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Think **Green** for the World



MODULE 3: ECOLOGY AND ECOSYSTEM

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PART ONE- INTRODUCTION TO THE TOPIC

We aim to provide you with a clear overview of what to expect in the upcoming sections of this module. We will touch upon the significance of studying ecology and ecosystems, emphasizing the role they play in shaping our natural world. As we progress, you'll gain insights into the interdependence of life forms, the delicate balance maintained in ecosystems, and the impact of human activities on these intricate systems.

Ecology is the science that studies the relationships between living organisms, as well as between organisms and their environment. It aims to understand how individuals, species, communities, and ecosystems interact, and the patterns and processes of these interactions in the natural world.

Ecosystem models are tools used to understand the complex relationships and processes within natural systems. By simulating the structure, functioning, and dynamics of an ecosystem, these models help predict how it may respond under various scenarios. They enable the evaluation of future changes in ecosystems, the impacts of human activities, and the consequences of different management strategies.

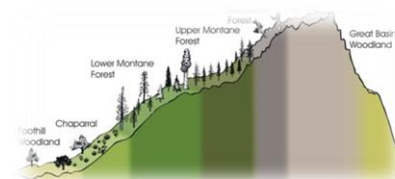
Specific ecosystem models are tools that focus on the characteristics and dynamics of a particular ecosystem, modeling the interactions among organisms, resources, and processes within that ecosystem in detail. These models are often developed for specific purposes, such as managing the habitat of a particular species or understanding the biological diversity within a specific ecosystem.

Specific ecosystem models;

1. **Savannas:** Savanna ecosystem models are used to understand the dynamics of savanna ecosystems by simulating interactions such as vegetation cover, rainfall, and soil type.

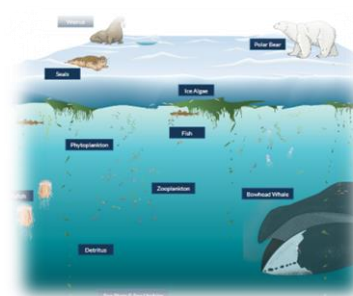


2. **Mountain Ecosystems:** Models of mountain ecosystems focus on simulating the structure and functioning of ecosystems in high-altitude regions, considering factors such as climate, vegetation, and topography.



3. **Polar Ecosystems:** Polar ecosystem models simulate the unique conditions of polar regions, including freezing and thawing events, ice thickness, and interactions among organisms on both land and sea.

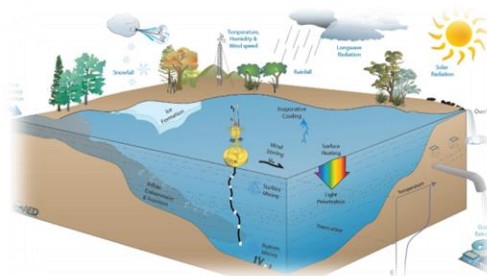
4. **Open Ocean Ecosystems:** Models of open ocean ecosystems examine the distribution of plankton, fish, and other marine organisms, as well as factors such as feeding relationships and ocean currents.



5. **Deep Sea Ecosystems:** Models of deep sea ecosystems investigate the living conditions, feeding relationships, and biological diversity of organisms inhabiting deep ocean floors.

6. **Coastal Ecosystems:** Coastal ecosystem models analyze the structures and functions of coastal ecosystems, taking into account variables such as tides, wave action, salinity, and temperature fluctuations.

- Lake Models:** Lake ecosystem models focus on simulating the circulation of freshwater ecosystems, nutrient balances, interactions among aquatic plant and animal species, and other factors.



8. **Marine Ecosystems Models:** Marine ecosystem models examine dynamics such as seawater temperature, salinity, acidity, fish populations, plankton distribution, and the health of coral reefs.



9. **Grassland Ecosystems:** Grassland ecosystem models investigate factors such as grass species, grazing pressure, and soil quality to understand the structures and functions of grassland ecosystems.

10. **Agricultural and Aquaculture Systems:** These models study ecosystems shaped by human intervention, such as agriculture and aquaculture, aiming to increase productivity and minimize environmental impacts.

