



Wildlife & Environmental Education



A sourcebook for Primary Schools



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Foreword

The development of the Wildlife and Environmental Education Sourcebook for primary schools has come at the right time when the Ministry of Education is reviewing the National Primary Curriculum (NPC). This will ensure that the primary school curriculum is relevant and responsive to the needs of Malawi society.

This is in line with the Malawi Agenda 2063 (MW2063) specifically enabler 7, the Global Action Programme (GAP) on Education for Sustainable Development (ESD) and the Malawi National Strategy for Sustainable Development (NSSD) with the goal to manage the environment responsibly, prevent degradation, provide a healthy life for all, protect the rights of future generations and conserve and enhance biodiversity. Further, the Education Act 2013, section 76 (1) stipulates that the national curriculum in schools should be relevant and responsive to the needs of students and society. As such, this sourcebook is necessary for preparing learners to become responsible citizens who will participate fully in the country's development agenda.

Recently, there has been a decline in the status of wildlife and the environment coupled with the destruction of natural habitats through deforestation, overexploitation, pollution, poaching and other human activities. In response to the challenges, the Malawi government reviewed various related legislations and policy frameworks to contain the situation. These include National Parks and Wildlife (Amendment) Act, 2017, the Environmental Management Act 2017 and the amended Forestry Act 2020, to provide for sustainable management of the environment and wildlife.

An audit of the curriculum showed that the primary school curriculum did not contain adequate content on wildlife and the environment. Ministry of Education (MoE) and the Malawi Institute of Education (MIE) therefore felt it necessary to include wildlife and environmental issues in the curriculum so that the curriculum should be relevant in addressing emerging issues.

Being a catalyst for development, education equips individuals with knowledge, skills, values, and attitudes to enable them to perform their roles more effectively and to promote and sustain the social-economic development of Malawi. Schools, therefore, play a critical role in the provision of knowledge, skills, values, and attitudes which are crucial for enabling Malawians to preserve wildlife and the environment.

School children are probably the most effective change agents. Any intervention coming through schools usually has a long-lasting impact on their day-to-day life. They can also influence their peers and parents to change their behavior in line with the acquired skills and values.

It is against this background that the Ministry of Education decided to develop a sourcebook on wildlife and the environment to be used by teachers and learners in primary schools for reference purposes. It is envisaged that the content in this sourcebook will complement the existing topics in the curriculum. It is also expected that this sourcebook will inform the ongoing primary school curriculum review so that issues of wildlife and the environment are incorporated at the right scope and depth.

It is my sincere hope that MoE, through DQAS and MIE, will ensure that the content in this sourcebook will be imparted to all primary school teachers and learners in Malawi and enhance sustainable management of the environment to achieve Malawi Agenda 2063. Finally, I wish to express my gratitude to the team that developed this sourcebook. A word of thanks and appreciation is also owed to the Nyika Vwaza Trust (UK) and Born Free Foundation (UK) through Lilongwe Wildlife Trust for the financial support towards the development of the sourcebook.



Mangani Chilala Katundu, PhD
Secretary for Education

Introduction to sourcebook

The Wildlife and Environmental Education Sourcebook has been designed to provide supplementary information to existing wildlife and environmental topics in the primary school curriculum. It will help teachers and learners widen their understanding of environmental issues as these are also included in the sourcebook for them to appreciate the connection between wildlife and the environment.

The sourcebook is written in such a way that both teachers and learners will easily understand. Illustrations have been included to explain some concepts. Practical activities and review exercises are included to enhance teachers' as well as learners' understanding of the concepts. The overall objective of the sourcebook is to equip teachers and learners in primary schools with knowledge and skills in wildlife and environmental conservation measures.

How to use the sourcebook

The sourcebook has been prepared to be used by both teachers and learners in primary schools. However, it is also useful to other stakeholders.

Teachers are encouraged to integrate wildlife and environmental content into various relevant subjects. There are 8 units in the sourcebook. Each unit has the following components: introduction, learning outcomes, content and activities, summary, review exercises, glossary, and references. The following are guidelines on how teachers and learners may handle each component:

Introduction	It provides an overview and the rationale for the unit as well as the way forward.
Learning Outcomes	The expected outcomes which the user should achieve after going through the content and activities.
Content and activities	Each unit has sub-topics following the learning outcomes. The sub-topics provide content which is important for knowledge acquisition and application. Each sub-topic is followed by an activity or a series of activities which help the teachers and learners to enhance their understanding of the content under that sub-topic.
Summary	It outlines the main points covered in a unit.
Review Exercises	Review exercises are meant to assess understanding of the unit.
Glossary	This is a list of key terms used in the unit and their meanings.
References	This is a list of publications containing relevant information on a topic covered in a unit. These publications can be consulted for more details by the teacher.

Abbreviations and acronyms

BFF	Born Free Foundation
CEPA	Centre for Environmental Policy and Advocacy
DNPW	Department of National Parks and Wildlife
DQAS	Directorate of Quality Assurance
EAD	Environmental Affairs Department
FRIM	Forest Research Institute of Malawi
LPG	Liquefied Petroleum Gas
LWT	Lilongwe Wildlife Trust
MIE	Malawi Institute of Education
MOE	Ministry of Education
PEA	Primary Education Advisor
TTC	Teacher Training College
UK	United Kingdom
NPC	National Primary Curriculum
NSSD	Malawi National Strategy for Sustainable Development
NVT	Nyika Vwaza Trust
TTC	Teachers Training College
WESM	Wildlife and Environmental Society of Malawi

UNIT 1

Environment and biodiversity

Introduction

The environment comprises several features which include living and non-living things. The environment plays a very important role in influencing social and economic development at household and national levels. Most Malawians depend on renewable natural resources from the environment for their livelihoods.

This Unit will look at the environment, its components, importance and ways of protecting it. It will also examine biodiversity (variety of plant and animal life in a particular habitat), types of ecosystems (types of connections between living and non-living things), importance and threats to biodiversity and ways of protecting biodiversity.

The knowledge gained in this unit will assist you to appreciate the environment and biodiversity and understand how to protect and manage them.

Learning outcomes

By the end of this Unit, you should be able to:

- ▶ define the term environment
- ▶ describe the components of the environment
- ▶ describe the impact of human activities on the environment
- ▶ explain ways of managing the environment
- ▶ explain the meaning of the term biodiversity
- ▶ analyse the importance of biodiversity
- ▶ examine types of ecosystems
- ▶ describe the threats to biodiversity
- ▶ explain ways of managing biodiversity

Activity 1.1

Defining *the term environment*

- 1 Define the term environment.
- 2 Describe the main features in the definition of the term environment.
- 3 Identify things that make up the environment at home and school.

Understanding the term environment

The environment refers to the surroundings or conditions in which a person, animal and plant live.

It is also defined as the physical and biological surroundings of a human being. The physical surroundings include land, water, atmosphere, climate, sound, smell, taste and the biological surroundings include fauna and flora (animals and plants).

Activity 1.2

Describing components of the environment

- 1 List the components of the environment.
- 2 Describe each component of the environment.
- 3 Identify some examples of the environment found at school under each component.
- 4 Draw four food chains from the food web shown in figure 1.2.

Components of the environment

In general, the environment consists of the following:

- a. Biological component (biotic)
- b. Physical component (abiotic)

Biological component

The biological component of the environment includes all living things. It is also called the biotic component. An ecosystem refers to a group of living organisms (animals, plants and microorganisms) that interact with each other in a specific environment. Organisms in ecosystems are classified as producers, consumers and decomposers. They occupy different levels in a food chain or food web, starting with primary producers which are the plants and trees, through primary and secondary consumers such as antelopes or frogs to the apex predators such as large carnivores like lions or birds of prey like eagles. **Figure 1.1.** shows two food chains, one with the lion as the top predator and one for the eagle as the top predator. A combination of food chains forms a food web as shown in **Figure 1.2.**

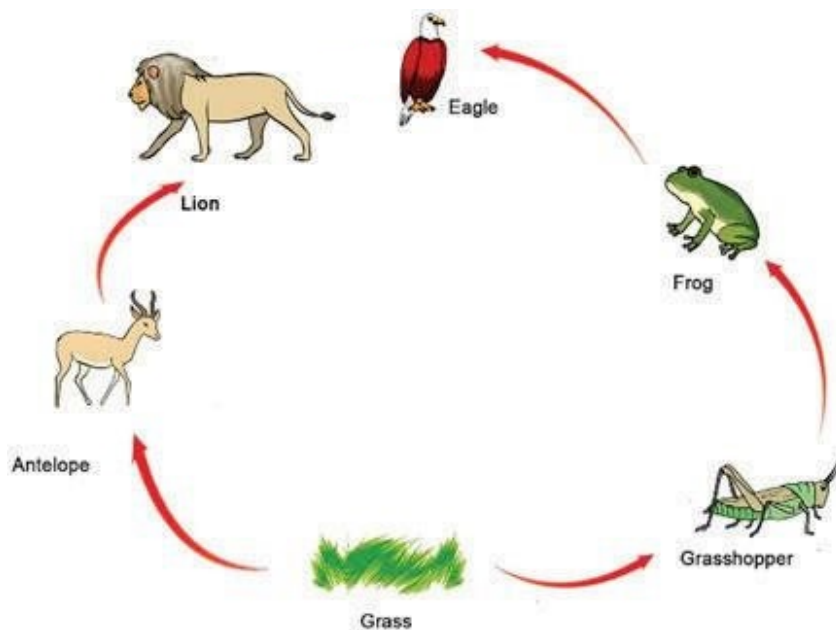


Figure 1.1. Food chain

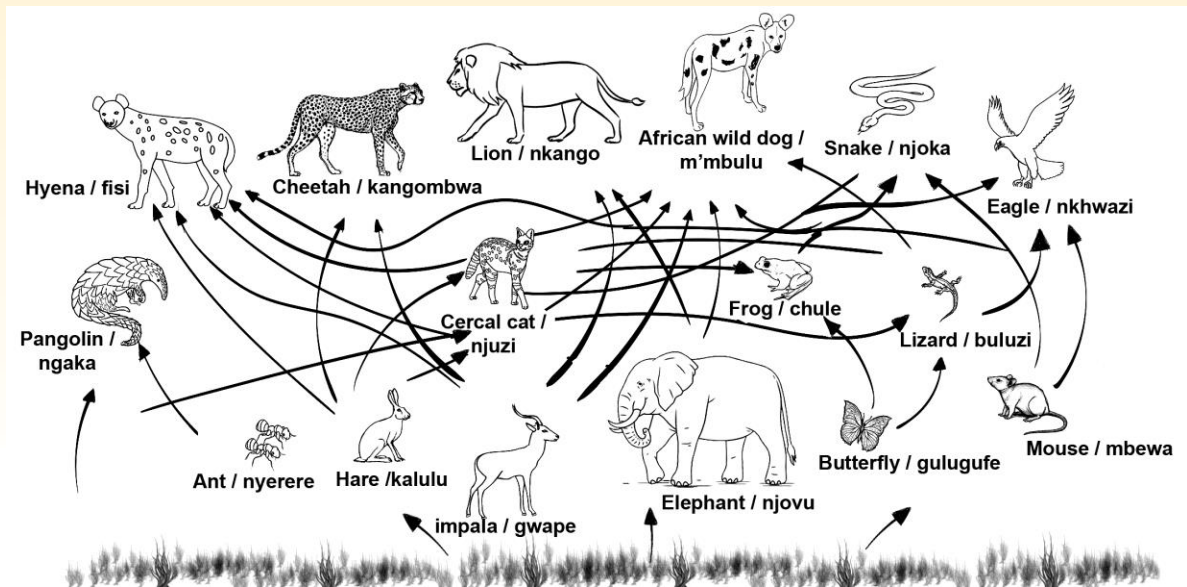


Figure 1.2: Food web

Physical component

The physical component of the environment refers to the non-living aspect of the environment. This includes air, water and soil. The physical component of the environment is broadly classified into three groups as follows:

- a. Atmosphere: The layer of the earth covered by air.
- b. Hydrosphere: The layer of the earth covered by water.
- c. Lithosphere: The solid part of the earth containing soil and rocks.

Activity 1.3

Describing the impact of human activities on the environment

- 1 Conduct research in your community on human activities that damage the environment.
- 2 Write messages on posters and placards that encourage people to stop or minimise activities that damage the environment.
- 3 Organize an open day at school or a visit to the school's surrounding communities with the aim of sensitizing people to stop or minimise activities that damage the environment.
- 4 Display the posters and placards during the open day or visit to the communities.

Negative effects of human activities on the environment

Some human activities affect the environment. These bring negative changes or disturbances to the environment such as water resources degradation (loss of water quality and quantity) as shown in **Figure 1.3**, soil degradation, air pollution and loss of habitat and wildlife.



Figure 1.3: A polluted river

Activity 1.4

Discussing ways of managing the environment

- 1 Mention ways of managing the environment.
- 2 Explain ways of improving quality of water shown in Figure 1.3.
- 3 Describe each of the identified ways of managing the environment.
- 4 Explore ways of managing the environment at school and home.
- 5 Explain effects of poor environmental management.

Ways of managing the environment

a. Recycling

Recycling is a process of changing waste materials into new materials and objects. Examples of materials that can be recycled include paper, plastic, wood, water and metal.

b. Reduce consumption

i. **Conserve and reduce water consumption**

Water is life. There is need to conserve it. It is therefore crucial to do whatever can be done in order to prevent/reduce water pollution and conserve it. There are a number of ways of saving water, some of them include:

- Turning the tap off when brushing teeth
- Planting vegetation around the water sources
- Harvesting rain water
- Having specific places for livestock to drink water
- Avoiding throwing used oils and paints into the drains or on the ground as they can lead to polluting water bodies such as rivers
- Avoiding washing cars on a bare land/ground
- Avoiding using hose pipes when washing cars or watering gardens (at school or home)
- Reporting water pipe damages to the authorities

ii. **Conserve electricity**

Some of the ways of saving electricity include:

- Turning off electric appliances after use
- Replacing bulbs that use a lot of energy (high voltage bulbs) with energy-saving bulbs

iii. **Expand the use of electricity**

Increase number of people using electricity by connecting more households to the electricity grid to reduce use of wood or wood products for energy which results in environmental degradation.

iv. **Plant trees**

Planting trees has the following benefits:

- Providing oxygen which is a source of fresh air
- Providing shade during hot days
- Removing carbon dioxide from the atmosphere
- Preventing run-off of water, protecting the soil and helping to stop flooding
- Providing habitat for some living organisms
- Influencing rainfall

v. **Reduce the use of chemicals**

Chemicals and pesticides pollute water and soil causing diseases to human beings and other living organisms. One of the ways of reducing the use of chemicals is planting crops using organic methods such as growing vegetables without using chemicals and pesticides.

vi. **Make compost manure**

Making composite manure from waste matter helps to reduce littering. Compost manure is efficient and causes no harm to the environment and helps to reduce land pollution.

vii. **Use rechargeable batteries**

Batteries are extremely dangerous for the environment, unfortunately, only a

fraction of these batteries are recycled. The rest are thrown away immediately after the first use, causing harm to the environment. It is important to use rechargeable batteries as one way of protecting the environment as they take long to be disposed of as they can be recharged many times instead of buying new batteries.

viii. **Quit smoking**

Smoking tobacco cigarettes is very dangerous to the health of human beings. Some diseases which lead to death are caused by smoking tobacco cigarettes. It also contributes to air pollution affecting people who do not smoke. In addition, throwing cigarette butts on the ground increases littering and land pollution.

ix. **Vehicle maintenance**

Smoke and gases released by vehicles increase air pollution. Vehicles that are not well-maintained release a lot of gases and smoke into the atmosphere. It is important to maintain vehicles so that they should be in good condition in order to reduce air pollution.

x. **Environmental awareness**

Discussing environmental protection with your friends, family members and communities is helpful. The more people are aware of environmental protection methods, the more chances that we will make things better. All living organisms live on the same planet and it is everyone's responsibility to protect it.

