



## SCENARIO

### CLIMATE CHANGE AND ITS IMPACT ON THE ENVIRONMENT



## Module 2: "Environmental Issues and Solutions"

### Topic: "Climate Change and its Impact on the Environment"

**Duration: 8 hours** (depending on the size of the group and their level of advancement, the duration of the module can be adjusted flexibly)

**Participants: Green Leaders working in the local environment**

**Training Objective:** The aim of the training is to provide participants with the knowledge and skills necessary to fulfill the role of a Green Leader.

**Training Description:** This module aims to emphasize the significance and seriousness of climate change and its impact on the global environment. It focuses on the role of green leaders as key catalysts for ecological change. Throughout this program, participants gain a deeper understanding of the main factors accelerating climate change, such as greenhouse gas emissions. The module encourages analysis of specific examples of climate change and environmental disasters around the world. Furthermore, it introduces the concept of a green leader as an individual acting to protect the environment in their surroundings. Participants will learn about the characteristic features of green leaders, such as commitment, knowledge, innovation, and the ability to mobilize communities. It is worth noting that a significant element of the module is education on the responsible use of natural resources and the minimization of greenhouse gas emissions. The entire module aims to inspire participants to actively take action to restore balance in nature and promote a sustainable lifestyle, so that they become leaders in tackling the challenges posed by climate change.

**Learning Outcomes:** Upon completing the training, participants will:

Acquire knowledge about the basic climate processes, such as global warming and changes in climate cycles.

Understand how human activities, including greenhouse gas emissions, contribute to climate change.

Gain knowledge about different types of pollution, including air, water, and soil, and their impact on the environment.

Discover the key characteristics and competencies of a green leader and how they can influence environmental protection.

Develop the ability to effectively communicate and mobilize communities on environmental issues.

The training will inspire participants to take action to reduce their own carbon footprint and promote a sustainable lifestyle.

# FRAMEWORK PROGRAM

## Part 1: Introduction

Welcome participants and introduce the facilitator

Present the training objectives

Familiarize participants with their expectations

Discuss the agenda and the training program

Explain the importance of understanding environmental issues.

Highlight the key challenges facing the world, such as climate change and pollution.

## Part 2: Climate

Discuss the main factors influencing climate change, including greenhouse gas emissions and carbon footprints.

Present the consequences of climate change, such as extreme weather events, rising sea levels, threats to biodiversity, and human health.

Explain what the Paris Climate Agreement is and its main assumptions.

Clarify who a green leader is and why their role is crucial in the fight against climate change.

Present specific steps that a green leader can take to combat climate change.

Discuss the challenges faced by a green leader.

Summarize the topic through exercises.

## Part 3: Pollution

Introduce the definition and discuss various types of environmental pollution.

Present the health consequences resulting from exposure to environmental pollutants.

Discuss ways to reduce environmental pollution, highlighting waste segregation as a key solution.

Summarize the topic through exercises.

**CONDUCT OF THE SESSION:** The trainer has at their disposal:

A multimedia presentation and various additional substantive materials in the scenario to use during lectures, discussions, and exercises.

A podcast that can be played for participants as an introduction or given to listen to at home as a form of summary.

10 Worksheets – tasks/practical exercises.

# PART 1: INTRODUCTION—BASED ON THE FRAMEWORK PROGRAM POINTS. GUIDELINES:

Welcome participants and introduce the facilitator. The educator begins the meeting by greeting participants and introducing themselves.

Present the training objectives. The facilitator discusses the key objectives of the training.

Exercise that allows participants to get to know each other and share their expectations for the training. The facilitator proposes an exercise aimed at getting to know each other and sharing their expectations regarding the training. This can be a brief round of self-presentation, where participants state their names, professions, a brief statement about their experience related to environmental protection, and one expectation they have regarding the training.

Discuss the agenda and training program. The facilitator presents a detailed training plan, listing each section, its duration, and key issues that will be covered. They assure participants that they will have the opportunity to ask questions and actively participate in all parts of the training.

Explain the importance of understanding environmental issues. Highlight the key challenges facing the world, such as climate change and pollution.

The biggest factor leading to the deterioration of the natural environment is human activity. Therefore, it is extremely important that our economic activity is conducted in harmony with nature, that is, within the framework of sustainable development. Various initiatives and efforts undertaken by people to protect the environment serve this goal.


The destruction of the natural environment affects the entire world because people across the globe exploit natural resources. They do this in various ways, contributing to damage to nature to varying degrees, both directly and indirectly. On a global scale, the most important threats to the natural environment include:

**Ozone depletion** - This is significant damage to the ozone layer in the upper atmosphere, resulting in a greater influx of ultraviolet radiation to Earth. Excessive exposure to this radiation has harmful effects, such as destroying chlorophyll in plants, causing climate changes, and increasing the incidence of cancers and other diseases. The greatest losses of the ozone layer occur in polar regions.

