

Earth Cycle of Resources

Before you Begin

We constantly need oxygen to breathe, water to drink and food to live. The carbon dioxide which animals breathe out is converted to oxygen by plants through photosynthesis and vice-versa. This is a continuous process which happens over and over again and hence we call it a “Cycle”. Cycles are part of nature. There is a limited availability of resources like water; elements such as oxygen, carbon and minerals and nature keeps the supply by continuously cycling them. If nature did not recycle these, we would have run out of the resources years ago.

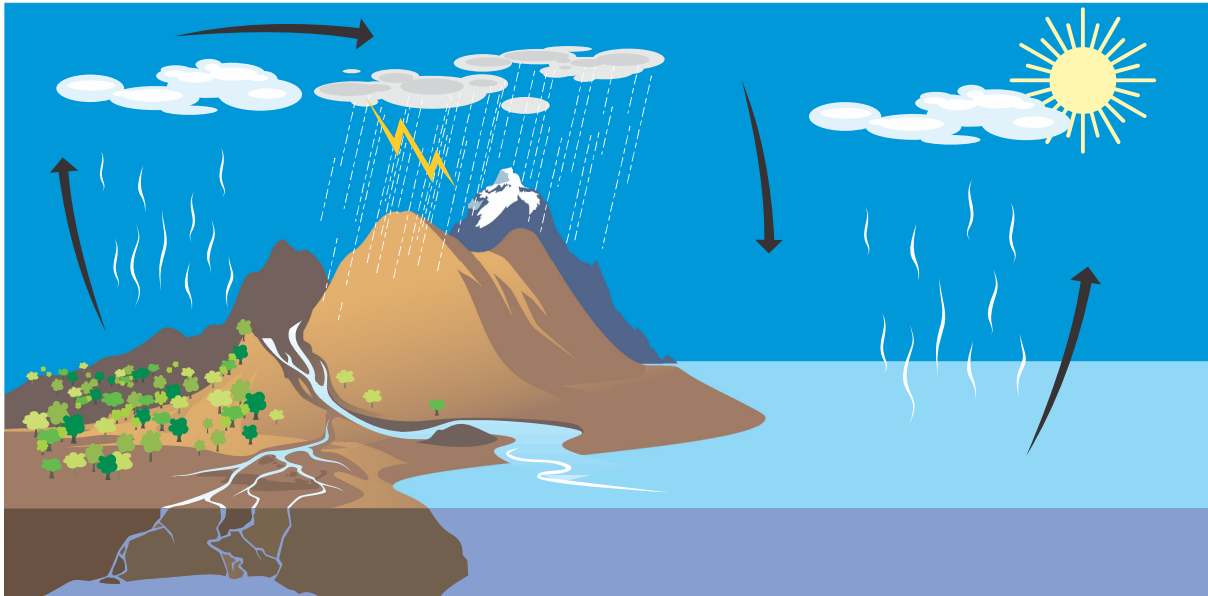
These cycles sustain various aspects of life on Earth including birth, growth, reproduction and death. The water cycle ensure the continuous circulation of water both above and below the ground. As part of the water cycle, water passes through all the different states that it exists as in nature - liquid water, gaseous vapour and solid ice. In addition to water there are a number of other substances that move through the abiotic and biotic components of the Earth. These constitute the biogeochemical cycles (bio = life; geo = Earth; chemical = elements including C, N, O, P). Some common examples of biogeochemical cycles are the carbon, nitrogen, phosphorous, nutrient and oxygen cycles. All these cycles together sustain the world and its various ecosystems.

Decomposition is the process by which organic substances are broken down into simpler matter. The process is a part of nutrient cycle and is essential for recycling the finite matter that occupies physical space in the biosphere. Bodies of living organisms begin to decompose shortly after death. Organisms that do this are known as decomposers.

Decomposers are organisms that break down dead and decaying organisms. They help recycle matter in an ecosystem. Decomposers are heterotrophic and derive energy by consuming other organisms. There are two main categories of decomposers. Chemical decomposers work by using chemicals in their bodies to break down organic matter into simple compounds for energy. Chemical decomposers include bacteria, protozoa, and fungi. Physical decomposers are detritivore that feed on the organic materials. Physical decomposers are mostly macro organisms that can be seen without a microscope. Some examples include worms, mites, flies, and snails.