Activity 1.5

Discussing the meaning of the term biodiversity

- 1 Define the term "biodiversity".
- 2 Discuss the meaning of the term "biodiversity".

Biodiversity

Biodiversity is the variety of plant and animal life in a particular habitat. So, a habitat that has a high biodiversity is one with many different species (or types) of plants and animals.

Activity 1.6

Analysing the importance of biodiversity

- 1 Brainstorm the importance of biodiversity.
- 2 Discuss the importance of biodiversity.

The importance of biodiversity

Biodiversity is important to people in many ways. Plants, for instance, help humans by giving off oxygen. They also provide food, shade, construction material, medicines, and fibre for clothing and paper. The root system of plants helps prevent flooding. Plants, fungi, and animals such as worms keep soil fertile and water

clean. As biodiversity decreases, these systems break down. The following points categorise the importance of biodiversity:

a. Source of medicine

A lot of medicines are made from natural chemicals from various types of organisms. For example, many plants produce compounds meant to protect the plant from insects and other animals that eat them. Some of these compounds also work as human medicines. An example of an important medicine made from plant compounds is aspirin.

b. Source of food

Biodiversity is a source of plant and animal food. Some of the food e.g. maize, millet and groundnuts are grown by human beings and others such as mushroom *masuku*, *matowo* and *chisoso* are obtained from the wild. In addition, people rear animals such as cattle, goats, pigs and chickens for food. They also hunt wild animals such as antelopes, duikers, mice, birds and grasshoppers for food.

Ecosystem

An ecosystem is a community or group of living organisms that live and interact with each other in a specific environment.

An ecosystem consists of a community/group of organisms existing together with their physical environment. Ecosystems are of different sizes and can be, aquatic (in water), or terrestrial (on land). Broad categories of terrestrial ecosystems are called biomes (large community of plants and animals). In ecosystems, both matter and energy are conserved as in Figure 1.4.



Figure 1.4: A river ecosystem

Activity 1.7

Assessing categories of ecosystems

- 1 Explain the meaning of the term ecosystem.
- 2 Describe categories of ecosystems.
- 3 Investigate ecosystem services provided by the school environment.

Categories of ecosystems

There are two categories of ecosystems

- a. Terrestrial:** A terrestrial ecosystem is found on land comprising living and non-living things. Terrestrial includes grassland, mountain, forest and desert.
- b. Aquatic:** An aquatic ecosystem is found in water which includes oceans, lakes, rivers, streams, estuaries and wetlands. The aquatic ecosystem includes animals which depend on water for their survival, such as fish and hippopotamus.

Ecosystem services

Ecosystem services are the benefits people obtain from ecosystems. These services are very important to human well-being. Some of the benefits of healthy, functioning ecosystems include:

- Provisioning services: Ecosystems are source of materials such as food, water, medicines, wood and grass.
- Regulating services: Ecosystems maintain the quality of air, water and soil, provide flood and disease control and help in pollination of plants.
- Cultural services: Ecosystems provide nonmaterial benefits such as sense of beauty, spiritual values as well as educational and recreational activities.

Activity 1.8

Describing threats to biodiversity

- 1 Identify the threats to biodiversity from Figure 1.5.
- 2 Explain the identified threats to biodiversity.

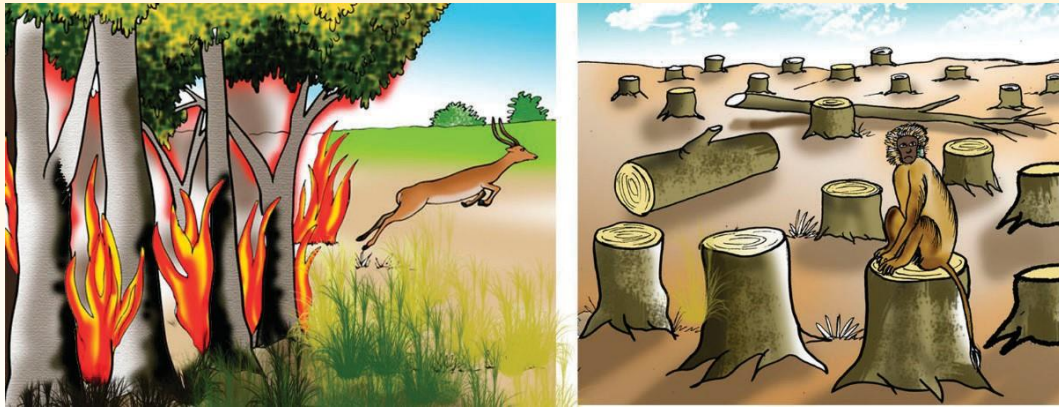


Figure 1.5: Threats to biodiversity

Threats to biodiversity

Biodiversity is very important in boosting productivity in ecosystems where species depend on one another for survival. However, a lot of human activities are threatening biodiversity. Some of the threats to biodiversity include:

- a. **Climate change:** Long-term change in the average weather pattern. It results in increased temperatures and alteration of weather patterns. There are many negative effects of climate change such as destruction of natural habitats, floods, drought and heat waves.
- b. **Habitat loss and degradation:** Habitat loss refers to a reduction in the amount of space where a particular species or groups of species can survive and reproduce. For example, when a forest is cut down, the trees and plants are lost and so there is no food or homes for the animals. Habitat degradation is when the habitat is damaged by e.g. pollution, invasive species, or over-utilisation of resources (such as cutting down too many trees). When a habitat is degraded, it cannot support all of the biodiversity that should live in a healthy ecosystem.
- c. **Invasive species:** These are plants or animals from another country or region that do not belong to a particular area. They can harm an ecosystem by outcompeting the indigenous plants and animals for space, food etc.
- d. **Over-exploitation:** The human population requires resources to survive and grow and when we use too much of a resource, those resources are over-exploited, they are used up without being replaced for example if large parts of a forest are cut down too quickly for new trees to grow.
- e. **Illegal wildlife trade:** Wildlife trade (catching and selling wild animals or plants) can contribute to the loss of biodiversity. For some endangered species (endangered means there are not many individuals of the species left) wildlife trade is the main threat to the species and could make them extinct (when there are no individuals of a species left in the wild). Illegal wildlife trade also results in a huge loss of income for the country because animals (or parts of them like the tusks of an elephant) are sold illegally so no money goes to the government and the country loses out on money that could come from tourists paying to see the animals in the wild. Some endangered species we see in the illegal wildlife trade in Malawi include elephants, pangolins and rhinoceros.

Explaining ways of managing biodiversity

- 1 Suggest ways of managing biodiversity.
- 2 Identify ways in which biodiversity is maintained in your communities.
- 3 Explain ways of managing biodiversity.

Ways of managing biodiversity

The biodiversity of many habitats is in danger. However, there is more that can be done to manage this danger. The following are some of the ways of managing biodiversity:

a. Enforcement of laws and policies

The government has put in place laws and policies to protect wildlife and to stop over-harvesting of natural resources, or other destructive activities that negatively impact biodiversity. An example is the establishment of protected areas such as National Parks, Wildlife and Forest Reserves which gives special protection under law to all animals and plants living there.

b. Reducing the number of invasive (hostile) species

Invasive species are foreign plants or animals which disturb ecosystems. Examples include water hyacinth (*namasupuni*) and some types of fish. They cause economic and environmental harm to the native habitats. They can be brought to an area on purpose and sometimes by accident. To control the number of invasive species moved by planes, ships and vehicles, cargo must be thoroughly checked before it is offloaded in a new country. In addition, people should not bring new species of animals or plants to an area without consulting authorities. This can be done by checking all entry points to Malawi for the movement of plants and animals.

c. Habitat restoration

Habitat restoration means stopping things that might be damaging the area, like pollution or deforestation and may involve planting plants and trees, removing invasive species, stopping soil erosion or cleaning up rivers and streams.

d. Establish seed banks

Seed banks are areas where huge varieties of plant seeds are stored. This provides a guarantee for restoration where species face extinction (loss). For example, if a particular plant is extinct, it can be grown using seeds from the seed bank and reintroduced back into its habitat. Malawi has one of its seed banks at Chitedze Research Station.

e. Manage climate change

Climate change has disastrous consequences for all living things on earth. One of the causes of climate change is the use of huge amounts of fossil fuels (like coal, oil and natural gas) which are formed underground from the remains of plants and animals that died millions of years ago, which is why they are called 'fossil'

fuels. Fossil fuels are non-renewable, this means they will eventually run out.

There is a need to move away from the use of fossil fuels towards alternative energy sources and natural or sustainable products. Climate change can be managed in several ways such as planting trees and using renewable energy such as solar energy.

Summary

Human survival depends on common efforts to sustain and renew the environment. Individuals, industries, organisations and government agencies should employ concrete measures for both living and non-living things to live in harmony. All necessary steps should be taken into consideration to avoid disturbing the biodiversity and ecosystem.

Review exercise

- 1 Define the term 'environment'.
- 2 Explain each of the following components of the environment:
 - a. Physical environment.
 - b. Biological environment.
- 3 Describe any **three** steps you can take to reduce global warming.
- 4 Explain the importance of biodiversity.
- 5 Carry out the following projects at your school:
 - a. Establish a plot where you can demonstrate how to maintain an ecosystem.
 - b. Establish a club which can be recycling waste into useful products, for example, wastepaper into classroom or office waste bins and food waste into compost.

Glossary

Aquatic:	Animals and plants that live in water.
Biodiversity:	Richness and variety of life on earth.
Biome:	Large naturally occurring community of plants and animals.
Degradation:	The process in which something is losing its value or becoming weak.
Habitat:	A place where an organism makes its home.
Invasive species:	An organism that is not indigenous or native to a particular area.
Resilience:	Capacity to recover from a difficult situation.
Restoration:	The action of returning something to a former owner, place or condition.
Terrestrial:	Refers to things that are related to land/earth/ground.

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UNIT 2

Wildlife conservation and welfare

Introduction

Malawi has a wide range of natural resources. Wildlife is one of the natural resources found in Malawi. However, wildlife faces many threats in the country mainly due to rapid population growth. As a result, wildlife is now becoming scarce or extinct. This, therefore, calls for urgent action for wildlife protection and conservation.

This Unit discusses wildlife conservation and welfare. This knowledge will help you appreciate the importance of protecting wildlife.

Learning outcomes

By the end of this Unit, you should be able to:

- ▶ differentiate wild animals and domesticated animals
- ▶ identify different animal habitats
- ▶ describe animal adaptation
- ▶ identify protected areas in Malawi
- ▶ identify wildlife in Malawi
- ▶ describe animal rights and welfare
- ▶ explain threats to wildlife species in Malawi
- ▶ explain ways of conserving wildlife

Wildlife conservation

Wildlife conservation is the protection of animals, plants, and their habitats from damage for present and future generations.

Activity 2.1

Discussing the difference between wild animals and domesticated animals

- 1 Using table 2.1 classify the following animals into wild and domestic animals: dog, elephant, sheep, cat, hippopotamus, cattle, antelope, goat, leopard, buffalo, chicken, zebra and horse.
- 2 Describe the difference between wild animals and domesticated animals.

Table 2.1 Animal classification

Wild animals	Domesticated animals

Wild and domesticated animals

1 Wild animals

These are animals that do not depend on human beings but their natural environment for survival. They naturally live and exist in the wild in an environment free of human intervention. Wild animals should not be kept in captivity in people's homes or gardens. Wild animals include elephants, monkeys, hyenas, hares, giraffes and antelopes among others.

2 Domesticated animals

These are animals that depend on human beings for their survival. They have been modified and trained for many years to live with humans. They rely on humans for food, water, shelter and welfare. They are domesticated to provide companionship, food, income and labour. They include chickens, dogs, goats and cattle among others.



Figure 2.1a: A wild animal (Hippopotamus) feeding on grass



Figure 2.1b: A girl feeding chickens

Activity 2.2

Describing ways in which animals adapt to their habitats

- 1 List any 5 wild animals
- 2 For each wild animal mention where it lives

- 3 Describe ways in which the animals mentioned adapt to their habitat by stating
 - a. How their bodies are covered
 - b. What they eat
 - c. How they find shelter
 - d. How they protect themselves

Animal habitat and adaptation

a. Animal habitat

A habitat is the natural home of an animal, plant, or other organisms. It is where the basic needs of wildlife such as food, water and shelter are met. Examples of habitats include mountains, forests, lakes, rivers, grasslands, and deserts.

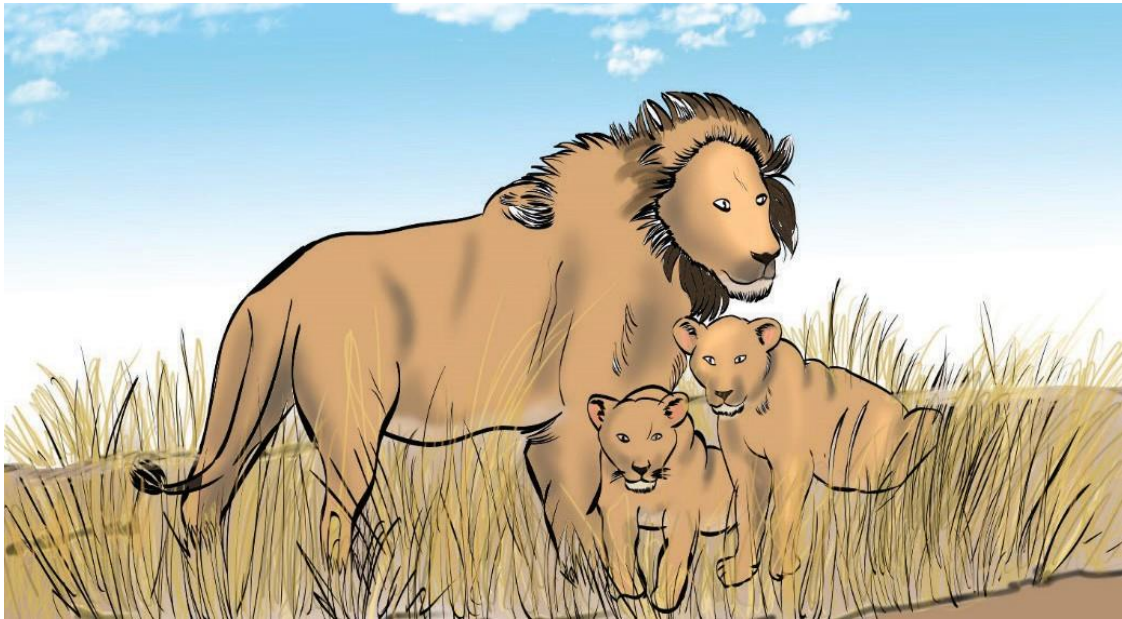


Figure 2.2: A pride of lions in a grassland habitat

b. Animal adaptation

Adaptation is the change in the organism's body or behaviour that helps it to survive. The animal's environment is made up of different things such as climate, vegetation and other animals that may be competitors or predators. Because of this, wild animals have adapted to live in different habitats. Examples of adaptation include:

- the thickness of fur (for temperature),
- shape of a bird's beak (for feeding),
- size of eyes (for seeing in the light or dark),
- colour of skin/fur (for camouflage) and
- shading of plant leaves to reduce water loss.

