SDS 4HEI

HIGHER EDUCATION MISSION FOR SUSTAINABILITY

Module 4

Environment
(Goals 6, 7, 13, 14, 15)

Imprint

Citation

Acknowledgement

Legal notice

Copyright

Table of Contents

Figures

Glossary of Terms

Term	Explanation
Biodiversity Offsetting	Conservation practice to compensate for biodiversity losses from development by protecting or restoring other habitats, aiming for "no net loss" or "net gain" of biodiversity
Blue Economy	Sustainable use of ocean resources for economic growth, improved livelihoods, and ocean ecosystem health, balancing development with marine conservation
Carbon Neutrality	Achieving a balance between emitting carbon and absorbing carbon from the atmosphere in carbon sinks, contributing to the reduction of greenhouse gas emissions
Circular Economy	An economic model focused on reducing waste and making the most of resources through recycling, reusing, and refurbishing products, instead of the traditional linear "take-make-dispose" model
Climate Resilience	The ability of communities, ecosystems, and economies to anticipate, prepare for, and respond to climate-related risks, such as extreme weather events and climate change impacts
Ecosystem Services	The benefits humans derive from ecosystems, including clean water, air, food, climate regulation, and pollination
Nature-Based Solutions	Approaches that use natural systems to address societal challenges, such as reforestation or wetland restoration, enhancing resilience to climate impacts while protecting biodiversity
Net-Zero	The state of having no net release of greenhouse gas emissions into the atmosphere by balancing emissions produced and removed

1 The Environmental SDGs

WHAT TO EXPECT?

You will learn how SDGs 6, 7, 13, 14, and 15 are key environmental goals that focus on ensuring the sustainable management of water resources, providing clean energy for all, combating climate change, conserving marine ecosystems, and protecting terrestrial biodiversity.

The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development, outline a global blueprint for addressing critical social, economic, and environmental challenges. Among these, SDGs 6, 7, 13, 14, and 15 are key environmental goals that focus on ensuring the sustainable management of water resources, providing clean energy for all, combating climate change, conserving marine ecosystems, and protecting terrestrial biodiversity. This section examines these environmental SDGs, the main drivers behind them, relevant actions, linkages to other SDGs, and the relevant regulations and agreements that underpin their achievement.

1.1 SDG 6, "Clean Water and Sanitation,"

Aims to ensure the availability and sustainable management of water and sanitation for all. Water is fundamental to life, and access to clean and safe water is essential for human health, ecosystems, and economic development. However, approximately 2.2 billion people globally lack access to safe drinking water, and 4.2 billion people do not have adequate sanitation services (UN-Water, 2020). The drivers behind SDG 6 include increasing water scarcity due to population growth, urbanisation, climate change, and the degradation of water sources from pollution, industrial waste, and agricultural runoff. These challenges are particularly acute in developing countries, where the lack of infrastructure and financial resources exacerbates the problem. (Arora & Mishra, 2022)

To achieve SDG 6, several actions are critical. First, substantial investments are needed to improve water infrastructure, particularly in rural and underserved areas, ensuring equitable access to clean water and sanitation services. This includes expanding water supply systems, improving wastewater treatment, and promoting efficient water use in agriculture, industry, and households. Water resource management also needs to be strengthened to protect freshwater ecosystems and prevent over-extraction, which can lead to the depletion of aquifers and surface water bodies. **Integrated Water Resources Management (IWRM)** is a key approach that promotes the coordinated development of water, land, and related resources to maximise social and economic benefits without compromising ecosystems (UN-Water, 2020).

SDG 6 is closely linked to other SDGs, particularly SDG 3, Good Health and Well-being, as access to clean water and sanitation is essential for preventing waterborne diseases and

improving public health. It also supports SDG 12, Responsible Consumption and Production, by encouraging the efficient use of water resources. Regulations and agreements such as the **European Union's Water Framework Directive and the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses** provide a legal basis for the protection and sustainable management of water resources. These frameworks promote cooperation among countries, particularly in managing transboundary water bodies, which is essential for achieving SDG 6 on a global scale.(European Parliament and Council of the European Union. (2000).

1.2   SDG 7, "Affordable and Clean Energy"

Sustainable Development Goal 7 (SDG 7) aims to ensure universal access to affordable, reliable, sustainable, and modern energy by 2030. Despite progress, approximately 675 million people worldwide still lack access to electricity, and 2.3 billion rely on harmful cooking fuels, leading to significant health and environmental issues (International Energy Agency [IEA], 2024). Achieving SDG 7 is crucial for improving quality of life, fostering economic development, and mitigating climate change impacts.

Key drivers for advancing SDG 7 include technological innovation, policy support, and economic incentives. Advancements in renewable energy technologies, such as more efficient solar panels and energy storage solutions, have reduced costs and increased accessibility (International Renewable Energy Agency [IRENA], 2024). Government policies and international agreements, like the **European Union's Renewable Energy Directive**, set ambitious targets for renewable energy adoption, providing a regulatory framework that encourages investment and development (European Commission, 2024). Economic incentives, including subsidies and tax benefits, further stimulate the transition to clean energy sources.

However, significant challenges remain. High initial costs for renewable energy infrastructure, especially in developing countries, and the ongoing reliance on fossil fuels pose substantial obstacles (IEA, 2024). Political resistance and vested interests from traditional energy sectors can also impede progress. To overcome these challenges, increased investment, technology transfer, and international cooperation are essential. Legal and regulatory frameworks, such as the **Paris Agreement**, play a pivotal role in setting binding commitments for carbon emission reductions and promoting renewable energy adoption (United Nations Framework Convention on Climate Change [UNFCCC], 2015).

Achieving SDG 7 is interconnected with multiple other environmental goals, SDG 13 (Climate Action) is the most obvious one, as transitioning to clean energy sources is vital for reducing greenhouse gas emissions and combating climate change. It is also fundamental for the preservation of land and ecosystems (SDG 15) which are greatly impacted by the extraction of fossil fuels. Further interconnections include but are not limited to SDG 1 (No Poverty) and SDG 3 (Good Health).

