

OL PEJETA CONSERVANCY

TOPIC 4: THE FUNCTIONING OF SYSTEMS



ECOLOGICAL AND PHYSICAL

TOPIC 4: THE FUNCTIONING OF SYSTEMS

TOPIC OUTLINE

Over the course of the last three topics we have learnt about the many organisms that we share the earth with, looking at how they function and survive. In this final topic, we are interested in how those organisms interact within a wider system that includes both biological and physical components.

An **ecosystem** includes all of the living things (plants, animals and organisms) in a given area and their interactions with each other, but also with their non-living environments (weather, earth, sun, soil, climate, atmosphere).

In ecosystems, energy is transferred from one **trophic level** to another, beginning with the **producers** which absorb energy from sunlight during photosynthesis and ending with the **decomposers** that return the energy once plants and animals die back into the soil as nutrients. This restarts the cycle, as the nutrients are then taken up by the plants for use in photosynthesis.

An ecosystem can be as large as a desert or an ocean or as small as a tree or a pond. Every part of an ecosystem works together to create equilibrium – a balanced system. If light or water become limited, or the soil does not have the right nutrients, plants will die. If plants die, so do the animals that depend on them – and the other animals that depend on those animals – and thus the **food chains** and **food webs** are affected.

Each organism has adaptations that help them survive in their particular ecosystem.



SUB-TOPICS:

Man's role in the ecosystem

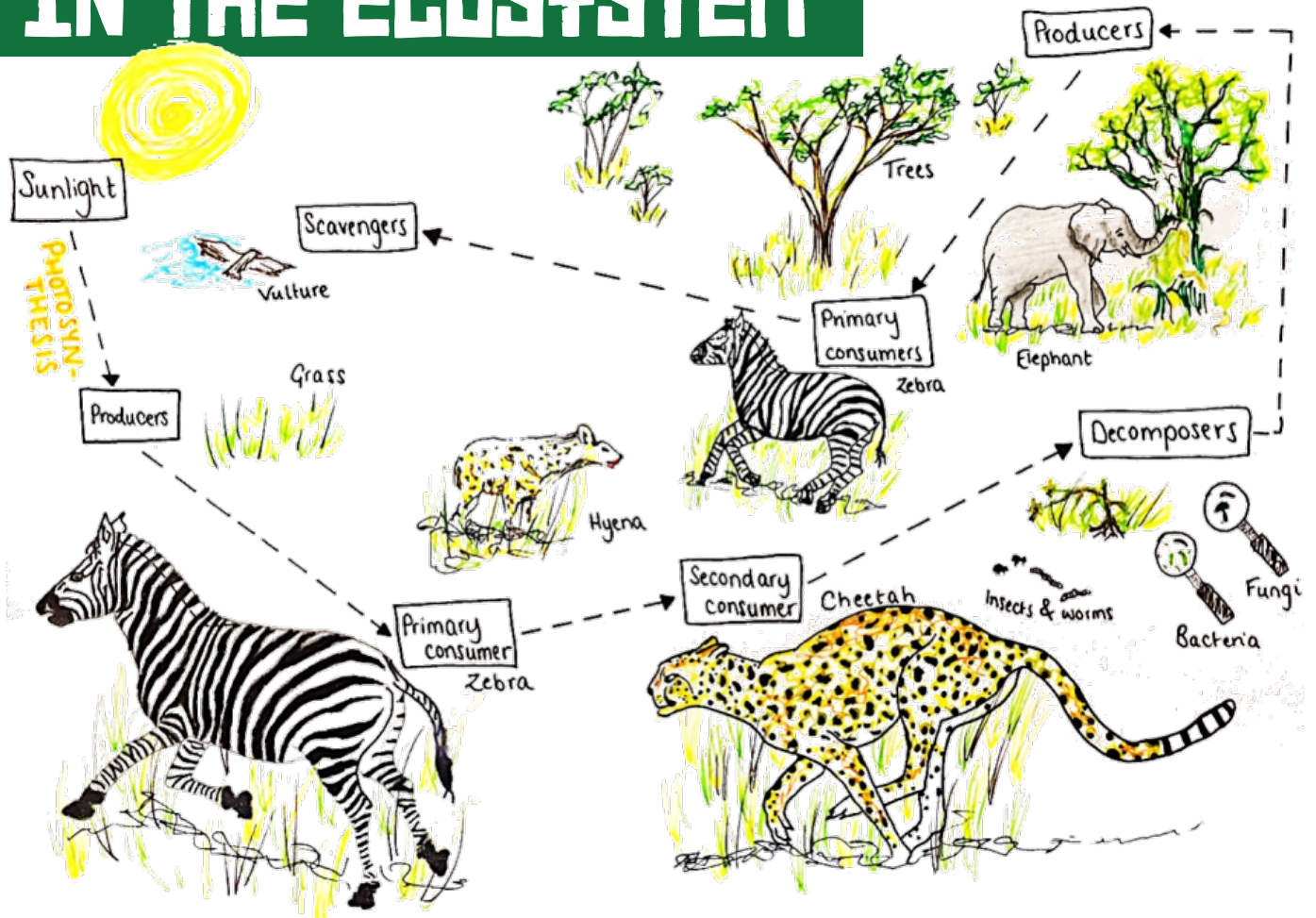
- Learners will learn about the components, organisms, and energy flows within the food webs and habitats of Ol Pejeta.
- Learners will be encouraged to think about how the presence of humans affects ecosystems and the individual trophic levels within them.