It would help students to know the important role that different decomposers play in the decomposition process. Some decomposers are microscopic in nature e.g. bacteria and others are large enough and visible to the naked eye, e.g. earthworm. A short nature walk could help introduce students to some of the larger decomposers.

WATER CYCLE



Cycles in Nature



INTRODUCTION:

The balance in nature or on Earth has been achieved through cycles. Different systems are dependent on each other and have settled in cycles which has resulted in the right environment and conditions required for life to evolve and sustain.

The lesson plan encourages students to investigate cycles in nature. The learning processes includes hands on demonstration by individual students, brainstorming, reading and exchanging information pertaining to the topic (especially as part of twinning), classroom interactions, group work, nature walk, analysing responses from the twinned school and communicating about the topic through an article.

Objectives:

Students will be able to

- list “cycles” in nature.
- explain concept of cycle through water cycle.
- illustrate the nutrient cycle (Nitrogen).
- explain the steps in a nutrient cycle.
- explain how cyclic systems in nature do not produce waste.

Eco-Schools Steps: Curriculum linkages, Environmental review, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



Time required/ Duration:

- **Classroom Session 1:** 45 minutes for each student to conduct the hands-on demonstration to understand the water cycle.
- **Classroom Session 1:** 45 minutes (15 min to explain what “Cycles” mean and to then brainstorm with students other cycles in nature. 30 minutes provided to students to label and colour the Nitrogen cycle worksheet and explain the importance of cycles in nature and that in a truly natural system, no waste is created).

Resources Required:

- Hot water
- Large transparent bowl
- Cup to be placed in the center of the bowl
- Transparent plastic sheet
- Ice cubes
- Student notebooks, pencils and other stationary
- An online film of the facilitator's choice, which depicts to students the nitrogen cycle
- Resource 1 - (Nitrogen cycle worksheet)



Activity

Classroom session

1

1. Demonstrating water cycle

- Place some hot water in a large transparent bowl. Explain to students that the bowl represents water on Earth.
- Place an empty cup at the centre of the bowl to collect water which will precipitate back as rain.
- Cover the bowl with a transparent plastic sheet and place a few ice cubes on it.
- Ask students to record their observations.
- Explain to students that, when the hot water rises, it condenses in the atmosphere in the form of rain/precipitation (where there is lower temperature - represented here in the form of ice cubes).
- Students will notice that the empty cup which was placed in the centre of the bowl now has some water. Explain to them that the water got into the empty cup because of the process of condensation and precipitation.
- Explain to students that this movement of water is a continuous process and repeats over and over again and hence is referred to as the “water cycle”.
- Discuss the advantages of the water cycle. *For Example - It brings fresh water.*