1.3 SDG 13, "Climate Action,"

Addresses the urgent need to combat climate change and its impacts. The scientific consensus, as outlined in reports by the Intergovernmental Panel on Climate Change (IPCC), confirms that human activities, particularly the burning of fossil fuels and deforestation, are the main drivers of global warming (IPCC, 2021). The key drivers of SDG 13 are the increasing frequency and intensity of extreme weather events, rising sea levels, and the loss of ecosystems and biodiversity. These impacts are disproportionately felt by vulnerable populations, including those in small island developing states and least developed countries, which lack the resources to adapt to climate change. (United Nations Framework Convention on Climate Change (UNFCCC). (2021).

To meet the targets of SDG 13, immediate and collective action is needed to reduce global greenhouse gas emissions. This includes transitioning from fossil fuels to renewable energy sources, such as solar, wind, and hydropower, improving energy efficiency, and adopting sustainable agricultural and land-use practices. The **Paris Agreement**, adopted in 2015, is the central international agreement supporting SDG 13, setting out legally binding commitments for countries to limit global warming to well below 2°C, with efforts to limit it to 1.5°C (UNFCCC, 2015). Additionally, adaptation measures are crucial for helping communities and ecosystems cope with the unavoidable impacts of climate change. This includes building climate-resilient infrastructure, protecting coastal zones, and promoting sustainable water and land management practices.

SDG 13 is closely linked to other SDGs. For example, climate change exacerbates water scarcity (SDG 6), threatens food security (SDG 2, Zero Hunger), and impacts health outcomes (SDG 3, Good Health and Well-being). Mitigating and adapting to climate change also supports SDG 7, Affordable and Clean Energy, by promoting the use of renewable energy sources. The Green Climate Fund, established under the UNFCCC, plays a critical role in mobilising finance for climate mitigation and adaptation, particularly in developing countries (UNFCCC, 2020). Together, these international agreements and financial mechanisms are essential for achieving the ambitious targets of SDG 13.

1.4 SDG 14, "Life Below Water,"

Focuses on conserving and sustainably using the oceans, seas, and marine resources. Oceans are vital for regulating the Earth's climate, supporting biodiversity, and providing food and livelihoods for millions of people. However, human activities such as overfishing, pollution, and habitat destruction are severely degrading marine ecosystems. One of the major drivers behind SDG 14 is overfishing, which has led to the depletion of fish stocks, threatening food security and economic stability in many coastal regions (FAO, 2020). Another driver is marine pollution, particularly from plastics, which has devastating effects on marine life and ecosystems.

To address these challenges, several actions are needed to achieve SDG 14:

- Sustainable fishing practices must be enforced to prevent overfishing and allow fish stocks to recover. This can be achieved through stricter regulations on fishing quotas, better monitoring of fishing activities, and the promotion of sustainable aquaculture.

- Marine pollution must be reduced, particularly through better waste management practices and policies to reduce plastic production and usage. International cooperation is essential to clean up existing pollution and prevent further degradation of marine environments.

- The protection and restoration of marine ecosystems, such as coral reefs and mangroves, is crucial for maintaining biodiversity and supporting coastal communities.

SDG 14 is interlinked with other SDGs, such as SDG 2, Zero Hunger, since many communities depend on fish as a primary source of protein. It is also closely tied to SDG 13, as oceans play a key role in regulating the Earth's climate by absorbing carbon dioxide. International agreements such as the **United Nations Convention on the Law of the Sea (UNCLOS)** and the **1995 Fish Stocks Agreement** provide a regulatory framework for the sustainable management of marine resources, while initiatives like the **Global Programme of Action for the Protection of the Marine Environment from Land-based Activities** (GPA) aim to reduce marine pollution (UN, 1995).

1.5 SDG 15, "Life on Land,"

Focuses on protecting, restoring, and promoting the sustainable use of terrestrial ecosystems, managing forests, combating desertification, and halting biodiversity loss. Forests and other terrestrial ecosystems are essential for maintaining biodiversity, regulating the climate, and providing ecosystem services such as water purification and carbon sequestration. However, deforestation, habitat destruction, and over-exploitation of natural resources are key drivers behind the degradation of terrestrial ecosystems. The main drivers of SDG 15 include agricultural expansion, illegal logging, mining, and urbanisation, all of which contribute to the loss of biodiversity and the degradation of ecosystems (IPBES, 2019).

Achieving SDG 15 requires urgent action to halt deforestation, restore degraded ecosystems, and promote sustainable land-use practices. Protecting forests and other ecosystems can also serve as a natural climate solution by sequestering carbon and mitigating climate change. Efforts must also be made to combat desertification, which threatens the livelihoods of millions of people in arid regions, and to curb the illegal wildlife trade, which endangers species and undermines local economies. The **Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora** (CITES) provide important frameworks for protecting terrestrial ecosystems and promoting sustainable land management (CBD, 1992).

SDG 15 is closely linked to other SDGs, particularly SDG 13, as ecosystem degradation contributes to climate change, and protecting ecosystems can help mitigate its impacts.

It also connects to SDG 1, No Poverty, as many rural communities rely on healthy ecosystems for their livelihoods. **The United Nations Convention to Combat Desertification (UNCCD)** and the **CBD's Aichi Biodiversity Targets** further support efforts to protect terrestrial ecosystems and halt biodiversity loss (UNCCD, 2018).

In conclusion, SDGs 6, 7, 13, 14, and 15 are crucial for addressing the environmental challenges of the 21st century. These goals focus on ensuring sustainable water management, combating climate change, conserving marine ecosystems, and protecting biodiversity on land. Achieving these SDGs requires coordinated global action, supported by international agreements such as the Paris Agreement, the United Nations Convention on the Law of the Sea, and the Convention on Biological Diversity. The interconnected nature of these goals highlights the need for an integrated approach to sustainable development, where progress in one area supports progress in others.
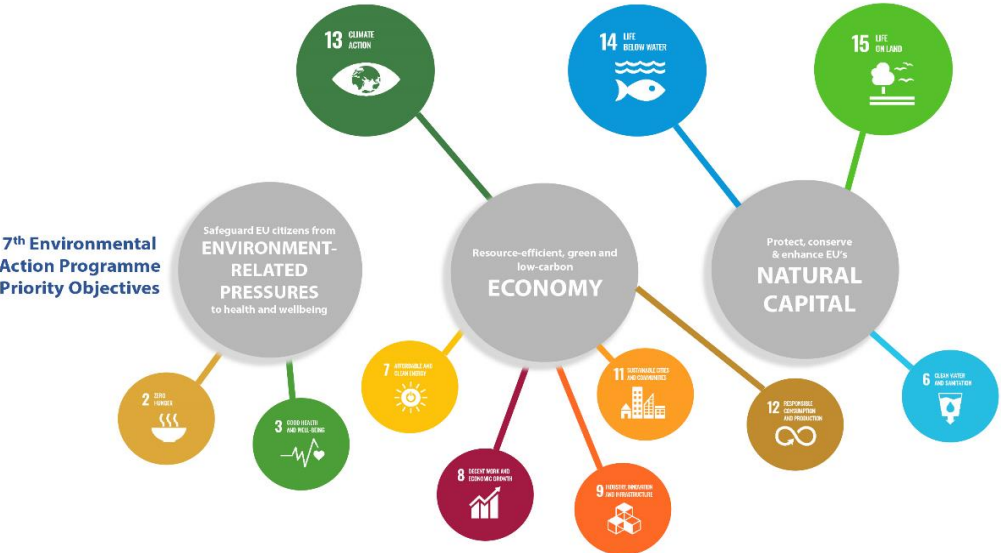
Figure 1: SDGs where progress towards environmental sustainability is sought (SOER 2020)