Over the years, animals and plants have changed to survive in their natural environments. However, increasing human population and activities have changed much of the natural habitats faster than most animals and plants can adapt. As a result, more animals are becoming endangered or have become extinct. Therefore, there is a need to protect animal and plant habitats. It is for this reason that everyone should take part in caring for wildlife.

Protected areas in Malawi

A protected area is a clearly defined area, dedicated and managed through laws to achieve the long-term conservation of nature. It could be on land, water.

Activity 2.3

Identifying protected areas and wildlife in Malawi

- 1 List the protected areas in Malawi.
- 2 Name the protected areas marked on the map of Malawi in Figure 2.3.
- 3 Identify at least three animals which are found in each protected area.

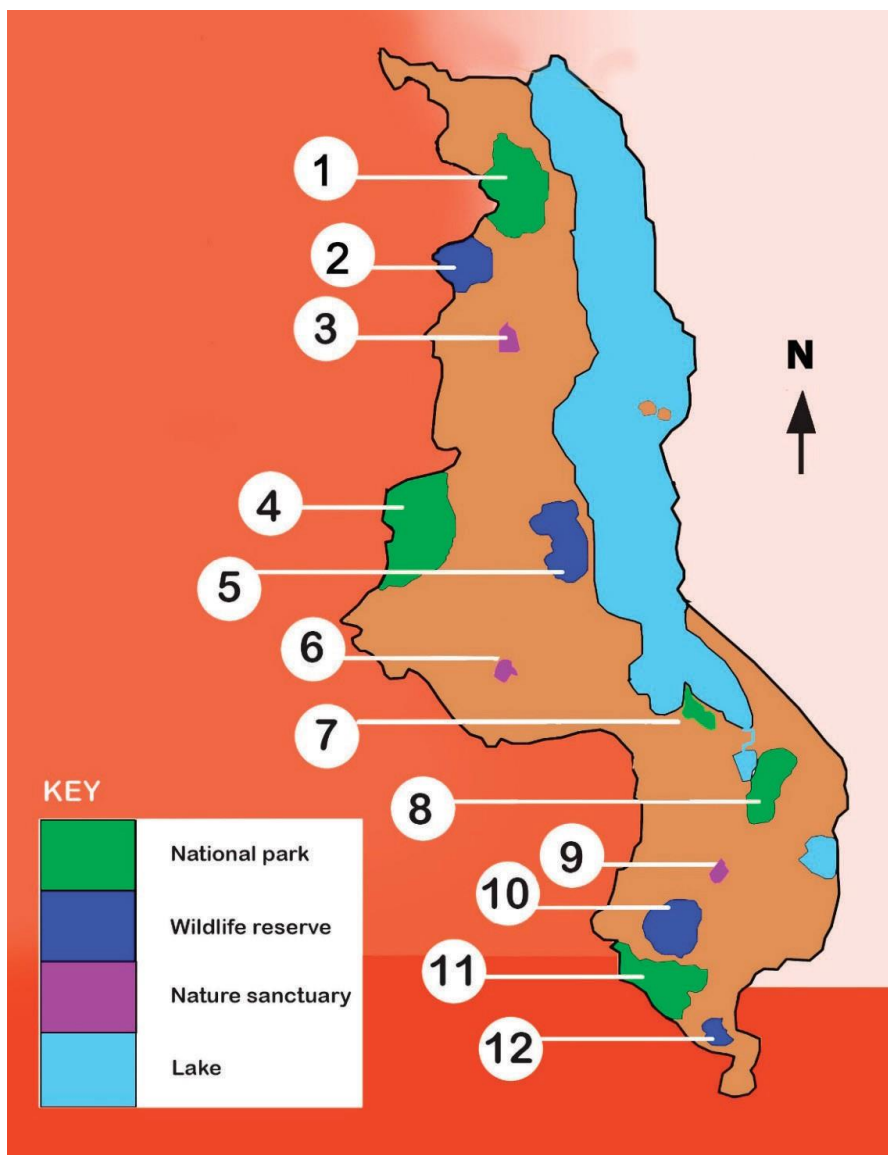


Figure 2.3 Map of Malawi showing protected areas

Wildlife protected areas in Malawi

Wildlife-protected areas provide habitat and protection for animals from danger such as poaching. It is important that endangered animals and plants should be

kept in the protected areas. By law, nobody is either allowed to encroach or poach animals in these places.

The wildlife protected areas shown on figure 2.3 are:

- 1 Nyika National Park
- 2 Vwaza Wildlife Reserve
- 3 Mzuzu Nature Sanctuary
- 4 Kasungu National Park
- 5 Nkhotakota Wildlife Reserve
- 6 Lilongwe Nature Sanctuary
- 7 Lake Malawi National Park
- 8 Liwonde National Park
- 9 Michiru Nature Sanctuary
- 10 Majete Wildlife Reserve
- 11 Lengwe National Park
- 12 Mwabvi Wildlife Reserve

Some animals found in protected areas in Malawi

Protected areas in Malawi have a variety of animals, some are small areas while others are big. Malawi has all the Big Five animals (lion, leopard, rhinoceros, elephant, and cape buffalo) however, at present, all of the Big Five are only found in Majete Wildlife Reserve and Liwonde National Park.

Table 2.2 Some animals found in protected areas in Malawi

No.	Protected wildlife area	Examples of animals	Size	Year established
1	Nyika National Park	Zebra (mbidzi), Roan Antelope (mpherembe) puku, Eland (Ntchefu/sefu), Elephant (Njobvu)	3200km ²	1965
2	Vwaza Wildlife Reserve	Elephant (Njobvu), Buffalo (njati), hippopotamus (mvuu), impala (Nswala), Kudu (Ngoma), waterbuck (Chuzu)	986km ²	1977
3	Mzuzu Nature Sanctuary	Monkeys (pusi), porcupine (nungu), common duiker (ngwape), bird species (mbalame)	30ha/0.3 km ²	1985
4	Kasungu National Park	Elephants (njovu), Warthogs (Kaphulika), bushbuck (mbawala), hippopotamus (mvuu)	2316km ²	1970

5	Nkhotakota Wildlife Reserve	Elephant (njovu), lion (mkango), impala (Nswala), warthog (kaphulika)	1800km ²	1945
6	Lilongwe Nature Sanctuary	Velvet Monkey (pusi), hyena (fisi), common duiker (Gwape), crocodiles (Ng'ona) African python (nsato) Bush pigs (Nguluwe)	166 ha	1972
7	Lake Malawi National Park	Ciclids mbuna fish (somba za mamba ndi maluwa), baboon (nyani), klipspringer (mbuzi Phiri/nkhalamba) monkey (pusi), Hippopotammous (mvuu)	94 km ²	1980
8	Liwonde National Park	Elephant (njovu), Lion (mkango), Black Rhinoceros (Chipembere), waterbuck (chuzu)	548 km ²	1973
9	Michiru Nature Sanctuary	Hyena (fisi), Baboon (Nyani), monkey (pusi), common duiker (Gwape)	18 km ²	1975
10	Lengwe National Park	Nyala (Boo), Buffalo (njati), bushbucks (mbawala), monkeys (pusi)	887 km ²	1928
11	Majete Wildlife Reserve	Elephant (njovu), Hippo (Mvuu) warthog (kaphulika), lion (Mkango) Nyala, Buffalo (Njati)	704 km ²	1954
12	Mwabvi Wildlife Reserve	Buffalo (Njati) Impala (nswala), monkeys (pusi), baboon (nyani)	135 km ²	1953

Activity 2.4

Discussing animal rights and welfare

- 1 Outline the rights of animals.
- 2 Explain human practices that violate the rights and welfare of animals.
- 3 Suggest ways of protecting animal rights and welfare.

Animal rights and welfare

Human beings live on planet earth with wildlife which equally deserves to live peacefully. Animals too can think, feel emotions and pain, communicate, love and fear which makes them not so different from human beings. Therefore, just as human beings, animals also have some rights which safeguard their welfare. Animal welfare refers to how animals cope with the conditions in which they live. It relates to the feelings, behavior, and health status of the animal. An animal is said to be in a good state of welfare if it enjoys the following main five animal welfare freedoms:

- Freedom from hunger and thirst by having ready access to fresh water and a diet to maintain full health and vigour.

- Freedom from discomfort by having an appropriate environment including shelter and a comfortable resting area.
- Freedom from pain, injury, or disease by having access to prevention or rapid diagnosis and treatment.
- Freedom to express normal behaviour by having sufficient space, proper facilities and company of the animal's own kind.
- Freedom from fear and distress by having conditions and treatment which protect from mental suffering.

It is important therefore that human beings have the responsibility to ensure a good level of animal welfare.

Ways of protecting animal rights

Animal rights can be protected in the following ways:

- Awareness campaigns on animal rights.
- Enforcement of rules and regulations for the protection of animals.
- Reporting animal abuse and cruelty to parks and wildlife offices, traditional leaders, agricultural offices, forestry offices and police.
- Not taking wild animals as pets.

Activity 2.5

Discussing threats to wildlife species in Malawi

- 1 Brainstorm threats to wildlife species in Malawi.
- 2 Explain threats to wildlife species in Malawi.

Threats to wildlife

The following are some of the major threats to wildlife in Malawi:

- Overharvesting of wildlife resources.
- Habitat loss and degradation due to bush fires, poor farming practices and deforestation.
- Pollution of wildlife habitats such as water, land and air.
- Poaching.
- Illegal wildlife trade and trafficking.
- Climate change resulting in drought and excessive flooding etc.
- Parasites and diseases infestation.
- Invasive alien species.

Activity 2.6

Discussing ways of conserving wildlife

- 1 Mention ways of conserving wildlife.
- 2 Describe different ways of conserving wildlife.

Ways of conserving wildlife

Wildlife can be conserved in a number of ways. Some of the ways include:

- Conducting public awareness and education on the protection of animals.
- Do not take wild animals as pets.
- Stopping careless dumping of litter and use of plastics.
- Restoring habitats by taking actions such as tree planting.
- Avoiding buying or eating wild meat.
- Enforcing legislation for the protection of wildlife- this means making sure that laws are obeyed and those who do not obey the law are punished.
- Participating in wildlife protection and conservation activities.

Summary

Wild animals and domesticated animals are different in many ways. Wild animals depend on their natural environment for survival. These animals have adapted to living in different habitats. Malawi has several wildlife-protected areas that provide better habitats for different wildlife species. These include national parks, wildlife reserves and sanctuaries. Wildlife has rights in the same way as human beings, and people have the responsibility to protect animal rights and welfare. This is important because there are a number of threats to animal life such as pollution, poaching and overharvesting. Human beings need to conserve wildlife for sustainable development.

Review exercise

- 1 State the difference between wild animals and domestic animals.
- 2 Mention any **three** wildlife-protected areas in Malawi.
- 3 Explain any **two** threats to wildlife species in Malawi.
- 4 Describe any **two** ways of conserving wildlife.

Glossary

Deforestation:	Careless cutting down of trees in a forest in large number.
Encroachment:	Living or conducting different activities in a protected area without permission.
Poaching:	Illegal taking or killing of wildlife.
National Park:	An area of land set aside for the protection of wildlife, culture and natural resources.
Sanctuary:	A portion of land set aside for the safety and protection of wildlife from danger or difficult situations.
Species:	Types of different animals and plants.

Sustainable development: Development which meets the needs of the present generation without affecting the future generation to meet their own needs.

Wildlife reserve: An area of land that is protected and managed in order to preserve a particular type of habitat and its flora and fauna.

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UNIT 3

Forestry and people

Introduction

Forests are very important to human health, wellbeing, and livelihoods. The abundant opportunities forests provide have led to exploitation in the form of fuel wood, timber, and the creation of land for farming and settlement.

This Unit discusses the meaning of forests, the importance of forests, the types of forests, human activities that impact forests and ways of managing forests. This knowledge will help you to understand the need to take care of trees and Forests.

Learning outcomes

By the end of this Unit, you should be able to:

- ▶ explain the meaning of the term forest
- ▶ describe the importance of trees in our environment
- ▶ distinguish the types of forests
- ▶ describe the impact of human activities on forests in Malawi
- ▶ describe ways of managing forests in Malawi

Activity 3.1

Discussing the meaning of forest

- 1 Brainstorm the meaning of forests.
- 2 Discuss the meaning of forests.

Forests

A forest is a large area covered mainly with trees and undergrowth. It is a complex ecosystem consisting mainly of trees that support the earth and many forms of life. Malawi has 88 forest reserves and 21 forest plantations.

Forestry

Forestry is the science and practice of managing and taking care of forests. It involves activities such as planting trees, protecting wildlife and sustainably using forest resources. Forestry helps to ensure that forests are healthy, diverse, and able to meet the needs of people and the environment.

Activity 3.2

Describing the importance of trees in the environment

Explain the importance of trees in the environment.

Importance of trees and forests in the environment

Trees play a significant role in the environment and for human well-being.

a. Trees provide food, shelter and shade

When it is hot, human beings and animals look for trees that can give shade. There are several trees that people grow to give a good canopy for them to hold meetings and also have wonderful places to relax. The trees also provide building materials for human shelter as well as their animals.

b. Cleaning the air of unwanted gases and odours

The canopies of trees serve as air filters, confining dust and absorbing pollutants from the air. Trees release oxygen by continually absorbing carbon dioxide and other chemicals.

c. Safeguard the environment from climate change

Trees help to reverse global warming and prevent climate change as they absorb carbon dioxide in the atmosphere.

Trees decrease wind speed and cool the air as they lose moisture. The trees also reflect heat upwards from the leaves; hence trees are considered to lessen temperatures in the environment.

d. Trees are an essential source of medicine

For many years people have used forest resources to treat and cure various ailments both in humans as well as in animals. Some of them are used for preparing solutions to drink. Others are rubbed on parts that are hurt. With time and the advancement in science, people use different trees to manufacture modern medicine. Now even with technology, many people still depend on trees for medication to treat most diseases.

e. Trees prevent soil erosion and floods

Trees protect the earth from soil erosion, fires, flooding and act as windbreaks.

f. Trees provide livelihoods for people

People earn their living from trees. There are many business opportunities, for example, timber production and firewood. Trees sustain the distinctive character of a place and promote local pride. Woodlands can serve as an educational resource and enhance activities like walking and bird-watching.

g. Trees control noise pollution

Trees decrease urban noise almost as efficiently as stone walls. Trees when planted at strategic positions in a neighborhood or around a house, can reduce major noises from roads and airports.

h. Trees are a natural playground

Trees give a great place to climb and explore. Trees are also valuable for children to play in and explore their sense of adventure. Children can learn to take risks while climbing trees.

i. Trees promote biodiversity conservation

Biodiversity is critical as it helps to keep the planet thriving hence the need to conserve trees and the environment. Human beings use trees as a place to hang hives to bring bees to their land to help in pollination and to get honey.

j. Trees are the primary source of energy

Some parts of the world depend on wood to cook meals and boil water.