**Greenhouse effect** - This phenomenon occurs in the atmosphere, naturally increasing the temperature on Earth by trapping solar energy through so-called greenhouse gases, such as water vapor, carbon dioxide, and methane. These gases absorb and reflect energy radiating from the Earth's surface, which contributes to the increase in temperature. This effect impacts climate change.

**Acid rain** - These are rains, snows, and fogs that contain elevated amounts of sulfuric and nitric acids. These substances negatively affect organisms, contributing, among other things, to respiratory and immune diseases, and leading to forest die-offs. Moreover, they acidify soils and accelerate corrosion of various metal structures, such as roofs of historical buildings. Acid rain occurs in areas where the atmosphere is exposed to prolonged emissions of sulfur dioxide and nitrogen oxides, from both natural sources (like active volcanoes) and anthropogenic sources (burning fossil fuels).

An individual serving as a green leader, who has in-depth knowledge about environmental issues, faces various challenges and obligations. One of the key aspects is the need to achieve harmony between economic development and environmental protection. In this context, the green



leader plays an important role in promoting strategies and solutions that support sustainable development while considering the needs of both current and future generations. Fighting climate change is one of the most important challenges. The green leader takes specific actions aimed at reducing greenhouse gas emissions, promoting the use of renewable energy sources, and adapting to the effects of climate change. Protecting species diversity and preserving their natural habitats is another important area of activity. The green leader actively engages in efforts to protect endangered species and ecosystems that constitute their living environment. Raising public awareness on ecological issues poses a challenge in itself. Therefore, the green leader plays a crucial role in educating and increasing public awareness, trying to encourage responsible actions for environmental protection.

After concluding the introductory part, it is worth asking whether the topics and the information provided so far are understood. If participants have not yet had the opportunity to share their experience on the training topic, it is advisable to ask a few questions and allow participants to talk about themselves and their green projects. This facilitates group integration. Efforts should be made to engage with the group. Icebreakers in the form of training games, quizzes, or movement tasks unrelated to the training topic can be used.

## PART 2: CLIMATE

Discuss the main factors influencing climate change, including greenhouse gas emissions. The facilitator begins with a brief introduction that draws attention to the significance of the climate change issue. They then proceed to explain key terms such as „greenhouse effect,” „greenhouse gases,” and „greenhouse gas emissions.” They discuss the types of greenhouse gases, present the main sources of greenhouse gases, and explain what carbon footprint is.

Around the presented definitions, a discussion, group work can be built. Each group can develop definitions in graphic form or mind maps (words associations) – participants will then be engaged in building content.

**Below are examples of definitions:**

The greenhouse effect is a physical phenomenon by which the temperature at the planet's surface increases. This occurs due to the trapping of radiation, including heat, in the planet's atmosphere by certain gases. It can be compared to the operation of a greenhouse, where sunlight penetrates through the glass, but heat is retained inside, causing an increase in temperature. In the case of the planet, these atmospheric gases act like a "greenhouse glass," which increases the temperature at its surface.

Greenhouse gases are gaseous substances that play a primary role in generating the greenhouse effect in Earth's atmosphere.

Carbon dioxide (CO<sub>2</sub>) is a gas composed of one carbon atom and two oxygen atoms. It is one of the main greenhouse gases responsible for global warming.

Greenhouse gas emissions refer to the release of these gases into the atmosphere. These emissions come from various sources, including industrial activities, transport, energy production, agriculture, and other processes.

Since different greenhouse gases produce varied effects in enhancing the greenhouse effect, this is usually expressed in tons of carbon dioxide equivalent (CO<sub>2</sub>e) to allow for comparisons between them.

In 2021, greenhouse gas emissions resulting from economic activities in the European Union amounted to 3.6 billion tons of CO<sub>2</sub> equivalent, which is 22% lower than in 2008. CO<sub>2</sub> accounted for almost 80% of the total greenhouse gases emitted in the European Union in 2021, while methane was second, responsible for over 12% of emissions.

It is worth noting that methane does not remain in the atmosphere as long as CO<sub>2</sub> but absorbs solar energy much more effectively. It is also a harmful air pollutant and can lead to explosions in case of leakage.

Fluorinated greenhouse gases, although emitted in smaller quantities, account for around 2.5% of greenhouse gas emissions in the European Union. However, despite their smaller quantity, these gases trap heat in the atmosphere far more effectively than CO<sub>2</sub>.

**What gases are classified as greenhouse gases:**

Carbon dioxide (CO<sub>2</sub>): CO<sub>2</sub> is a gas naturally exhaled by animals during breathing and produced during the decomposition of organic materials. It also enters the atmosphere from the burning of fossil fuels and chemical reactions. Plants remove CO<sub>2</sub> from the atmosphere during photosynthesis, transforming sunlight, CO<sub>2</sub>, and water into sugar and oxygen. This captured CO<sub>2</sub> is stored out of the atmosphere until the plants die. Hence, forests play an important role in removing carbon dioxide from the atmosphere.

**Methane:** Methane is a colorless gas that constitutes the main component of natural gas. Its emissions come from the production and transport of coal, natural gas, and oil, but also from agricultural practices, such as livestock farming and land use. Methane emissions also arise from the decomposition of organic waste in municipal landfills. In 2021, the majority of methane emissions originated from the agricultural, forestry, and fisheries sectors.