- SDG 6, Clean Water and Sanitation, emphasises the importance of access to safe water and sanitation for health, ecosystems, and economic growth, but faces challenges from water scarcity and pollution.
- Achieving SDG 7, Affordable and Clean Energy, is vital for quality of life and climate mitigation, yet barriers like high infrastructure costs persist, particularly in developing countries.
- SDG 13, Climate Action, requires urgent global cooperation to reduce greenhouse gas emissions and build resilience against climate impacts, with the Paris Agreement central to these efforts.
- SDG 14, Life Below Water, addresses marine conservation by promoting sustainable fishing, reducing pollution, and protecting marine habitats crucial for biodiversity and food security.
- SDG 15, Life on Land, targets terrestrial ecosystem preservation through actions like halting deforestation and regulating land use, which also support climate mitigation (SDG 13) and poverty reduction (SDG 1)

- How can I contribute to ensuring clean water and sanitation for all (SDG 6) in my community or field?
- What actions can I take to promote access to affordable and clean energy (SDG 7)?
- How might my work support climate action (SDG 13) and reduce environmental impacts?
- How can I help protect marine life (SDG 14) and terrestrial ecosystems (SDG 15)?
- Which sustainable development goals align most with my values and career aspirations?

Further Resources:

THE 17 Goals | Sustainable Development – the United Nations.
Available at https://sdgs.un.org/goals

2 Section 2. Current Trends and Terminology in Environmental SDGs

WHAT TO EXPECT?

You will learn how SDGs 6, 7, 13, 14, and 15 are key environmental goals that focus on ensuring the sustainable management of water resources, providing clean energy for all, combating climate change, conserving marine ecosystems, and protecting terrestrial biodiversity.

The Environmental Sustainable Development Goals (SDGs) are a critical part of the United Nations' 2030 Agenda for Sustainable Development, with specific goals such as SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land) directly addressing environmental issues. As global awareness of environmental challenges grows, new trends and terminologies emerge in sustainability discourse.

2.1 Net-Zero and Carbon Neutrality

One of the most prominent trends across environmental SDGs is the movement toward achieving "net-zero" emissions or "carbon neutrality." This refers to the balance between the amount of greenhouse gas emissions produced and the amount removed from the atmosphere. Many countries, cities, and corporations are setting net-zero targets for the mid-century, particularly in line with SDG 13, Climate Action. Countries committing to reduce their emissions to net-zero by 2050 aim to mitigate the impacts of global warming in accordance with the Paris Agreement. (United Nations Framework Convention on Climate Change [UNFCCC], 2015)
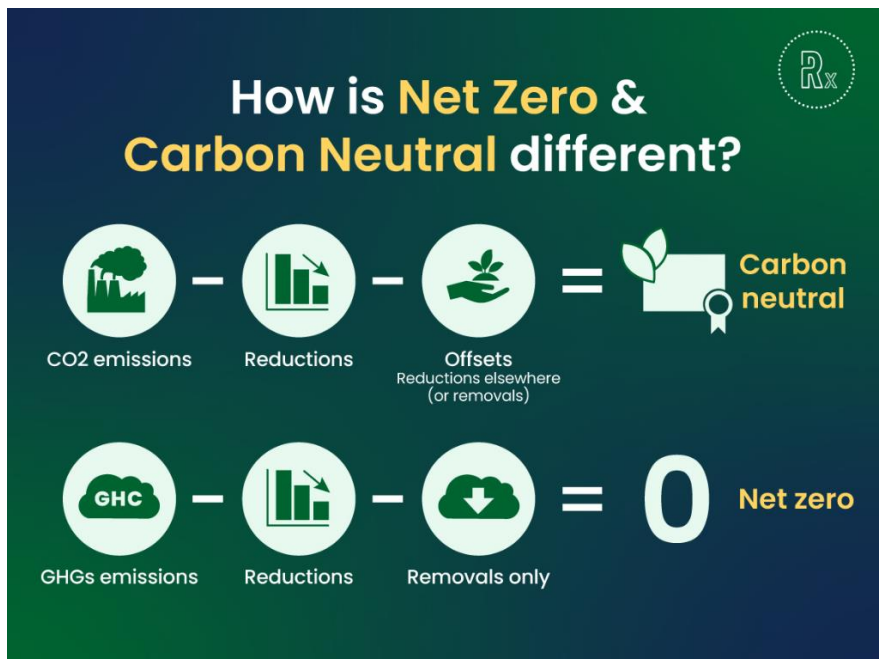
Figure 2: Difference between Net Zero & Carbon Neutral (https://regenx.ag/blog/carbon-neutral-vs-net-zero/)

2.2 Circular Economy

The concept of a circular economy has become central in discussions around SDG 12 (Responsible Consumption and Production), which also connects with SDG 14 and SDG 15. The circular economy promotes the idea of reducing waste and making the most of resources through recycling, reusing, and refurbishing products. This shift away from a linear "take-make-dispose" model is key to addressing environmental degradation, promoting sustainability, and supporting biodiversity.

Figure 3: Circular Economy (EU Parliament Research Service)

2.3   Nature-Based Solutions (NBS)

Nature-based solutions are another emerging trend, particularly linked to SDGs 13, 14, and 15. This approach involves using natural systems to solve societal challenges, such as climate change, water management, and disaster risk reduction. Examples include reforestation, wetland restoration, and green infrastructure projects like urban green spaces or sustainable agriculture. Nature-based solutions are gaining traction as a means to enhance resilience to climate impacts while protecting biodiversity.

