this activity, learners can choose any of the aquatic environments and design a poster that will educate members of the public about the dangers of aquatic environment.

In assessing the posters, you need to look at the following

Skill	Competency level			
	1	2	3	4
1. The appearance of the poster				
2. The visibility of the poster				
3. The ability of the poster to send a message				
4. Fitness for purpose				

1. The learner has failed to execute this skill 2. Trouble has been taken to ensure that this skill is exposed  
3. The learner has shown an ability to execute this skill 4. The skill has been achieved excellently

- Design posters that would be used to educate other learners and children about water safety.

# FORESTRY AND IAP'S

## 13. INVASIVE ALIEN PLANTS

### MAIN LEARNING AREA

#### AL: LO3 READING AND VIEWING

The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.

**AS5:** Analysis photographs in texts (e.g. advertisement and newspapers).

- Identifies what has been left out of the photo and why.

#### NS: LO2 CONSTRUCTING SCIENCE KNOWLEDGE

The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

**AS3:** Interprets information by translating tabulated data into graphs, by reading off graphs, and by making predictions from patterns.

### INTEGRATION WITH OTHER LEARNING AREAS

#### MATHS: LO1 NUMBERS, OPERATIONS AND RELATIONSHIPS

The learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.

**AS4:** Solves problems in context including context that may be used to build awareness of other Learning Areas, as well as human rights, social, economic and environmental issues such as:

**Solve problems that involve ratio and rate.**

#### ACTIVITY:

**The learner will be able to:**

- Compare two pictures.

#### Background Information

A species of a plant or animal which does not occur naturally in an area (i.e. is not indigenous), but which has been introduced there by people is called alien. Examples of plants which had been brought to South Africa by people include roses and mealies. Not all alien species become invasive, that is, spread so rapidly that they take over the local environment and become a threat to indigenous species.

Invasive alien plants are one of the greatest threats to natural ecosystems and cost the country a lot of money. They reduce our already scarce water supplies, are a threat to biodiversity, take over agricultural land, create great fire hazards, and in these and other ways, cause great economic losses – the equivalent of 4% of our Gross Domestic Product each year.

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 close to extinction.

#### Guidelines for the activity

- The following are the pictures of the same area.
- The first picture shows the river and surrounding vegetation before the invasive alien plants had been cleared.
- The second picture shows the same area after the invasive alien plants had been cleared.

Picture 1



A stream in the Eastern Cape that has been invaded by black wattles, effectively drying it up

Picture 2



A stream in the same area but where invading wattles have been cleared and stream flow and biodiversity have returned.