**Nitrous oxide:** This gas is primarily produced in microbiological processes in soil, the use of nitrogen fertilizers, the burning of wood, and in the chemical industry. Emissions come both from agricultural and industrial activities and from land use. Burning fossil fuels and solid waste, as well as wastewater treatment, also contribute to nitrous oxide emissions. In 2021, in the European Union, the agricultural, forestry, and fisheries sectors generated the most nitrous oxide emissions.

**Hydrofluorocarbons:** Hydrofluorocarbons account for about 90% of fluorinated gas emissions, and the European Union aims to eliminate them by 2050. They are mainly used in cooling processes, such as refrigerators, freezers, air conditioners, and heat pumps. Additionally, they are used as propellants in asthma inhalers, and for technical purposes in foam production and fire extinguishers. In 2021, they were a dominant factor in the retail and vehicle repair industries.

**Perfluorocarbons:** Perfluorocarbons are chemical compounds widely used in industrial production processes.

**Sulfur hexafluoride:** Sulfur hexafluoride is commonly used for the insulation of power lines.

**Nitrogen trifluoride:** Nitrogen trifluoride is used as a cleaning gas in manufacturing processes, serving to remove unwanted deposits on microprocessors and circuit components during production.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator moves on to practical tasks (worksheets). Each participant receives two worksheets: Worksheet 1 and Worksheet 2. The facilitator then discusses each exercise in sequence, explaining what needs to be done and what their objectives are. Each exercise concludes with summary discussions and common conclusions.

### Tip for the trainer!

Below are sample answers for Worksheet 2:

**Air pollutants:** Air pollutants are substances or particles present in the atmosphere that are not part of the natural composition of the air and occur at higher concentrations than those typical for clean air.

**Greenhouse effect:** The greenhouse effect is a physical phenomenon whereby some gases in the Earth's atmosphere trap heat from solar radiation, leading to an increase in surface temperature.

**Greenhouse gases:** Greenhouse gases are substances that naturally occur in the atmosphere and play a role in the greenhouse effect.

**Carbon dioxide:** Carbon dioxide (CO<sub>2</sub>) is a gas composed of one carbon atom and two oxygen atoms. It is one of the main greenhouse gases responsible for global warming.

**Greenhouse gas emissions:** Greenhouse gas emissions refer to the release of these gases into the atmosphere. These emissions come from various sources, including industrial activities, transport, energy production, agriculture, and other processes.

**Present the consequences of climate change, such as extreme weather events, rising sea levels, and threats to human health.** The facilitator presents various forms of extreme weather events, such as heatwaves, storms, floods, droughts, hurricanes, etc. They explain how climate change increases the frequency and intensity of these phenomena. They introduce the topic of how clima-

te change affects human health, discussing threats such as extreme temperatures, vector-borne diseases, air pollution, and shortages of water and food, as well as mental health issues related to climate.

It is worthwhile to involve participants by asking them about the causes of climate change, which should build another thematic discussion. It is also important to consider how, as local leaders, we can take preventative measures. What actions can we undertake?

### Causes of climate change:

**Greenhouse gas emissions:** One of the key factors influencing climate change is greenhouse gas emissions. These gases, such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), trap heat from solar radiation in the atmosphere, resulting in an increase in the surface temperature of Earth. Greenhouse gas emissions primarily result from human activities, such as burning fossil fuels (coal, gas, oil), agriculture, deforestation, and industry.

**Deforestation:** Deforestation is a significant cause of climate change. Forests are important «sinks» for carbon dioxide, absorbing it during photosynthesis. When trees are cut down, accumulated CO<sub>2</sub> is released, contributing to the increase in concentration of this gas in the atmosphere.

**Land use changes:** Changes in land use, such as converting forests to agricultural or urban areas, contribute to the loss of natural ecosystems capable of absorbing CO<sub>2</sub>. Additionally, agriculture can be a source of methane emissions, such as from livestock farming.

**Air pollution:** Emission of air pollutants, such as particulate matter and nitrogen oxides, can affect atmospheric quality and cause an increase in surface temperature.

**Changes in energy use:** Dependence on fossil fuels like coal and gas contributes to CO<sub>2</sub> emissions. Transitioning to renewable energy sources, such as solar and wind energy, is one of the ways to reduce this cause of climate change.

**Transport:** Increasing road and air traffic, which is driven by fossil fuels, contributes to greenhouse gas emissions. More efficient public transport and alternative energy sources in transport can help mitigate this impact.

**Trends in land use:** Urbanization and city expansion lead to changes in land use that affect the climate. Creating urban areas enhances the so-called heat island effect, as well as potentially leading to deforestation.

**Natural cycles:** There are also natural climate variables, such as ocean cycles (El Niño, La Niña) and solar cycles, that influence the climate. However, the current climate changes are occurring far more rapidly than these natural cycles.

