



*Sustain/Biodiversity Education  
for Sustainable Development*

THE EFFECT OF POLLUTION ON ANIMALS AND  
ECOSYSTEMS

**LESSON PLAN**

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This Lesson Plan is part of the project ***Sustain: Biodiversity Education for Sustainable Development***. This project is financed by the European Union, under the Erasmus+ program. The project aims to promote education on biodiversity loss and to analyze the relation between air pollution and biodiversity loss.

This Lesson Plan is created to teach the topic of ***The Effect of Pollution on Animals and Ecosystems***, along with two more, *Air Pollution* and *The effect of air pollution to plants and the role of technology*. These Lesson Plans will contribute to the overall mission of assisting students in realizing the enormous impact of air pollution in their lives and initiate actions for changing this situation and protecting Earth's ecosystems.

This document serves as a valuable resource for teachers, offering a range of **extracurricular activities** to be taught in a **flexible style**. Within these pages, you will find a variety of engaging exercises. Some are structured as standalone lessons, while others are intended to supplement and enhance the teacher's instructional approach, allowing for **adaptability and freedom of choice**.

This serves as a **foundation that can be customized** by the teacher to suit their teaching hours and the specific age of their class. While the primary focus of this project is school students between 9 and 12 years old, the teacher has the flexibility to tailor certain activities to cater to the **precise requirements of their students' age group**.

Apart from these Lesson Plans, the teacher will also receive the ***Sustain Teacher's Manual***, which introduces the topic of biodiversity loss and its connection to air pollution causes to them so they can transmit this knowledge to their students more effectively.



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**Topic 1:  
Air pollution and  
animal health**

# LEARNING GOALS AND OBJECTIVES

This section collects the learning goals and objectives of the proposed sessions as a whole. This also includes the materials that will be needed for all the activities and the assessment methods that the teacher will use.

## LEARNING GOALS

- Understanding the impact of pollution on animal health: One of the primary goals in teaching about pollution and animal health is to help students understand the different types of pollution and how they can impact the health of animals. This can include learning about different pollutants such as chemicals, plastics, and noise pollution, as well as the ways in which these pollutants can affect animals both physically and behaviorally.
- Identifying ways to prevent and mitigate pollution: Another important goal in teaching about pollution and animal health is to help students understand the different ways in which pollution can be prevented or mitigated. This can involve learning about different policies and regulations that are in place to protect animals from pollution, as well as exploring different technologies and practices that can be used to reduce pollution.
- Understanding the interconnectedness of animal and human health: Pollution can have a significant impact on both animal and human health, and teaching about pollution and animal health can help students understand the ways in which these two are interconnected. For example, pollution can lead to the spread of diseases between animals and humans, and can also impact the quality of food and water that we consume.
- Developing critical thinking skills: Learning about pollution and animal health can also help students develop critical thinking skills. This can involve analyzing different sources of information to evaluate the impact of pollution on animal health, as well as considering different solutions and their potential impact on both animals and the environment.

## LEARNING OBJECTIVES

- Students will understand the effects of pollution on animal health and ecosystems
- Students will identify sources and types of pollution that can harm animals
- Students will analyze data and scientific research on the effects of pollution on animals
- Students will develop strategies to reduce pollution and protect animal health

## MATERIALS

- PowerPoint presentation or video on the effects of pollution on animals
- Data on air and water pollution levels in local area
- Worksheets for data analysis and discussion
- Access to the internet for research and presentations
- Minecraft world Animal Sanctuary

## ASSESSMENT

- Class participation in the group discussion and presentations
- Completion and accuracy of the data analysis worksheet
- Completion and thoughtfulness of the final reflection worksheet

By the end of this lesson, students will have gained an understanding of how pollution affects animal health and ecosystems, identified potential sources of pollution in their local area, and developed strategies to reduce pollution and protect animal health.

# LESSON PROCEDURES

In this section a formal structure for full lessons can be found. These can be taught consecutively or in the order that the teacher deems appropriate. Some aspects of these sessions can be adapted depending on the teaching style or exact age group of the class.

# ACTIVITY 1

## INTRODUCTION (10 MINUTES)

- Begin by asking students to brainstorm ways that humans impact animals. Write their responses on the board.
- Ask students if they have ever heard of pollution affecting animals. Have a brief class discussion on what pollution is and how it can affect animal health.