Figure 4: The NATWiP nature–based solution Conceptual Framework (Lima et al. 2022).

2.4 Ecosystem Services

Ecosystem services refer to the benefits humans derive from natural ecosystems, including clean water, air, and food, as well as climate regulation and pollination. The concept is essential for understanding how ecosystems contribute to human well–being, making it a critical consideration in SDGs 14 and 15. The valuation of ecosystem services has become a focus of policy frameworks, encouraging their integration into decision–making processes, especially in economic planning and conservation strategies.
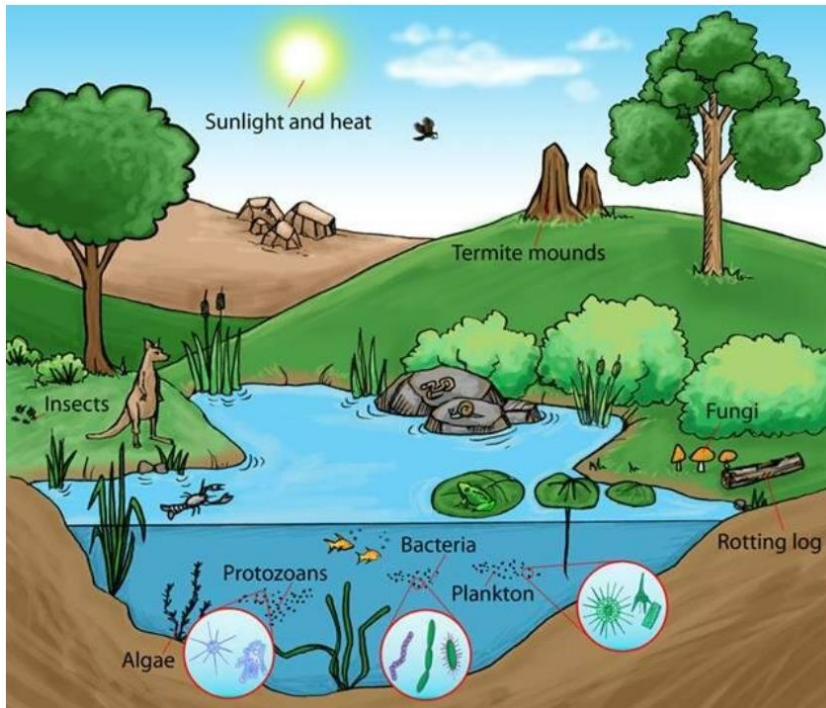
Figure 5: Drawing of ecosystem services (Yotova, 2018)

2.5   Climate Resilience

As the impacts of climate change intensify, the term "climate resilience" has gained importance in discussions of SDG 13. Climate resilience refers to the ability of communities, ecosystems, and economies to anticipate, prepare for, and respond to climate-related risks. This includes adaptation strategies, such as building flood defenses, shifting to climate-resilient crops, and designing infrastructure to withstand extreme weather events. Governments and organisations increasingly focus on building climate resilience as part of long-term sustainability efforts.

Figure 6: Building Climate Resilience https://www.snhpc.org/environmental-energy-planning/climate-resiliency)

2.6   Blue Economy

The "blue economy" is a term closely associated with SDG 14 (Life Below Water), emphasizing the sustainable use of ocean resources for economic growth, improved livelihoods, and ocean ecosystem health. It advocates for balancing economic development (e.g., fisheries, tourism, renewable energy) with conservation practices that protect marine biodiversity. As oceans face growing threats from overfishing, pollution, and climate change, the blue economy offers a framework for achieving sustainability in marine environments.

Figure 7: Blue Economy (https://energyindustryreview.com/analysis/why-blue-economy-is-so-important/)
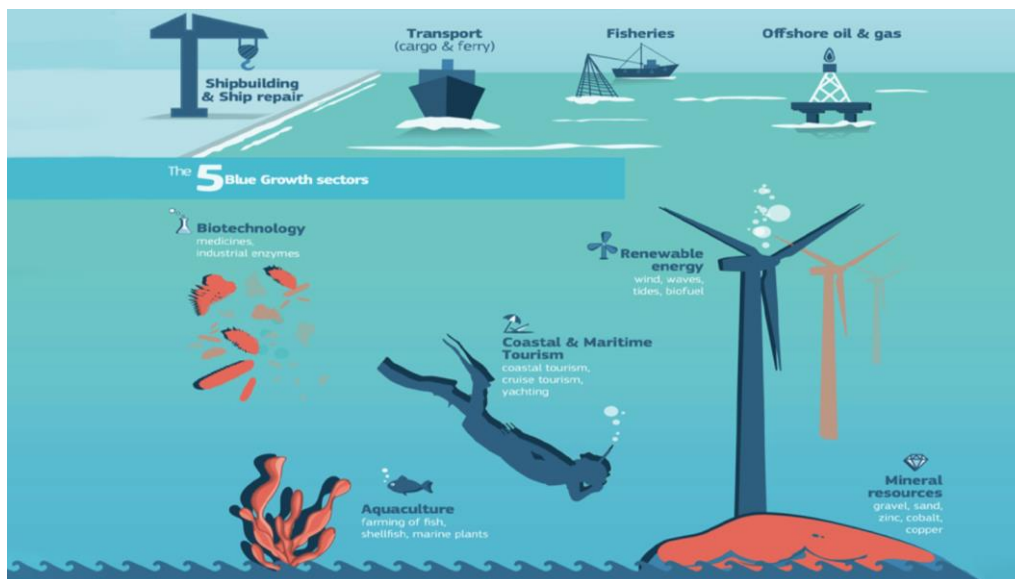
2.7   Biodiversity Offsetting

In the context of SDG 15 (Life on Land), biodiversity offsetting refers to a conservation practice where losses to biodiversity from development are compensated by the protection or restoration of other habitats. The goal is to achieve a "no net loss" or "net gain" of biodiversity. This practice is increasingly used in environmental policy and corporate sustainability strategies to balance development needs with conservation goals.