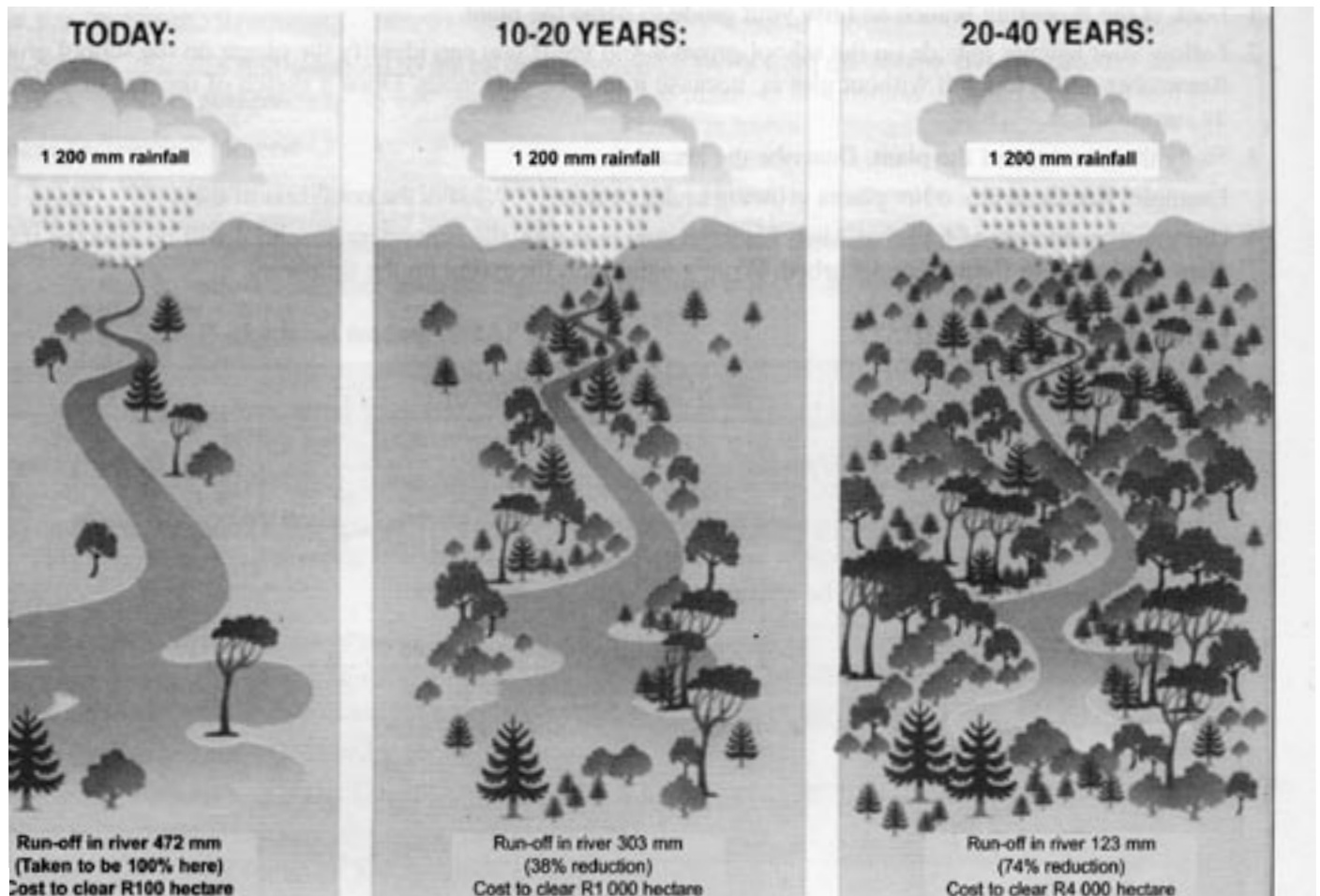
### ACTIVITY 13A: Life and Living

1. Ask learners to compare the two pictures using the following guidelines:
  - a. Plants growing in the area.
  - b. Amount of water visible.
  - c. Amount of sunlight that the river receives.
2. Use your knowledge of invasive alien plants to give a possible reason for the water level of the river in picture 1.
3. What do you think brought about the change in the water level in picture 2?
4. All the plants in this picture 2 are non – invasive (indigenous) plants. What does it tell us about the water requirements of these plants?
5. Why are invasive alien plants such a problem?



## ACTIVITY 13B

The following pictures show how invasive alien plants can change a catchment area in a period of 40 years.



### Ask learners to:

1. Calculate the amount that the run-off will reduce in 40 years.
2. What (i) increases and (ii) decreases in the above pictures?
3. Formulate a conclusion about the effect of invasive alien plants on our water resources.

### ASSESSMENT

3	2	1	0
Compared pictures accurately on 3 levels	Compared pictures accurately on 3 levels	Only 1 level	Inaccurate / made no attempts
	Gives a sensible reason for the water level in picture 2.	Reason is incomplete but makes sense.	Not relevant / made no attempt.
	Conclusion concerning the needs of indigenous plants is accurate.	Sensible but incomplete	Not relevant / no attempt made
	Sees the relationship between an increase in IAP's and the increase / decrease of water in that area.	Makes sense but incomplete.	Made no attempt / does not see relationship.
	Calculation accurate	Calculation correct	Calculation incorrect

# FORESTRY

## 14. INDIGENOUS AND NON- INDIGENOUS TREES

### MAIN LEARNING AREA

#### NS LO2: CONSTRUCTING SCIENCE KNOWLEDGE

The learner will be able to interpret and apply science, technological and environmental knowledge.

