



Co-funded by
the European Union



Ecosystems and Biodiversity

Go Green Against Climate Change -
2023-1-RO01-KA220-SCH-000161283

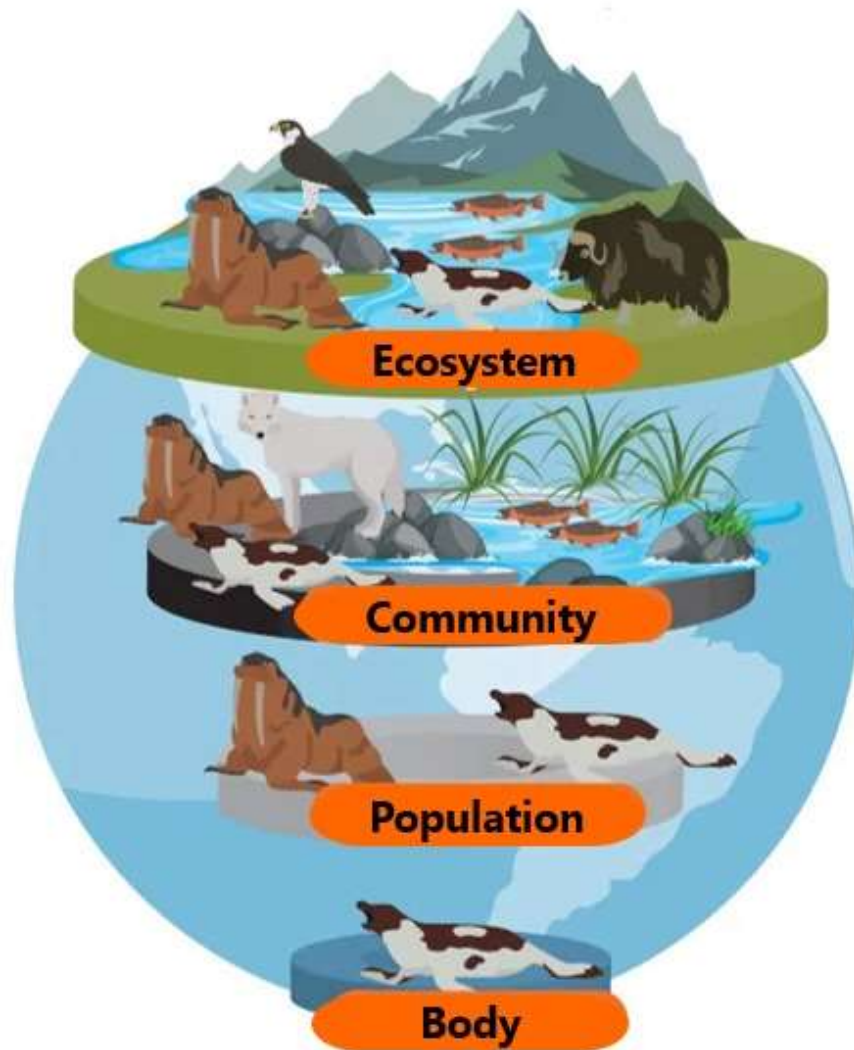


- 1) Ecosystems
- 2) Biodiversity
- 3) Human Impact to the Ecosystem and Biodiversity
- 4) EU biodiversity strategies to 2030
- 5) Activity students



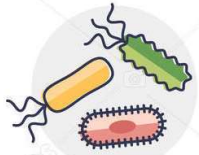


1) Ecosystems



- An ecosystem is a **complex network** of living organisms (plants, animals, microorganisms) **interacting with each other** and their **physical environment** (air, water, soil, sunlight) in a **specific area**.
- Ecosystems can vary greatly in size, from a small pond to a vast forest or even the entire Earth. The interactions within ecosystems are essential for the flow of energy and nutrients, and they sustain the life forms within them.

BIOTIC FACTORS



BACTERIA



FUNGI



PLANTS



ARCHEA



ANIMALS



PROTISTS



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Key Components of Ecosystems:

Biotic Factors: The living organisms within an ecosystem, such as:

1. **Producers** (e.g., plants and algae that produce energy via photosynthesis)
2. **Consumers** (e.g., herbivores, carnivores, omnivores, and decomposers that feed on other organisms)
3. **Decomposers** (e.g., fungi, bacteria that break down dead material, returning nutrients to the soil)