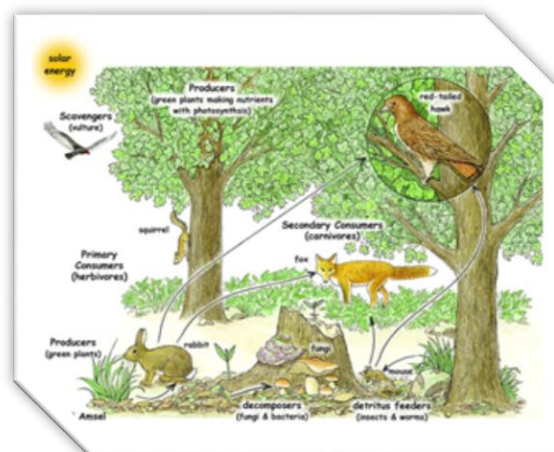
11. **Wastewater Treatment Systems:** Models of wastewater treatment systems evaluate the effectiveness of tools and techniques used to reduce water pollution and minimize environmental impacts.

PART TWO- SPECIFICATION OF THE ELEMENTS TO LEARN UNDER THIS TOPIC INCLUDING LEARNING TASKS:

In this section, we will outline the key elements and learning tasks that constitute the core of our exploration into ecology and ecosystems. Each element is designed to provide a comprehensive understanding of the topic, fostering both theoretical knowledge and practical application. Let's delve into the specifics:

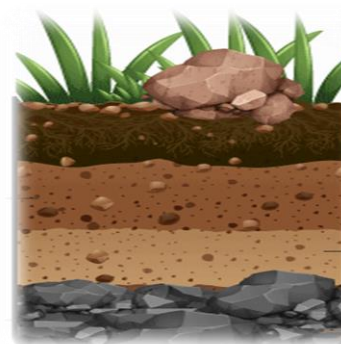
Element 1: Basics of Ecology

- **Learning Task 1:** Define and differentiate between key ecological concepts, such as ecosystems, biomes, and biodiversity.
- **Learning Task 2:** Explore the levels of ecological organization, from individual organisms to entire ecosystems.



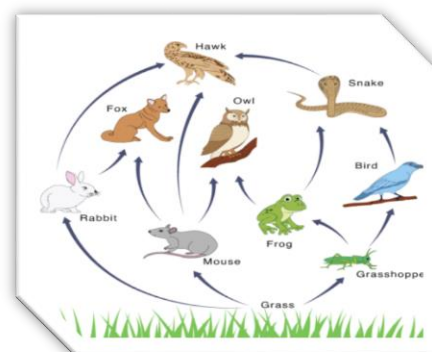
Element 2: Components of Ecosystems

- **Learning Task 1:** Identify and describe the abiotic components (non-living) of ecosystems, including soil, water, and climate.
- **Learning Task 2:** Examine the biotic components (living organisms) of ecosystems, classifying them into producers, consumers, and decomposers.



Element 3: Interactions in Ecosystems

- **Learning Task 1:** Analyze symbiotic relationships, such as mutualism, commensalism, and parasitism, among organisms within ecosystems.
- **Learning Task 2:** Investigate predator-prey interactions and their impact on population dynamics.



Element 4: Human Impact on Ecosystems



- **Learning Task 1:** Assess the various ways human activities influence ecosystems, including deforestation, pollution, and climate change.
- **Learning Task 2:** Explore sustainable practices and conservation efforts to mitigate the negative effects of human impact.



Element 5: Case Studies and Best Practices

- **Learning Task 1:** Examine successful ecological initiatives in our institution, city, country, and partner countries.
- **Learning Task 2:** Analyze case studies illustrating the positive outcomes of applying ecological principles in real-world scenarios.



Element 6: Importance of Ecosystems in Youth Education

- **Learning Task 1:** Reflect on the relevance of ecological knowledge in shaping the perspectives and actions of today's youth.
- **Learning Task 2:** Collaborate on projects that integrate ecological concepts into educational programs for youth.



These learning tasks are designed to promote a holistic understanding of ecology and ecosystems, combining theoretical knowledge with practical applications. As we progress through the module, you will not only acquire foundational knowledge but also develop the skills to contribute to the sustainability and well-being of our planet.

PART THREE- BEST PRACTICES WE HAVE IN OUR INSTITUTION, IN OUR CITY OR COUNTRY EVEN IN THE PARTNERS' COUNTRIES

In this section, we will explore the best practices related to ecology and ecosystems implemented in our institution, city, country, and among our partners in **Portugal, Germany, Romania, and Turkey.**

Partner Country: Portugal

Azores Islands: The Azores Islands are a member of the Renewable Energy Union and reported in 2018 that 86% of the electricity production on the islands was derived from renewable sources. This demonstrates significant progress in the transition to sustainable energy on the islands.



