

Project LEAF – ERASMUS+

“Climate change and urban biodiversity”

ENERGIES 2050



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Project LEAF – ERASMUS+
Module “Climate change and urban biodiversity”
Prepared by ENERGIES 2050



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ENERGIES 2050

COMMITTED FOR 25 YEARS TO THE FIGHT AGAINST **CLIMATE CHANGE** AND
THE PROMOTION OF **SUSTAINABLE AND INCLUSIVE DEVELOPMENT**
WORLDWIDE. AS CATALYSTS FOR A BRIGHT FUTURE AND BEARERS OF
HOPE, WE REFUSE TO BELIEVE IN SEEMING FATALITIES.



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OUR IMPACT

+70 Countries involved

+100 Nationalities represented

+250 Projects deployed

+250K People trained

+20M People impacted

OUR VISION

We strive for a world where development is sustainable, inclusive and socially equitable.

Today's ecological challenges represent opportunities to build a fairer, more resilient society, based on responsible, shared management of our resources. Our mission is to innovate and provide concrete solutions while strengthening international cooperation and solidarity between citizens of the world. Our goal is to shape a future where responsible management of natural resources ensures shared peace, global well-being, and where every individual is actively involved in this change.

OUR MISSIONS

&

OUR ACTIONS

ENERGIES 2050 is deeply committed to building a sustainable and equitable future. Our missions are divided into four main axes:

Acting for the climate and the environment on the field:

We transform ecological challenges into opportunities for sustainable growth with demonstrative low-carbon projects of high social value.

Creating innovative and sustainable knowledge:

We develop integrated and durable solutions, tailored to the needs of communities, to improve quality of life locally and globally.

Educating and building capacity:

We share our research and best practices, educate and train on environmental issues so that everyone can act proactively and in an informed way.

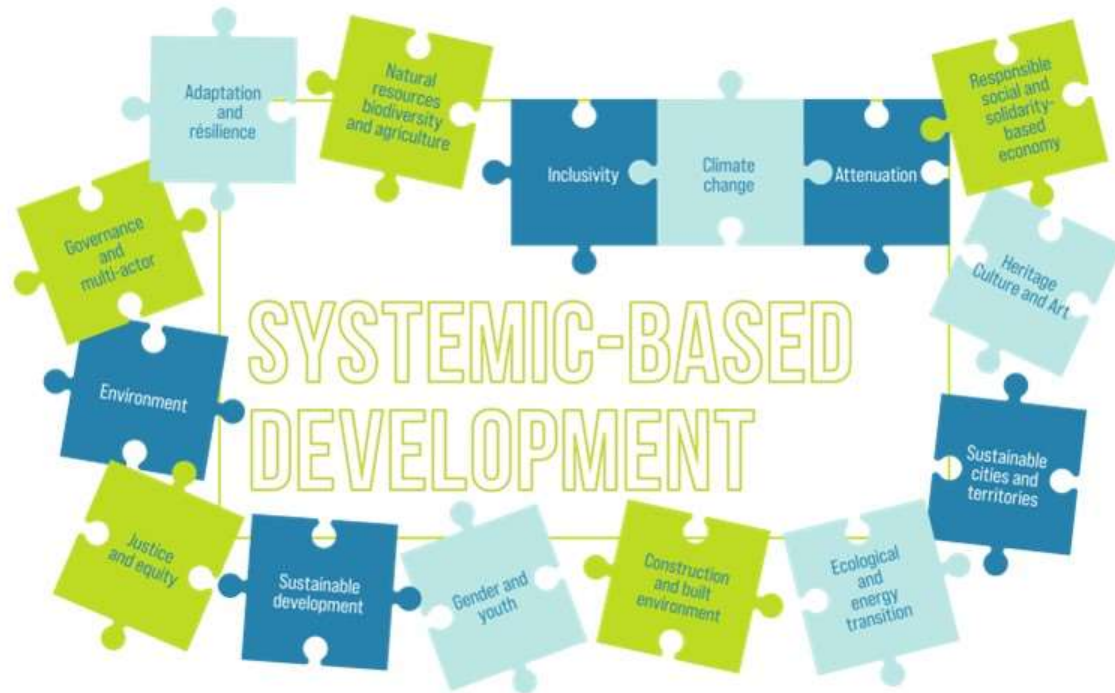
Cooperating to mutually enrich each other:

We work with various partners to influence policies, promote international cooperation, and participate in meetings and conferences to enrich discussions.