ABIOTIC FACTORS



AIR



SALINITY



SOIL



TEMPERATURE



LIGHT



WATER



MINERALS



pH



HUMIDITY

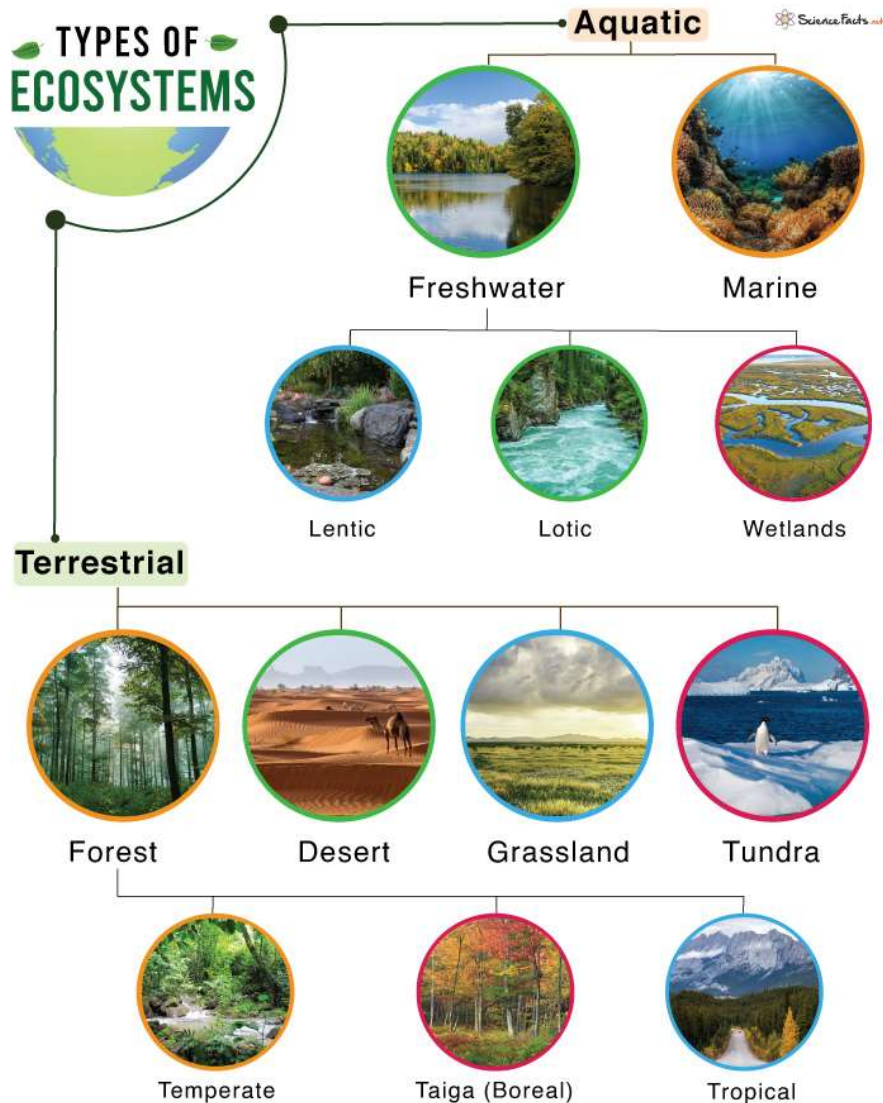


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Key Components of Ecosystems:

Abiotic Factors: The non-living physical and chemical components that influence living organisms in the ecosystem, such as:

- Climate (temperature, precipitation)
- Soil type and water availability
- Sunlight
- Nutrients and gases (like oxygen and carbon dioxide)



Types of Ecosystems:

- **Terrestrial Ecosystems:** Found on land. Examples include forests, grasslands, deserts, and tundra.
- **Aquatic Ecosystems:** Found in water. These include freshwater ecosystems (rivers, lakes) and marine ecosystems (oceans, coral reefs).
- **Artificial Ecosystems:** Human-made environments such as urban areas, farms, or gardens.