### Consequences of climate change:

**With the increasing concentration of greenhouse gases, the global surface temperature is steadily rising.** The last decade, that is, the period from 2011-2020, is recorded as the warmest in history. Moreover, since the 1980s, each successive decade has been warmer than the previous one. Increased numbers of extremely hot days and heatwaves are observed on land areas. The rise in temperatures contributes not only to heat waves but also poses a health risk to humans by heating the atmosphere, thereby increasing occurrences of heat-related diseases and making outdoor work more difficult. Additionally, higher temperatures create more favorable conditions for forest fires, which start more easily and spread more rapidly in a warmer climate. The Arctic region is particularly endangered as its temperature is increasing at least twice as fast as the global temperature.



**In many areas, we are struggling with more intense and frequent storms that are becoming increasingly destructive.** The temperature rise causes increased evaporation of moisture, leading to extreme rainfall and floods, making storms more destructive. Additionally, the warming ocean influences the frequency and range of tropical storms, such as cyclones, hurricanes, and typhoons. These storms feed off warm ocean waters and often destroy homes and communities, causing immense economic losses and human suffering.

**Climate change also affects water availability, leading to an increase in the number of regions affected by droughts.** Global warming leads to even more severe water shortages in areas already experiencing deficits. This increases the risk of agricultural droughts that affect crop yields and ecological droughts that affect the vulnerability of ecosystems. Droughts can also cause devastating sand and dust storms that transport huge amounts of sand across continents. Deserts are expanding, reducing the available agricultural land. Many people currently face a lack of regular access to drinking water.

**The ocean absorbs most of the heat generated by global warming.** Over the past twenty years, the rate of ocean warming has significantly accelerated at all depths. The spread of heat causes the volume of ocean water to increase as water expands with rising temperatures. Melting ice caps also contribute to sea-level rise, posing a threat to coastal and island areas. Furthermore, the ocean absorbs carbon dioxide, isolating it from the atmosphere, but this leads to ocean acidification, which poses a threat to fauna and coral reefs.

**Climate change increases the risk of species extinction both on land and in oceans.** These threats increase with rising temperatures. Currently, worldwide, species are being lost at a rate a thousand times higher than any previous period in human history. Millions of species are at risk of extinction in the coming decades. Climate change contributes to forest fires, extreme weather conditions, and the presence of invasive species and diseases that threaten biodiversity. Some species will be able to adapt and survive, but others will not.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator moves on to practical tasks. Each participant receives Worksheet 3. The facilitator then discusses the exercise, explaining what should be done. Each exercise concludes with summary discussions and common conclusions.

**Explain what the Paris Climate Agreement is and its main assumptions.** The facilitator begins by explaining the concept of the Paris Agreement, then proceeds to discuss its main assumptions. The Paris Agreement is a key, legally binding international treaty adopted by 196 parties at the United Nations Climate Change Conference in 2015. Its main goal is to control global warming by keeping the increase in the Earth's average temperature well below 2°C above pre-industrial levels while continuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. In recent years, global leaders have emphasized the need to limit warming to 1.5°C by the end of this century, as the UN Intergovernmental Panel on Climate Change warns that surpassing this threshold threatens serious consequences such as more frequent droughts, heatwaves, and rainfall.

Main points of the Paris Agreement:

**Long-term goal:** Countries have committed to limiting the increase in global average temperature to well below 2°C, while striving to limit it to 1.5°C compared to pre-industrial times.

**National commitments:** Before and during the Paris conference, countries presented their own comprehensive action plans for reducing greenhouse gas emissions known as «national contributions.»

**Cyclic reviews:** Countries pledged to present their plans every five years, setting more ambitious goals with each subsequent plan.

**Transparency:** To ensure transparency and monitor progress, countries committed to regularly reporting their actions and informing the public about progress in achieving their set goals.

**Financial support:** EU member states and other developed countries pledged to continue funding climate actions, supporting developing countries in reducing emissions and building resilience to the impacts of climate change.

Implementing the Paris Agreement requires drastic societal and economic changes based on scientific findings. The agreement is based on a five-year cycle whereby countries commit to increasingly ambitious climate actions by presenting their national climate action plans, referred to as nationally determined contributions (NDCs).

The Paris Agreement established a framework for enhanced transparency (ETF), which requires countries to transparently report on their mitigation efforts, adaptation measures, and support given or received. The information gathered through the ETF will be subject to international review procedures. This information will be included in a global review that will assess progress toward the long-term climate goals, leading to recommendations for countries to set more ambitious plans in subsequent rounds.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator moves on to practical exercises. The facilitator moves now to Worksheet 4 and asks participants to form pairs of 2-3. They then explain the exercise, clarifying what they need to do in pairs and what the objective of this task is. The worksheet can be presented in the form of a presentation using a projector.

#### **Tip for the trainer!**

Choose 2-3 topics together with the participants to make discussions interesting. Ensure that for each topic there are both proponents and opponents, which will allow for engaging debate. Verify that participants understand the rules of the debate. If necessary, explain the basic rules to ensure they are well-acquainted with what a debate is. Give groups time to prepare. Organize space for free debate. Lead the debate. Discuss with participants the process of communication, challenges faced during the debate, what unexpectedly arose, and what difficulties they experienced.