## PRESENTATION ON POLLUTION AND ANIMAL HEALTH (30 MINUTES)

- Show a PowerPoint presentation or video on the effects of pollution on animals (examples at the end). This could include examples of specific animals that are impacted by pollution, such as birds with oil spills or fish with plastic pollution.
- Discuss the types of pollution that can harm animals, such as air pollution, water pollution, and plastic waste.

## DATA ANALYSIS ACTIVITY (10 MINUTES)

- Provide students with data on air and water pollution levels in their local area. Ask them to analyze the data and identify potential sources of pollution that could impact local animal populations.
- Have students work in small groups to discuss their findings and come up with solutions to reduce pollution and protect animal health.

# ACTIVITY 2

## GROUP PRESENTATIONS (40 MINUTES)

- Have each group present their findings and solutions to the class. Encourage discussion and questions from the rest of the class.
- Ask students to reflect on the impact of pollution on animal health and what they can do to reduce pollution in their own lives.

## FINAL ACTIVITY (20 MINUTES)

- Ask students to complete a worksheet reflecting on what they have learned about pollution and animal health. This could include a summary of the types of pollution that can harm animals, examples of specific animals impacted by pollution, and strategies for reducing pollution and protecting animal health.

## CONCLUSION (10 MINUTES)

- Summarize the main points of the lesson
- Ask students to reflect on what they learned and how they can apply this knowledge in their daily lives
- Encourage students to take action to reduce pollution and protect plants and the environment



# MINECRAFT ACTIVITY

In this section you will find a formal structure for the entire lesson. This particular scenario, The Animal Sanctuary, has 4 challenges. Including the introduction from Topic 1 and conclusion, a minimum of 4 lessons should be scheduled. Topic 2 +3 can be brought in as a supplement, as they address themes of the game that are also important. Another 4-6 lessons could be planned for this. Some aspects of these lessons can be adapted depending on the teaching style or exact age group of the class.

# THE ANIMAL SANCTUARY

## INTRODUCTION (10 MINUTES)

- Students turn on their computers and access the animal sanctuary world
- In this Minecraft Education activity, student will embark on an adventure to deepen their understanding of the effect of pollution on animals, ecosystems and its causes, various tools and components provided within the game.

## ACTIVITY (45 - 70 MINUTES)

You are in a city that suffers from pollution. In this game, your main task will be to eliminate the pollution in some places and allow the animals of the city or the forest to find a suitable habitat again. In doing so, you'll have to mine garbage, create new things and fight against monsters!

## CONCLUSION (10 MINUTES)

- Summarize the main points of the challenge
- Ask students to reflect on what they learned and how they can apply this knowledge in their daily lives
- Encourage students to take action and enquire about how to reduce pollution and protect animals and ecosystems

# DATA ANALYSIS

This table of data is additional material for the teacher. It can be used at the end of a lesson or as a support for another activity. This allows students to practice using raw data. The teacher has full flexibility in using these resources.

# DATA ANALYSIS ON AIR AND WATER POLLUTION

**DATA SET: THE FOLLOWING DATA SHOWS THE AIR QUALITY INDEX (AQI) AND WATER QUALITY INDEX (WQI) FOR A LOCAL AREA OVER A PERIOD OF 12 MONTHS:**

| Month | AQI | WQI |
|-------|-----|-----|
| Jan   | 120 | 75  |
| Feb   | 135 | 80  |
| Mar   | 125 | 90  |
| Apr   | 150 | 85  |
| May   | 140 | 70  |
| Jun   | 145 | 75  |
| Jul   | 160 | 60  |
| Aug   | 170 | 50  |
| Sep   | 155 | 65  |
| Oct   | 130 | 80  |
| Nov   | 125 | 90  |
| Dec   | 135 | 70  |

## DATA ANALYSIS

### AQ I ANALYSIS

- The AQI for the local area ranged from 120 to 170 over the 12-month period, indicating that the air quality was generally poor.
- The highest AQI was recorded in August, which suggests that air pollution was at its peak during this month.
- The lowest AQI was recorded in January, which indicates that the air quality was relatively better during the winter months.
- Overall, the AQI for the local area exceeded the safe limit of 100 for most months of the year.

## WQI ANALYSIS

- The WQI for the local area ranged from 50 to 90 over the 12-month period, indicating that the water quality was generally poor to moderate.
- The highest WQI was recorded in March, which suggests that water pollution was at its peak during this month.
- The lowest WQI was recorded in August, which indicates that the water quality was relatively better during the summer months.
- Overall, the WQI for the local area was below the safe limit of 100 for all months of the year.