Ecosystem Functions

1 Productivity

3 Energy Flow

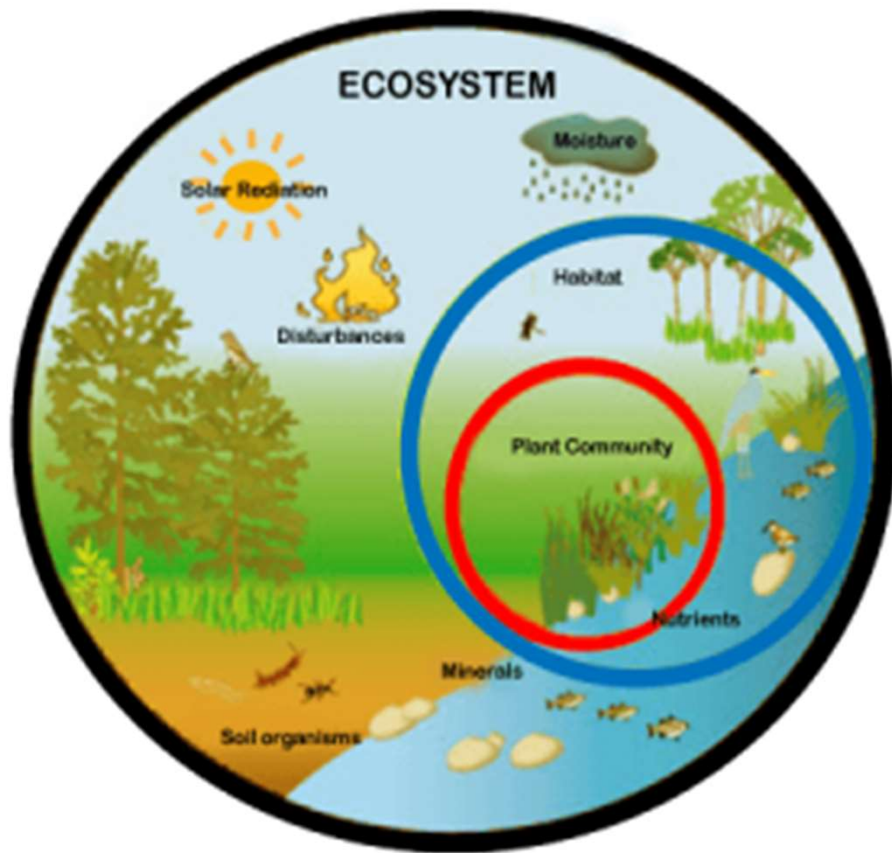
2 Decomposition

4 Nutrient Cycling

Ecosystem Functions:

- Energy Flow: Energy enters an ecosystem through sunlight, is captured by plants, and moves through the food chain or food web as organisms consume each other.
- Nutrient Cycling: Ecosystems recycle nutrients such as carbon, nitrogen, and water to sustain life. For example, plants take up nutrients from the soil, herbivores eat the plants, and decomposers break down dead organisms, returning nutrients to the soil.
- Supporting Services: Ecosystems provide essential services such as air purification, water filtration, and pollination of crops.





Importance of Ecosystems:

- **Biodiversity:** Ecosystems support a wide variety of species, which are critical for maintaining ecological balance.
- **Human Well-being:** Ecosystems provide resources such as food, medicine, raw materials, and aesthetic value.
- **Climate Regulation:** Ecosystems like forests and oceans play a key role in controlling climate patterns and mitigating climate change.

Understanding and protecting ecosystems is crucial for maintaining the planet's health and ensuring the sustainability of life on Earth.





2) BIODIVERSITY

BIODIVERSITY



- Biodiversity is the name given to the variety of ecosystems (natural capital), species and genes that exist in the world or in a given habitat.
- Essential to human well-being, as the services it provides are the mainstay of our economies and societies.
- Biodiversity is also crucial from the point of view of ecosystem services – the services provided by nature – such as pollination, climate regulation, flood protection, soil fertilisation and the production of food, fuels, fibres and medicines.

BIODIVERSITY



Biodiversity refers to the variety and variability of life on Earth, encompassing all living organisms, ecosystems, and ecological processes. It is often described in three main levels:

1. **Genetic Diversity:** The variation in genes within species, which allows for adaptability and resilience to environmental changes. This includes the genetic differences between individuals of a species, as well as differences between populations.
2. **Species Diversity:** The variety of species in a given area or ecosystem. It includes both the number of different species (species richness) and the relative abundance of each species (species evenness).
3. **Ecosystem Diversity:** The variety of ecosystems within a given region, such as forests, wetlands, deserts, oceans, and grasslands. Ecosystem diversity includes the different habitats and ecological processes that sustain life.

Importance of BIODIVERSITY



- **Ecological Balance:** Biodiversity plays a vital role in ecosystem health and stability. Diverse ecosystems are more resilient to disturbances like disease, climate change, and natural disasters.
- **Ecosystem Services:** Biodiversity provides many critical services for human life, including:
 - **Pollination:** Insects, birds, and other animals pollinate plants, which is essential for food production.
 - **Water Purification:** Wetlands, forests, and other ecosystems filter water and regulate water cycles.
 - **Climate Regulation:** Forests, oceans, and other ecosystems help regulate the Earth's climate by absorbing and storing CO₂.
 - **Soil Fertility:** Various organisms, including microbes, contribute to the process of soil formation and nutrient cycling.
- **Human Well-being:** Biodiversity directly impacts human life by providing food, medicine, raw materials, and cultural value. Many modern medicines are derived from plants, fungi, and other organisms, and biodiversity contributes to the aesthetic and recreational value of nature.