**It is important that each exercise concludes with a summary from the trainer and the group.**

**Explain who a green leader is and why their role is crucial in the fight against climate change.** The facilitator starts by providing a definition of who a green leader is, explaining that a green leader is a person or organization engaged in initiatives for environmental protection and combating climate change. This is someone who acts proactively and inspires others to take action for the environment. They clarify why the role of a green leader is crucial in the fight against climate change. They emphasize that climate change is currently one of humanity's greatest challenges. Introducing this role is important because green leaders help initiate actions on many fronts. They present the characteristics that define a green leader.

**Climate change is currently one of the largest and most urgent challenges humanity faces.** The increase in temperature on Earth, resulting from greenhouse gas emissions, is a global issue affecting every aspect of our lives and our planet as a whole.

The role of a green leader is crucial in the fight against climate change because:

Green leaders can raise awareness and educate society about climate-related issues, which is vital for understanding the scale of the challenges involved.

They can inspire and mobilize others to take concrete actions for climate protection, turning words into deeds.

They influence the business sector, encouraging investments in green technologies and adopting more sustainable practices.

They act at the political level, which can result in the introduction of stricter regulations regarding greenhouse gas emissions and environmental protection.

They set a personal example by living in accordance with environmental protection principles, which inspires others to act ecologically and implement positive changes in their everyday lives.

Thus, climate change is one of the most crucial challenges humanity faces. Addressing these challenges requires commitment at multiple levels, from individuals and communities to businesses, governments, and international organizations. Implementing sustainable practices, reducing greenhouse gas emissions, and protecting the environment become key priorities aimed at preserving our planet and its ability to meet the needs of future generations.

**Present specific steps that a green leader can take to counteract climate change and what challenges may lie ahead for green leaders.** The workshop facilitator begins by listing example steps that can be taken to combat climate change. They then proceed to brainstorm with participants, where each participant presents one action that can be carried out in their area to help fight climate change. Subsequently, the facilitator discusses the challenges that leaders must confront.

#### **Examples of steps a green leader can take to combat climate change:**

A green leader can initiate actions promoting environmentally friendly means of transport, such as developing public transport networks, investing in infrastructure for public transport, supporting car-sharing systems, and promoting low-emission transport means such as bicycles or electric vehicles.

The leader can encourage investments in renewable energy sources, such as photovoltaics, wind energy, or hydroenergy, supporting the development of infrastructure and technology related to renewable energy production.

A green leader can stimulate actions to improve energy efficiency by promoting energy-saving technologies, modernizing existing buildings to enhance thermal insulation, and educating on energy-efficient practices.


Increasing the number of green spaces: The leader can seek to increase the area of green spaces in cities and rural areas through investments in parks, community gardens, recreational areas, and the protection of natural areas and ecosystems.

The leader can support public education on climate change and the natural environment by organizing awareness campaigns, seminars, workshops, and educational programs in schools.

A green leader can support scientific research on climate change, its impact on the environment, and seek innovative solutions in environmental protection.

Implementing these actions can significantly contribute to reducing impacts on the natural environment, decreasing greenhouse gas emissions, and enhancing public awareness about the essence of combating climate change.

**Facing challenges in the field of environmental protection is not only a scientific analysis, but also a careful consideration of the complex issues that green leaders face.** In the fight against climate change, many aspects require attention, and overcoming them can pose challenges for those who seek to implement positive changes. One of the first challenges is political resist-



ce, especially when pro-ecological decisions impact economic interests or employment issues. A lack of consensus on taking eco-friendly actions can obstruct the implementation of specific solutions, as different political parties may have varying approaches. Financing pro-ecological initiatives is another challenge. Implementing projects related to renewable energy sources or sustainable transport may incur costs. Financial support is crucial, yet limited budget resources can pose challenges. The opposition of industries and corporate interests, which rely on traditional energy sources, presents another challenge. Their resistance may lead to opposition to radical pro-ecological decisions.

Implementing social and cultural changes is difficult, as it requires changing habits and societal norms, which often meets with resistance from society towards new solutions. Combatting climate change encompasses a wide range of issues, such as protecting biodiversity, waste management, and air quality, not just CO<sub>2</sub> emission reduction, which constitutes another challenge. Finally, uncertainty about the effectiveness of pro-ecological actions is an important aspect. This arises from the fact that the effects of environmental actions are difficult to assess over a short period, leading to uncertainty and doubts about the actions taken.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator proceeds to a practical exercise.

The facilitator now moves to Worksheet 5 and asks participants to form pairs. They then explain the exercise, clarifying what they should do in pairs and the objective of this task. After conducting the exercise, the results are discussed, and conclusions are drawn.

## PART 3:

The facilitator presents to participants the definition of environmental pollution, then moves on to discussing various types of pollution, such as air, water, and soil pollution, along with their sources and how they impact the natural environment and human health.