Classroom session

2

2. Understanding the Nitrogen cycle

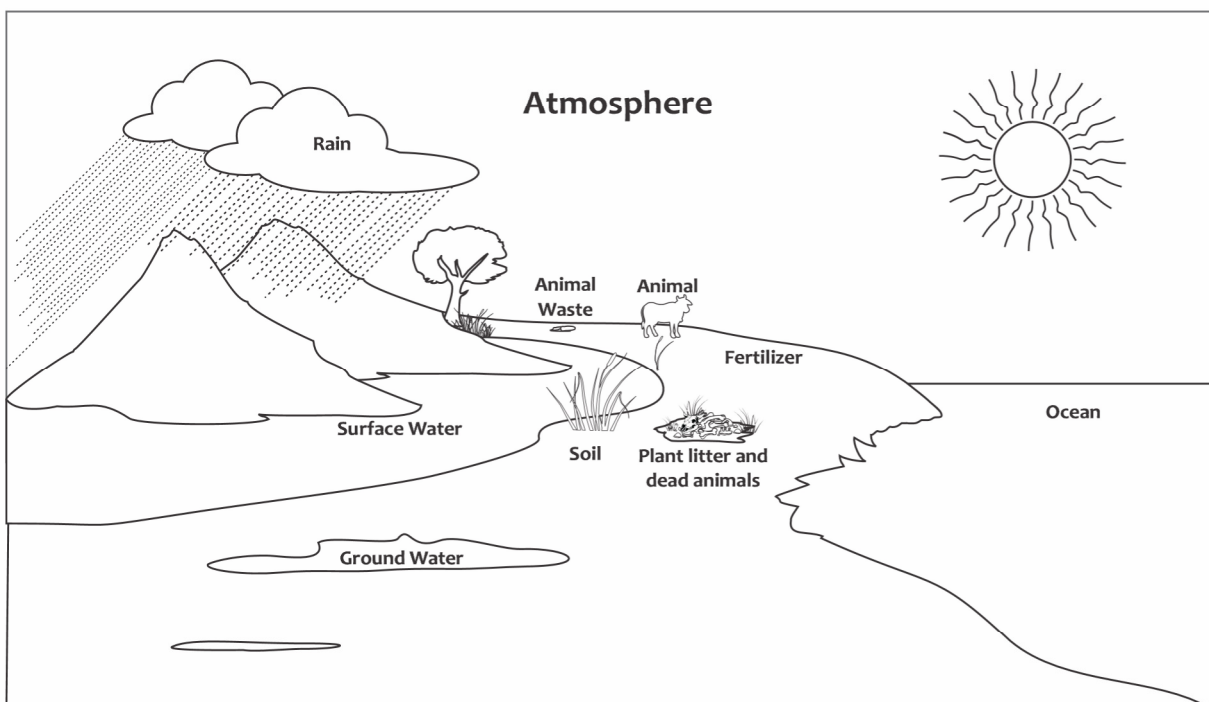
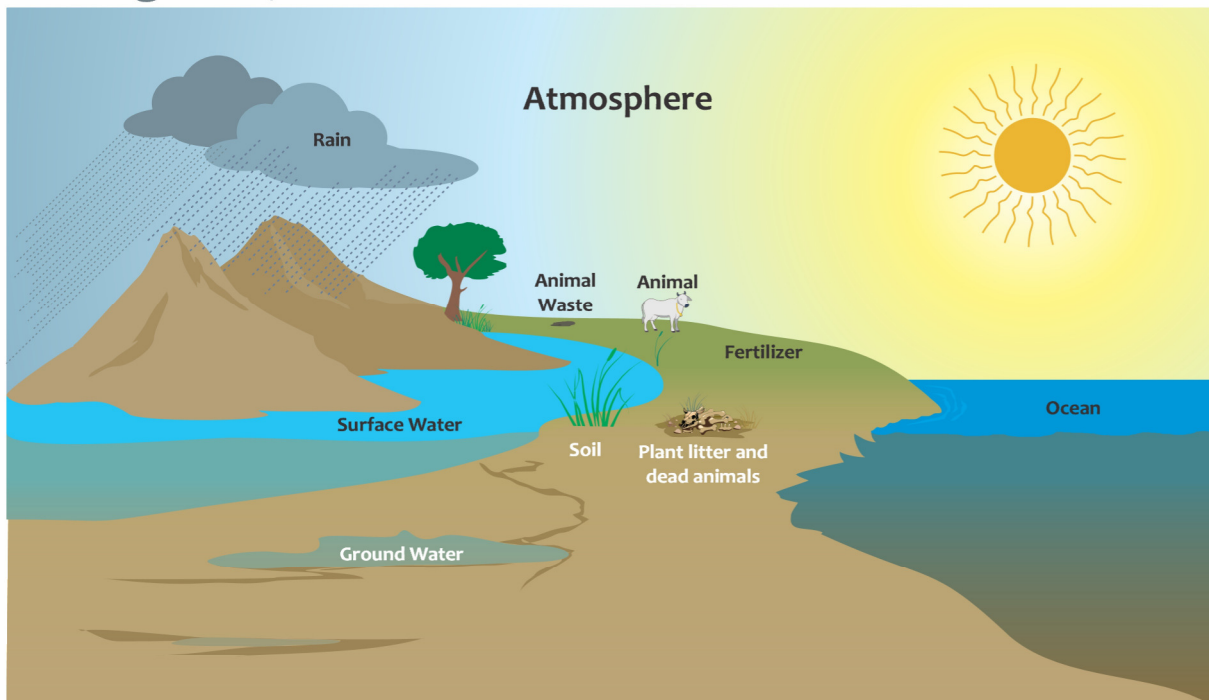
- Screen the film, Nitrogen Cycle | It's AumSum Time to depict to students the importance of the nitrogen cycle.
- Provide students with worksheets of the nitrogen cycle. Ask them to label the same and complete the representation of arrows to indicate the flow of nutrients through this cycle.
- Check out <https://betterlesson.com/lesson/640166/exploring-the-nitrogen-cycle> .
- Assist students to understand that all waste in nature whether it is dead and decomposing matter from both plants and animals undergoes a decomposition process and becomes available for use again in the nutrient cycle.
- Discuss and emphasize to students that there is no “waste” in nature.
- Lead the discussion to bring out a list of human made items which which do not decompose/ or take very long to decompose. The facilitator must make students understand that these items which do not decompose are human made and piling up as waste in nature.