Threats to BIODIVERSITY



1. **Habitat Loss and Fragmentation:** Deforestation, urbanization, and agriculture reduce the space where species can live and thrive, leading to population declines and extinction.
2. **Climate Change:** Changing temperatures, rainfall patterns, and extreme weather events disrupt ecosystems and force species to adapt, migrate, or face extinction.
3. **Pollution:** Air, water, and soil pollution can harm species directly or alter their habitats. (Ex. chemicals can poison plants, animals, and microorganisms, and plastic pollution can kill marine life)
4. **Overexploitation:** Overfishing, hunting, and logging can deplete populations of species and disrupt ecosystems. Unsustainable agricultural practices can also degrade the land and reduce biodiversity.
5. **Invasive Species:** Non-native species can outcompete, prey on, or introduce diseases to native species, threatening local ecosystems and leading to the decline or extinction of native organisms.

Conservation to BIODIVERSITY



Efforts to conserve biodiversity are crucial to protect the planet's ecological health. These efforts include:

- **Protected Areas:** Establishing national parks, wildlife reserves, and marine protected areas to safeguard ecosystems and species.
- **Sustainable Practices:** Promoting sustainable farming, fishing, and forestry practices to minimize human impact on natural habitats.
- **Restoration Ecology:** Rehabilitating damaged ecosystems to restore biodiversity and ecological functions.
- **Legislation and Policy:** Implementing laws and agreements like the Convention on Biological Diversity (CBD) to regulate and protect species and ecosystems.



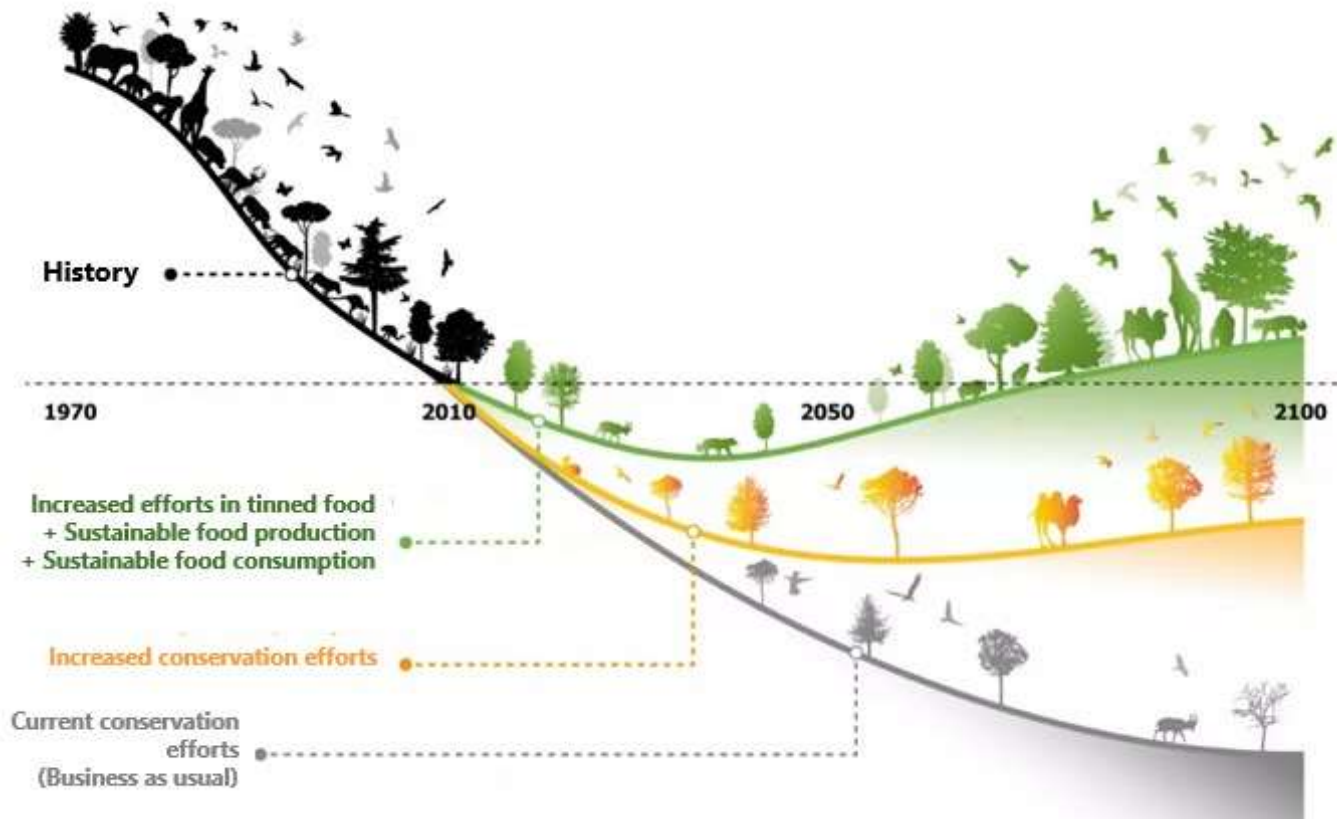
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Preserving biodiversity is critical for maintaining the health of ecosystems, supporting human life, and ensuring the survival of species, including our own.