Activity 3.3

Distinguishing the types of forests in Malawi

- 1 Identify types of forests and protected trees in Malawi.
- 2 Differentiate natural forests from plantation forests in Malawi (Figure 3.1).

Types of Forest in Malawi

Forests in Malawi can be divided into two main categories namely, natural and plantation forests.

a. Natural forest

Natural forest is a forest reproduced naturally, consisting of indigenous tree species (those that are traditionally found in the area, rather than exotic species which are brought from another country). In Malawi, they are largely the remainder of the Miombo forests that once covered almost the whole country. These forests are on customary land under the control of local authorities. They are also in protected forests and wildlife reserves. Most of them are on hills and mountains which help to protect catchment and watershed areas from environmental degradation. The Department of Forestry helps to manage forest reserves. Some natural forests are located on leased land in estates involved in commercial farming. Natural forests are not effectively managed, and this results in low productivity.

b. Plantation forest

Plantation forest is a planted forest established and managed for commercial production of wood and non-wood forest products. Plantation forests also provide a specific environmental service, for example, erosion controls, landslide stabilisation and windbreaks among others. In Malawi, forest plantations have been established mainly by the government and to a smaller extent by private estate owners and smallholder farmers. Viphya (Chikangawa) is the largest plantation in Malawi. It is mostly dominated by pine.

These plantations are mostly in the central and southern parts of Malawi. Figure 3.1 shows the types of forests.



a. Natural forests



b. Planted forests

Figure 3.1: Types of Forest in Malawi

These trees are planted or grown naturally in gardens, around homes, and along roads. Some of the common trees found in Malawi's forest reserves are shown in Table 3.1.

Table 3.1 Common trees found in forest reserves of Malawi

English name	Vernacular name
Redwood	<i>Mwenya, Chonya, Mgwenya, Mung'ona, Mwina, Mungwina</i>
Mahogany Bean	<i>Nkongomwa, Msokosa, Mnangaliondo, Msambamfumu, Mkongwa, Chikunda, Ipapa, Mpapa, Mpapadende</i>
Palm	<i>Mgwalangwa, Mkomakoma, Mvumo, Mdikwa, Makoma, Mulala</i>
Coast Gold leaf	<i>Msopa, Chisopa, Mpasa, Mlewezi, Msongamino, Mwisya</i>
Ash	<i>Mkalati, Kalinguti, Kawidzi, Nakapanga</i>
Butterfly Tree/Turpentine	<i>Tsanya, sanya, Ntsano, Mopani, Mpani</i>
Sunbird Tree /Wild Mango	<i>Mtondo</i>
Mahogany	<i>Mbawa, Muwawa, Bulamwiko</i>
African Teak	<i>Mlombwa, Mtumbati, Mbira, Nawazi</i>
Yellow Wood	<i>Naphini, Nyapini, Mpini Nalinsi, Mkodoni, Mpululu; Njoyi</i>

Activity 3.4

Identifying forests reserves on a map of Malawi

Identify the forests reserves on the map of Malawi (Figure 3.2).

MAP OF MALAWI SHOWING FOREST RESERVES

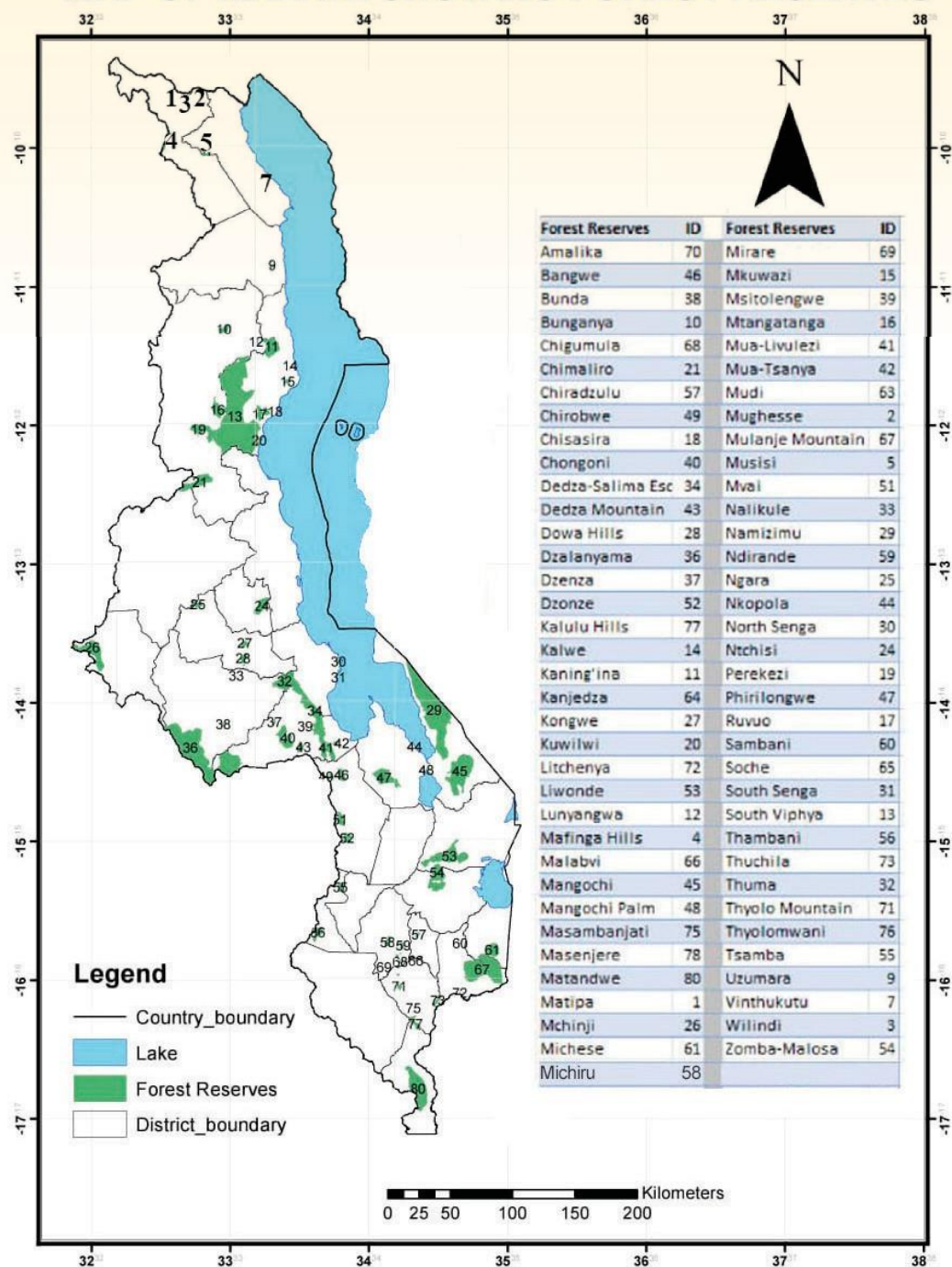


Figure 3.2: Map of Malawi showing location of forests reserves

Forest reserves in Malawi

A forest reserve is a specific area sustainably managed by the government for wildlife protection and conservation. A forest reserve is covered with woodlands, most commonly *miombo* (*Brachystegia*) woodlands and a striking variety of plants and indigenous trees.

The following are some of the forest reserves in Malawi:

a. **Dzalanyama Forest Reserve**

Dzalanyama Forest Reserve is located approximately 60 kilometres South-West of Lilongwe City. It was declared as a protected area in 1922. It is the second largest of all the 88 forest reserves in the country and covers approximately 98,000 hectares that stretch across Lilongwe, Dedza and Mchinji Districts.

b. **Mulanje Forest Reserve**

Mulanje Forest Reserve is unique in its ecosystem. The reserve is home to a variety of rare life forms such as Mulanje Cedar, White Sunflower, Erica and scarce herbs and grass species. The reserve is famous for its plateau and Michesi Hills which tourists like to hike for the views and unique environment. Mount Mulanje, where the Mulanje Forest Reserve is located, is a catchment area for different rivers and is highly valued by surrounding communities because of its unique features that preserve and sustain life forms. The Department of Forestry and Mount Mulanje Conservation Trust (MCCT) spearhead the area's sustainable management and conservation.

c. **Perekezi Forest Reserve**

Perekezi Forest Reserve is in Mzimba District of Malawi's Northern Region. It serves as a water catchment area and has numerous streams including the South Rukuru River. The forest's water catchment area sustains domestic and agricultural activities as well as preserves and conserves the reserve's biological diversity.

d. **Thuma Forest Reserve**

Thuma covers part of Salima, Lilongwe and Dedza districts. It has a variety of trees, plants, animals, birds and insect species which have scarcely been recorded or studied in Malawi. Animals in Thuma include elephants, baboons, warthogs, bush pigs, porcupines, vervet monkeys, klipspringers, greater kudu, etc.

Activity 3.5

Describing the impact of human activities on forests in Malawi

- 1 List human activities that affect forests in Malawi.
- 2 Describe the impact of human activities on forests in Malawi.

The status of forests and impacts of human activities on forests in Malawi

Forest resources in forest reserves, national parks and wildlife reserves are generally not available for exploitation. Their function is to conserve the environment and biodiversity and to provide habitat for wildlife. Forest reserves are mostly located in water catchment areas and fragile areas. Forests on customary land are the most accessible to the rural majority of Malawians.

Major threats to forest resources in Malawi

There are various factors that threaten the sustainable management of forest resources in Malawi. Some of the factors are:

i. **Population growth**

The increase in population has resulted in an increase in the demand for services and products offered by forests. As the population pressure increases, the capacity of the forests to supply products and services sustainably is threatened.

ii. **Poverty**

Poverty is characterized by serious deprivation of basic needs in terms of food, water and shelter. Some of the factors that contribute to poverty in Malawi are low agricultural productivity, low non-farm income, low education, and poor health. Since poor people have small land holdings and lack access to farm inputs, their common strategy for survival is to sell forest products (firewood and charcoal) to obtain cash for purchasing basic needs and services. In a particularly bad year, when the agricultural harvest is poor, the trade in firewood and charcoal increases.

iii. **Unsustainable harvesting for energy and timber**

Biomass (this means plant sources i.e. mainly trees for firewood and charcoal) provides most (93%) of the country's total energy needs. There is a 99% dependency on biomass energy for cooking in rural areas where almost 85% of the national population live. This means almost everyone in rural areas is using charcoal or firewood for cooking or other heating. In urban areas, charcoal is the most used energy source for cooking. About 44% of the urban households use charcoal for cooking, 33% of the households use firewood, while 10% use electricity.

Malawi's increasing population means that more energy is required, but if we keep using charcoal and firewood from the forests, this will cause serious environmental damage.

iv. **Wildfires**

Wildfires destroy considerable amounts of forest resources every year. Most fires are caused due to malicious reasons like conflicts between forestry staff and local communities.

v. **Deforestation and encroachment**

Forest resources have been subjected to deforestation. The causes of deforestation include

- uncontrolled tree felling for fuel wood and for curing tobacco.
- charcoal production.
- poor agricultural practices such as shifting cultivation.
- encroachment of forest reserves for both farming and settlement.

vi. **Livestock population**

Domestic animals like goats generally trample upon or eat young tree seedlings.

Describing ways of managing forests in Malawi

- 1 List different ways of managing forests in Malawi.
- 2 Describe ways of managing forests in Malawi.

Ways of managing forests in Malawi

Various efforts have been put in place to promote sustainable management of forest resources and to mitigate the effect of pressure on the forests. Some of the ways are:

a. Reforestation and afforestation programmes

Reforestation programmes help to replace trees where they have been cut. This is so because mostly the trees that are cut down could not grow again on their own. This practice commonly establishes forest reserves where tree seedlings are grown in nurseries and later planted and cared for as shown in figure 3.3.



Figure 3.3: A young girl and a boy taking care of a tree nursery

Afforestation refers to the planting of trees in an area where there were no trees before. This is done in plantations and woodlots by communities or individuals. In response to forestry extension initiatives undertaken by the Forestry Department and other supporting departments and Non-Governmental Organizations, there are growing numbers of communities and individuals engaged in planting trees for various purposes including fuel wood, poles, fruit production, boundary demarcation and shade.

b. Wood energy conservation initiatives

There have been initiatives designed to improve energy saving by introducing the distribution and fabrication of energy-saving stoves (*mbaula*). Currently, private entrepreneurs are producing and marketing them. Alongside this initiative is the production of pine charcoal to reduce the need for charcoal from indigenous wood.

Solar energy development (using the sun to produce electricity which we can use to light our homes, charge phones etc) is still in its infancy in Malawi. However, Malawi is taking a good direction in the installations of both solar electrical and thermal systems.

c. Forest guidelines and laws

Malawi passed a new law to protect forests in 2020. The Forestry Laws of 2020 aim to protect forests for the benefit of the nation and to the satisfaction of the diverse and changing needs of Malawi's population, particularly the rural smallholders.

The forestry laws provide for, among other things, the protection and rehabilitation of environmentally fragile areas and forest resources.

The law means that it is illegal to cut down trees to make and sell charcoal unless you have a license issued by the Department of Forestry. If you are caught illegally cutting down trees or selling charcoal, you may be arrested and the court can sentence you to pay a fine of between MWK500, 000-10,000,000 or go to prison from 1 up to 20 years.

d. Forest research

The Forestry Research Institute of Malawi (FRIM) conduct several programmes in tree breeding and research.

The Forestry Department keeps the public informed about forestry issues through a variety of programmes. Because of some levels of illiteracy in the country, the radio remains the major means of increasing public awareness of forestry issues. To this end, the Forestry Department jointly sponsors programmes such as "*Ulimi wa makono*" (Modern farming methods) aired by the Malawi Broadcasting Corporation. Forestry jingles, interviews, messages and commercials are broadcast frequently, often on a daily basis.

What can people do?

Everyone has a role to play in combating deforestation to save the remaining forests: This can be done by:

- Using cleaner cooking stoves, using legally produced charcoal, using other forms of energy like LPG or electricity where possible.
- Supporting the policing of forest resources by reporting forest crimes and supporting law enforcement agencies.
- Helping communities involved in illegal charcoal production to find new ways to make money.
- Planting trees and caring them.

Summary

In this Unit, you have learned the meaning of forest and its importance to the environment as well as human beings. In addition, you have learnt the different types of forests, status and the impact of human activities on forest resources. You have also explored major threats to forest resources and how to manage them. This knowledge will assist you to be responsible towards forest resources and influence people in your family and community to protect forests and the environment.

Review exercise

- 1 What does the term forest mean?
- 2 Mention **five** important roles of trees in our environment.
- 3 Describe the **two** types of forest.
- 4 Explain the status of forest resources.
- 5 Mention **three** impacts of human activities on forests.
- 6 Explain **four** ways of managing forests in Malawi.