Evaluation:

Ask students to write a letter to a friend explaining their trip through the nitrogen cycle. Ask them to Include information about (1) where they went, and (2) how they got to each destination.

Resource 1

Nitrogen Cycle Worksheet



Nature Walk - Decomposers



INTRODUCTION

Decomposition is one of the most important processes by which nutrients are recycled in nature. It is the reason why there is no concept of waste in nature. The decomposition is carried out by decomposers that break down dead organisms or organic matter.

Decomposers are heterotrophic, meaning that they use organic substrates to get their energy, carbon and nutrients for growth and development.

The lesson familiarise the students with some of the common macro decomposers and initiates them in observing the process of decomposition happening all the time around them.

Objectives:

Students will be able to

- identify some macro decomposers.
- provide examples of some macro decomposers.
- describe the importance of macro decomposers.

Eco-Schools Steps: Audit, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



13-16
Years

Time required:

- **Classroom Session 1:** 90 minutes to set the context and brainstorm with students followed by Nature Walk to identify decomposers and sketch some of these.
- **Classroom Session 2:** 45 min for classroom interaction wherein students display sketches of the different decomposers each of the groups came across and a wrap up discussion by the teacher.

Resources Required:

- Gloves, shoes, rake/ stick and other safety equipment for going through a compost pile/ leaf litter.
- Resource - 2 (Macro decomposer reference chart)
- Resource - 3 (Decomposer sketch sheet).
- Magnifying glass



Activity

Classroom session 1

- With the background of importance of cycling nutrients in nature, the teacher should introduce students to the importance of decomposers.
 - Decomposers are significant to the ecosystem as they recycle nutrients after the organisms. These nutrients are then released into the ecosystem and available again for use.
 - Decomposers play the role of recyclers in the ecosystem.
- Brainstorm with students to help them recall and identify some of the macro decomposers they are already aware of.
- Introduce students to some more macro decomposers. The macro decomposers reference chart could be used as an example. You can prepare your own chart as per your region.
- Divide students into groups of 4-5 members for the nature walk. Assign different areas to different groups.
- Students should be guided to carefully go through the leaf litter or a pile of compost using a rake/ stick and study and sketch the different types of macro decomposers that they come across. A magnifying glass would be a useful tool.
- Guide the students to use the macro decomposer reference chart as a reference for identifying some of the decomposers that they come across. (Resource - 2)
- Ask students to use the decomposer sketch sheet for this purpose.

