



ROAD TO GREEN FUTURE

**“DID YOU KNOW
THESE?”**



**This book,
was prepared with the contributions of
teachers and students of the
"Road To Green Future" eTwinning
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"Aerosol Loading" ?

Aerosol loading refers to the concentration of tiny particles, known as aerosols, suspended in the Earth's atmosphere. These particles can be natural, like dust and sea salt, or man-made, such as soot and sulfates from burning fossil fuels. Aerosols play a significant role in the Earth's climate system by affecting cloud formation, atmospheric circulation, and the balance of solar radiation. However, increased aerosol loading due to human activities has led to various environmental and health issues. For instance, some aerosols reflect sunlight, causing cooling, while others absorb it, leading to warming. Additionally, aerosols can reduce crop yields and contribute to respiratory diseases.

WHAT DO TREES SAY ABOUT THE CLIMATE



But to understand what trees are telling us, we first need to understand the difference between weather and climate.

Weather is a specific event that occurs over a short period of time—like a rainstorm or a hot day. Weather can be tracked in hours or days. Climate is the average weather conditions in a place over a long period of time (30 years or more).

Scientists at the National Weather Service have been tracking weather in the United States since 1891. But trees can keep a much longer record of Earth's climate. In fact, trees can live for hundreds or even thousands of years!

One way scientists use trees to learn about past climate is by studying the tree rings. If you've ever seen a tree stump, you've probably noticed a series of rings around the top of the stump. It looks a little like a bullseye

How much will glacier raise the seas?



The IPCC's optimistic scenarios are based on two foundations. The first is that the Greenland and Antarctic glaciers will not actually melt until 2100, and the second is that there will be no unexpected changes in the climate until 2100. If the glaciers in Greenland or Antarctica break up and slide into the sea instead of melting in place, the melting of these glaciers will accelerate significantly. Such a scenario can be expected for Greenland in this century in particular. If the glaciers in Greenland melt, the world's sea level will rise by 6-7 meters. Although it is not expected to happen this century, the melting of the glaciers in East Antarctica will raise the sea level by approximately 80 meters. Although these two events seem like science fiction to us today, they may be at the top of the list of problems that the world will have to deal with in the not-so-distant future. When we consider that almost half of the world's population lives within the first hundred meters above sea level, the magnitude of this problem can be better understood.

WHAT IS THE ECOLOGICAL FOOTPRINT?



Ecological footprint is a concept that measures the rate at which an individual, society or a country consumes natural resources and the damage it causes to the environment. This is calculated by taking into account the environmental impact of the energy, water, food and other resources individuals use and is usually expressed in hectares. Ecological footprint is directly related to factors such as lifestyle choices, transportation preferences, waste management and consumption habits. This concept helps people understand their impact on the environment and aims to raise awareness to adopt more sustainable lifestyles. Reducing the ecological footprint is possible through practices such as more efficient energy use, recycling, and consumption of local and organic food, which contributes to the protection of natural resources and reduction of environmental destruction.



WHY DO FORESTS BURN?



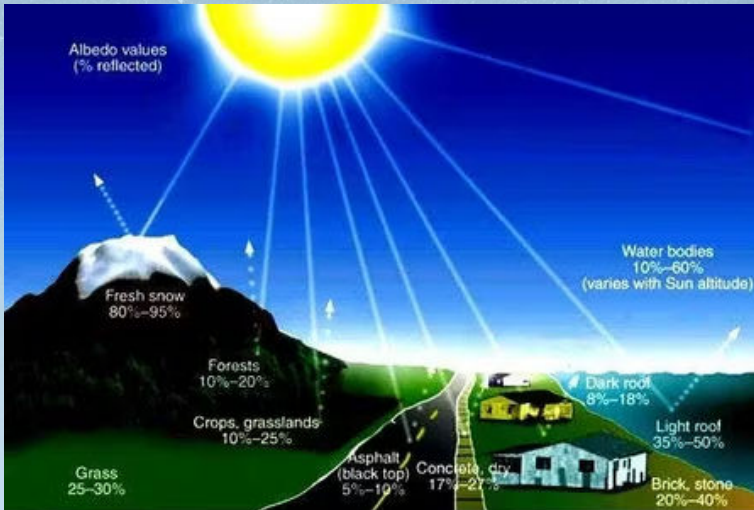
Forest fires occur for various reasons. One that can be commonly used is climatic conditions such as high temperatures, low humidity and wind; These factors can cause glitter to melt quickly. Human functions are an important factor and can occur with intentional or accidental remote explosions, especially lighting a fire, throwing cigarette smoke into the forest, or using machinery that may cause malfunction. Additionally, natural events such as lightning strikes can also trigger forest fires, as lightning can ignite dry trees. Dry vegetation in forests, especially those that retain long-term rainfall, is another factor that enables the rapid growth of the eruption. Agriculture and farming activities can also lead to forest decay; for example, farmers using fire to clear their land or settlements built in forest villages. As a result, forest fires greatly protect the environment, threatening ecosystems and damage to animals, while humans are directly at risk.