OUR APPROACH

SYSTEMIC-BASED DEVELOPMENT

We take a holistic, systemic-based approach to the challenges our societies face. Drawing on decades of engineering experience, we create adaptable and replicable solutions that meet the specific needs of communities while delivering global impact.



I. Introduction

1. Exploring the Handbook Module

- Presenting the actual context of the climate change and biodiversity loss, as well as the multilevel climate governance. We will navigate through all the scales of the climate change governance and its levels. Plus, we will highlight the major role and the commitments made by the states and local governments.
- After presenting the international situation, the trajectories, the consequences but also the international political response, the presentation will show how climate change challenges are to be taken into account in our cities and daily life.
- Then the module will put the emphasis on the role of biodiversity as a cornerstone to mitigate these changes while also creating a significant number of co-benefits both in terms of adaptation and resilience with, among other, nature-based solutions.
- Then it will present examples in practice that promote biodiversity in the urban areas. Furthermore, it will point to the importance of environmental education, by proposing a pedagogy to encourage students' commitment.



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I. Introduction

2. Understanding the interplay: Climate Change, Biodiversity, and Environmental Education (1/2)

Through this presentation , we will explore the intricate relationship between climate change and biodiversity in urban environment, along with the significance of environmental education in addressing these challenges.

We will approach the multilevel climate governance which refers to the collaborative efforts and policies implemented. Those collaborative efforts and policies are established by various stakeholders, including governments, international organizations, local communities, and individuals, to address the challenges posed by climate change. Moreover, it recognizes the need for coordinated action across multiple levels of governance to effectively tackle the global issue of climate change.

We will also delve into the critical relationship between climate change and biodiversity, with a specific focus on the urban environment. Urban areas are home to diverse ecosystems that play a crucial role in maintaining biodiversity and providing essential services to both humans and wildlife. Understanding the implications of climate change on urban biodiversity is vital for developing sustainable strategies to protect and enhance our urban ecosystems.



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I. Introduction

2. Understanding the interplay: Climate Change, Biodiversity, and Environmental Education (1/2)

Furthermore, we will emphasize the importance of environmental education in this context.

Environmental education plays a pivotal role in raising awareness, fostering understanding, and empowering individuals to make informed decisions regarding environmental issues. By equipping people with the knowledge and skills necessary to mitigate and adapt to climate change, environmental education serves as a catalyst for positive change and sustainable development.

Throughout this presentation, we will explore case studies, highlight best practices, and discuss potential solutions for promoting multilevel climate governance, preserving urban biodiversity, and integrating environmental education into various sectors. Together, we can work towards a more resilient and sustainable future for our planet.

Let's begin our journey into the world of multilevel climate governance, climate change, biodiversity, and environmental education!!



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I. Introduction

1.2 The Collaborative Journey towards Global Climate Solutions

Building climate solutions is a complex, global-scale process that involves all levels and is relevant to all sections of society. Climate change governance is linked to countries development, and the well-being of nature and people.

For processes to be participatory and result in efficient and effective climate action, people's rights and the regulations that protect them must be taken into account. It is also vital that climate decisions and policies are sensitive to the perceptions, interests and rights of vulnerable populations. Young people are important actors for climate action success, and their participation in climate decision-making processes is a human right.