3) Human Impact to the Ecosystem and Biodiversity

BIODIVERSITY



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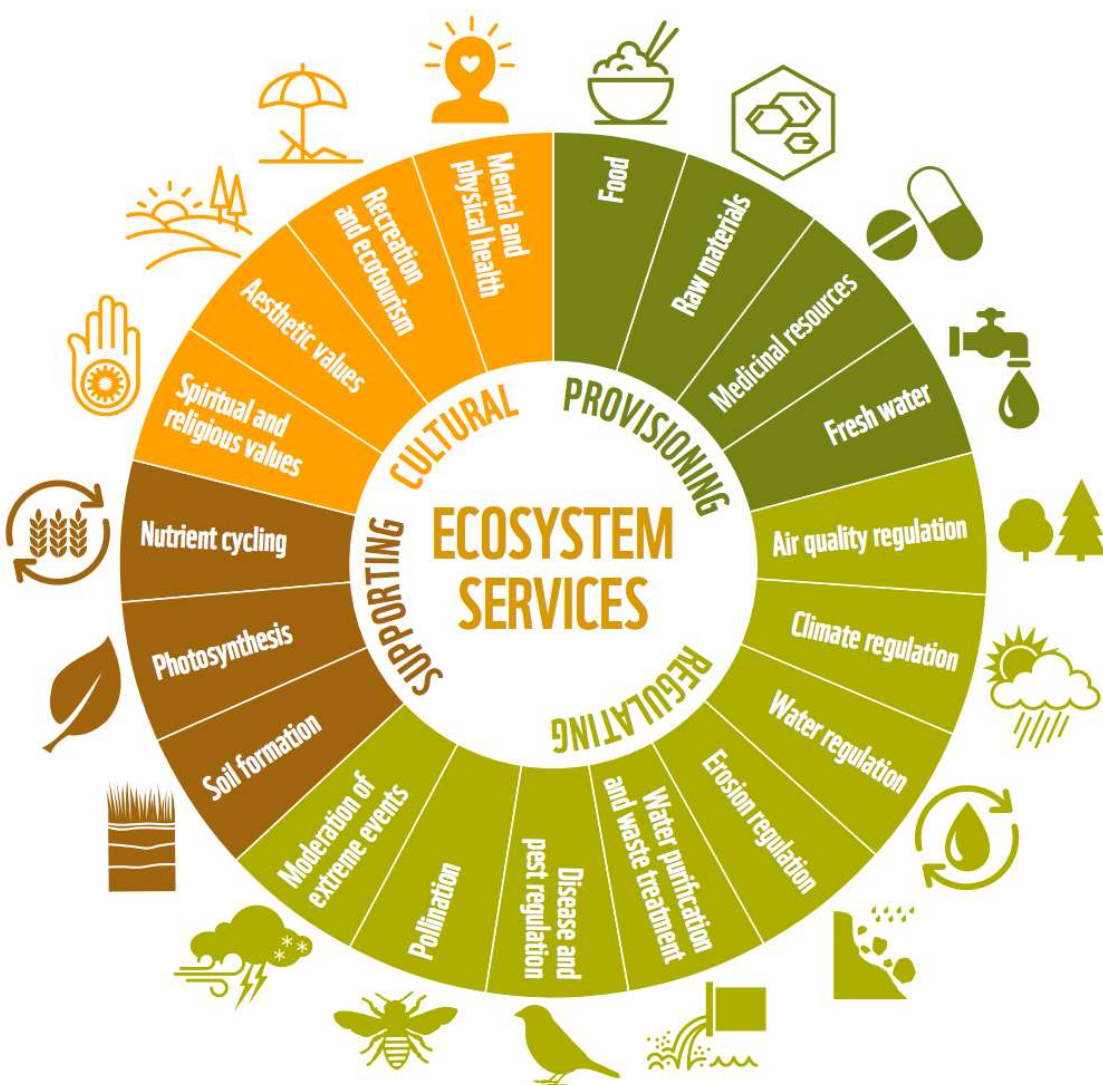
Current situation of biodiversity loss
on planet Earth.

- Need to increase effort in resource conservation.
- Goal of reversing biodiversity loss by 2050.
- It requires redoubled efforts and rapid intervention in environmental policies.



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Importance of Ecosystem Management and Protection



Biodiversity Loss by Continents (1970-2016)

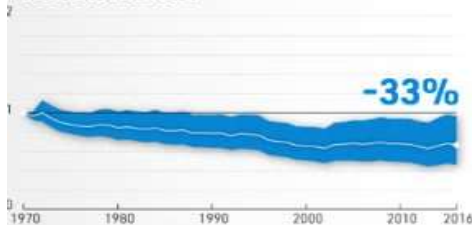


The Living Planet Index (LPI) tracks the abundance of mammals, birds, fish, reptiles, and amphibians across the globe.