Lisbon: Lisbon was selected as the European Green Capital in 2020. This underscores the city's commitment to combating climate change and building a sustainable future. Lisbon has implemented various policies and programs to promote public transportation, increase energy efficiency, and develop renewable energy sources.



Green Energy Center Portugal: The Green Energy Center Portugal is an organization that provides research, education, and consultancy services in the fields of renewable energy and energy efficiency. The center's efforts play a crucial role in helping Portugal achieve its goals in combating climate change and ensuring energy security.

Partner Country: Germany

Solar Energy: Germany is the global leader in solar energy production. In 2022, more than 50% of the electricity generated in Germany was derived from solar energy. This signifies significant progress in Germany's transition to renewable energy.

German Environment Agency (Umweltbundesamt): The German Environment Agency is an organization that provides research and consultancy services to support national policies in environmental protection and sustainable development. The agency's efforts play a crucial role in helping Germany achieve its goals in environmental conservation and combating climate change.



German Nature Conservation Act (Bundesnaturschutzgesetz): Germany's Nature Conservation Act provides a fundamental framework for preserving the country's natural resources and managing them sustainably. The law encompasses various objectives, including the conservation of endemic species, protection of natural habitats, and the sustainable use of natural resources.

Partner Country: Romania

The National Institute of Research and Development for Forestry (Institutul Național de Cercetare-Dezvoltare pentru Silvicultură) in Romania is an organization that provides research, education, and consultancy services in the fields of forestry and biological diversity. The institute's work plays a significant role in preserving and sustainably managing Romania's forests.

Romania's Biodiversity Law (Legea nr. 131/2010 privind protecția mediului) provides a fundamental framework for conserving and sustainably managing the country's biodiversity. The law encompasses various objectives, including the conservation of endemic species, protection of natural habitats, and the sustainable use of natural resources.



Partner Country: Turkey

Turkey is also focusing on combating climate change. The country aims to achieve net-zero emissions by the year 2053. This involves developing renewable energy sources, increasing energy efficiency, and reducing carbon emissions.

Waste Management: Turkey has taken significant steps in waste management as well. The country has implemented various policies and regulations concerning the recycling and recovery of waste. As a result, the amount of waste in Turkey has been substantially reduced.

PART FOUR- LINKS TO VIDEOS AND FURTHER READING SOURCES FOR THE CONTENT OF MODULE

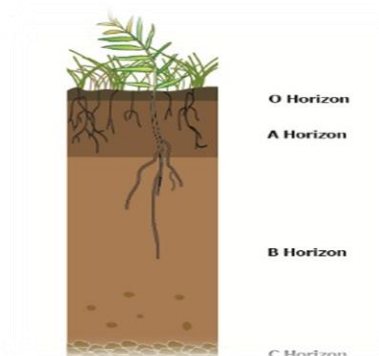
Aspect 1: Fundamentals of Ecology

- Video: "Crash Course Ecology: Introduction to Ecology" by Crash
Course: <https://m.youtube.com/watch?v=izRvPaAWgyw>
- "Ecology: Concepts and Applications" by Manuel C. Molles (2023)



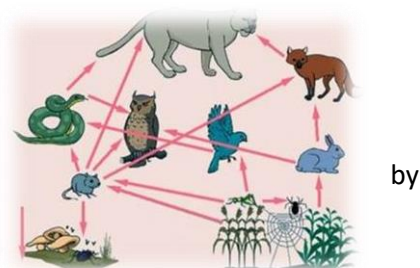
Aspect 2: Components of Ecosystems

- Video: "The Amazing World of Soil" by TED-Ed: <https://m.youtube.com/watch?v=OILITHMVcRw>
- "Fundamentals of Ecology" by Eugene P. Odum ve Gary W. Barrett (2005)



Aspect 3: Interactions in Ecosystems

- Video: "Food Webs: Crash Course Biology" by Crash Course: <https://m.youtube.com/watch?v=Vtb3l8VzIfg>
- "Symbiosis: An Introduction to Biological Associations" Douglas H. Boucher (1985)