Classroom session 2

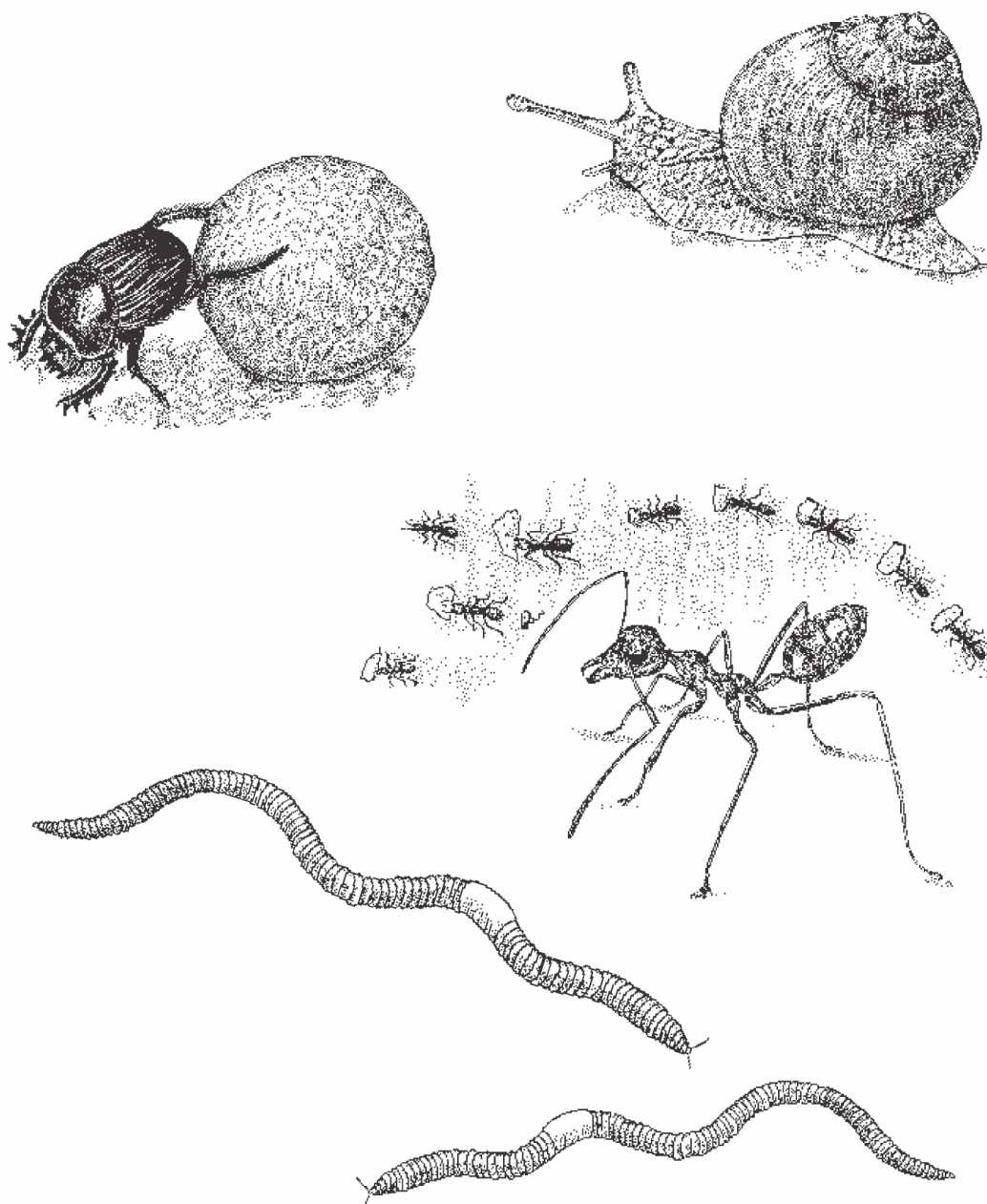
- Facilitate students to consolidate the different types of macro decomposers they came across during the nature walk.
- Ask the students to label the different macro decomposers by making use of the macro decomposers reference chart.
- Facilitate a classroom discussion following the nature walk to help students list the different types of non-biodegradable items they came across and whether they decomposed.
- Student sketches, prepared during the nature walk should be displayed on the Eco-Schools bulletin boards.

Evaluation:

Conduct a quiz to understand whether students are able to identify the different macro decomposers.

Resource 2

Macro decomposers reference chart



Resource 3

Decomposer sketch sheet

Cross Country Decomposers



INTRODUCTION

The lesson is designed to conduct an enquiry in the process of decomposition and factors that effect it. The rate of decomposition is dependent on quality of organic matter and environmental conditions. Organic matter with higher concentrations of nutrients decompose at a faster rate. Soil temperature and moisture content are very important factors affecting decomposition rates. At favorable moisture conditions, increasing temperature results in an exponential increase in decomposition rates.