The equator – seasons, day & night, and biodiversity

- Learners will develop their understanding of the effects of the equator on biodiversity and climate, while also broadening their understanding and awareness of the geography of continents and countries across the world

Please note: the activities below act as guidelines. You may wish to adapt them to suit the needs of your class (e.g. different age groups, abilities, grades, materials and time available).

ACTIVITY SHEETS: MAN'S ROLE IN THE ECOSYSTEM



Food webs consist of various consumers and different flows of energy across **trophic levels**. Almost every food web starts with energy from the sun, which is absorbed by **producers** (usually plants) in photosynthesis. **Primary consumers** (herbivores or omnivores) eat the producers, but are in turn eaten by **secondary consumers** (carnivores or omnivores). Everything in the end, however, gets broken down by decomposers and detritus feeders (such as beetles, maggots, bacteria, and fungi).

BACKGROUND INFORMATION

In a modern world where populations are rising and humans encroach further into natural spaces, it is important to think about the role man plays and how humans are entwined in each part of the ecosystem. Humanity's survival, like all other organisms, is dependent on the derivation of energy from the sun by plants at the very beginning of the chain.

Therefore, overconsumption of plants or animals, destruction of any of the system's components, or interruption of any of the energy flows distorts the cycle and makes the ecosystem unstable. When this happens, the survival of both humanity and any other organism in the food web is threatened.

ACTIVITY 1

10+ YRS

OPC/HOME

OL PEJETA'S HABITATS

Objective:

- To challenge learners to think about and analyse different habitats and the parts that make them up, and to develop writing skills by imagining what would happen if one of those parts were changed or taken away.

Age group:

- 10+ years

Materials needed:

- Notebooks/paper
- Pen/pencils

Procedure:

1. Ask the learners which habitats can be found on Ol Pejeta. Tell them that there are at least four.
2. Help the learners look at and observe the different habitats on Ol Pejeta, and for each identify the following:
 - a. its characteristics;
 - b. the animals found there and their features/adaptations;
 - c. the plants found there and their features/adaptations;
 - d. how the different components interact.
3. Discussion: what would happen if one of the components of a particular ecosystem was removed, reduced, or increased?
4. Discussion: where do **humans** fit into each ecosystem? What happens to each component when humans are introduced?
5. Let each learner choose one ecosystem and write a short essay (1 page) speculating what would happen in **three** different situations where one component of their chosen ecosystem was either removed, reduced, or increased.

FACT BOX

HABITATS ON OL PEJETA

Ol Pejeta has several different habitats, including:

- Grassland
- Bushland (mixed acacia)
- Wetland (marsh area)
- Riverine

How many of these ecosystems have you seen?

7-11 YRS

OPC/HOME

ACTIVITY 2

STEP ON IT! A LIFE-SIZED FOOD-WEB

Objective:

- To help learners actively learn about food webs and the processes that go on at each **trophic level**.