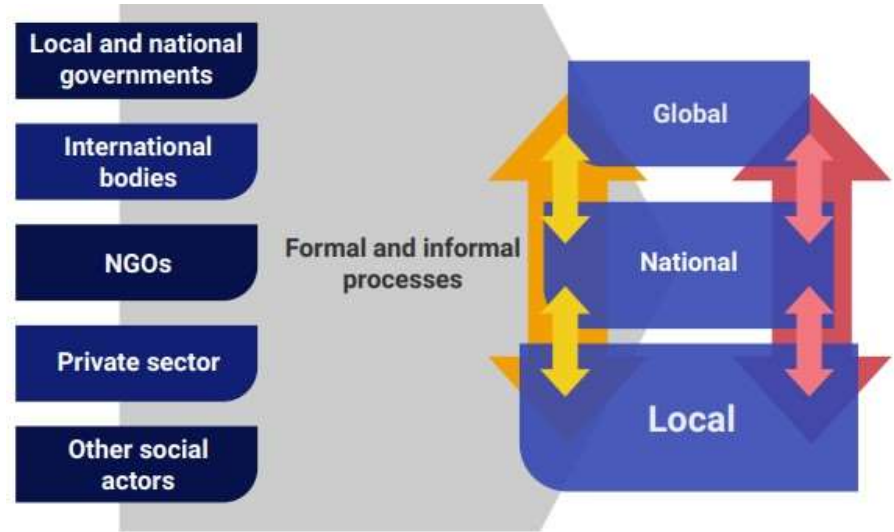


Source: <https://www.unicef.org/lac/sites/unicef.org.lac/files/2021-07/what-is-climate-governance.pdf>

II. What is a multilevel climate governance?

1. Description of the process

Multilevel climate governance is a **continuous process** of discussions and negotiations involving a diverse group of national and local governments, international organizations, the private sector, NGOs and other social actors. Its purpose is to promote opportunities and prompt action to address climate change. These decision-making and discussion processes may be formal or informal, flexible and adaptive, and take place at various levels: local, national, regional or international.



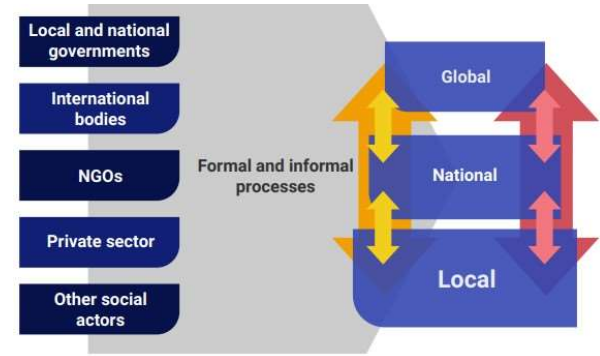
Source: <https://www.unicef.org/lac/sites/unicef.org/lac/files/2021-07/what-is-climate-governance.pdf>

II. What is a multilevel climate governance?

1. Description of the process

Why is it important?

The comprehensive nature of multilevel governance also means that it strengthens and promotes **innovation**, **problem-solving capacity**, learning, and the **development** of solutions that benefit more sectors. In addition to this, it can make decision-making or public policy processes more **efficient** and create mechanisms that can be adapted to specific contexts and a wide range of topics. Therefore, when trying to understand climate-related decision-making processes, we need to bear in mind their multilevel nature.



Source: <https://www.unicef.org/lac/sites/unicef.org/lac/files/2021-07/what-is-climate-governance.pdf>