BEYZA /Türkiye

What is the Albedo Effect?

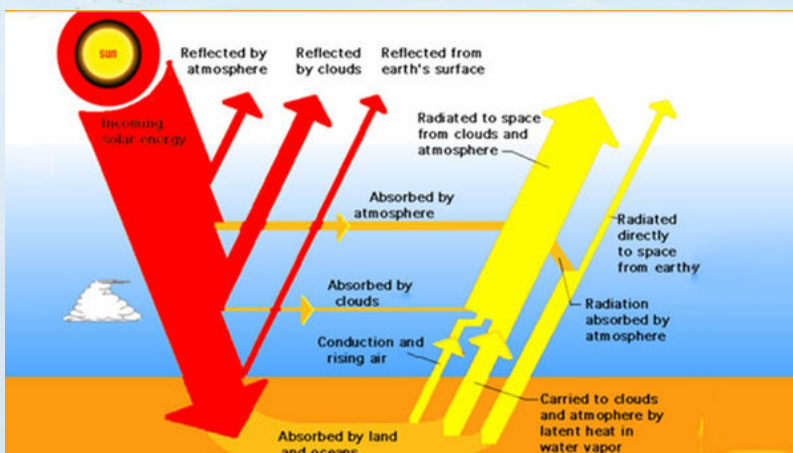
The capacity of any surface to reflect sunlight falling on it is called albedo. So what do we know about the albedo capacities of different areas on Earth?

The albedo of an object varies depending on the angle of incidence of sunlight, the surface area of the object, its texture or color. For example, light-colored surfaces reflect a large portion of the light coming from the Sun and send it back to the atmosphere. These surfaces are called high-albedo surfaces. Dark surfaces, on the other hand, absorb a high amount of light coming from the Sun. Therefore, dark surfaces are called low-albedo surfaces.



Is the Albedo Effect Important?

The average surface temperature of the Earth is currently around 15 °C. If the Earth were completely frozen, meaning it had a very high albedo effect, the average temperature of the planet would drop below -40 °C. If only the land were covered in ice, the average temperature would drop to 0 °C. If it were completely covered in water, meaning it had a low albedo effect, the average temperature would rise to around 27 °C. Therefore, the albedo effect is important for the Earth to have a temperature suitable for life.



How much fossil fuel is in the ground?

Coal

There are roughly 1.1 trillion tonnes of coal around the world, with the largest reserved found in the US, Russia, China, Australia and India. According to recent estimates, we have enough coal to last us for about **132 years**.

Oil

As of 2022, proven oil reserve total at around 1,757 billion barrels. Venezuela holds the highest concentration of the world's oil reserves at 18 percent, followed by Saudi Arabia (16 percent) and Canada (10 percent). Estimations vary slightly, but it is predicted that - if demand forecasts hold - we will run out of oil from known reserves in about **47 years**.

Natural Gas

Natural gas is considered to be among the least polluting fossil fuels, compared to oil and coal. Like other fossil fuels, natural gas is a depleting source, and as of 2020, about 7,257 trillion cubic feet of proved natural gas reserves were available around the world. How long will this last us? Predictions vary and largely depend on consumption rates, but experts estimate that it will be between 90 and 120 years before we run out of natural gas.

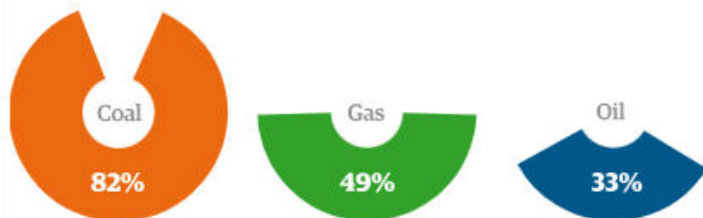
To prevent the earth from overheating, countries must leave vast reserves of fossil fuels untouched underground. That's the conclusion of a new report published this week in the journal Nature. Trillions of dollars of known and extractable coal, oil and gas – including deposits in Canada and the Arctic – cannot be burned if the global temperature rise is to be kept under the agreed-upon goal of 2C.