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UNIT 4

Human - wildlife conflict and Co - existence

Introduction

Conflicts between human beings and wild animals are happening at an increasing rate. This is due to the loss of wildlife habitat, caused by increased human population. This means that people and wildlife are in some areas living more closely together, and competing for space and resources such as food and water. When people settle and grow crops close to animal habitats, such as close to national parks, human-wildlife conflict can occur. Human-wildlife conflict includes animals destroying and eating crops, killing livestock, damaging property and injuring or killing people. This conflict has negative results for both people and animals. People can lose their crops or be injured and sometimes they kill wildlife in self-defence or to stop further conflicts.

This Unit discusses human-wildlife conflict, its causes, consequences and solutions. The knowledge will help you to appreciate the need to live in harmony with wildlife and thereby prevent human-wildlife conflict and promote human-wildlife coexistence.

Learning outcomes

By the end of this Unit, you should be able to:

- explain the term human-wildlife conflict and human-wildlife co-existence
- outline causes of human-wildlife conflict
- list common wildlife species causing conflicts with humans
- identify the consequences of human-wildlife conflict
- explain solutions to human-wildlife conflict

Activity 4.1

Defining *human-wildlife conflict*

- 1 Define human-wildlife conflict.
- 2 Describe scenarios of human-wildlife conflict you experienced, heard or read.
- 3 List examples of human-wildlife conflict.

Human-wildlife conflict

Human-wildlife conflict is any interaction between humans and wildlife that negatively affects property, culture, livelihood and life. It also affects the conservation of wildlife and the environment.

Examples of human-wildlife conflicts include:

- People killing wild animals in self-defense
- Wild animals are found at local water sources during times when humans are using the resource
- Elephants or monkeys destroying crops like maize, sweet potatoes and bananas
- Fishermen being attacked by a hippopotamus
- Birds eating people's rice
- Lions killing cattle
- Disease transmission between livestock or people and wild animals
- People destroying habitats for new settlement and farming

Activity 4.2

Listing wildlife species commonly causing conflicts with humans

List some animals commonly in conflict with humans in table 4.1

Table 4.1 Animals commonly causing conflicts with humans.

Small animals	Big animals

Animals commonly in conflict with humans

Small animals, that pose no obvious threat to humans, can be responsible for destroying crops. These animals include locusts, caterpillars, birds, rodents, rats, springhares, porcupines, baboons, vervet monkeys, bush pigs, genets, servals, mongooses.

However, it is the larger herbivores: elephant, buffalo and hippopotamus, large carnivores: lion, leopard, cheetah, spotted hyena, wild dog and crocodile that are traditionally defined as problem animals and are responsible for most of the human-wildlife conflict.

Causes of human-wildlife conflict

- Rapid human population growth that leads to the destruction of the environment mainly through deforestation
- Bush fires which make animals flee to people's settlement areas
- Encroaching protected areas (people using or living in protected areas)
- Limited awareness of human-wildlife issues
- Poverty and the reliance on natural resources
- Poor agricultural practices such as the cultivation of marginal lands (such as those near protected areas)

- Climatic factors such as drought and floods which lead to a shortage of animal food
- Unclear demarcation of boundaries between settlement areas and wildlife-protected areas

Activity 4.3

Discussing causes, problems and negative effects of human-wildlife conflict

- 1 Draw a tree.
- 2 Complete the causes of human-wildlife conflict on the roots of the tree in figure 4.1.
- 3 Complete effects of human-wildlife conflict on the branches of the tree.

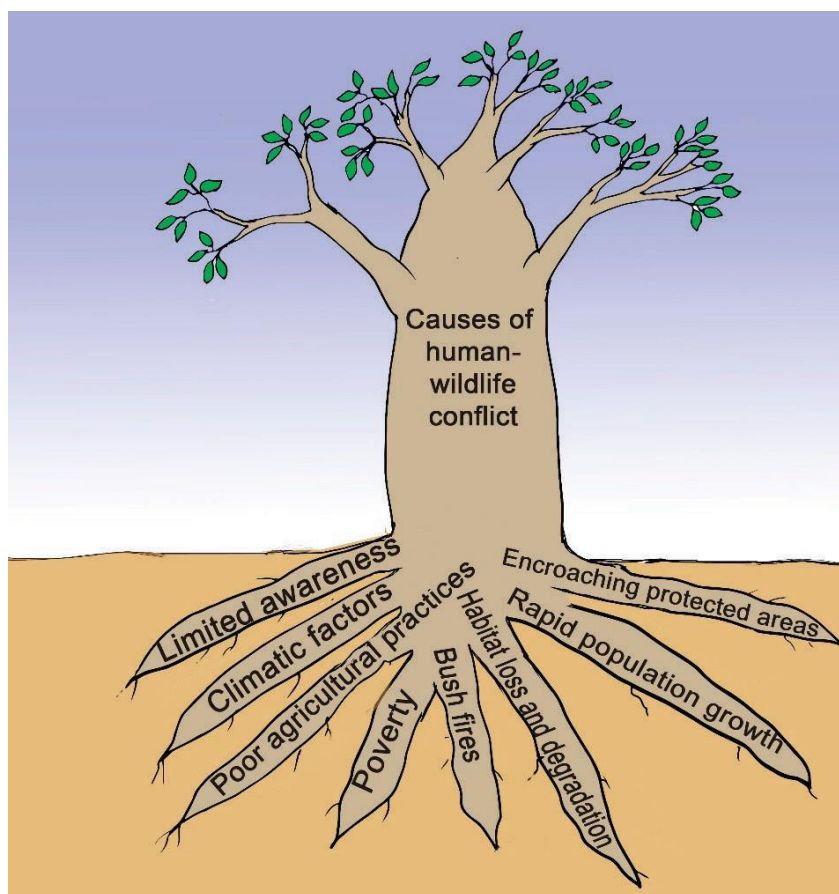


Figure 4.1: Cause and effect of human-wildlife conflict

Activity 4.4

Discussing the consequences of human-wildlife conflict

Describe the consequences of human-wildlife conflict in a community

Consequences of human-wildlife conflict

- Food insecurity and poverty

Wild animals move into people's fields and destroy crops when there is insufficient food, water and shelter. This reduces farmers' produce for food and for sale. Additionally, the number of livestock for people also reduces when they are attacked by wild animals.

- **Death and fear**

Wild animals may attack people thereby causing injury or death. Wildlife that escapes from protected areas creates fear in people. Human-wildlife conflict is generally associated with the physical threat of living with animals. This results in restricting people's freedom of movement for fear of running into such animals or restricting access to resources such as water, wood and grassland as well as to social services such as schools, hospitals and shops.

- **Loss of property**

Some wildlife destroy infrastructures such as buildings, water sources and also trees. Therefore, people develop negative attitudes towards wildlife which can lead to the killing of animals.

- **Diseases**

People that stay close to some protected areas could be at risk of getting infected with various diseases that can be caught from animals. For example, tsetse flies can cause sleeping sickness disease that affect both animals and people.

- **Loss of habitat**

Human-wildlife conflict can result in people damaging wild animal habitats (for example clearing land for homes or crops) which destroys the habitat for the animals and increases the chance of human-wildlife conflict as the animals look for food and new areas to live.

Activity 4.5

Exploring solutions to human-wildlife conflict

- 1 State ways of preventing human-wildlife conflict.
- 2 Find out ways of preventing human-wildlife conflicts from parents, siblings, friends or teachers, community leaders and members.
- 3 Compare what you know with what you found from parents, siblings, friends or teachers, community leaders and members.

Solutions to human-wildlife conflict and coexistence

Successful management of human-wildlife conflicts involves different techniques and no one solution works for all species. Finding solutions to human-wildlife conflicts is key to ensuring that people can live in harmony with wildlife. Below are some practical solutions to human-wildlife conflicts:

- Construction of electric fences around wildlife-protected areas as shown in Figure 4.2. The electric fence stops animals leaving the protected area (they usually don't cross the fence because it gives them an electric shock) so the communities living near to the park are protected.

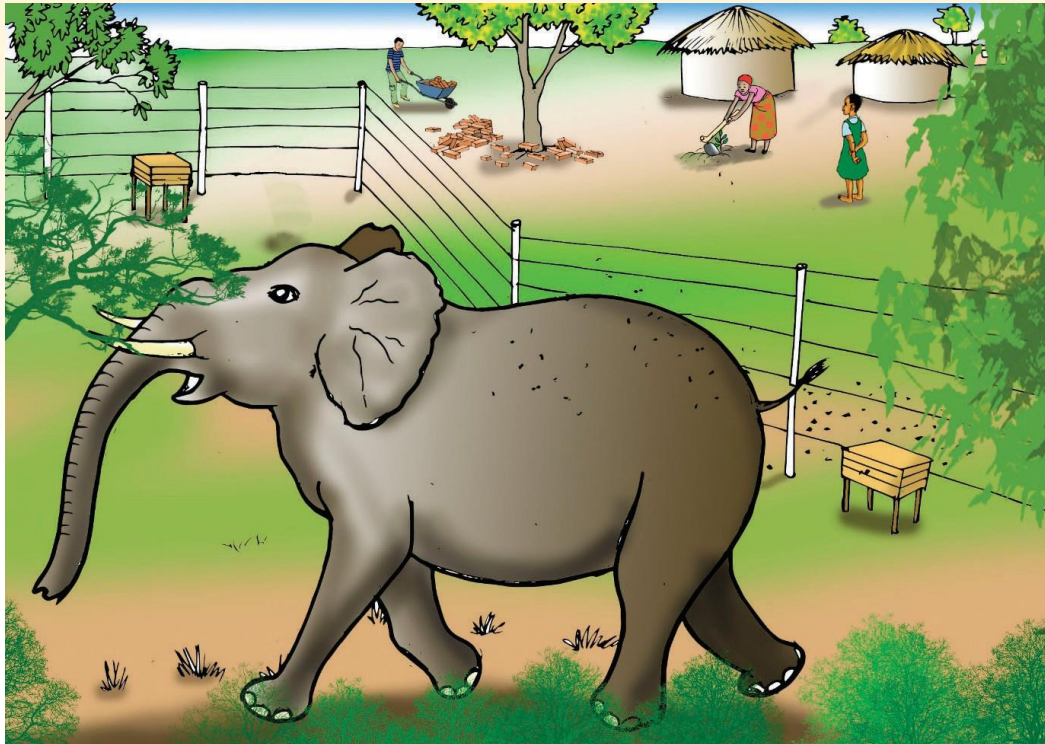


Figure 4.2: An example of successful management of human-wildlife conflict

- Using trenches to protect crops – Trenches can be dug, either exposed or covered, to prevent the movement of elephants and hippos into a field as they are unable to jump over obstacles. For elephants, spikes made from strong wood such as mopane and dug into the ground at regular intervals can make the trench even more difficult to pass.
- Guarding crop fields - farmers keep watch on their fields and if they see animals approaching that might destroy the crop -like elephants or monkeys - they use different methods to try to scare them away including traditional methods like beating drums and animal scares which are mounted in the fields.
- Reporting to authorities like Parks and Wildlife Officers, traditional leaders and the police etc.
- Placing beehives along the boundary of the protected area as shown in Figure 4.2, when elephants attempt to cross the boundary, it disturbs the bees which react angrily and scare the elephants away.
- Civic education on how to manage human wildlife conflict. For example, when a wild animal is out of the protected area.

Summary

Human-wildlife conflict is any interaction between humans and wildlife that results in negative effects on property, culture, livelihood, and life. It is caused by population growth and the destruction of natural habitats among other factors. Considering the human population growth rate and the increasing demand for natural resources such as land, human-wildlife conflicts will remain a problem. Therefore, it is everybody's responsibility to conserve the natural environment to reduce conflict.

Review exercise

- 1 Define human-wildlife conflict
- 2 List any **two** wildlife species commonly causing conflicts with humans
- 3 Outline any **three** causes of human-wildlife conflict
- 4 Identify any **three** consequences of human-wildlife conflict
- 5 Explain any **two** solutions to human-wildlife conflict

Glossary

Food insecurity:	Lack of access to adequate and nutritious food.
Guarding:	Protect against damage or harm
Livelihood:	Source of income
Mammals:	Animals which breastfeed the young ones
Trenches:	Drains

References

- Lilongwe Wildlife Trust. (2022). *Human-wildlife conflict*. (*Environmental Education Handbook*.)
- Government of Malawi. (2018). *National Parks and Wildlife Act*.
- World Wide Fund for Nature. (2005). *Human-wildlife conflict*.

UNIT 5

Wildlife and forestry crime

Introduction

Malawi's wildlife and forest resources are facing huge pressure which if not properly managed could lead to negative results. This is due to rapid population growth, agricultural activities, and other factors. This pressure is leading to an increase in wildlife and forestry crimes. Therefore, the Government of Malawi is committed to raising awareness of wildlife crime so everyone knows the law and to enforcing the law when people commit crimes.

This Unit discusses the common wildlife and forestry crimes. This will make you aware of the laws related to wildlife and forests and the importance of not getting involved in wildlife and forestry crimes. Additionally, this will help to inspire other people in the community not to commit crimes.

Learning outcomes

By the end of this Unit, you should be able to:

- ▷ explain the meaning of wildlife and forestry crime
- ▷ describe forms of wildlife and forestry crimes
- ▷ identify common examples of wildlife and forestry products associated with crime
- ▷ identify wildlife and forestry crime issues in your communities
- ▷ explore the causes of wildlife and forestry crimes
- ▷ explain the effects of wildlife and forestry crimes
- ▷ describe ways of preventing wildlife and forestry crimes

Activity 5.1

Discussing the meaning of wildlife and forestry crime

Discuss the meaning of wildlife and forestry crime.

Wildlife and forestry crimes

Wildlife and forestry crime describes activities which are not allowed under the laws which protect wildlife and forests, they are illegal. In recent times, there has been an increase in wildlife crimes such as poaching, and selling ivory or pangolin scales. Wildlife crime and the illegal wildlife trade has reduced populations of some species such as elephants and rhinos and is a threat to their survival. In addition, there has been an increase in forestry crimes such as illegal and careless cutting down of trees for charcoal making, timber and firewood.

Describing forms of wildlife and forestry crime

Describe forms of wildlife and forestry crime.

Forms of wildlife and forestry crimes

There are different forms of wildlife and forestry crimes. The most common forms of wildlife crimes include poaching, illegal wildlife trade which includes killing, possessing, transporting or selling wild animals without permission and illegal fishing. Forest crimes include illegal cutting of trees and charcoal production. Encroachment in protected areas is also one of the crimes in wildlife and forestry.

Wild animal poaching

Wild animals are hunted and killed for meat and other products as in Figure 5.1. The meat is commonly known as 'bushmeat'. It is still a widespread problem in Africa including Malawi. However, eating bushmeat can be very dangerous as deadly diseases such as *ebola* can be transmitted from some animals to humans.