### Definition of environmental pollution:

Pollution transforms the environment, such as air, water, and soil, making them potentially harmful to humans and nature. There is a variety of pollutants, such as chemicals, dust, noise, and radiation, which have various origins. Some are diffuse, such as emissions from transport or agricultural practices, while others are location-specific, such as industrial sites or power plants.

### Types of environmental pollution:

#### Air pollution:

Emissions from vehicles: Such as nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM), volatile organic compounds (VOCs).

Industrial emissions: Arising from industrial processes, energy generation, and fuel combustion that emit various pollutants.

#### Water pollution:

Municipal waste: Substances from households and industries that may enter rivers, lakes, and seas.

Industrial contamination: Emissions of chemicals, heavy metals, and pesticides into waters.

#### Soil pollution:

Industrial pollution: Chemical substances, heavy metals that enter the soil and can negatively impact agricultural crops.

Waste: Stored waste that can contain toxic and harmful substances.

#### Noise pollution:

Generated by traffic, industry, and even natural phenomena, which can disturb peace and impact the health of humans and animals.

#### Light pollution:

Caused by excessive city lighting, which disrupts natural light and dark cycles, negatively impacting living organisms.

#### Radiation pollution:

Arising from various activities, such as accidents in nuclear power plants or the storage of radioactive waste, which can cause harm to the environment and human health.

#### Sources of environmental pollution:

**Industry:** Emissions from factories and industrial plants, involving processes such as fossil fuel combustion, raw material processing, and chemical actions.

**Transport:** Emissions generated by vehicles with internal combustion engines, such as cars, airplanes, ships, and other means of transport, producing air-polluting substances, e.g., nitrogen oxides and carbon dioxide.

**Agriculture:** Use of pesticides, fertilizers, and livestock farming practices that can lead to the con-

tamination of groundwater and surface water.

**Waste:** Municipal and industrial waste that, if not properly disposed of and processed, can contaminate water, soil, and air.

**Households:** Emissions from heating systems, cooling, burning waste, and daily activities that can contribute to air and water pollution.

**Natural phenomena:** Such as volcanic eruptions, forest fires, and airborne mineral dust that can affect air quality.

**Urban infrastructure:** Construction of roads, bridges, buildings, and urban infrastructure elements that can cause emissions of dust, noise, and other air pollutants.

**Lighting and technology:** Excessive urban lighting and energy consumption lead to emissions of carbon dioxide and other air-polluting substances during electricity generation.

Impact of environmental pollution on the natural environment and human health:

**Air pollution** causes various respiratory diseases, such as asthma, chronic obstructive pulmonary disease (COPD), and allergies. It also worsens air quality through unpleasant odor, haze, and reduced visibility.

**Water pollution** can induce poisoning and gastrointestinal diseases, as well as skin issues from consuming contaminated water. It also disrupts the balance of aquatic ecosystems, affecting the diversity of fauna and flora in rivers, lakes, and seas.

**Soil pollution** reduces soil fertility and the ability to productively cultivate plants. It can also enter the food chain, contaminating food.

**Noise pollution** affects mental health, causing stress, insomnia, and lowering quality of life. It disturbs animal behavior, affecting their feeding and migration habits.

**Light pollution** leads to disruptions in the biological rhythm of organisms, both humans and animals. It can impact wildlife migration and reproductive behaviors.

**Radiation pollution** may lead to cancers and genetic mutations in humans and animals. It causes die-offs of plants and animals, disrupting ecosystem balance.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator moves to the practical exercise stage. Each participant receives Worksheet 6 and Worksheet 7. The facilitator then discusses the exercises, explaining what needs to be done.

**In the next stage, the facilitator discusses the health consequences of exposure to pollution. They indicate how pollutants impact human health, including on the respiratory system, skin, and overall health condition.**

**Air Pollution:** Air pollution can lead to a range of health consequences for individuals exposed to it. Breathing contaminated air introduces harmful substances into the respiratory system and lung alveoli. The intensity and degree of exposure strongly correlate with the size of particles in polluted air and the anatomical condition of the airways, including any pathological changes. This inhalation of pollutants can affect an individual's overall health, particularly their respiratory health. The relationship between the dose of inhaled pollutants and their accumulation in targeted cells influences the degree of damage within the respiratory systems of exposed individuals. Air pollution becomes a key risk factor for many respiratory diseases, such as asthma and lung cancer. Substances like PM2.5 (particulate matter with a diameter of 2.5 micrometers) and other chemical pollutants, such as ozone (O<sub>3</sub>) and benzene, can cause serious damage to the



respiratory system. Asthma, as a respiratory condition, may develop due to exposure to toxic substances. Research confirms a link between air pollution related to traffic and/or industry and an increased risk of developing chronic obstructive pulmonary disease (COPD). Exposure to air pollution affects the respiratory system from the fetal stage, and every exposure, both short- and long-term, has a significant impact on health. Short-term exposure to air pollution may aggravate pre-existing respiratory symptoms.