**AS2:** Categorises information: Applies classification systems to familiar and unfamiliar objects, events, organisms and materials.

- Uses a simple classification system to group root of plants, including unfamiliar species, and link them to dicotyledon vs. monocotyledon classification.

### INTEGRATION WITH OTHER LEARNING AREAS

#### HL LO3: READING AND VIEWING

The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.

**AS3:** Discusses socio-cultural, environmental and ethical issues contained in texts and identifies the aspects of texts which carry the values related to them (e.g. content, language, artwork, point of view and characterization).

### ACTIVITY

Learners will be able to:

- Learn about types and uses of trees.

#### Indigenous trees

- Trees that naturally occur in a particular region, area, ecosystem or habitat.
- They grow without direct or indirect human actions.
- They are known as trees that have existed here in our country before white people arrived from Europe to South Africa.

#### Non-indigenous alien trees

- Also known as Alien or foreign trees.
- They are trees that were brought in from other countries, regions, areas, habitats or ecosystems.
- Trees are moved or brought in by people and even animals.
- They were brought in for many reasons, such as to beautify an area, to act as windbreakers and to stabilise sand dunes.

#### Invasive alien trees

- Some of the non-indigenous trees are invasive aliens.
- They spread rapidly.
- They take over the local environment.
- They have a negative impact on the environment.

#### Negative impact of invasive alien trees on the environment

- They are a great threat to natural environmental ecosystems.
- The roots of some trees go deep down and they use up vital groundwater.
- They use more of the already scarce supply of drinking water.
- They are a threat to the biodiversity.

(Biodiversity is the variety of our indigenous plants, animals and habitats.)

- They take over cultural land.
- They create great fire hazards. (Fynbos needs fire, but the alien trees causes fire that is too hot.)
- Alien trees are a great threat to eco-tourism.
- They are a threat to the medicinal potential of indigenous trees.
- They increase erosion.

### ACTIVITY 14A: CLASSIFICATION OF IAP'S ON OUR ENVIRONMENT

1. Ask learners to choose **the correct word**: (bio- iversity, indigenous, non-indigenous, invasive alien plants)

(a) They grow naturalyl in a particular habitat.

-----

(b) They grow fast and they take over local areas.

-----

(c) They were planted to stabilise sand dunes.

----- (3)

2. Name any 3 **non-indigenous** plants.

(a)-----

(b)-----

(c)----- (3)

3. Name any 2 **invasive alien** trees.

(a)-----

(b)----- (2)

4. Ask learners to mention any **5** reasons why we say that **invasive Alien** trees have a negative impact in our environment.

(a)-----

(b)-----

(c)-----

(d)-----

(e)----- (5)

5. Let the learners fill in the missing words.

(a) Bio - diversity is the variety of our indigenous----- and-----.

Total Marks: 15

**Formal Assessment**

Learner's	Code	Marks allocated
Performance has exceeded the requirements of the learning outcome of this grade.	4	12-15 Marks
Performance has satisfied the requirements of the learning outcome of this grade.	3	8-11 Marks
Performance has partially satisfied the requirements of the learning outcome of this grade.	2	6-7
Performance has not satisfied the requirements of the learning outcome of this grade.	1	Under 5 marks

Code:.....

Teacher:.....

Date:.....

**ACTIVITY 14 B: Uses of Trees**

**Poster Activity**

Ask learners to work in groups for this activity. They can draw, cut and paste newspaper pictures to highlight the uses of trees. Pictures must be labelled.

**Group Assessment**

**Rubric**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
1. The poster has a topic				
2. Pictures relates to the topic				
3. Pictures have labels				
4. The poster has a border				
5. Words and pictures on the poster are big enough to see from a distance of at least 2 metres.				

Teacher.....

Date.....

Name of learners:

1.....

2.....

3.....

4.....

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