Unburnable fossil fuels

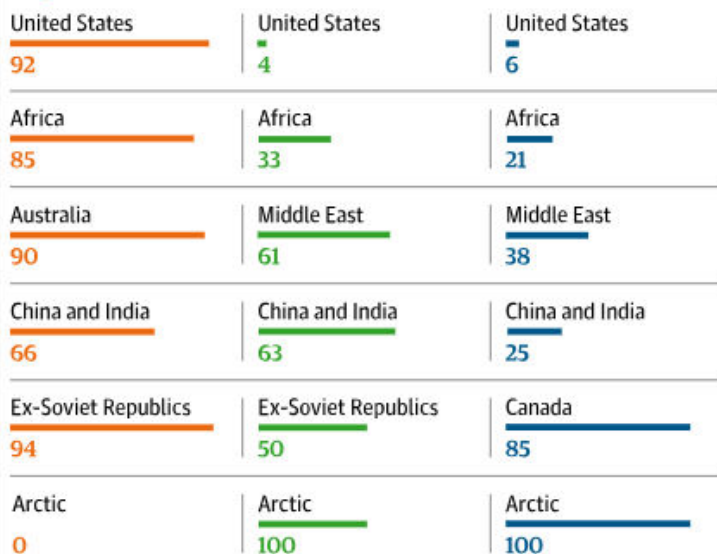
Known, extractable coal, oil and gas reserves that must not be burnt in order to prevent dangerous climate change of more than 2C

Global reserves

Per cent that cannot be burned



Regional reserves



GUARDIAN GRAPHIC

SOURCE: McGLADE & EKINS, NATURE, 2015



Ginevra Bova/Italy

How can “Zero Waste” happen?

Zero Waste is a holistic approach to addressing the problem of unsustainable resource flows. Zero Waste encompasses waste eliminated at the source through product design and producer responsibility, and waste reduction strategies further down the supply chain such as recycling, reuse and composting.

Whether you’re embracing more sustainable habits or purchasing more environmentally friendly products, every small change counts.

Here are some simple tips to help you get started on your zero-waste journey, to reduce waste at home

Here are some simple tips to help you get started on your zero-waste journey, to reduce waste at home through the “5rs” strategy: Refuse, Reduce, Reuse,

Recycle, Rot;; strategy: Refuse, Reduce, Reuse, Recycle, Rot:

Refuse The first step in implementing the 5 Rs is to refuse unnecessary items. Identify items that you can do without and stop buying them. Say no to disposable single-use plastic.

Reduce – Be mindful of what you buy. Purchase only what you need and limit impulse purchases. Buy secondhand items whenever possible for clothing, furniture, etc.

Reuse – Before you throw something out, think about whether you could repair or reuse it for another purpose. Breathe new life into old pieces of furniture or donate these items.

Recycle - make sure to recycle all materials that can be recycled. This includes paper, plastics, and metals.

Rot – Compost! It doesn’t matter if you live in a tiny apartment in the city or on a big farm, composting options are available to you.

Zero Waste Is Our Futur



Are nuclear power plants necessary?

Nuclear plants are necessary to satisfy the growth in energy demand because they can produce a lot of it with little fuel. Furthermore, these plants do not produce carbon dioxide emissions, in fact they are the second source of low-carbon energy after hydroelectric plants. However, nuclear plants produce radioactive waste and a way must therefore be found to reuse or eliminate it. This energy that can be obtained quickly, but has high production costs. These plants should be made safer because if an accident were to happen, many people would die. They must therefore be made safer because we need greater energy production given that the world population is increasing. The international companies of the AIE and the IEA also support the growth of nuclear plants. At this moment nuclear plants produce 10% of the world's energy.