### **Soil Pollution:**

Healthy and unpolluted soils play a crucial role in maintaining human health. They are fundamental in food production, providing nutrients, plant material, and organic matter, while also supporting the cultivation of medicinal plants. Moreover, they fulfill important roles in water retention and purification. Healthy soils are also essential for the nutrient life cycle and carbon. When soil becomes polluted, its quality and fertility deteriorate, posing risks to food security. This presents a risk not only to overall health through the consumption of contaminated food or water but also to individuals who may have direct contact with polluted soil.

**How pesticides affect soil:** Pesticides are chemical substances used for various purposes, including:

Protecting plants from pest (insecticides) and fungal attacks (fungicides).

Eliminating plant diseases caused by bacteria (bactericides).

Eradicating weeds to prevent their growth and spread (herbicides).

Pesticides disperse in the environment through air and water, but are also retained in the soil. Due to their remarkable durability, toxicity, and biological activity, pesticides pose significant threats to the natural environment.

Plants need nutrients for growth, and intensive agricultural practices can deplete these nutrients faster than natural replenishment processes can occur. To compensate, fertilizers and other substances are used, although plants do not always fully utilize them. Excess amounts of these substances often wash into waters, especially nitrogen, leading to excessive plant and algae growth that can disrupt oxygen levels in water and harm aquatic ecosystems.

Copper, used as a fungicide in agriculture, has been detected at higher concentrations than the average in European soils, primarily in vineyards. It is also used in animal feeds and enters the environment through the decomposition of manure on various agricultural lands.

Cadmium, another toxic metal, is found in mineral phosphorus fertilizers. Improper use of certain organic fertilizers, such as sewage sludge or compost, can introduce many heavy metals and organic pollutants into the soil.

Additionally, soil samples from across Europe contain chemical substances resulting from long-term use of pesticides. Studies have shown that over 80% of soil samples contain pesticide residues, with 58% containing at least two different types of these substances.

### **Some effects of soil pollution:**

**Decreased soil fertility:** Pollutants can reduce soil's ability to sustain plant life, diminishing its fertility and its capacity to provide adequate nutrients for plants.

**Plant poisoning:** Pollutants can poison plants, leading to decreased yields, and in extreme cases, plant death.

**Health risks to humans:** Soil pollutants can enter the food chain, contaminating fruits, vegetables, and even meat, posing health risks to humans.

**Environmental degradation:** Soil pollution can lead to environmental degradation, resulting in soil erosion, loss of biodiversity, and a general decline in ecosystem condition.

Ways to counteract soil degradation:

**Recycling and waste disposal:** Limiting emissions of pollutants through appropriate processing and disposal of waste to prevent them from entering the soil.

**Using natural agricultural methods:** Sustainable agricultural methods, such as cultivating without harmful pesticides and chemical fertilizers, can limit soil pollution.

**Rehabilitation of degraded areas:** Restoring degraded areas using various techniques, such as planting plants, applying ecological engineering methods, and improving soil structure.

**Monitoring and controlling pollution:** Regular monitoring of soil quality and controlling pollution sources can help prevent further contamination.

**Education and public awareness:** Educating society about the consequences of soil pollution and promoting eco-friendly practices can contribute to reducing environmental impact.

**Applying cleaning technologies:** Utilizing soil cleaning technologies, such as phytoremediation (using plants to remove pollutants) and other environmental engineering methods, can help remove pollutants from the soil.

Health consequences associated with polluted soil:

**Food poisoning:** Soil pollutants can enter crops like vegetables and fruits, potentially causing food poisoning in people consuming these products. Some chemicals, such as heavy metals and pesticides, can accumulate in plants and be harmful to health.

**Health issues related to heavy metals:** Pollution from heavy metals such as lead, cadmium, or mercury can lead to health problems, including kidney damage, neurological issues, cardiovascular problems, and health issues linked to the immune system.

**Skin diseases:** Contact with polluted soil can lead to various skin diseases, irritations, skin allergies, and rashes.

**Respiratory problems:** Some soil pollutants, especially when the soil dries, can contribute to dust generation and airborne particles, which can lead to respiratory issues such as asthma, allergies, and other illnesses.

**Carcinogenicity:** Certain chemicals present in polluted soil may be carcinogenic and increase the risk of tumors in humans.

**Direct poisoning:** People who have direct contact with polluted soil, for example, during agricultural work or land reclamation work, may be exposed to toxic substances.

**Water pollution:**

Water pollution refers to a situation where various factors negatively impact the physical, chemical, and bacteriological properties of water. This condition results from introducing organic, inorganic substances (in gaseous, liquid, or solid form), and radioactive substances into water bodies. It leads to disturbances in the natural physicochemical composition of water, which may also result from heat interference.

**Types of water pollution:**

There is a fundamental division of water pollution based on its origin. We can distinguish:

**Natural pollution:** This results from „impurities“ contained in water, for instance, upon contact with natural substances like fluoride or arsenic. These are natural elements that enter waters through



interactions with soil, for example.

**Artificial pollution:** These are directly related to human activities and constitute a negative impact on the environment.