## CORRELATION ANALYSIS

- There is a negative correlation between AQI and WQI, which suggests that when air pollution is high, water pollution tends to be lower and vice versa.
- This may be due to the fact that during the summer months, when air pollution is high, there is more rainfall which helps to wash away pollutants and improve water quality.

## CONCLUSION

Based on the data analysis, it is clear that the local area has a significant air pollution problem, with most months exceeding the safe limit for AQI. While water pollution is not as severe, it still poses a moderate risk to human and environmental health. It is important for policymakers and individuals to take action to reduce air and water pollution in order to protect public health and the environment.

# WORKSHEETS

These worksheets are additional materials for the teacher. They can be used at the end of a session or as support for a different activity related with biodiversity. The teacher has full flexibility to use these resources.

# WORKSHEET 1

## EFFECTS OF POLLUTION ON ANIMALS

### INSTRUCTIONS:

READ THE FOLLOWING STATEMENTS AND WRITE WHETHER THEY DESCRIBE THE EFFECT OF POLLUTION ON ANIMALS AS POSITIVE, NEGATIVE, OR NEUTRAL.

1. Increased pollution levels can lead to genetic mutations in animals.
2. Pollution can lead to habitat destruction, which can negatively impact animal populations.
3. Some animals have adapted to live in polluted environments.
4. Pollution can lead to the accumulation of toxins in animal tissues, which can harm animal health.
5. Some animals can tolerate pollution better than others.
6. Pollution can lead to the decline or extinction of certain animal species.
7. The increased use of pesticides and fertilizers in agriculture has led to a decline in pollinator populations.

# WORKSHEET 2

## IDENTIFYING POLLUTION SOURCES

**INSTRUCTIONS:**  
**LOOK AT THE FOLLOWING SCENARIOS AND IDENTIFY THE SOURCE OF POLLUTION THAT IS AFFECTING THE ANIMALS.**

A group of fish in a river have developed tumors and other abnormalities. Answer: Industrial waste is being dumped into the river.

A flock of birds near a factory have blackened feathers and respiratory problems. Answer: Air pollution from the factory is affecting the birds.

A population of frogs near a farm have a high rate of deformities. Answer: Pesticide and fertilizer runoff from the farm is contaminating the water and harming the frogs.

A colony of bats near a mining site is experiencing a decline in population. Answer: Mining activities are disrupting the bats' habitat and food sources.



# WORKSHEET 3

## SOLUTIONS TO POLLUTION

**INSTRUCTIONS:**  
**READ THE FOLLOWING SCENARIOS AND CHOOSE THE SOLUTION THAT IS MOST APPROPRIATE FOR REDUCING POLLUTION AND PROTECTING ANIMAL HABITATS.**

1. A community is experiencing high levels of air pollution from nearby factories. Solution: Implementing emissions standards for the factories to reduce air pollution.
2. A river is contaminated with agricultural runoff, leading to the decline of fish populations. Solution: Regulating agricultural practices to reduce pesticide and fertilizer runoff.
3. A city is experiencing high levels of light pollution, which is affecting nocturnal animal populations. Solution: Reducing artificial lighting at night and implementing wildlife-friendly lighting practices.
4. A beach is contaminated with plastic pollution, harming marine wildlife. Solution: Implementing beach cleanup programs and reducing plastic waste through better waste management practices.

# QUESTIONNAIRE ON ANIMALS AND POLLUTION

**1. Have you ever seen or heard of animals being affected by pollution?**

- a. Yes
- b. No

**2. What types of pollution have you seen affecting animals? (Select all that apply)**

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Noise pollution
- e. Light pollution
- f. Other (please specify)

**3. What are some examples of animals that are commonly affected by pollution?**

- a. Birds
- b. Fish
- c. Insects
- d. Mammals
- e. Reptiles and amphibians
- f. Other (please specify)

**4. How do you think pollution affects animal habitats?**

- a. It destroys or alters habitats.
- b. It reduces the availability of food or resources.
- c. It makes habitats uninhabitable for certain animals.
- d. It increases competition for resources.
- e. Other (please specify)

**5. How does pollution impact animal health?**

- a. It can cause genetic mutations or birth defects.
- b. It can lead to respiratory problems.
- c. It can cause skin irritation or lesions.
- d. It can lead to reproductive problems.
- e. Other (please specify)