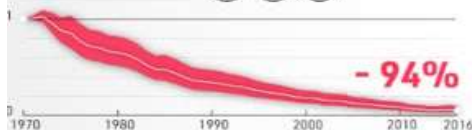
Between 1970 and 2016, vertebrate population sizes dropped by **68%** on average worldwide. However, this rate of this loss varies from region to region.

NORTH AMERICA



LATIN AMERICA & CARIBBEAN

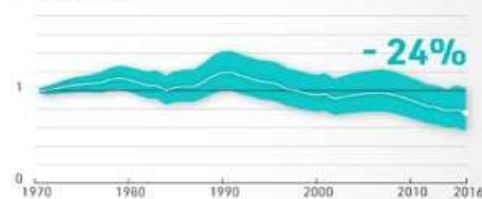
Latin America & Caribbean has seen the largest drop in biodiversity at **94%**, mainly driven by a significant decline in reptile, amphibian, and fish populations.



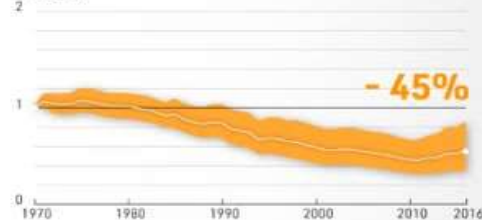
<https://livingplanet.panda.org/en-gb/>

EUROPE

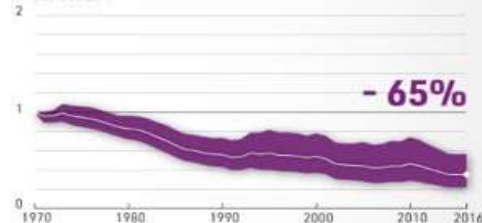
Index value (1970 = 1)



ASIA



AFRICA



Source: Living Planet Report 2020



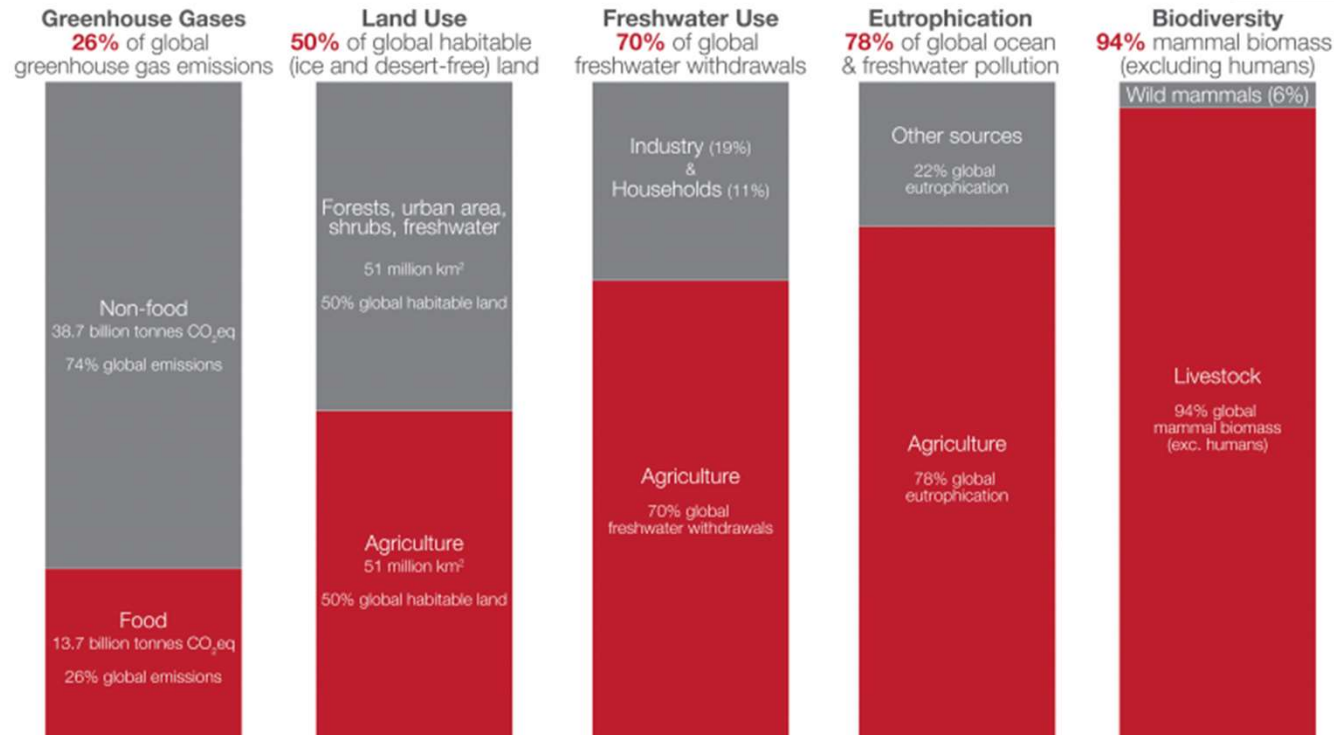
Evolution of the Percentage of animal biodiversity by continents between 1970-2016.