The current trends and terminology in Environmental SDGs reflect a growing emphasis on systemic changes, from how economies function to how natural resources are valued and protected. Net-zero emissions, circular economy models, and nature-based solutions are pivotal in driving progress toward a more sustainable future, ensuring that the goals outlined in the SDGs can be met by 2030. These concepts also show the interconnectedness of the SDGs, as efforts in one area, such as climate action, can significantly impact others, including biodiversity protection and water resource management.

TAKEAWAYS

- SDG 6, Clean Water and Sanitation, emphasises the importance of access to safe water and sanitation for health, ecosystems, and economic growth, but faces challenges from water scarcity and pollution.

- Achieving SDG 7, Affordable and Clean Energy, is vital for quality of life and climate mitigation, yet barriers like high infrastructure costs persist, particularly in developing countries.

- SDG 13, Climate Action, requires urgent global cooperation to reduce greenhouse gas emissions and build resilience against climate impacts, with the Paris Agreement central to these efforts.

- SDG 14, Life Below Water, addresses marine conservation by promoting sustainable fishing, reducing pollution, and protecting marine habitats crucial for biodiversity and food security.

- SDG 15, Life on Land, targets terrestrial ecosystem preservation through actions like halting deforestation and regulating land use, which also support climate mitigation (SDG 13) and poverty reduction (SDG 1)

- How can I contribute to initiatives like net-zero goals, circular economy, or nature-based solutions within my field to support sustainable development?

- In what ways can I help integrate ecosystem services and climate resilience into decision-making processes to foster a more sustainable future?

Further Resources:

Progress Towards the Sustainable Development Goals – Report 2024
Available at https://unstats.un.org/sdgs/files/report/2024/secretary-general-sdg-report-2024--EN.pdf

3 Multi-disciplinary Environmental Practices

WHAT TO EXPECT?

You will learn the multidisciplinary nature is essential because achieving environmental sustainability requires integrated approaches that encompass ecological conservation, social equity, and economic development

The Environmental Sustainable Development Goals (SDGs) are inherently multi-disciplinary, involving various fields such as ecology, economics, social sciences, and engineering. This multidisciplinary nature is essential because achieving environmental sustainability requires integrated approaches that encompass ecological conservation, social equity, and economic development. For instance, SDG 6 (Clean Water and Sanitation) is not only a matter of providing water infrastructure but also requires expertise in public health, environmental management, and social policy to ensure equitable access to water and proper sanitation systems (UN-Water, 2020). Similarly, SDG 13 (Climate Action) involves a broad range of disciplines, including climatology, renewable energy engineering, urban planning, and economics, to develop effective strategies for both mitigation and adaptation to climate change (IPCC, 2021).

SDG 14 (Life Below Water) and SDG 15 (Life on Land), which focus on conserving marine and terrestrial ecosystems, respectively, also demand multi-disciplinary approaches. Marine biologists, environmental economists, and policymakers collaborate to develop sustainable fisheries and tackle marine pollution, while forestry experts, agronomists, and conservationists work to halt deforestation and restore degraded lands (FAO, 2020). The interlinkages among the environmental SDGs mean that progress in one area often depends on advancements in others, requiring coordinated action across disciplines. For example, sustainable land management under SDG 15 contributes to carbon sequestration, which directly supports SDG 13's climate goals (UNCCD, 2018). Furthermore, environmental policies must be designed with input from legal experts, economists, and engineers to ensure that they are practical, economically viable, and technologically feasible.

This multi-disciplinary integration is crucial for addressing complex global challenges and ensuring that environmental sustainability is achieved in a manner that supports economic development and social well-being.

Figure 9: Multi-Disciplinary Environmental Practices

TAKEAWAYS

- Environmental sustainability relies on a multidisciplinary approach, integrating ecological conservation, social equity, and economic development.
- Collaboration across fields is vital to address complex sustainability challenges holistically and effectively.
- Integrating ecological, social, and economic perspectives enables balanced solutions that support long-term environmental and societal well-being.

REFLECTION

- How can I apply a multidisciplinary approach in my work or studies to balance ecological conservation, social equity, and economic development for sustainable outcomes?

Further Resources:

Environmental and Social Framework
Available at https://www.worldbank.org/en/projects-operations/environmental-and-social-framework

4 Drivers of Change and Barriers to Change

WHAT TO EXPECT?

An exploration of key drivers and barriers impacting environmental SDGs, highlighting the roles of public awareness, technology, international policies, economic challenges, and political resistance.

Drivers of change and barriers to change play pivotal roles in determining the success or failure of implementing Environmental Sustainable Development Goals (SDGs). These goals—particularly SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land)—are influenced by various political, social, economic, and technological factors that either accelerate or hinder progress. Understanding these drivers and barriers is essential for effectively addressing global environmental challenges.

4.1 Drivers of Change

One of the most significant drivers of change regarding environmental SDGs is the increasing global awareness of climate change and environmental degradation. Scientific reports, such as those from the Intergovernmental Panel on Climate Change (IPCC), have highlighted the urgency of reducing greenhouse gas emissions and protecting biodiversity. This scientific evidence has catalysed action at both governmental and societal levels (IPCC, 2021). Public pressure and grassroots movements demanding climate action have intensified in recent years, pushing governments and corporations to adopt more sustainable policies and practices. This heightened awareness, along with public activism, serves as a critical social driver of change, accelerating the shift toward greener policies, renewable energy investments, and more robust environmental protection laws (Fridays for Future, 2020).

Technological innovation is another key driver. Advances in renewable energy technologies, such as solar, wind, and hydropower, as well as innovations in energy efficiency and green infrastructure, have made it easier and more cost-effective to transition away from fossil fuels. Technological improvements in water management, waste reduction, and pollution control are also essential for achieving SDGs 6, 14, and 15 (IRENA, 2019). Furthermore, the rise of the circular economy, which encourages sustainable production and consumption, contributes to waste reduction and resource conservation, supporting progress on multiple environmental SDGs (Geissdoerfer et al., 2017).

International cooperation and policy frameworks also drive change. Agreements such as the Paris Agreement on climate change and the Convention on Biological Diversity create global targets for reducing emissions and preserving ecosystems, which drive national-level policy reforms. These agreements facilitate cross-border collaboration, sharing of

knowledge, and financial support for developing countries, enabling them to implement sustainable development strategies (UNFCCC, 2015).