Aspect 4: Human Impact

- Video: "A Short History of Nearly Everything: Humans and the Environment" by BBC
Earth: <https://m.youtube.com/watch?v=N-WZeaTd4Vg>





- "Human Impacts on Ecosystems: A Global Perspective" edited by John I. Campbell ve Michael D. Smith (2015)

Aspect 5: Case Studies and Best Practices

- Video: "The Story of Plastic" by National Geographic: <https://www.youtube.com/watch?v=iO3SA4YyEYU>



- "Ecological Restoration: Principles, Values, and Practice" edited by Stephen D. Hobbs ve Eric S. Higgs (2009)

Aspect 6: The Importance of Ecosystems in Youth Education

- Video: "Why We Need Nature: Oliver Sacks and the Power of Place" by The Guardian: <https://www.youtube.com/watch?v=O0veMIju1AA>



- "Children and Nature: Psychological, Social, and Evolutionary Investigations" edited by Stephen Kellert ve Peter Kahn (2015)

PART FIVE- THE IMPORTANCE OF THE MODULE IN YOUTH EDUCATION

The Importance of the Module in Youth Education: Ecology and Ecosystems

Young individuals possess the power to shape the future of our planet. Having knowledge about ecology and ecosystems, developing environmental consciousness, adopting sustainable lifestyles, and making decisions that protect our planet are crucial for them. Therefore, the utilization of the Ecology and Ecosystems module in youth education is of paramount importance for the following reasons:



1. Awareness and Knowledge:

- The module teaches young learners how ecosystems function, the relationships between living organisms, the impact of human activities on the environment, and sustainability issues. This knowledge helps them become aware of their responsibility to protect the environment and aids them in making critical decisions for the future of our planet.

2. Critical Thinking:

- The module encourages young people to develop critical thinking skills. Students learn to evaluate different perspectives, analyze evidence, and generate solutions for complex environmental issues. These skills enable youth to make informed decisions on environmental matters.

3. Action and Participation:

- The module motivates young individuals to take action and create solutions for environmental issues. Students can design and implement environmental awareness campaigns, implement sustainable practices, and advocate for environmental changes in their communities. These actions boost their confidence and strengthen their commitment to protecting our planet.

4. Educating Future Leaders:

- The Ecology and Ecosystems module contributes to nurturing capable leaders seeking solutions to environmental challenges in the future. Informed, sensitive, and proactive youth will play a critical role in building a sustainable future.

5. Collaboration and Problem-Solving:

- The module provides opportunities for students to enhance their teamwork and collaboration skills. Solving complex environmental problems requires collaboration among experts from different disciplines and volunteers. By teaching the importance of working together, sharing ideas, and problem-solving, the module equips young individuals with the necessary skills.

Implementing the Ecology and Ecosystems Module in youth education serves as a powerful tool to increase environmental awareness, contribute to the adoption of sustainable lifestyles, and inspire action for the future of our planet. This module's application will better equip the next generation to address environmental challenges and fulfill the vision of building a sustainable world.

PART SIX- IMPLEMENTATION ACTIVITIES FOR THE CONTENT OF MODULE

The implementation of the Ecology and Ecosystem module should include interactive activities aimed at increasing understanding, promoting practical application and instilling a sense of environmental responsibility.





1. Field Trips and Nature Explorations:

Organize trips to local ecosystems, parks, or nature reserves. Provide students with the opportunity to observe and document biodiversity, ecosystems, and environmental conditions. This hands-on experience reinforces theoretical knowledge and establishes a connection with nature.

2. Project-Based Learning:

Assign projects that require students to design solutions for local environmental challenges. This could include creating a community garden, initiating a recycling program, or developing an educational campaign about local biodiversity.

3. Guest Speakers and Expert Presentations:

Invite guest speakers such as ecologists, environmentalists, or scientists to share their experiences and insights. This exposure to real-world perspectives enhances students' understanding of the practical applications of ecology.

4. Simulation Games:

Introduce games that simulate ecosystems. This interactive approach allows students to experience the complexities of ecosystem dynamics, the impact of human activities, and the importance of balance.

5. Ecological Initiatives:

Encourage students to implement ecological initiatives within the school, such as waste reduction campaigns, energy-saving measures, or the creation of green spaces. This not only reinforces ecological principles but also promotes a sustainable school environment.

6. Community Engagement Projects:

Collaborate with local communities to undertake projects that address environmental concerns. This could involve organizing clean-up events, tree-planting campaigns, or collaborating with local authorities on sustainable development initiatives.