Age group:

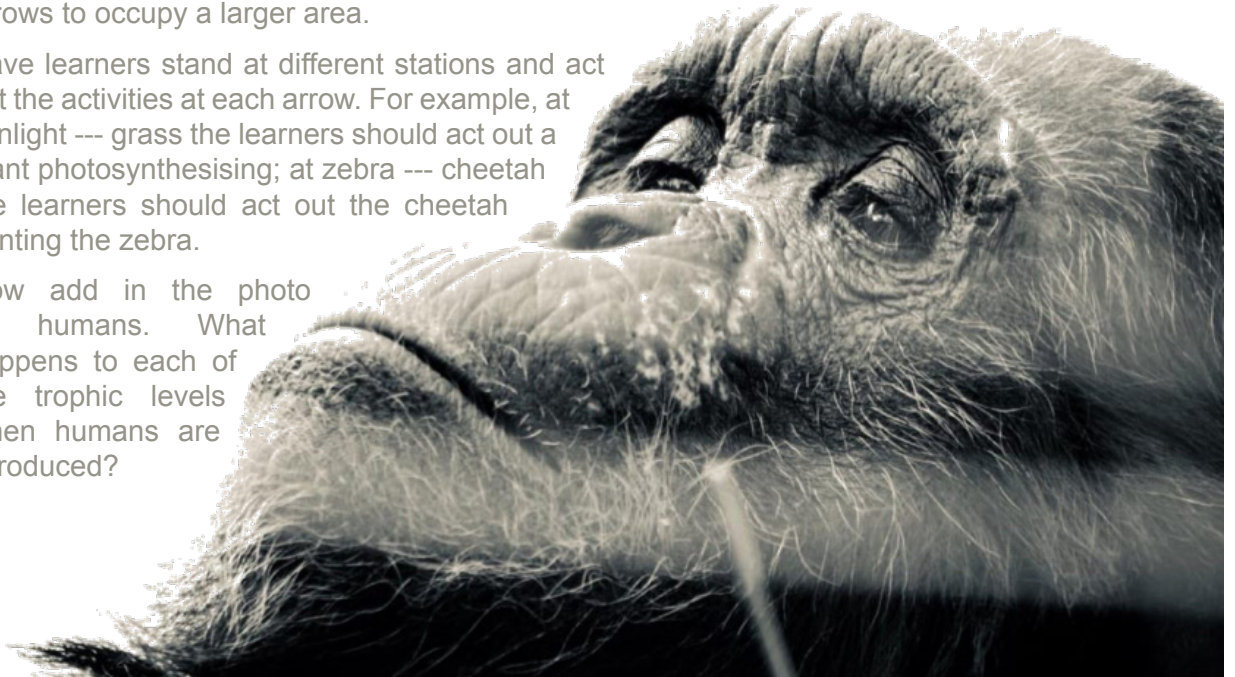
- 7-11 years

Materials needed:

- Printed photos of different components of a savannah food web (including the energy source, producers, primary and secondary consumers, and decomposers)
- A printed photo of humans
- Nine printed arrows

Procedure:

1. Before the lesson: print photos of the components of a food web and at least nine arrows.
2. Have learners help you let up the food web in a large open space using the photos and the arrows. If you have a bigger group and you are on a stone floor, you can use chalk instead of paper arrows to occupy a larger area.
3. Have learners stand at different stations and act out the activities at each arrow. For example, at sunlight --- grass the learners should act out a plant photosynthesising; at zebra --- cheetah the learners should act out the cheetah hunting the zebra.
4. Now add in the photo of humans. What happens to each of the trophic levels when humans are introduced?



ACTIVITY 3

7+ YRS

OPC/HOME

ORDER UP

Objective:

- To help learners learn about the energy flows and processes that occur in different ecosystems while using creativity and communication skills.

Age group:

- 7+ years

Materials needed:

- Chart paper
- Pens/pencils
- Colouring materials

Procedure:

1. Split learners into groups of 6-9 students, depending on class size.
2. Give each group a different ecosystem, choosing from: grassland, bushland, wetland, or riverine.
3. Each group must produce **nine** posters, including: the sun, a producer, primary consumer, secondary consumer, tertiary consumer (decomposers), and at least four arrows representing energy flows. They can do one each or, in smaller groups, join up to make the arrow posters.
4. Each group should then present their ecosystem to the rest of the class by each standing up with a different sign and putting themselves in the correct order to model a food chain.