Figure 5.1: A common duiker (gwape) killed by a poacher

Wildlife trafficking

Some of Malawi's wildlife is seen as an important commodity in other countries. Animals are trafficked across borders such as leopards (*kambuku*), serval cats (*njuzi*) and crocodiles (*ng'ona*) for their skins, hippopotamus (*mvuu*) for teeth, elephants (*njovu*) for ivory, rhinoceros (chipembere) for horns and pangolin (*ngaka*) for meat or scales. For example, Table 5.1 shows how many people were arrested for pangolin, ivory, rhino and charcoal crimes in 2022-2023 and the animals/products that were seized by the police.

- **Wildlife trafficking - elephant ivory**

Poaching has reduced the population of elephants in Africa. Despite a worldwide ban on the ivory trade between 2009 and 2014, criminal networks trafficked as many as 170 tons of ivory. In 1979, the total population of elephants in Africa was estimated at 1.3 million, and in 2022 the total population of elephants in Africa was down to 415,000, as a result of habitat destruction and the trade in ivory. It is not possible to remove ivory tusks from an elephant (tusks are just like large teeth) without killing the elephant. So the high demand for ivory in some parts of Asia to make ornaments and jewelry means that many elephants are poached in Africa and the ivory is illegally taken to Asia to be sold.

- **Wildlife trafficking - rhinoceros horns**

Rhinoceros poaching has increased in recent years. This is due to the demand for rhinoceros horns. It is believed that rhinoceros horns can be used in traditional medicines to treat a variety of sicknesses. Despite its high value for use in medicines, rhinoceros horn is made out of keratin - the same as our fingernails - and there is no scientific proof that it can heal any disease.

- **Wildlife trafficking - pangolins**

Some wildlife species such as pangolins are under increasing threat of extinction because of the demand for their products, such as scales and meat. Like rhino horn, pangolin scales are in high demand to make medicines in Asia and some people also eat them. Pangolin scales are also made from keratin, and there is no scientific proof that they can cure any sickness. In order to protect pangolins, the Government of Malawi has reviewed the wildlife act to punish people found in possession or trading pangolins as in Figure 5.2. If you are found guilty in court you can go to prison for up to 30 years for having a pangolin at your home, transporting it or selling it.

Table 5.1 Wildlife trafficking cases (April 2022-March 2023)

Animals/product	Wildlife Trafficking cases	Products confiscated
Pangolins	48 individuals	27 pangolins seized
Ivory	41 individuals	438.534 kgs seized
Rhinoceros horn	3 individuals	1.08 kgs
Charcoal	74 individuals	4024 bags

Source: LWT Annual Programme Report (March 2023)



Figure 5.2: People caught with a pangolin will be arrested and will go to prison if they are found guilty at the court.

Illegal wild pet trade

The illegal pet trade is an international as well as a local issue. Animals are taken from the wild and sold as pets. The most common type of animals sold for this purpose in Malawi are birds and primates such as monkeys. However, infant monkeys need 24hr care and when they grow older they can be extremely strong and can bite people. Adult monkeys are very difficult to keep in a home environment and are often kept in chains or abandoned completely which is very bad animal welfare - and means they are suffering. Animals kept as pets may also lack the natural behaviours needed to survive in the wild as they have been brought up by humans. Other animals traded as pets include common duiker.

Illegal fishing in protected areas

Fishing is a big business in Malawi since one-third of the country's surface area is covered with water. Rapid population growth and high demand for fish in Malawi are causing fishing to become unsustainable. For example, fishing is happening in protected areas such as national parks, which is illegal. If illegal fishing continues, the fish population would be reduced or wiped out.

Encroachment

Rapid population growth has led to increased encroachment for settlement or cultivation in protected areas such as Kasungu National Park. This leads to higher conflict with animals. It is illegal to use the land within national parks for any purpose and anyone who does this can be arrested and if a court finds them guilty, they may have to pay a fine or go to prison.

Illegal cutting of trees

Illegal cutting of trees leads to a high rate of deforestation in Malawi. The illegal cutting of trees in protected areas is causing deforestation as shown in Figure 5.3. For example, Mulanje Cedar, Malawi's national tree and a protected species, is critically endangered because so many of these trees have been illegally cut down. Illegal cutting of trees has serious economic and social effects on the poor and disadvantaged individuals and families as it has led to more flooding and poorer soils reducing crop yields in the process.

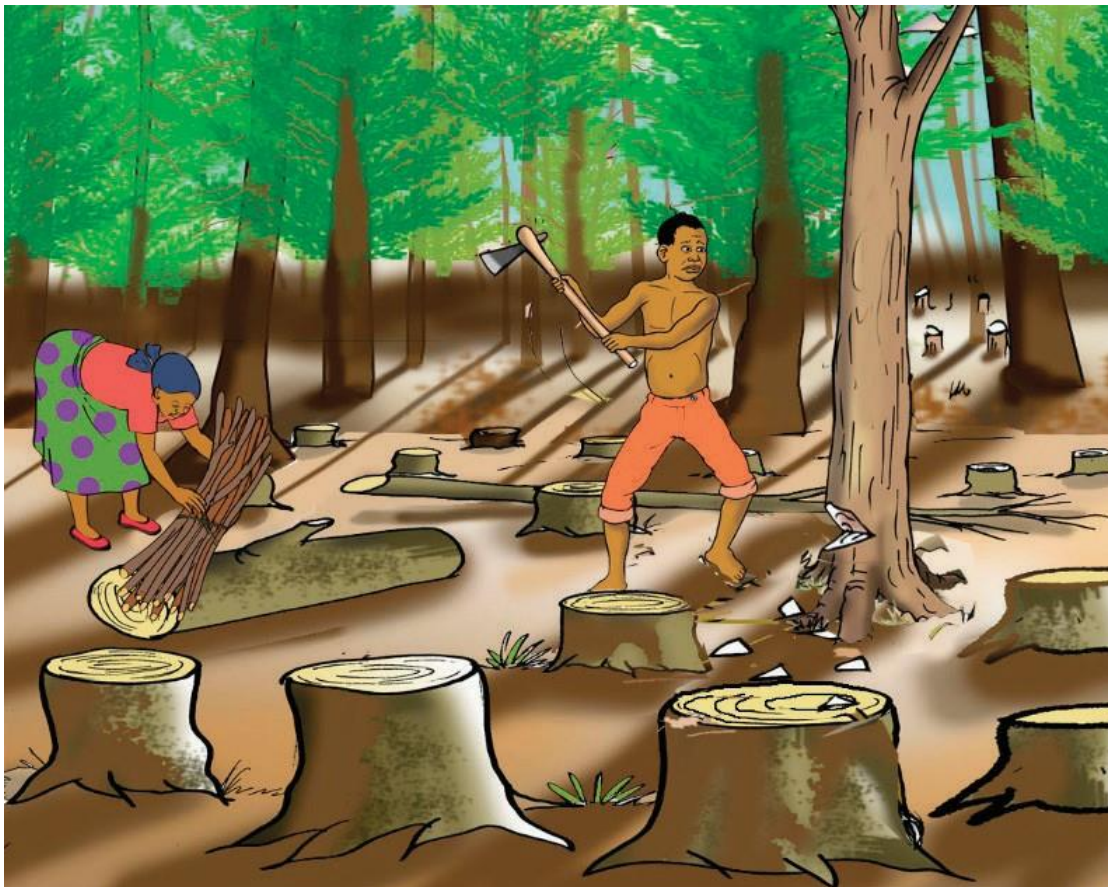


Figure 5.3: Unlawful and careless cutting of trees in a forest reserve

Illegal charcoal production

Most people rely on charcoal and firewood for cooking in their homes. As a result, there is huge pressure on forests. Since so many forests outside of parks and forest reserves have been chopped down, many people now choose to enter protected

areas to meet the need for wood and charcoal. Most of the charcoal is transported to urban areas for sale as shown in Figure 5.4.

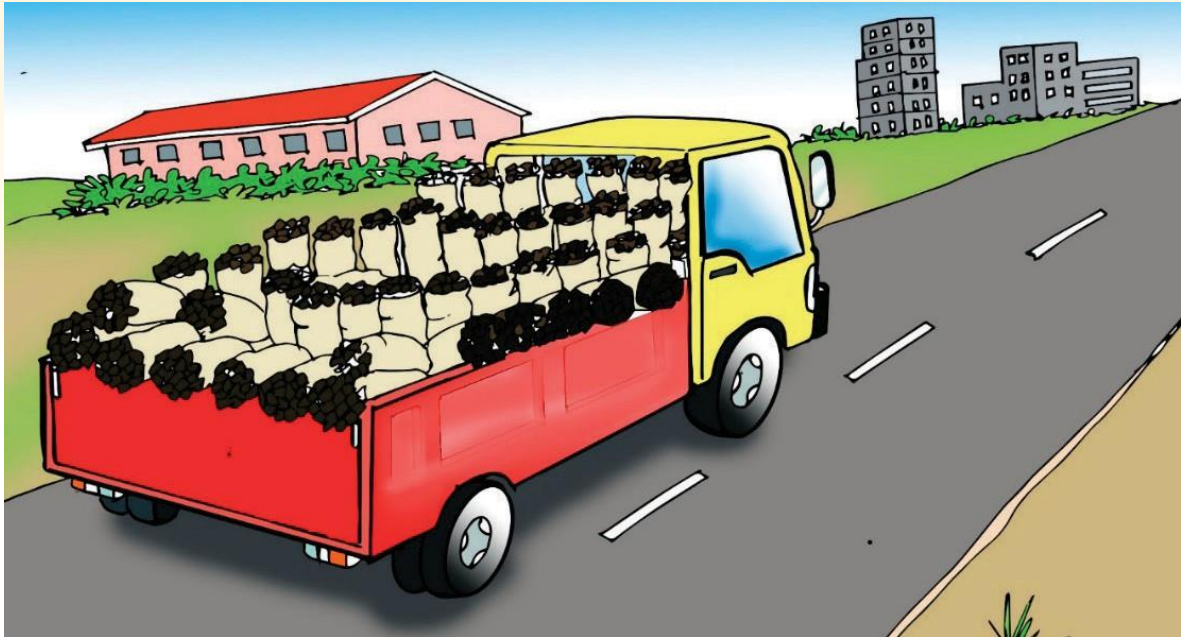


Figure 5.4: Transportation of charcoal for sale

Activity 5.3

Identifying common examples of wildlife and forestry products associated with crime

- 1 List the species that are the most vulnerable to wildlife and forestry crime.
- 2 Identify the common examples of wildlife and forestry products associated with wildlife and forestry crime.

Common examples of wildlife and forestry products associated with crime

Species that are most vulnerable to wildlife and forestry crime are elephants, rhinoceros, pangolins, fish, hippopotamus, big cats, Mulanje Cedar and others.

Activity 5.4

Identifying wildlife and forestry crime issues in communities

Identify the common wildlife and forestry crime issues in your communities.

Wildlife and forestry crime issues in the communities

The common wildlife and forestry crime issues in the communities include careless cutting down of trees for charcoal making and timber, fishing during the off-season or in protected areas and poaching wild animals for meat and other products.

Activity 5.5

Exploring the causes of wildlife and forestry crimes

- 1 Find out the causes of wildlife and forestry crimes in your community.
- 2 Discuss the main causes of wildlife and forestry crimes in the communities.

Causes of wildlife and forestry crimes

The main causes of wildlife and forestry crimes include:

- 1 Rapid population growth which is causing a high demand for land for cultivation and settlement. This leads to the encroachment of protected areas which is not allowed.
- 2 Corruption is promoting wildlife and forestry crimes in the sense that people involved in the crime corrupt officers such as immigration officers (usually by paying them money) to allow them to pass the border posts or roadblocks.
- 3 The illegal wildlife trade has promoted the poaching of some of Africa's most widely known species of wildlife. The high demand for elephant ivory and rhinoceros horns in Asia and elsewhere has created a major illegal market for elephant ivory and has led to high rates of poaching in Africa.
- 4 The attitude towards wildlife crime, poaching and bush meat has not changed much. One of the attitudes among people is that any animal that comes into a village should be killed for bush meat or other products. The Government is trying to raise awareness of the wildlife and forestry laws so that everyone understands what is allowed and what is a crime.

Activity 5.6

Discussing the effects of wildlife and forestry crimes

- 1 Brainstorm the effects of wildlife and forestry crimes.
- 2 Discuss the effects of wildlife and forestry crimes.

Effects of wildlife and forestry crimes

Wildlife and forestry crime is damaging to wildlife, forests, and human beings. The effects of wildlife and forestry crimes include:

- **The decline in wildlife and forestry species.**
- **Loss in revenue** - The illegal wildlife trade has robbed communities of wildlife-related tourism revenue (if all the big animals are killed, then no tourists will pay to come and see them). The loss of forests has negative effects on revenue to the Government because no taxes are paid on the illegal charcoal.
- **The loss of forests has negative effects on agricultural produce** - Damaging the forests reduces soil fertility and the amount of rainfall resulting in poor crop production.
- **Disturbance to the ecosystems and loss of biodiversity** - Wildlife and plants depend on each other for survival. A decline in one species affects the survival of other living things.

- **Destroying Malawi's natural and cultural heritage** - Malawi's natural and cultural heritage is linked to a rich variety of plants and animals. Malawi is so lucky to have wildlife such as lions, elephants and rhinoceros and we have a responsibility to maintain and protect them.

Activity 5.7

Discussing ways of preventing wildlife and forestry crimes

- 1 Suggest a part you can play in preventing wildlife crimes.
- 2 Discuss community practices in addressing wildlife and forestry crimes.

Ways of preventing wildlife and forestry crimes

Each one of us has roles and responsibilities to play in preventing wildlife and forestry crimes. The following are some of the ways we can prevent wildlife and forestry crimes:

- **Law enforcement**
The government has a responsibility to prevent wildlife and forestry crimes from happening. For example, setting appropriate laws, providing sufficient monitoring on the ground such as anti-poaching teams and adequate sentencing for offenders. Examples of wildlife crimes include **illegal entry into the protected area, carrying a weapon while inside the protected area, killing or possession of wild animal, clearing vegetation inside the protected area, setting fire and dumping waste.**
- **Civic education**
There is a need to educate communities across the country about the benefits of wildlife and forest protection.
- **Reporting wildlife crime**
If you see or hear anything that you think might be part of an illegal activity involving Malawi's wildlife you can tell an adult and they can report it to the nearest police station or the Department of National Parks and Wildlife (DNPW). Do not let other nations profit at our expense.
- **Do not get involved**
It is illegal to keep, kill, eat, buy or sell any wild animal in Malawi. As part of the new Wildlife Act, wildlife criminals could find themselves behind bars for up to 30 years with no option for a fine if they are involved in the crime at any level of the chain, even if they just transport the animal for someone else. So, do not get tempted to participate in any activity associated with wildlife crimes. It is also illegal to buy wildlife parts or products such as ivory and rhinoceros carvings and any purchases that are fueling the trade.

Summary

In this Unit, you have learned that wildlife and forest crimes are on the increase due to rapid population growth, agricultural land expansion and illegal wildlife trade. These crimes lead to loss of tourism revenue, disturbance in the ecosystem, loss of biodiversity, climate change and destruction of the natural and cultural heritage. Wildlife and forestry crimes can be prevented through increased awareness of the causes and negative effects of these crimes, enforcing laws related to wildlife and forests as well as reporting and not participating in these crimes. This knowledge will enable you to behave responsibly towards forest and wildlife resources and influence people in your family and community to protect forest and wildlife resources.