7. Documentary and Discussion Sessions:

Screen documentaries or video content related to ecology and ecosystems. Follow these viewings with discussion sessions to encourage critical thinking and reflections on the presented information.

8. Interactive Workshops:

Conduct workshops on topics like composting, sustainable gardening, or wildlife conservation. Hands-on activities provide practical skills and contribute to a deeper understanding of ecological concepts.

9. Environmental Impact Assessments:

Assign students to conduct environmental impact assessments for specific human activities or development projects. This exercise helps them analyze the potential consequences and propose sustainable alternatives.

10. Educational Outreach Programs:





Organize educational outreach programs where students share their knowledge with peers, younger students, or the community. This reinforces their understanding and promotes the dissemination of environmental awareness.

PART SEVEN- YOU CAN INCLUDE A SELF-CHECK FOR THE LEARNER AT THE END, A CHECKLIST ABOUT COMPETENCES THEY HAVE GOT FROM THE MODULE.

Self-Check for Learners - Competence Checklist

After completing the Ecology and Ecosystems module, use the following checklist to self-assess the competences and knowledge gained:

1. Understanding of Ecosystem Dynamics:
 - Can I explain how different components of an ecosystem interact with each other?
 - Do I understand the concept of biodiversity and its importance in ecosystems?
2. Awareness of Human Impact:
 - Am I aware of the various ways human activities can impact the environment?
 - Can I identify sustainable practices to mitigate human impact on ecosystems?
3. Application of Ecological Concepts:
 - Can I apply ecological concepts to real-world scenarios?
 - Have I participated in projects or activities that demonstrate the practical application of ecological knowledge?
4. Critical Thinking and Problem-Solving:
 - Have I developed critical thinking skills when analyzing environmental issues?
 - Can I propose solutions to local environmental challenges based on ecological principles?
5. Collaboration and Communication:
 - Have I collaborated with peers on projects related to ecology and ecosystems?
 - Can I effectively communicate ecological concepts to others?
6. Hands-On Skills:
 - Have I acquired practical skills, such as composting or sustainable gardening?
 - Can I implement eco-friendly initiatives in my school or community?





7. Environmental Stewardship:

- Am I committed to adopting sustainable lifestyle practices?
- Have I taken action to promote environmental stewardship in my community?

8. Reflection and Continuous Learning:

- Have I reflected on the impact of my actions on the environment?
- Am I motivated to continue learning about ecological topics beyond the module?

9. Community Engagement:

- Have I actively engaged with the local community on environmental projects?
- Can I advocate for sustainable practices within my community?

10. Overall Competence:

- Do I feel confident in my understanding of ecology and ecosystems?
- Have I developed competencies that contribute to a more sustainable and environmentally conscious lifestyle?

By checking off the relevant items, learners can self-assess their progress and identify areas where they have successfully developed competences through the Ecology and Ecosystems module. This checklist serves as a tool for reflection and encourages a continuous commitment to environmental awareness and stewardship.

PART EIGHT- CONCLUSION

The Ecology and Ecosystems module serves as a comprehensive educational tool, equipping learners with a profound understanding of the intricate relationships within our environment. Throughout this module, participants delve into the dynamics of ecosystems, human impact on nature, and sustainable practices, fostering a sense of responsibility for the planet.

In conclusion, the module not only imparts theoretical knowledge but also emphasizes the practical application of ecological concepts. Learners are encouraged to think critically, collaborate effectively, and take meaningful actions in their communities. By exploring best practices in various countries, including Portugal, Germany, Romania, and Turkey, students gain a global perspective on environmental conservation.

The inclusion of field trips, project-based learning, and interactive workshops ensures an engaging and immersive learning experience. Exposure to expert insights, simulation games, and community engagement projects further enriches the educational journey, making it both informative and enjoyable.

As we empower the youth with knowledge and skills related to ecology, we pave the way for future leaders committed to environmental sustainability. The module's significance in youth education lies





in its ability to instill a deep sense of environmental stewardship, critical thinking, and a passion for creating a sustainable future.

In implementing the activities outlined in the module, educators and institutions contribute to the development of environmentally conscious citizens who are well-equipped to address the challenges of our ever-changing world. Through this module, we not only educate but inspire the next generation to be active contributors to a healthier and more sustainable planet.

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