ACTIVITY SHEETS: THE EQUATOR

BACKGROUND INFORMATION

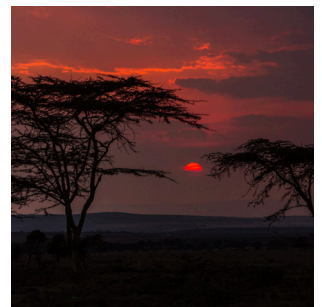
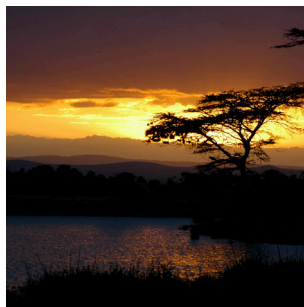
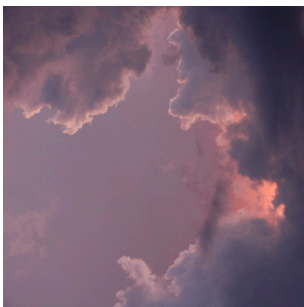
The equator itself crosses the land or territorial waters of 14 countries. The fastest rates of sunrise and sunsets in the world take place on the equator, often lasting only a matter of minutes, and both day time and night time are consistently twelve hours each throughout the year.

In its seasonal movement through the sky, the sun passes directly over the equator only twice each year, on the March and September equinoxes.

A common misconception about life on the equator is that the weather stays the same throughout the year. In fact, tropical areas along the equator often experience both wet and dry seasons, while some are wet throughout the year.

Biodiversity

The parts of the Earth that lie on the equator mark the area with the world's greatest concentration of natural biodiversity. Almost half of the world's rainforests are concentrated on the equator in just three countries: Brazil, Congo and Indonesia.



ACTIVITY 1

ANY AGE**OPC**

EQUATOR CROSSING POINT

Objective:

- To engage learners' interest in the topic of the equator by taking them to the equator crossing point on Ol Pejeta.

Age group:

- Any age

Materials needed:

- No materials needed

Procedure:

1. Go to the equator crossing point at Ol Pejeta, near the Rongai gate.
2. Talk to learners about how the equator affects night and day, seasons, and biodiversity (see the 'Background information' section). Be careful of animals!
3. If the materials are there, you can show them how water moves clockwise/anticlockwise when filtered through a funnel on the north/south side of the equator (10m either side). This is because of magnetic forces pulling from the north and south. On the equator point the water moves straight through – when the magnetic forces are in balance.



ACTIVITY 2

7-11 YRS

OPC/HOME

WALK THROUGH THE CONTINENTS

Objective:

- To develop learners' research skills and awareness of different equator climates and cultures around the world.

Age group:

- 7-11 years

Materials needed:

- Large printed map or large individual cut outs of the continents
- Notebooks/paper
- Pens/pencils
- Research facilities (books or computers)

Procedure:

1. Before the activity: print out a large map or prepare large cut outs of the different continents.
2. Place these on the floor and allow a small group of learners to stand in a straight line where they think the equator should be.

3. Ask the other learners if they are correct (and re-place them if they are wrong!).
4. Explain that if they were really standing on the equator, they wouldn't see a line at all. The line on our maps represents the invisible line that divides the globe in half (exactly half way between the north and south poles).
5. Have each learner on the map form groups with the other learners of the class (who are not standing on the map). As a group, they must research the continent/country/ocean the learner was standing on, paying particular attention to the effects of the equator on that location. They should produce 10 interesting facts about their location.
6. Each group presents their 10 facts to the rest of the class.

11+

HOME

ACTIVITY 3

EQUATOR RESEARCH TASK

Objective:

- To develop **older** learners' research skills and awareness of different equator climates and cultures around the world.

Age group:

- 11+ years

Materials needed:

- Notebooks/paper
- Pens/pencils
- Research facilities (books or computers)

Procedure:

1. Divide learners into small groups of 2-3 (the groups may have to be larger if working with a bigger class).
2. Research task: each group must select a country found on the equator and find out the following information.
 - a. the geography of the country;
 - b. population;
 - c. interesting wildlife found in the country;
 - d. climate;
 - e. major economic activities;
 - f. tourist attractions.
3. You may wish to have your students perform **group presentations** on their topic, to develop confidence and speaking and communication skills, or produce an **individual written report**, to develop written communication skills.

ACTIVITY 4

10- YRS

OPC/HOME

RIBBON EQUATOR

Objective:

- To develop **younger** learners' research skills and awareness of different equator climates and cultures around the world.

Age group:

- 10 and under

Materials needed:

- Printed copies of the world map
- Ribbons of different colours
- Paper
- Glue

Procedure:

1. Before the activity: print copies of the world map.
2. Ask learners to name the countries through which it runs.
3. Discussion: what does it mean to live on the equator?
4. Give each learner a copy of the map (or one per small group).
5. Let the learners select different colour ribbons to stick along the equator on their map. They can also stick ribbons along the prime meridian (the line of longitude that runs through the centre of the atlas).