4.2 Barriers to Change

Despite these drivers, several barriers hinder progress towards achieving environmental SDGs. One of the most persistent barriers is economic, particularly in developing countries where immediate economic growth is often prioritised over long-term environmental sustainability. Many nations rely on industries that are carbon-intensive, such as coal mining and deforestation for agriculture, which conflict with the goals of SDG 13 and SDG 15. Transitioning to sustainable practices may entail short-term economic sacrifices, which can deter governments and industries from making the necessary investments in renewable energy or conservation projects (Sachs et al., 2021).

Another significant barrier is political. Even with international agreements, many countries face internal political resistance to enacting strong environmental policies. This resistance can stem from a lack of political will, conflicting interests within government bodies, or lobbying from industries that benefit from maintaining the status quo. For instance, the fossil fuel industry has historically lobbied against climate regulations in various countries, delaying the adoption of renewable energy policies (Oreskes & Conway, 2010). Additionally, political instability or corruption in some countries can prevent the effective implementation of environmental policies, particularly in regions where environmental governance is weak.

Social and cultural factors also act as barriers. In many parts of the world, environmental degradation is closely linked to poverty. Communities that rely on unsustainable practices, such as illegal logging or overfishing, often do so out of economic necessity. Without alternative livelihoods, these communities cannot transition to more sustainable practices, thus creating a feedback loop of environmental degradation and poverty (Barbier, 2010). Addressing these issues requires not only environmental policies but also comprehensive social and economic reforms to provide sustainable alternatives.

Finally, the lack of financial resources is a significant barrier, particularly for developing nations. Although international funds such as the Green Climate Fund exist to support climate mitigation and adaptation, they are often insufficient to cover the vast investments required to overhaul national energy systems or restore ecosystems. The difficulty in accessing such funds, due to complex application processes or political barriers, further hampers progress. Without adequate funding, developing countries struggle to implement the changes necessary to meet their environmental SDG targets (UNFCCC, 2020).

While there are strong drivers of change promoting the achievement of environmental SDGs, including increased public awareness, technological innovations, and international agreements, significant barriers remain. Economic interests, political resistance, social inequalities, and a lack of financial resources continue to hinder progress. Over-

coming these challenges requires integrated approaches that address not only environmental goals but also economic development, governance, and social equity, ensuring that no one is left behind in the pursuit of a more sustainable future.

Further Resources:

The European Green Deal Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

5 Ultimate Costs

WHAT TO EXPECT?

Will learn about the severe socio-economic and environmental consequences of failing to achieve SDGs, impacting livelihoods, health, and economic stability, particularly in vulnerable communities and climate-sensitive industries

The ultimate costs of not achieving the Sustainable Development Goals (SDGs) extend far beyond the degradation of ecosystems and climate impacts; they also directly affect human well-being, economies, and careers. Failure to meet goals such as SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land) will result in severe consequences for livelihoods, public health, and economic stability. Water scarcity, for instance, which is addressed by SDG 6, could lead to increased conflicts over water resources, exacerbate poverty, and severely limit agricultural productivity, causing food insecurity and displacement of rural populations. This, in turn, creates economic instability in vulnerable regions (UN-Water, 2020). The daily lives of millions, particularly in developing countries, will become more precarious due to a lack of access to clean water and sanitation.

Climate change, as addressed in SDG 13, could further destabilise societies by increasing the frequency and intensity of extreme weather events such as floods, droughts, and hurricanes. These events not only destroy homes and infrastructure but also lead to long-term economic losses, job displacement, and increased migration as people are forced to leave uninhabitable areas (IPCC, 2021). This will create significant disruptions in careers, particularly in industries reliant on stable climates, such as agriculture, fishing, and tourism. Failure to protect marine and terrestrial ecosystems (SDG 14 and SDG 15) will also have cascading effects on daily life. The depletion of fish stocks, for example, threatens food security and livelihoods for millions of people who depend on the ocean, while deforestation accelerates biodiversity loss, undermining ecosystem services that support agriculture, medicine, and clean air (Barbier, 2010).

The combined socio-economic impacts of failing to meet environmental SDGs will perpetuate cycles of poverty, inequality, and health crises, while also destabilising global markets, making the achievement of other SDGs, such as those focused on education and economic growth, far more difficult.

5.1　Time to Relect

Some questions to reflect on related to personal actions and the costs of them in relation to the SDGs discussed above.

1. What, if anything, might I lose personally if SDG goals like Clean Water and Sanitation (SDG 6) or Climate Action (SDG 13) are not achieved in my community or country?

2. How might the failure to achieve environmental SDGs impact the people closest to me (family, friends, colleagues)?

3. What actions am I taking today that could contribute to environmental sustainability or degradation?

4. What concrete steps can I take to help achieve SDG 6, SDG 7, SDG 13, SDG 14, and SDG 15 in my personal life, local context or industry?

TAKEAWAYS

- Socio-economic and Environmental Risks: Failing to achieve SDGs like clean water, energy, and climate action has widespread impacts on livelihoods, health, and economic stability, particularly in vulnerable regions.
- Impact on Daily Life and Industries: Climate change and resource depletion affect food security, displace communities, and disrupt climate-sensitive industries like agriculture and tourism.
- Cycle of Poverty and Inequality: Environmental degradation and climate-related challenges exacerbate poverty, inequality, and health crises, complicating progress on other SDGs such as education and economic growth.

REFLECTION

- What, if anything, might I lose personally if SDG goals like Clean Water and Sanitation (SDG 6) or Climate Action (SDG 13) are not achieved in my community or country?
- How might the failure to achieve environmental SDGs impact the people closest to me (family, friends, colleagues)?
- What actions am I taking today that could contribute to environmental sustainability or degradation?
- What concrete steps can I take to help achieve SDG 6, SDG 7, SDG 13, SDG 14, and SDG 15 in my personal life, local context or industry?

6 Sustainability by Design

WHAT TO EXPECT?

The section explores how "sustainability by design" integrates environmental, social, and economic principles into product and infrastructure development to minimise environmental impact while maximising societal benefits.

Sustainability by design refers to the deliberate integration of environmental, social, and economic sustainability principles into the design process of products, systems, and services. It emphasizes a holistic approach to development, aiming to minimise negative environmental impacts while maximising social and economic benefits. This concept is particularly important in domains such as architecture, industrial design, urban planning, and product development, where design decisions significantly impact resource use, energy consumption, and waste generation (Ceschin & Gaziulusoy, 2019).