Objectives:

Students will be able to

- plan and conduct a simple investigation - related to decomposition.
- gather and analyze the data, and frame their conclusion/explanation.
- communicate results of the investigation and explanations with students from other countries.
- communicate the findings of their research in the form of an article (suggested for YRE students).

Eco-Schools Steps: Curriculum linkages, Environmental review, Action Plan, Monitor and Evaluate, Inform and Involve

Curriculum Linkage: Science/
Environmental Studies/Social Science



Time required/ Duration:

- **Classroom Session 1:** 45 minutes to set the context and discuss with students the process of decomposition.
- **Group Assignment 1:** 4-5 weeks for response from the counterpart school. Two hours for consolidating, analysing and discussing the findings subsequent to the response received from the counterpart school.
- **Classroom Session 2:** 45 minutes for classroom interaction for consolidating, analysing and discussing subsequent to the response received from the counterpart school.
- **Group Assignment 2:** Three to four hours over three days for home based assignments for compiling and disseminating student articles.

Resources Required:

- Open space for conducting the investigation or similar sized earthen pots or other containers with equal quantities of similar type of soil placed in them
- Digging implements like - Stick/shovel/spade
- Different types of materials to check the rate of decomposition.
 - eg., those which decompose: vegetable peels, leaves, left over food, etc
 - eg., those which do not decompose: plastics, metal bits, cigarette butts, etc.
- Soil thermometer, stationery - books, pens, etc
- Resource - 4 (Decomposition - data collection sheet)
- Internet



Activity

Pre activity task for teachers/ facilitators

- With the help of your Eco-Schools/YRE National Operator, teachers should initiate the process of selecting a counterpart school in another country. This exercise of finding a counterpart school could take a few days to a few weeks.

Classroom session 1

- Set the context and brainstorm with students - the nature of things that decompose on their own.
- Ask students to make two lists of materials - those which decompose naturally and those which do not decompose.
- Assign students into groups. Group size of 4-5 students work best.

Group Assignment 1

- Student groups work over a period of 4-5 weeks to execute their investigation.
- Assign to different groups material which decompose and those which do not.
- Communicate to your counterpart school the materials selected for the experiment, this would help give better results.
- Students bury the material in soil and record their observations including sketches over a period of 4-5 weeks. Teacher should facilitate here that students put in only one type of material into a single pit.
- An exemplar resource 4 (data collection sheet) has been provided to record observations related to decomposition.

Classroom session 2

- Discuss findings in class - materials which decomposed and which did not, those which decomposed faster compared to others.
- Discuss the factors that affected the rate of decomposition.
- Share findings of your work with the counterpart school.
- Classroom interaction for consolidating, analysing and discussing subsequent to the response received from the counterpart school.

Activity

Group Assignment

2

As part of this groups take up the assignment of investigating an issue related to waste/litter or a live project with scope of impact can be reported in the form an article or in form of a photo story (2-3 working days should be provided to student groups to accomplish this task):

- Students should continue to work in groups and report one article per group.
 - The article should cover the purpose of taking up the short research, the differences in their findings if any.
 - Ask the student groups to share their articles to create awareness through the school social media page or share the same during an assembly in the school, etc.
- For article: Refer Lesson Plan 1 from chapter “Learning to be an Environmental Journalist”
 - For photo: Refer Lesson Plan 4 from chapter “Learning to be an Environmental Journalist”

Evaluation:

Ask students to list indicators that shows that decomposition is occurring and identify factors on which the rate of decomposition depends.

Resource 4

Data collection to measure decomposition

Material under investigation: e.g Vegetable peel						
Time	Observable changes in the material considered for investigation					Sketch of how the material looks
	Weight	Height	Temperature	Change in smell	Change in appearance	
Prior to burying						
Week 1						
Week 2						
Week 3						
Week 4						
Week 5						

References

<https://www.youtube.com/watch?v=HOprt8BRGtk>

<https://earthref.org/SCC/lessons/2010/biogeochemistry/nitrogen-carbon-cycles/>