Sergio / ITALY

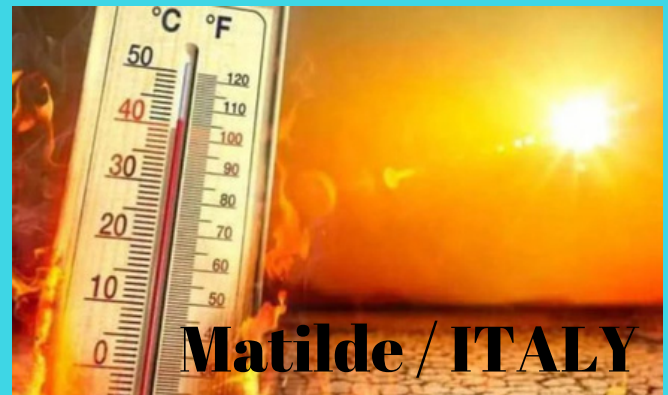
CLIMATE CHANGE E WATER

Global warming is a phenomenon that is causing an increase in temperatures on Earth. This happens mainly due to human activities, such as pollution, the use of fossil fuels (coal, oil, and gas), and deforestation, which increase the concentration of greenhouse gases in the atmosphere, especially carbon dioxide (CO₂). These gases trap the Sun's heat, causing the planet's temperature to rise.

Water is one of the resources most affected by climate change. The main effects include melting glaciers and rising sea levels, droughts and freshwater shortages, and extreme rainfall leading to flooding. It is important to protect the environment to stop climate change and conserve water.

To reduce the impact of climate change, we must decrease our reliance on fossil fuels by choosing renewable energy sources such as solar and wind power. At the same time, saving water is essential; small actions like turning off taps when not in use, collecting rainwater, and using efficient irrigation methods can make a difference. Protecting forests is also crucial, as trees absorb CO₂ and help regulate the water cycle. Additionally, reducing plastic consumption is necessary to limit pollution, as plastic waste often ends up in the ocean, further harming marine ecosystems.

Climate change is altering the water cycle in dangerous ways, but we can take action to protect the planet. Each of us has a role to play, and by adopting more sustainable behaviors, we can help safeguard the environment for future generations.



Matilde / ITALY

CLIMATE CHANGE AND FOOD SECURITY

On our planet, the phenomenon of climate change is constantly increasing; in addition to causing the melting of glaciers, drought, and acid rain, it also has significant effects on the food we and animals consume.

Many crops are contaminated by germs that thrive in humid conditions, infecting the food we eat. Animals also suffer from the negative effects of this evolving phenomenon: many marine animals die because they feed on “toxic” algae.



New parasites can be carried by certain animals (especially insects and birds), known as vectors, which spread diseases and viruses with harmful consequences for wildlife and farmed animals. For example, midges of the *Culicoides* genus transmit a highly dangerous disease—bluetongue fever—when they bite animals such as sheep, cattle, goats, and deer. High temperatures and humidity further promote the spread of these parasites.

A particularly serious risk to food security is the transmission of diseases from animals to humans “zoonotic diseases” through the consumption of contaminated food or direct contact with infected animals; an example of this is salmonella.



Climate change is also linked to the spread of toxic substances produced by fungi (mycotoxins) and plankton, which can easily enter the food chain. Again, humidity and high temperatures lead to the exponential growth of fungi and infections in crops. As a result, climate change is causing shifts in the presence of these mycotoxins in Europe. For example, aflatoxins are carcinogenic substances produced by two species of a fungus called *Aspergillus*, which thrives in warm, humid climates. Due to rising temperatures and humidity, this fungus has spread to Southern Europe since the early 2000s and continues to expand northward. Climate change also significantly affects the availability of phytoplankton, a vital food source for many fish and marine organisms. This phytoplankton can become toxic, leading to contamination of seafood. An example is ciguatera poisoning, which typically occurs in tropical regions but, due to climate change, caused a large-scale fish poisoning incident in Spain and Portugal in 2008. The effects of climate change on food security are increasingly evident, posing serious risks to human and animal health. Without effective action to mitigate global warming and adapt agricultural and food production systems, these challenges will continue to grow. It is crucial to invest in sustainable solutions to protect both our environment and future food supplies.

will there be no fish left in the seas?

Fishing is one of the most significant drivers of declines in ocean wildlife populations. Catching fish is not inherently bad for the ocean, except for when vessels catch fish faster than stocks can replenish, something called overfishing. The number of overfished stocks globally has tripled in half a century and today fully one-third of the world's assessed fisheries are currently pushed beyond their biological limits. Overfishing is closely tied to bycatch—the capture of unwanted sea life while fishing for a different species. This, too, is a serious marine threat that causes the needless loss of billions of fish, along with hundreds of thousands of sea turtles and cetaceans.

“Biodiversity is a finite resource, and we are going to end up with nothing left ... if nothing changes,” People have to work to improve how the world manages and conserves ocean resources, to reform fisheries management globally, focusing on sustainable practices that not only conserve ecosystems, but also sustain livelihoods and ensure food security.