Review exercise

- 1 Define 'wildlife and forestry crime'.
- 2 Describe any **two** forms of wildlife and forestry crimes.
- 3 Identify any **three** common examples of wildlife and forestry products associated with crime.
- 4 Identify any **three** wildlife and forestry crime issues in your communities.
- 5 Explain any **three** causes of wildlife and forestry crimes.
- 6 Outline any **three** effects of wildlife and forestry crimes.
- 7 Describe **three** ways of addressing wildlife and forestry crimes.

Glossary

Conviction:	Being found guilty in a court of law
Endangered:	Become scarce and in danger of extinction/disappearance.
Primate:	Any mammal of the group that includes lemurs, lorises, tarsiers, monkeys, baboons and humans
Trafficking:	Smuggling or transferring and trading in something prohibited such as animal and plant species and their products
Wildlife:	Animals living and plants growing in their natural environment

References

- Lilongwe Wildlife Trust. (2022). *Wildlife crime module*
- Lilongwe Wildlife Trust. (2023). LWT annual programme report

UNIT 6

Energy sources

Introduction

Energy is very important to everyday life. People need energy, for light, powering radios and televisions, charging phones, cooking, and many other uses.

In this Unit, you will be introduced to what energy is, its sources and uses and the effects of the unavailability of the various sources of energy.

The knowledge will enable you to effectively use and find solutions to energy problems in your community and assist your community to use the existing sources of energy economically and adopt alternative efficient energy sources to meet the rising energy need and deal with local energy problems.

Learning outcomes

By the end of this Unit, you should be able to:

- ▶ define the term energy
- ▶ describe types of energy
- ▶ identify sources of energy
- ▶ explain the uses of energy
- ▶ describe problems associated with the use of different types of energy
- ▶ suggest solutions to energy challenges

Activity 6.1

Defining *the term energy*

Define the term energy.

Energy

Energy is the ability of an object or system to do work on another object or system. Any object that can do work on another object is said to have energy and it is called an energy source. For example; firewood can produce heat when burnt. The heat can be used for cooking, heating, drying and many more. Therefore, firewood is an energy source. Different objects produce different types and forms of energy which are also used in different ways in our everyday life.

Activity 6.2

Classifying different types of energy sources

- 1 Identify two types of energy sources.

- 2 List different energy sources in your community.
- 3 Classify the energy resources you identified into renewable and nonrenewable energy sources.

Types of energy sources

Energy sources are categorised into:

- Renewable energy
- Non-renewable energy

A **renewable energy source** is a natural resource which can produce energy and can be reproduced, grown, generated, or used on a scale which can sustain its consumption rate, once depleted there will be more available for future use. Resources such as solar energy, water, wood (when harvested sustainably) and wind are considered renewable resources. This is because they can be reproduced or regenerated. Trees are renewable sources of energy because once a tree is cut down, in a well-managed forest system more trees can be planted and regeneration of the forest takes place.

A **non-renewable energy source** is a natural resource which can produce energy, but it cannot be reproduced, grown, or generated and it is produced on a scale which cannot sustain its consumption rate; once depleted there will be none available for future use. Resources that are consumed much faster than nature can create them are also considered non-renewable. Fossil fuels (such as coal, petroleum and natural gas), nuclear power (i.e., uranium), certain aquifers and metal ores are prime examples of non-renewable resources.

Activity 6.3

Identifying the sources of energy for different tasks

State the common sources of energy in your community.

Sources of energy in communities

The following are the sources of energy:

1 Biomass fuels (made from plants)

Biomass energy is obtained from burning firewood, charcoal and crop/industrial residue. About 67% of fuel wood is used in rural households for cooking and heating, 15% in urban households, 7% is used in tobacco and tea industries and the remainder (11%) is used for other purposes, including small-scale and urban industries. 98% of rural households, 64% of urban households in Lilongwe and 42% in Blantyre and Mzuzu use fuel wood for cooking.

Firewood is the most used energy source for domestic cooking and heating in rural areas. Some firewood is also used for burning mud bricks and in production industries like tea companies and tobacco curing. It is also used to produce charcoal which is mostly used in urban and semi-urban locations accounting for 76.4% of the population using charcoal.

Energy needs in Malawi are mainly derived from firewood and charcoal, which accounts for 88.5% of the total energy demand. The rest of the energy is supplied by hydrocarbon fuels (6.4%); coal (2.4%); and others (2.8%).

2 Hydropower (waterpower)

Hydropower, also known as waterpower, is the use of falling or fast-running water to produce electricity or to power machines. Hydropower is a method of sustainable energy production through water forces or pressure as in Figure 6.1. In Malawi, the main hydropower plants are Nkula, Tedzani and Kapichira in the Shire River in the Southern Region. Another hydropower plant is Wovwe Hydropower in Wovwe River in the Northern Region.

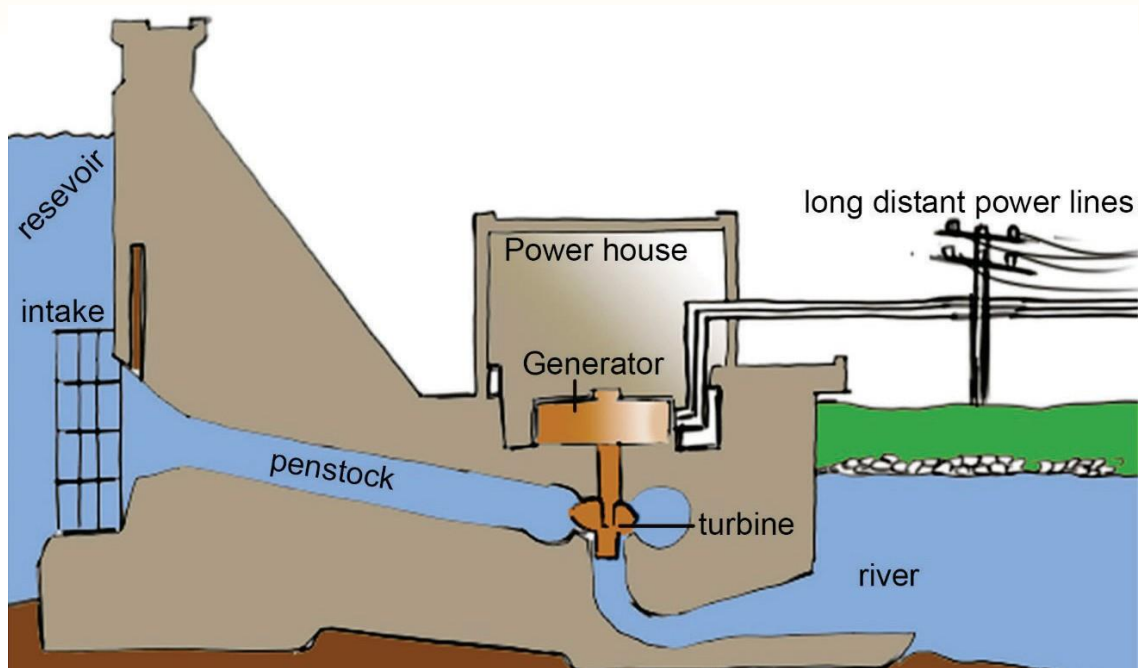


Figure 6.1: Hydropower plant uses water to turn the turbine and generate electricity

3 Solar energy



Figure 6.2 Solar energy panels on the roof capture energy from the sun which is converted to electricity

The Earth gets most of its energy from the sun. This energy is solar energy. Solar panels are used to capture energy from the sun and transmit it to homes for use.

4 Wind energy

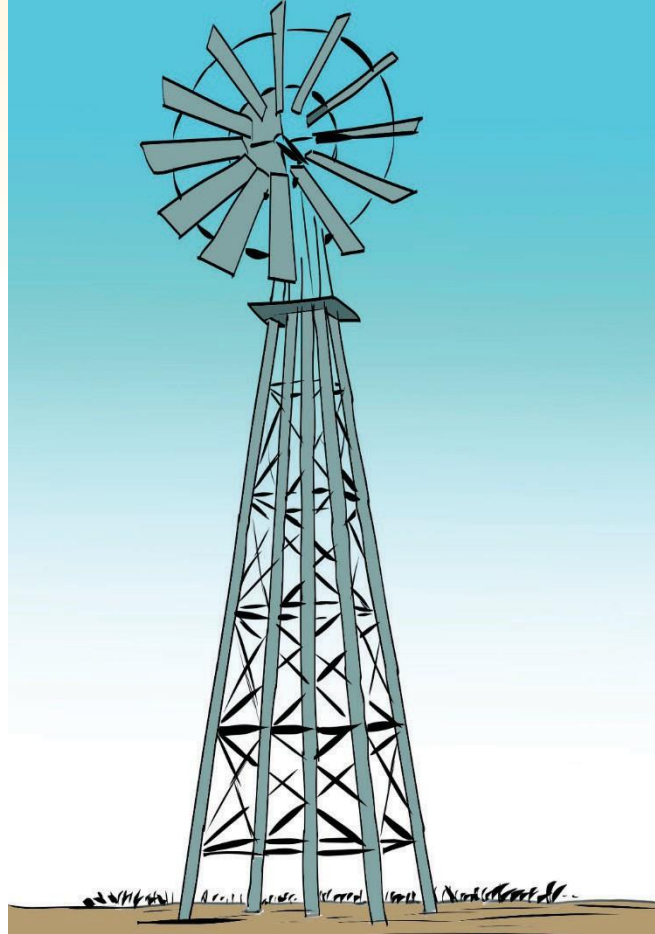


Figure 6.3: A Windmill as a source of power

The wind is moving air. Strongly moving air has the capacity of destroying the property of people by uprooting trees, bending down crops, removing roofs of houses, sinking boats through waves and currents. This means that wind (moving air) has energy. Therefore, this wind that destroys our property can be useful if properly harnessed, refer to Figure 6.3 showing a windmill. When the blades of the windmill are turned by the wind, the energy is captured and can be converted to electricity.

5 Fossil fuels (also called hydrocarbons) oil, gas and coal

Fossil fuels are produced from plants and animals that died a long time ago and became fossilized underground. Fossil fuels include oil, gas (including LPG), and coal. Energy sources like petrol, diesel, paraffin and natural gases are all products of petroleum or simply called oil. Petroleum (oils and natural gases) are naturally occurring chemicals. They are used in cars, airplanes, maize mills and cooking stoves. Care must be taken as these catch fire easily. Coal is a rock which can burn like charcoal. It is used for household

cooking and in industries. In Malawi, it is commonly found in the Chiweta Hills in Rumphi District.

Fossil fuels are not renewable, one day they will run out. They are also major causes of climate change, so it is important to use renewable energy sources where possible.

Activity 6.4

Describing uses of energy

- 1 Mention any three uses of energy.
- 2 Copy Table 6.1 and fill in the source of energy for the listed tasks and items.

Table 6.1 Common uses of energy

No	Task/Item	Energy sources
1	Cooking	
2	Transport	
3	Lighting	
4	Charging cell phones	
5	Running a maize mill	
6	Running a computer	
7	Heating	
8	Drying up wet substances	
9	Powering a radio	
10	Egg incubator	

Uses of energy

Different types and forms of energy are also used in different ways in our everyday life

- Firewood can produce heat when burning. People can use the heat for cooking, heating, drying and many more activities, refer to Figure 6.4.
- Electricity is a source of energy that is used to run cookers, refrigerators, radios, fans, maize mills, light bulbs, charge phones, and many other uses. Electricity can be produced from hydropower, windmills, fuel-powered generators, solar power, steam engines and other ways.



Figure 6.4: Improved cook-stoves are more efficient in keeping the heat from the fire, so less firewood is needed. They can also be safer and emit less pollution so are good for people and forests.

Activity 6.5

Describing problems associated with energy sources

- 1 List all the energy sources you have learnt in this unit.
- 2 Discuss the advantages and disadvantages of each energy source.
- 3 Explain problems linked to energy sources in your area.
- 4 Suggest possible solutions to the problems identified above.

Problems associated with the use of different types of energy

Energy problems depend on the availability of the energy source, the use of the energy and social and cultural beliefs about different energy sources.

- The use of different sources of energy, especially biomass and hydrocarbons, affects the environment through climate change including global warming, environmental degradation, deforestation and pollution, etc.
- With over-dependence on biomass as a source of energy, the resource is becoming scarce.
- The cost of firewood and charcoal is cheaper than the oils (paraffin, diesel, petrol) and electricity and this leads to overdependence on firewood and charcoal in Malawi.
- Very few people adopt new technologies due to cultural or some beliefs.
 - Associating using cow dung for making fire for cooking with being dirty.
 - Fears around dangers of using LPG. However, there is no significant evidence or experience to prove the dangers of using LPG in Malawi.
- It is expensive also to adopt sustainable energy resources like solar and wind power.

Activity 6.6

Identifying examples of less destructive energy sources

- 1 List examples of less destructive energy sources.
- 2 Explain how the energy sources you mentioned above are less destructive.

Alternative sources of energy

There are a lot of alternative energy sources that are less destructive and sustainable. There is a need for everybody to use energy sources that are less destructive to the environment and energy-saving technologies such as using:

- briquettes
- biogas
- biodiesel
- solar dryers
- solar incubators
- windmill
- energy saving stoves that use less firewood e.g., 3 pieces of firewood as shown in Figure 6.4

In addition, you may use existing alternative sources of energy in the community for cooking such as waste materials like paper, animal dung and tree leaves or grass.

Summary

Energy is very important in our everyday life. It is used for heating, transportation, light, powering radios and televisions, charging phones, cooking and many other uses. In this Unit, you have been introduced to the meaning of energy, and sources and uses of energy. You have also learned about problems associated with energy such as scarcity, unavailability and cost of energy sources. Now that you have understood energy and its sources and uses, you will be expected to share information on efficient and alternative sources of energy in your communities.

Review exercise

- 1 What is energy?
- 2 Explain the two groups of energy sources.
- 3 Describe four main sources of energy in your community.
- 4 Explain the main uses of the sources of energy identified above.
- 5 What are the three main problems associated with energy? Suggest solutions to these problems.

Glossary

Coal: A hard black substance that is extracted from the ground and burned as fuel.

- Electricity:** A form of energy that can be carried by wires and is used for heating, lighting and powering machines.
- Fuel:** A substance that is burned to provide heat or power, e.g., petrol, firewood etc.
- Non-renewable:** A natural resource which cannot be reproduced, grown, generated, or used on a scale which can sustain its consumption rate.
- Petroleum:** Oil found in the ground.
- Regenerate:** Healing and growing again after being severely damaged.
- Renewable:** A natural resource that can be reproduced, grown, generated, or used on a scale which can sustain its consumption rate.
- Reservoir:** A large natural or artificial body of water, that is available for use when needed.

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- GoM. (2018). *Malawi national energy policy*.

Introduction

Having access to clean safe water and sanitation in communities is key for healthy living. Malawi has an abundance of water in rivers, dams, lakes, and streams including ground water. However, providing enough clean water for every single citizen is a complex national problem. Many people (1 out of 3) in Malawi do not have access to clean and safe water. As such, sound management of sources of water is essential to human health and environmental sustainability and economic prosperity of communities and the nation at large.