There is also a division of water pollution based on their permanence:

**Biodegradable pollution:** These contain organic substances that can potentially harm human and other organisms' health but may decompose through chemical processes. Household waste is an example.

**Non-biodegradable pollution:** These include organic substances such as heavy metals that do not undergo decomposition processes.

**Persistent pollution:** These are pollutants that remain in the water in unchanged form for a very long time. An example of such pollutants includes pesticides.

### Sources of water pollution:

Water pollution primarily has anthropogenic origins, arising from human activities. There are three primary sources of water pollution:

**Municipal pollution:** Arising from human activities in households, public utility services, and places with drainage systems. Municipal pollutants include sewage containing physiological and household waste, hospital waste, and industrial effluents.

**Industrial pollution:** Originating from production processes. It comprises various industrial waste that may contain harmful substances, including acids, mineral bases, organic compounds, and heavy metals. Elevated temperatures in waters used in industrial processes also pose problems for aquatic ecosystems.


**Agricultural pollution:** Resulting from intensified agricultural activities that use large amounts of fertilizers and plant protection products. These substances leach from soil and contaminate groundwater and water bodies, leading to the eutrophication process. The predominant substances are nitrates, sulfates, chlorides, and phosphates, which are harmful to the environment.

**The individual responsible now moves to discuss ways to reduce environmental pollution, highlighting waste segregation as one of the key solutions.** They begin by providing a definition and explanation of the benefits stemming from this process. They then describe the proper waste segregation process, step by step. The facilitator then presents examples of how a green leader can combat environmental pollution and encourages participants to think creatively through "brainstorming" to suggest their examples.

Humans have a significant influence on the environment, both positively and negatively. Their actions can lead to environmental degradation. One common way of caring for the environment is through waste segregation. In 2019, a new system for waste categorization into five groups was introduced: metals, plastics, paper, glass, biodegradable waste, and mixed waste.

### Why segregate waste?

Waste segregation enables recycling through the recycling process, resulting in the creation of new products. Regular collection of segregated waste is incredibly important. Recovering secondary materials leads to reduced consumption of natural resources, which undoubtedly benefits the environment. By segregating waste at home, we limit the amount of waste that could contaminate the environment, posing a threat to human health and life. For example, the segregation of paper contributes to reducing energy and water consumption, decreases air pollution, and limits deforestation. One hundred tons of paper allow for the production of 90 tons of recycled paper, ultimately preventing the cutting down of trees, as it takes 17 trees to produce one ton of paper.



Recycling is a method aimed at environmental protection that seeks to reduce waste and recover materials for reuse in the production of new goods. Reusable materials are marked with a symbol.

Recycling is a critical process that brings a host of benefits, such as:

Protecting the natural environment by reducing waste amounts;

Reducing the consumption of natural resources;

Saving energy through the reuse of raw materials;

Decreasing the quantity and size of landfills by reusing materials;

Creating new products from recovered raw materials;

Limiting water pollution through proper waste management;

Reducing toxic gas emissions into the atmosphere by minimizing waste and using secondary raw materials.

The rules of waste segregation are essential for protecting the environment. There are five color-coded bins. Each serves to collect specific types of waste:

The **blue bin** is for **PAPER**: cardboard boxes, paper bags, newspapers, and even cardboard. However, this bin should not include dirty or greasy papers or building materials.

The **gray bin** for **MIXED WASTE** accepts food scraps, broken glass, and hygiene products. However, used electrical equipment, chemicals, or furniture do not belong in this bin.

The **brown bin** for **BIOWASTE** takes cut grass, scraps from vegetables, fruits, and eggshells. However, this bin should not include ash, spoiled food, or animal waste.

The **yellow bin** for **METALS AND PLASTICS** is for cans, cosmetic packaging, and plastic containers. However, batteries, plastic toys, or household appliances and electronics do not belong there.

The **green bin** for **GLASS** is designated for beverage bottles, jars, and glass containers. However, decorative glass, flower pots, or window panes should not be placed in this bin.

Waste that cannot be sorted into any of these bins can be taken to the PSZOK. There, larger waste, expired medicines, and tires are received.

**Exercises summarizing the topic:** After completing the presentation and discussion on the addressed topic, the facilitator moves to practical exercises.

Each participant receives Worksheets 8, 9, and 10. The facilitator then discusses each exercise in turn, explaining what needs to be done on each card and their objectives. Each exercise is reviewed after completion, sparking group discussions.

## PART 5: SUMMARY AND CONCLUSIONS

Summarize the main topics and ways participants can protect the environment.

Highlight the most crucial conclusions and recommendations for green leaders fighting environmental pollution.

Evaluate the training and gather participants' feedback.

At this point, it is essential for green leaders to summarize the conducted workshop. It is important to emphasize the key discussed issues as a connecting element throughout the training's content.

At this point, there is also time for:

Questions from the group.

Conclusions from both the group and the facilitator.

An evaluation survey.

Diplomas and thanks for participants.

An invitation for collaboration in green initiatives



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