Environmental Impacts



What are the environmental impacts of food and agriculture?

Our World
in Data



Data sources: Poore & Nemecek (2018); UN FAO; UN AQUASTAT; Bar-On et al. (2018).
OurWorldinData.org – Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

Warning!!!!

Biodiversity is the most
affected environmental
area by the human
activity



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4) EU biodiversity strategies to 2030

Biodiversity loss: solution from EU?



In line with the **European Green Deal**, these strategies propose ambitious EU actions and commitments to halt biodiversity loss in Europe and globally. Therefore, these two strategies commit to:

- increase the protection of land and sea (Rede Natura 2000);
- recover degraded ecosystems;
- make the EU an international leader, both in terms of protecting biodiversity and building a sustainable food chain.

Biodiversity loss: solution from EU?



The new **Biodiversity Strategy** addresses the main drivers of biodiversity loss, such as unsustainable land and sea use, overexploitation of natural resources, pollution and invasive alien species.

The strategy proposes to set the following binding targets for 2030:

- restore degraded ecosystems, opting for sustainable management;
- improve the status of protected species and habitats in the EU (improve the conservation status of at least 30% of protected habitats and species);

Biodiversity loss: solution from EU?



- reverse the decline of birds and insects on farmland, particularly pollinators;
- eliminate catches of protected species or reduce them to a level that allows for the full recovery of species and does not threaten their conservation status;
- restore at least 25,000 km of rivers to flow freely;
- reduce pollution;
- our greener cities;
- strengthen organic farming and other biodiversity-friendly farming practices;

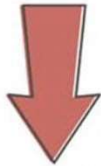
Biodiversity loss: solution from EU?



- reduce nutrient losses from fertilizers by at least 50%;
- Reduce the overall use of chemical pesticides and reduce the use of the most dangerous ones by 50%;
- improve the state of European forests by planting at least 3 billion trees, respecting ecological principles and protecting primary and old-growth forests.



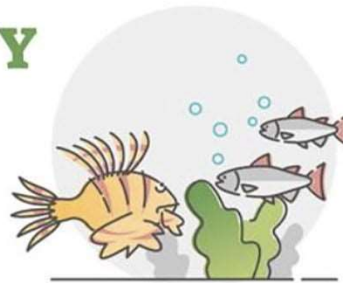
BIODIVERSITY LOSS



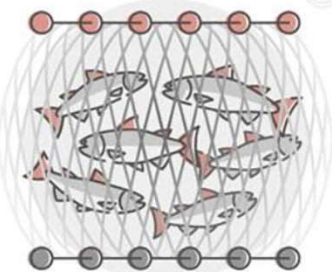
dreamstime.