**6. Who do you think is responsible for addressing pollution and protecting animal habitats?**

- a. Individuals
- b. Government and policy makers
- c. Corporations and industries
- d. All of the above
- e. Other (please specify)

**7. What can individuals do to reduce pollution and protect animal habitats?**

- a. Reduce energy consumption and carbon emissions.
- b. Use environmentally friendly products and practices.
- c. Support conservation efforts and environmental organizations.
- d. Properly dispose of waste and reduce littering.
- e. Other (please specify)

**8. What policies or regulations do you think are needed to reduce pollution and protect animal habitats?**

- a. Stricter emissions standards for industries and vehicles.
- b. Increased protections for wildlife and their habitats.
- c. Limits on the use of pesticides and fertilizers.
- d. Bans on single-use plastics and other harmful products.
- e. Other (please specify)

**CONCLUSION (10 MINUTES)**

1. Summarize the key points of the lesson and ask students to share one thing they learned about air pollution.
2. Encourage students to take action to reduce air pollution in their own lives and communities.

# ACTIVITIES ON THE EFFECT OF POLLUTION ON ANIMALS AND ECOSYSTEMS

These activities are additional resources for the teacher. They can be used at the end of a session or as support for a different activity related with biodiversity. The teacher has full flexibility to carry out these exercises how and when they consider.

**HAVE STUDENTS RESEARCH A SPECIFIC TYPE OF AIR POLLUTION AND CREATE A PRESENTATION ON ITS CAUSES, EFFECTS, AND SOLUTIONS.**

**ORGANIZE A FIELD TRIP TO A LOCAL PARK OR NATURAL AREA TO DISCUSS THE IMPORTANCE OF CLEAN AIR AND THE ROLE OF PLANTS IN REDUCING AIR POLLUTION.**

**OVERALL, THIS LESSON PLAN AIMS TO HELP STUDENTS UNDERSTAND THE IMPORTANCE OF CLEAN AIR AND THE NEGATIVE IMPACTS OF AIR POLLUTION ON HUMAN HEALTH AND THE ENVIRONMENT. IT ALSO PROVIDES STUDENTS WITH IDEAS AND RESOURCES TO TAKE ACTION AND PROMOTE CLEAN AIR IN THEIR OWN LIVES AND COMMUNITIES.**

## VIDEO RESOURCES

These videos provide a good overview of air pollution, its causes and effects, and possible solutions. You can select one or more of these videos to supplement your lesson and help students gain a better understanding of the topic

The Hidden Dangers of Plastics Pollution for Marine  
Animals

<https://www.youtube.com/watch?v=HGxBRTV3ejo>

[A Whale's Tale | Hope Works](https://www.youtube.com/watch?v=xFPoIU5iiYQ)

<https://www.youtube.com/watch?v=xFPoIU5iiYQ>

How does air pollution affect animals?

[https://www.youtube.com/watch?v=s7FcTM\\_tdMo](https://www.youtube.com/watch?v=s7FcTM_tdMo)

# Topic 2: Ecosystems and their animals

This topic can also be used as an add-on for teaching. It takes up other aspects of the minecraft scenario and deepens them. Of course, this topic can also be used individually or in combination with topic 1 or 3.

# **LEARNING GOALS AND OBJECTIVES**



## LEARNING GOALS

- Perceiving your environment: engaging with different ecosystems sharpens your perception of the environment in general
- Understand that each creature has different needs: students learn to look at the world from the point of view of other creatures
- Understanding consequences: students learn that some consequences are irreparable and that ecosystems and their inhabitants can suffer as a result
- Engaging with other parts of the world: students engage with other parts of the world during their research and learn about conditions outside their own environment

## LEARNING OBJECTIVES

- Students learn that there are different ecosystems (with examples - forest, orchard, ocean, ...)
- Students learn that all ecosystems provide different habitats for different animals and plants
- Students understand that all ecosystems and living things have different requirements and need different resources and therefore cannot be found everywhere

## MATERIALS

- PowerPoint presentation with information
- Maps of different ecosystems
- Access to the internet for research and presentations
- Minecraft world Animal Sanctuary

## ASSESSMENT

- Participation in the group work and research
- Participate in group discussion and in-class presentations.

By the end of this lesson, students will have an understanding of the differences between the various ecosystems on our planet and who lives in them. They have researched which ecosystems occur where and can understand what happens when an ecosystem is polluted or destroyed.