In practice, sustainability by design involves using strategies such as **Life Cycle Analysis (LCA)**, which evaluates the environmental impact of a product from raw material extraction to end-of-life disposal, ensuring that materials and energy are used efficiently throughout the product's lifespan. For example, in architecture, sustainable design might involve incorporating renewable energy sources like solar panels, using recycled building materials, and designing for energy efficiency, thereby reducing carbon emissions over a building's lifetime (Cabeza et al., 2020). Similarly, in product design, companies may use biodegradable or recyclable materials and develop modular products that can be easily repaired or upgraded to extend their useful life. An example of this is the "Fairphone," a modular smartphone designed to reduce e-waste and ensure ethical supply chains (Van der Velden, 2018).

Sustainability by design also works within urban planning, where cities are designed to reduce carbon footprints through green infrastructure, public transport systems, and energy-efficient buildings. Sustainable urban designs aim to foster social well-being while reducing environmental burdens (Broto, 2019). By embedding sustainability into the design process, professionals in various fields can ensure that both current and future generations benefit from environmentally responsible practices.

Further Resources:

Design for Sustainability Available at: https://fractory.com/design-for-sustainability/

7   Exercise – Create a Personal Sustainability Road-map

WHAT TO EXPECT?

This exercise offers a step-by-step guide for students to create a personal sustainability roadmap, aligning their career ambitions with sustainable practices through reflection, goal setting, skill-building, and continuous improvement.

The exercise to create a personal sustainability roadmap for students' future careers using the template we developed earlier is a structured, reflective, and goal-oriented process designed to align personal values and professional ambitions with sustainability principles. This roadmap helps students actively plan how they can integrate sustainability into their careers across various domains, from engineering and business to healthcare and design.

7.1   Step 1: Personal Sustainability Vision

The first step in this exercise is for students to articulate **what sustainability means in their chosen field and why it is personally important to them**?. This involves reflecting on their long-term career aspirations and the role they see themselves playing in contributing to environmental, social, and economic sustainability. **Students should explore how their future profession intersects with global sustainability challenges, such as climate change, resource depletion, or social inequality**? For example, an engineering student might envision a career in designing energy-efficient machinery, while a business student might focus on promoting ethical supply chains.

7.2   Step 2: Identify Key Drivers of Change in the Field

In this part of the exercise, students are tasked with **identifying what are the key technological, social, and regulatory drivers pushing for sustainability in their domain**? This might include new innovations, like renewable energy technologies for engineers, or changing consumer preferences for sustainable products in marketing. Students should research emerging trends and regulations relevant to their career, such as the European Green Deal for those in engineering or environmental management, or the UN's Sustainable Development Goals (SDGs), which offer a global framework for sustainable development across sectors.

7.3   Step 3: Research Relevant Policies and Regulations

Students should now focus on understanding the policies and regulations that directly impact sustainability in their field. This could include international frameworks like the

Paris Agreement for environmental standards, industry-specific regulations such as the Eco-Design Directive, or even national policies promoting sustainable agriculture or green urban development. By identifying these policies, students will be better prepared to work within regulatory frameworks and contribute to the achievement of sustainability goals in their future roles.

7.4 Step 4: Explore Relevant Certifications

Next, students are encouraged to research and list any relevant certifications that align with their sustainability goals. These might include professional certifications like ISO 14001 for environmental management, LEED for green building, or the Fairtrade certification for sustainable supply chain management. Pursuing these certifications can serve as both personal development and career advancement, ensuring students are equipped with the credentials needed to drive sustainability within their industry.

7.5 Step 5: Set Personal and Professional Sustainability Goals

Using the template, students will set clear short-, mid-, and long-term sustainability goals. Short-term goals could include attending workshops or courses on sustainability topics, participating in sustainability-focused internships, or joining a student-led sustainability group. Mid-term goals might involve working on sustainability projects during their degree or taking on leadership roles in initiatives related to environmental or social issues. Long-term goals could include aiming to lead sustainability efforts within an organization, start a sustainable business, or contribute to industry standards for sustainable practices.

7.6 Step 6: Actions to Build Knowledge and Skills

To achieve their goals, students need to plan actionable steps that help build the necessary skills and knowledge. This part of the roadmap involves identifying learning opportunities such as online courses, workshops, conferences, or networking events. For example, a student in environmental science might take online courses on renewable energy technologies, while an architecture student might focus on sustainable design workshops. Networking with professionals in the field or joining relevant professional associations can also provide mentorship opportunities and further skill development.

7.7 Step 7: Evaluate and Adjust the Roadmap

Finally, students are encouraged to regularly evaluate their progress and adjust their roadmap as necessary. They can set milestones and key metrics for success, such as completing a certain number of sustainability courses or contributing to a major project in the field. Periodic reflection allows students to assess whether they are on track to achieve their goals and to identify new opportunities or challenges that may arise. This iterative process ensures that the roadmap evolves as the student gains experience and new sustainability trends emerge in their field.

7.8   Outcome of the Exercise

By completing this exercise, students will have a clear, actionable plan for integrating sustainability into their career trajectory. The personal sustainability roadmap will not only help guide their professional development but also ensure that they are actively contributing to sustainable practices in their future work, helping address global environmental challenges while achieving personal and career growth.

TAKEAWAYS

- The personal sustainability roadmap is a structured, goal-oriented plan helping students integrate sustainable practices into their future careers.
- Key steps include defining a sustainability vision, understanding industry drivers, researching policies, and setting goals for skills and certifications.
- Regular evaluation ensures students stay on track and adapt as new trends and knowledge emerge, promoting continuous growth in sustainable practices.

REFLECTION

- How can I integrate sustainability into my career path to make a meaningful impact on environmental and social challenges?

Further Resources:

Blog – 35 Case Studies Exploring Sustainability. Available at:
https://mark-bridges.medium.com/35-case-studies-exploring-sustainability-08740fbc73ca

8   Conclusion

In conclusion, achieving environmental SDGs, such as climate action, life below water, and life on land are vital to preserving the planet and building a sustainable future for all. Climate change, biodiversity loss, pollution, and resource depletion threaten every aspect of life, affecting ecosystems, economies, and communities worldwide. Addressing these challenges demands an urgent, collaborative effort across multiple levels to ensure we can sustain both environmental health and human well-being.