HABITAT LOSS



INVASIVE SPECIES



OVEREXPLOITATION

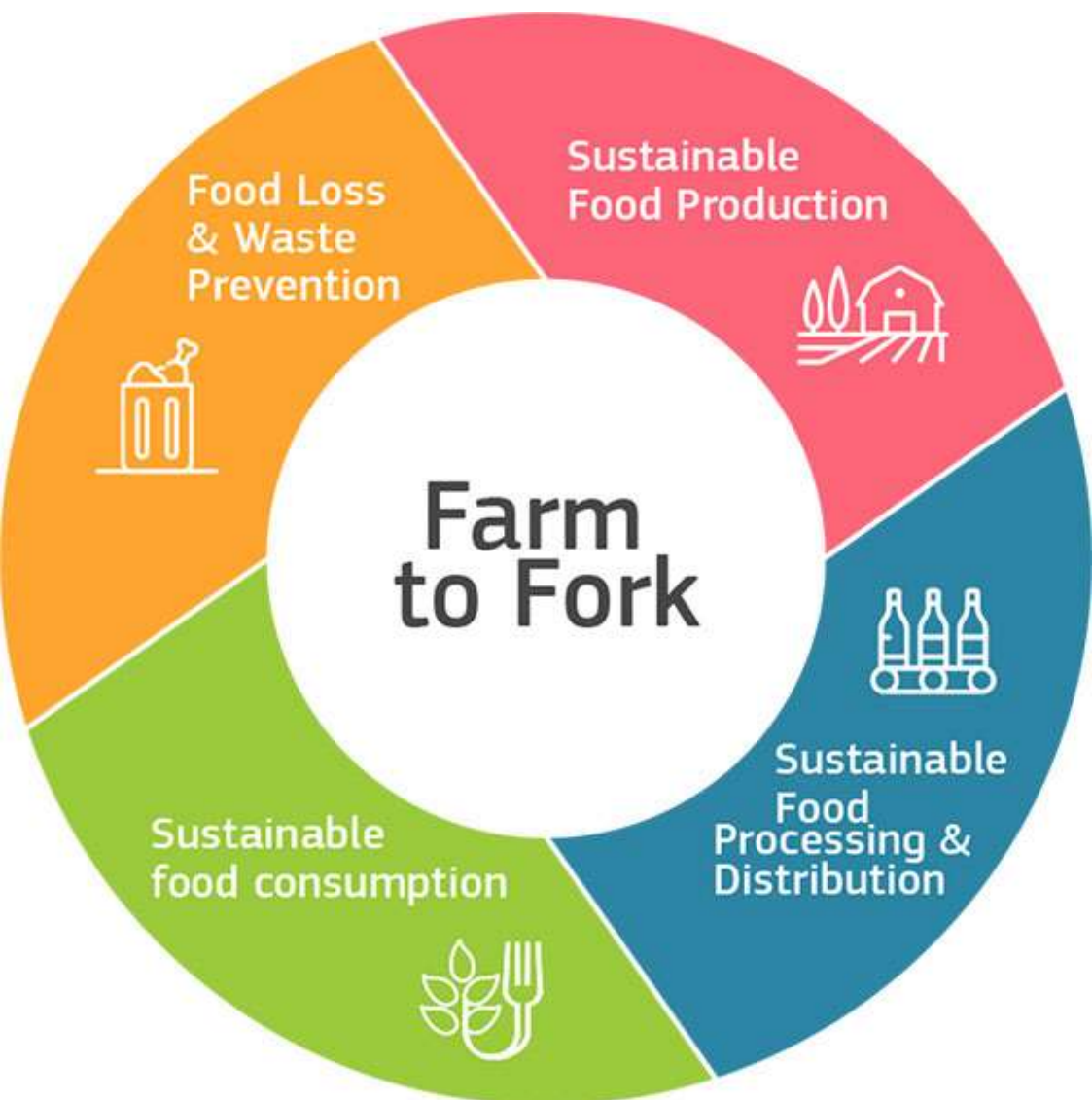


CLIMATE CHANGE ASSOCIATED
FROM GLOBAL WARMING



POLLUTION

Plant and animal species are disappearing at an ever faster rate due to human activity. What are the causes and why does biodiversity matter?



Farm to Fork Strategy

The Farm to Fork Strategy will enable the transition to a sustainable food system in the EU, safeguarding food security and ensuring access to healthy food. It will reduce the environmental and climate footprint of the EU food system and strengthen its resilience, protecting citizens' health.



5) Student Activity

Student Activity



BIODIVERSITY AND HUMAN IMPACT RESEARCH PROJECT

- **Objective:** Students will research the effects of human activities on biodiversity and ecosystems.
- **Materials:** Computers/tablets for research, presentation materials (PowerPoint, posters, etc.).
- **Instructions:**
 - Have students choose an issue related to human impact on ecosystems (e.g., climate change, deforestation, pollution, habitat destruction).
 - They will research the issue and its effects on biodiversity, using online resources or library books.
 - Students then create a presentation, summarizing their findings, and propose solutions to mitigate the negative effects.
 - Present the findings to the class and engage in a discussion about how human actions can help or harm biodiversity.

Student Activity



ECOSYSTEM DIORAMA CREATION

- **Objective:** Students will learn about different ecosystems and the organisms that inhabit them.
- **Materials:** Shoe boxes, craft supplies (colored paper, glue, scissors, markers), pictures of plants and animals, small figurines, clay, natural materials (like twigs or leaves).
- **Instructions:**
 - Each student (or group) chooses an ecosystem (forest, desert, ocean, etc.).
 - Create a 3D diorama puzzle to represent your chosen ecosystems.
 - Label the different components: plants, animals, climate, and special features.
 - Present the diorama to the class and explain how the organisms in the ecosystem depend on each other to maintain balance.



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- <https://livingplanet.panda.org/en-GB/>
 - <https://www.europarl.europa.eu/topics/en/article/20200109STO69929/biodiversity-loss-what-is-causing-it-and-why-is-it-a-concern>
 - https://commission.europa.eu/document/020f7141-d73d-4191-853e-c5918a52f9f3_en
 - <https://noctula.pt/estrategia-da-ue-para-biodiversidade-2030/>

Student activity:

- <https://www.youtube.com/watch?v=1ykkGiJ15IM>



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- <https://marsemfim.com.br/declinio-da-biodiversidade-um-perigo-que-nos-ronda/>
 - <https://livingplanet.panda.org/en-GB/>

Quiz



<https://forms.gle/TDLAwo6TWqnhbvKw5>