In this unit, you will learn about sources of water, its importance and how it can be protected. This knowledge will equip you with skills, values and knowledge to appreciate the availability of water in your community and how to take care of it.

Learning outcomes

By the end of this Unit, you should be able to:

- 🕒 identify sources of water
- 🕒 explain the importance of a safe and clean water supply
- 🕒 explain the challenges facing water management
- 🕒 explain management systems of water in your community to ensure equal and fair access to clean water

Activity 7.1

Identifying sources of water

- 1 Define water source.
- 2 Classify water sources.
- 3 Give examples of water sources.

Sources of water

A water source is referred to as a body of water. It is classified into two groups, which include:

a. Surface water

Surface water is water found on the surface of the earth. Some examples are rivers, lakes, dams, marshes, swamps and lagoons.

b. Ground water

Groundwater is water found beneath the earth's surface. Groundwater is usually accessed through boreholes and wells.

Activity 7.2

Discussing the importance of a safe and clean water supply

- 1 Explain the importance of water.
- 2 Identify indicators of unsafe water.

Importance of water

Water is important for livelihoods in the following ways:

- Helps with maintaining hygiene (for bathing and cleaning clothes)
- For drinking by people and animals
- For economic activities like irrigation of crops
- Habitat for aquatic life (for animals and plants that live in rivers, lakes)
- Used for water transport by boats and ships
- Tourism attractions like lakes and wildlife surrounding the water bodies

Signs of unsafe water

It is important to use safe water to avoid water-related diseases like dysentery, cholera and bilharzia. It is important to take note of unsafe indicators of water which include:

- Unclear or cloudy water, yellow, orange, green, blue, or brown water
- Smelly or water with odour may indicate too much chlorine
- Water with worms and other tiny organisms
- Water with faecal matter from people and animals
- Stagnant water
- Slippery feeling of hands after washing with soap and water
- Water full of litter
- Water with chemicals used for agriculture and from industries as shown in Figure 7.1

However, a number of contaminants are hidden from the naked eye, this is the reason water needs to be screened by professionals.



Figure 7.1: People using contaminated water

Activity 7.3

Explaining challenges facing water sources

- 1 List challenges facing water sources.
- 2 Explain challenges affecting water sources.

Challenges facing water sources

There are a number of challenges facing water sources which need our attention and these include:

- Siltation
- Poor agricultural practices
- Careless dumping of waste from industries and households
- Poor positioning of pit latrines

1 Siltation

Siltation is a process whereby soil particles transported by flowing water or other transporting actions are deposited as layers of solid particles in water bodies. Siltation leads to floods, drying up of water bodies and loss of habitat to aquatic animals and plants.

2. Poor agricultural practices

Poor agricultural practices include cultivating along river banks, cultivating along slopes, and applying fertilisers and chemicals which are released into water bodies during rains. Manure from livestock is also released into water sources. These materials and chemicals affect the quality of water sources such as rivers.

3. Careless dumping of wastes from industries and households

It is becoming very common for some people to dump waste from households like diapers, sanitary pads, bottles and plastics. Some industries are also contributing to the dumping of waste and chemicals into water sources. This is greatly affecting aquatic life, wildlife, and people, drinking dirty and polluted water can cause various illnesses and diseases.

4. Poor positioning of pit latrines

Poor positioning of pit latrines is contributing to leakages of faecal and urine waste into water sources like wells and boreholes and is a very serious cause of water-related diseases.

Activity 7.4

Describing management systems to protect water sources

Describe different management methods to safeguard water sources.

Water source management approaches

The challenges affecting water sources need to be reduced or halted completely to make sure everyone has access to clean and safe water. As such, communities need to come up with management approaches for water sources. The following approaches may help to reduce or manage poor practices affecting water sources:

- Stiffer penalties should be given to industries and householders that dump waste into water sources.
- Sensitization on ways of protecting water sources.
- Incentives should be given to those protecting water sources.
- Planting trees along water sources and slopes.
- Proper positioning of pit latrines, sewer systems, and septic tanks, especially when they are near water sources.
- Practice sustainable agricultural practices like avoiding dangerous chemicals.
- Communities create watchdogs like pollution control committees, committees on hygiene and the creation and enforcement of applicable laws.

Summary

This Unit has discussed sources of water, their importance and the challenges facing the management of sources of water. The skills, knowledge, values and attitudes gained are helpful in protecting and improving the quality of water in our respective communities for the betterment of our lives.

Review exercise

- 1 What are the better sources of water in your community?
- 2 If you were to rate the water supply in the community from 1-5, with 1 being

very poor, 2 poor, 3 average, 4 good and 5 very good, what score would you give it? Why?

- 3 Explain the management approaches used in your community to safeguard water sources.
- 4 Assess the efficiency of the management approaches used in protecting water sources in your community.

Glossary

Aquatic: Relating to living in or near water or taking place in water

Reference(s)

Government of Malawi. (2017). *National waste management strategy, 2017 -2022*.

Environmental Affairs Department (EAD): Lilongwe.

Lilongwe Wildlife Trust. (2022). *Waste Management. (Environmental Education Handbook.)*

Introduction

Waste management is one of the important activities in the prevention of environmental degradation. It involves how waste is managed from source, collection, transportation and disposal. When waste is not properly managed it affects human and animal life and the environment in general. Therefore, it is important to reduce the creation of waste through prevention, reduction, recycling and reuse.

This Unit discusses waste management. This will help you appreciate the importance of proper waste management.

Learning outcomes

By the end of this Unit, you should be able to:

- define the term "waste"
- mention sources of waste
- explain types of waste
- identify forms of waste in your community
- explain the effects of poor waste management on people, wildlife and the environment
- describe poor waste management practices
- suggest solutions to poor waste management practices in your communities

Activity 8.1

Discussing the meaning of waste

- 1 List any waste products in the environment.
- 2 Explain the term waste.
- 3 Discuss sources of waste.

Waste

Waste is any unwanted, useless, or unusable materials after use. It is also called rubbish or litter. Examples include plastic bags, plastic bottles, and cans of different drinks, banana leaves, cotton gloves, orange peels, cigarette butts, disposable diapers, foamed plastic cups and milk cartons as in Figure 8.1.



Figure 8.1: Examples of waste

Sources of waste

Sources of waste include:

- **Domestic** such as leaves, vegetable peels, empty packaging
- **Industrial or commercial** such as heavy metals and chemicals, plastics bags, glass and papers
- **Agricultural waste** such as left over livestock feed, crop residue and manure

Activity 8.2

Discussing types of waste in the community

Describe different types of waste.

Types of waste

- **Biodegradable waste:**

This is the type of waste that decomposes by itself, it comes from plant or animal sources. This includes waste that comes from kitchens such as food remains, vegetable peelings, egg shells and garden waste. It also includes agricultural waste like maize stalks, straw and products from trees like paper and cardboard.

- **Non- biodegradable:**

This is the type of waste that does not decompose by itself. They remain in the environment for a longer period of time. Some of the examples include broken glass pieces and plastics.

Activity 8.3

Identifying different forms of waste in the community

Identify different forms of waste in the community.

Different forms of waste

- i. Solid waste includes litter, construction debris, glass bottles, plastic bags and containers, waste tyres, medical waste, and electronic waste.
- ii. Liquid waste includes used oil and sewage sludge.
- iii. Gaseous waste: most of the gaseous waste is produced in chemical industries as byproducts of industrial processes and vehicle engines. Among the commonly produced gaseous chemicals are: carbon dioxide, carbon monoxide, methane, ethane and others.

Activity 8.4

Discussing the effects of poor waste management on people, wildlife and the environment

- 1 Brainstorm the effects of poor waste management in your community.
- 2 Discuss the effects of poor waste management in your community.

Effects of poor waste management

There are many problems associated with poor waste management that affect people, wildlife and the environment.

The following are the effects of poor waste management:

- i. **Human disease:** Improper management of sewage which can get into the water and cause diseases like dysentery and cholera. Air pollution like smoke from cars and factories can cause cancer. Even broken bottles left lying around can collect water and become a breeding ground for mosquitoes, leading to the spread of malaria.
- ii. **Injury and death to wildlife:** Fish can die from chemicals that are washed into the river. Birds and other animals that eat the poisoned fish can also die. Again, if all the fish die and there is no fish for the birds to eat, the birds will die from hunger. Animals may try to eat waste like plastic bags and can suffocate and die. If this happens to someone's domestic animals, like a cow, then this will also lead to a loss of income.
- iii. **Crop failure:** Gases released into the atmosphere - smoke from fires or gases from factories can lead to acid rain which can destroy crops and the fertility of the soil. Dumping waste in the wrong place can also cause blockages where water should drain, which can lead to floods which can damage crops.

- iv. **Climate change:** Air pollution also causes changes in climate. The gases which are emitted can also lead to a change in weather, which in turn can affect crop production.
- v. **Unpleasant places to live:** Poor waste management makes the environment look ugly. Most of the markets in Malawi are failing to manage waste which is unpleasant for the people who live nearby. Disposal of waste in the country remains a challenge as most of the cities lack proper and adequate disposal sites.

Activity 8.5

Investigating poor waste management

- 1 Find out about poor waste management practices.
- 2 Describe poor waste management practices.

Waste management in Malawi

Malawi is facing environmental problems due to poor waste management. Some of these problems can be minimised if waste management can be handled at different stages of the waste cycle such as:

i. **Waste generation**

Waste generation is the amount of waste produced by communities and industries in a country. Like all fast-growing cities in the world, the cities of Malawi are producing a lot of waste due to the growing population and the few resources for public services to adequately manage and recycle the waste.

ii. **Waste segregation**

Waste segregation is the process in which different types of waste are first separated and then collected differently as in Figure 8.2. Most of the waste is generated in households, marketplaces, cities, towns, institutions and industrial zones. Very few households segregate waste at the household level. There is minimal waste segregation at source within the Central Business District (CBD) areas, industries and institutions in most towns/cities. Segregating waste means that different types of waste can be managed appropriately e.g. biodegradable waste can be used to produce compost and fertiliser.



Figure 8.2: Waste segregation: metals, degradables and plastics

iii. Waste collection and transportation

Waste transportation is mainly done by using open trucks and hand carts, among other methods. These poor transportation modes have led to littering (as litter falls off the truck/cart), making wastes such as plastics an eye-sore, and a health and environmental hazard.

iv. Waste treatment

Waste treatment refers to activities required to ensure that waste has the least impact on the environment. Waste treatment mainly is done using technology. Malawi has not started using ways of treating waste due to limitations in technology. However, there are ongoing efforts to enhance waste treatment practices such as composting. Another way is recycling, 50–80% of Malawi’s general waste which can be recycled. Some industries exist that receive recovered materials such as paper, polythene, plastics, glass,

scrap metals, used oil, e-waste, and waste tyres for recycling. There is low public awareness of these facilities and that is why most industries do not recycle to the full capacity.

v. **Waste disposal**

Disposal of waste in the country remains a major challenge as most of the councils lack proper and adequate disposal sites. Most of the waste generated is disposed of in open dumpsites across the country. Although it is not a recommended method of waste disposal, it is the most common in use. The councils that have designated sites, practice open dumping of mixed waste as they lack appropriate technologies and disposal facilities. Some private operators who collect waste in residential areas dispose of the waste in areas specifically designated for that purpose by local government authorities, while others dump the waste in open fields or river banks. The sites for waste disposal are located at 5 Miles in Zomba City, Area 38 in Lilongwe City, Mzedi in Blantyre City, Nsilo in Mzuzu City and Katili in Karonga among others. Katili in Karonga and Nsilo in Mzuzu are fenced and protected.

Activity 8.6

Suggesting solutions to poor waste management in the communities

Suggest solutions to waste management.

Solutions to poor waste management in the communities

The main objective of waste management is to avoid or minimise waste and to promote reuse, recycling and recovery of goods and waste materials. Some of the solutions to poor waste management include:

Promote waste segregation at source (home, shops and markets)

- Provision of equipment for waste segregation
- Provision of segregated waste transport systems
- Intensified waste segregation
- Initiate pilot waste segregation

Reduce, Recycle, Reuse and Recover energy from the waste (4Rs)

- **Reduce:** As a society, there is a need to make less waste. For example, buy items that have little or no packaging. It is also better to use rechargeable batteries.
- **Recycle:** Recycling involves the use of discarded materials to produce another product - either another of the same type e.g. recycle glass bottles into more glass bottles, or into an entirely different product. Recycle all recyclable items. Paper and plastic items have a recycling code stamped on the bottom to show if they can be recycled. Also, buy items packaged in recyclable materials. Continue looking for new ways to recycle non-recyclable items.
- **Reuse:** This involves reusing the items which are thrown away. For example, using paper lunch bags multiple times instead of throwing them away after just one use.

- **Recover energy:** This involves changing non-recyclable waste materials into usable energy. As organic materials decay naturally in a landfill, they release methane which is a component of natural gas and this can be used to produce energy.

National Clean-up Day: The citizens are sensitized and encouraged to take part and participate in various cleaning activities of their surroundings such as offices, industries, business places, schools, hospitals, streets and homes or cutting grass, trimming bushes alongside the roads, planting trees, etc.

There are several benefits of National Clean-up Day. Some of them include:

- Promote a clean and healthy environment which in turn will enhance the general health and well-being of the population;
- Promote environmental consciousness and positive behavioural change in the way individuals, communities and institutions manage waste in this country;
- Instill a culture of cleanliness at home, work and business places in the country.

Summary

In this Unit, you have discussed waste as any unwanted, useless, unusable materials after use. The different forms of waste such as solid, liquid and gaseous waste, the effects of poor waste management such as human disease, injury and death to wildlife, crop failure and climate change. Additionally, you have also identified poor waste management practices such as poor waste generation, segregation, collection, transportation, treatment and disposal and some solutions to the problems of poor waste management such as minimising waste generation and promoting re-use, recycling and recovery of goods and waste materials.

Review exercise

- 1 Define waste.
- 2 State any **two** sources of waste in your community.
- 3 Identify types of waste.
- 4 Explain any **two** forms of waste in your community.
- 5 Describe ways in which poor waste management practices affect people, wildlife and the environment.
- 6 Identify any **three** poor waste management practices.
- 7 Explain any **three** solutions to poor waste management practices.
- 8 Form a club whose main objective is to recycle and reuse waste at the school.

Glossary

Biodegradable:	Any object capable of being decomposed by bacteria or other living organisms and thereby avoiding pollution
Compost:	Mixture of plant and food waste, manure which can be used as a fertiliser
Disposal:	Throwing away because it is no longer of use

Eye sore:	Not pleasant to look at
Hazardous:	Involving or exposing one to risk
Industrial:	Used or developed for use in industry
Non-recyclable energy:	Waste that cannot be recycled, e.g., decayed landfills and cow dung
Degradation:	Loss in quality, something becoming worse or weaker
Transformation:	Change in form, nature or appearance

References

- Government of Malawi. (2017). *National Waste Management Strategy, 2017-2022*. Lilongwe, Environmental Affairs Department (EAD).
- Lilongwe Wildlife Trust. (2022). *Waste Management. (Environmental Education Handbook.)*



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