Governments, businesses, and individuals all have unique roles to play in reaching these global goals. Large-scale policy efforts and corporate commitments are essential for systemic change, yet individual contributions are equally significant. When people adopt sustainable practices in their daily lives, they reinforce the demand for environmentally responsible policies and products, creating a cycle of positive influence. Personal actions, no matter how small, can collectively make a difference in reducing waste, conserving resources, and fostering sustainable behaviours.

Each of us has the potential to create a personal roadmap toward sustainability. By setting realistic goals, making mindful choices in energy use, consumption, and waste, and gradually adopting more sustainable habits, we contribute to the broader environmental goals. Small steps lead to larger changes, and as more individuals adopt sustainable lifestyles, the combined impact can create a healthier, more resilient planet. Empowering ourselves to make these choices today can drive the global shift needed for a sustainable future.

Creating a personal sustainability roadmap is a valuable exercise for students, as it aligns their career aspirations with sustainability principles, preparing them for a future in which sustainable practices are increasingly essential. This structured process encourages students to define their personal vision of sustainability within their chosen field, understand key drivers and relevant regulations, and explore certifications that enhance their career prospects. By setting specific goals and actionable steps, students can build essential skills, stay current with emerging trends, and adapt their plans as they progress. Ultimately, this roadmap not only aids in personal and professional growth but also empowers students to make a meaningful impact in their industry and contribute actively to global environmental challenges.

9 References

Arora, N.K., Mishra, I. Sustainable development goal 6: Global Water Security. *Environmental Sustainability* **5**, 271–275 (2022). https://doi.org/10.1007/s42398-022-00246-5

Barbier, E. B. (2010). Poverty, development, and environment. Environment and Development Economics, 15(6), 635–660.

Castán Broto, V., & Westman, L. (2019). Urban Sustainability and Justice: Just Sustainabilities and Environmental Planning. London: Zed Books.

Cabeza, L. F., Baño, R., & De Gracia, A. (2020). Environmental impact of buildings through life cycle assessment: Trends and analysis in the use of LCA tools. Building and Environment, 182, 107164.

Convention on Biological Diversity (CBD). (1992). Convention on Biological Diversity. Retrieved from https://www.cbd.int/

Ceschin, F., & Gaziulusoy, I. (2019). Design for sustainability: An evolutionary review. Journal of Cleaner Production, 231, 462–479.

European Parliament and Council of the European Union. (2000). Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (Water Framework Directive). Official Journal of the European Communities, L 327, 1–73. Retrieved from https://eur-lex.europa.eu/

Food and Agriculture Organization of the United Nations (FAO). (2020). The State of World Fisheries and Aquaculture 2020. Rome: FAO.

Fridays for Future. (2020). Global climate strike: FAQs. Retrieved from https://www.fridaysfor-future.org

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757–768.

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). Global Assessment Report on Biodiversity and Ecosystem Services. Retrieved from https://ipbes.net/global-assessment

Intergovernmental Panel on Climate Change (IPCC). (2021). Climate Change 2021: The Physical Science Basis. Retrieved from https://www.ipcc.ch/report/ar6/wg1/

International Renewable Energy Agency (IRENA). (2019). Global Energy Transformation: A Roadmap to 2050. Abu Dhabi: IRENA.

Oreskes, N., & Conway, E. M. (2010). Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming. New York: Bloomsbury Press.

Sachs, J. D., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2021). Sustainable Development Report 2021. Cambridge: Cambridge University Press.

United Nations Framework Convention on Climate Change (UNFCCC). (2021). Climate Change Disproportionately Affects the Most Vulnerable. Retrieved from https://unfccc.int/news/climate-change-disproportionately-affects-the-most-vulnerable

United Nations (UN). (1982). United Nations Convention on the Law of the Sea (UNCLOS). Retrieved from https://www.un.org/depts/los/

United Nations (UN). (1997). Convention on the Law of the Non-Navigational Uses of International Watercourses. Retrieved from https://treaties.un.org/

United Nations Convention to Combat Desertification (UNCCD). (2017). The Global Land Outlook. Retrieved from https://www.unccd.int/

United Nations Framework Convention on Climate Change (UNFCCC). (2015). Paris Agreement. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Green Climate Fund. (2020). Green Climate Fund. Retrieved from https://www.greenclimate.fund/

UN-Water. (2020). SDG 6 Data Portal. Retrieved from https://sdg6data.org/

Van der Velden, M. (2018). Design for sustainability: Ethics and ethical practices. Sustainability Science, 13(4), 987–998.

Yotova, G., Varbanov, M., Tcherkezova, E., & Tsakovski, S. (2021). Water quality assessment of a river catchment by the composite water quality index and self-organizing maps. *Ecological Indicators, 120*, 106872. https://doi.org/10.1016/j.ecolind.2020.106872

Blogs

https://regenx.ag/blog/carbon-neutral-vs-net-zero/
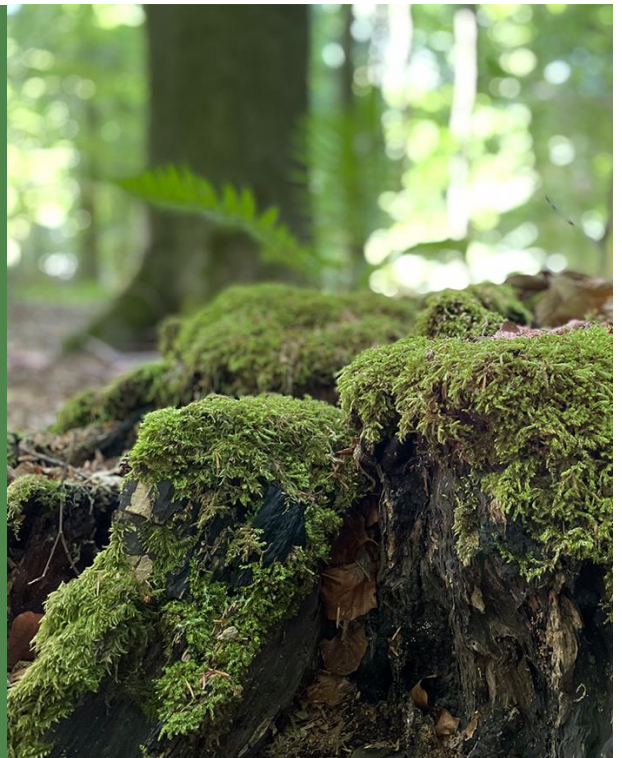
For further information visit
www.sds4hei.eu