Rebecca / ITALY



Drought and Desertification look scary?

Drought restricts plant growth because there is no water. This affects not only agriculture, but also wild plants. Due to drought, the soil can become fragile and land erosion occurs. Ecosystem collapse may occur. Different animals and plants are interdependent and drought can upset this balance. For example, if plant species die out, the animals that depend on them may starve or become extinct.

Drought reduces the availability of water in rivers and lakes, which can cause problems for people and animals that rely on these water sources. Drought increases the risk of wildfires. Fires can destroy large areas, affecting habitats and air quality. Prolonged drought can be linked to climate change and can exacerbate negative effects such as drought cycles and extreme weather events. Thus, drought is a serious challenge that affects not only nature but also people's lives and well-being.



How much Renewable Energy do we use?

The main sources of renewable energy are:

Solar energy - the use of solar panels can provide a significant part of the energy consumption, especially in sunny areas. **Wind Power**- Wind turbines can generate electricity and are particularly effective in areas with constant and strong winds.

Hydropower - hydroelectric plants can use the flow of rivers to generate electricity, but they require large infrastructures and can affect ecosystems.

Biomass - organic materials such as wood and agricultural waste can be used as fuel.

Geothermal energy - this energy is obtained from the internal heat of the Earth and can be used for heating and electricity generation.

Ksenija / Latvia



What does Climate Change have to do with Migration?

Climate change and migration are linked in several ways. Here are some key aspects:

Climate change can lead to environmental degradation such as increased frequency of droughts, floods, sea level rise and other natural disasters. These conditions can lead people to look elsewhere for new opportunities. Climate change can affect agricultural production and water availability, leading to food shortages and water crises. This can lead to moving to places with better resources. Climate change can negatively affect the economy, especially in those sectors that depend on natural resources, agriculture, fishing and tourism. Economic difficulties can encourage people to look elsewhere for work.

Lack of resources can lead to social conflict and instability, which can lead to migration as people seek safer and more stable places to live.

The problems caused by climate change can affect the political stability of countries, which in turn can lead to migration.



Climate justice

Climate justice emphasizes that climate change does not affect all people equally, and that social, economic and political differences can create inequalities in climate risk and access to resources.

Climate justice includes several aspects:

Social justice is understanding how climate change affects different groups in society, especially those who are already socially vulnerable.

It is important to know that the resources needed to mitigate and adapt to climate change are distributed fairly and equitably.

It is necessary to involve all layers of society in decision-making processes, especially those most affected by climate change.

Environmental justice is especially needed for those who are already exposed to environmental problems.

Climate justice is essential to ensure a sustainable and inclusive approach to climate action that takes into account all people and their needs.

Jelizaveta / Latvia



How do we solve climate problem?

The main directions for solving climate problems:

Switching from fossil fuels to renewable energy sources such as solar, wind and hydropower can reduce greenhouse gas emissions.

Improving energy efficiency in homes, businesses and transport can save energy and reduce emissions.

By encouraging the use of public transport, the development of cycling and walking infrastructure, emissions from cars can be reduced.

Forests absorb carbon dioxide, so preserving and restoring them is essential to mitigating climate change.

Promoting sustainable agricultural practices such as organic farming and biodiversity can reduce emissions and improve soil quality.

Education about climate change and sustainable living can help people make more environmentally friendly decisions.

Climate change is a global problem, so countries must work together to take effective action, for example through the Paris Agreement.

Vitalijs / Latvia



What does the future hold for us?

Climate change is a serious problem, and its impact on the future will be felt in many areas. Here are some possible scenarios and challenges we may face:

Extreme weather events such as heavy rains, droughts, heat waves and storms are expected to occur more frequently due to climate change. This can wreak havoc on agriculture and infrastructure.

Melting glaciers and warming seawater can lead to sea level rise, which threatens coastal regions and can lead to human displacement.

Climate change can affect the survival of animal and plant species, leading to species extinction and ecosystem collapse.

Higher air temperatures and pollution can cause health problems such as respiratory disease and heart disease.

Scarcity of resources, such as access to water and food, can lead to social and political tensions, as well as migration.

However, there is also hope that through joint efforts, technological advances and increased awareness of sustainable development, we can mitigate and adapt to the effects of climate change. It is important that each of us takes action to reduce our impact on the environment.

Mihails / Latvia



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