# LESSON PROCEDURES

# ACTIVITY 1

## INTRODUCTION (10 MINUTES)

- Start by giving an animal as an example in an ecosystem (e.g. the lion lives mainly in the savannah of Africa with its pride. They like warm places. Lions hunt mostly at dusk or at night and eat meat)
- Tell a little story with it

## RESEARCH (35 MINUTES)

- Students should now name animals that live in the wild (not pets or farm animals) themselves
- They form groups of about 3 students
- Now they should choose an animal in the group and research their way of life
- E.g. monkey, tiger, squirrel, fish, bee, ....

## COMPARE WITH OTHER GROUPS (30 MINUTES)

- Conclusion: Do all animals live in the same habitat? -> different animals need different habitats
- What is the name of the classic ecosystem in which the animal mainly lives (forest, lake, ocean, meadow, rainforest, ...)?
- Add or let children think that it is the same for plants
- Maybe also ask how it is with humans

## RESEARCH (40 MINUTES)

- Afterwards, children should research why these animals only live there and whether they could live somewhere else
- E.g. Frog can only live where it is humid enough. It dries out otherwise and cannot have offspring. Depends on the humidity
- Results are collected and compared

- Then have children research where their animal's ecosystem exists around the world
- E.g. rainforest only at the equator, lakes everywhere theoretically only not where it is very dry
- Here you could also work with (world) maps

## PRESENT RESULTS (30 MINUTES)

- Results are presented and compared
- Conclusion: Different ecosystems offer different resources and habitats and themselves have different requirements or arise in different places with certain conditions
- -> Can't just emerge everywhere

## ADDITIONAL TASK (10 MINUTES)

- Teacher Question: Can animals, plants, and ecosystems also "move" when a habitat is destroyed?
- Discuss and consider together
- -> Can't because ecosystems are created due to external conditions (lots of water = lake, river) and are not fast moving. Can migrate or re-form, but takes time
- Animals and plants are dependent on the ecosystems

# Topic 3:

## Pesticide use

This topic can also be used as an add-on for teaching. It takes up other aspects of the minecraft scenario and deepens them. Of course, this topic can also be used individually or in combination with topic 1 or 2.

# **LEARNING GOALS AND OBJECTIVES**

## LEARNING GOALS

- Understanding connections: students understand to some extent where their food comes from and what impact food can have on our environment. They deal with the interrelationships in nature and in the agricultural economy
- Weighing advantages and disadvantages: students learn that advantages and disadvantages can be weighed against each other. They understand that there are not always easy solutions
- Making decisions: they consider and discuss with each other how to deal with problems.

## LEARNING OBJECTIVES

- Students get an overview of what is done in the agricultural industry
- Students learn what pesticides are and when and why they are used
- Students get an overview of the different types of pesticides
- Students learn what advantages pesticides have and what disadvantages they bring
- Students get an understanding of where their vegetables come from

## MATERIALS

- PowerPoint presentation
- Video about how agriculture works
- Access to the internet for research and presentations
- Minecraft world Animal Sanctuary

## ASSESSMENT

- Class participation in group discussion and presentations
- Participation in the group work and research

By the end of this lesson, students will have an understanding of pesticide use and the consequences of using them. They will have identified advantages and disadvantages and developed an opinion based on that.

# LESSON PROCEDURES



# ACTIVITY 1

## INTRODUCTION (15 MINUTES)

- The teacher brings different vegetables to class
- The children should think about / research / explain where the vegetables come from

## LEARNING ABOUT PESTICIDE USE (45 MINUTES)

- The teacher uses targeted questions to get the children thinking about pesticides / helping plants grow
- The teacher introduces different pesticides
- The children should research the effects themselves
- The advantages and disadvantages are discussed together
- The teacher adds missing information

## CONCLUSION (20 MINUTES)

- Conclusion: Pesticides help to get a lot of harvest, but they kill field wild herbs, insects and fungi
- Putting it all in context - why is this bad?
- Fewer field wild herbs = fewer insects, which means fewer pollinators for plants in general = bad for the environment and for other animals.
- Insects are the food base for many larger animals like birds
- In addition, soil and water become saturated with pesticides, so we have the pesticides in our water and other plants may not be able to grow as well on the soil
- We can also eat the substances via the vegetables if we do not wash them off thoroughly.
- Open discussion: How should we deal with this?
- Further research on the subject could bring a good solution