II. What is a multilevel climate governance?

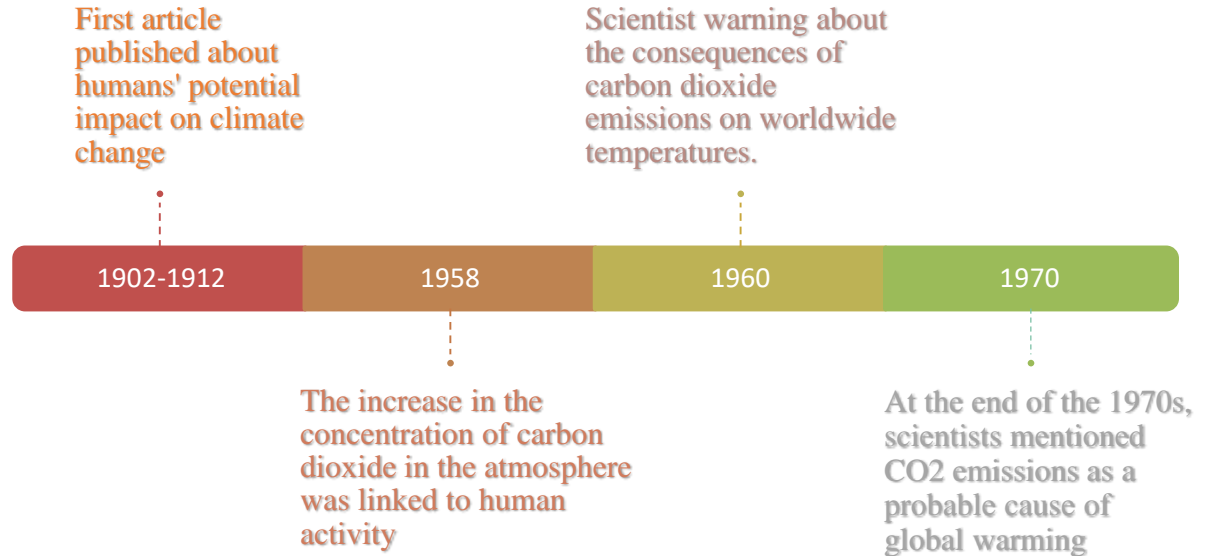
2.1 International climate governance

International climate negotiations are the processes developed to create agreements between countries to promote and ensure ambitious action against climate change and its effects. Negotiations within the international framework are important because they set out the guidelines to be followed at the global level under the principle of common but differentiated responsibilities aimed at ensuring sustainable development.

II. What is a multilevel climate governance?

2.1 International climate governance

Early warnings - With the industrialization that began in the 19th century, human activities turned out to be responsible for an aggravation of the greenhouse effect. Understanding the chronology of events will help us understand the origin of the policy hierarchy in the fight against climate change. This arborescence has its basis in an international response to scientific concerns.



Timeline @ENERGIES2050

First article published about humans' potential impact on climate change

- One of the first scientists to predict humans' potential impact on climate change was Swedish scientist and Nobel laureate Svante Arrhenius. Arrhenius was the first to recognize and calculate the effect of atmospheric CO2 on global temperature, now known as the greenhouse effect.

- The article below is from a late **1912 article** first published in Popular Mechanics. As you can probably guess, those early warnings didn't really materialize.



Source: https://en.wikipedia.org/wiki/Climate_apocalypse

1902-1912

The carbon dioxide concentration's increase

- Through a brief introspection in time, we go back to the year 1958 when American scientist Charles Keeling observed that the increase in the concentration of carbon dioxide in the atmosphere was linked to human activity.



Source: <http://8020vision.com/2010/12/21/how-charles-david-keeling-woke-the-world-up-to-climate-change/>

1958

Scientist warning about the consequences of carbon dioxide emissions on worldwide temperatures.

- The course of the 1960s, a slew of scientists surfaced with fresh computations and cautions regarding the consequences of carbon dioxide emissions on worldwide temperatures.
- The modern era of global environmental governance began in the 1960s and 1970s, as public concern grew about the impact of human activities on the natural world.

- This period saw the emergence of the modern environmental movement, as citizens, scientists, **artists**, and activists mobilized to address a range of environmental issues, including pollution, deforestation, and species extinction.



Source: <https://www.redbubble.com/fr/i/poster/-parlichtman2/112899760.LVTDI>

1960

1970

At the end of the 1970s, scientists mentioned CO2 emissions as a probable cause of global warming

- Scientists mentioned CO2 emissions as a probable cause of global warming. This awareness pushed the international community to react.
- The correlation between unusually cold weather and concerns about man-made pollutants like smog causing a cooling effect led to a perplexing question: were humans responsible for global warming or cooling?

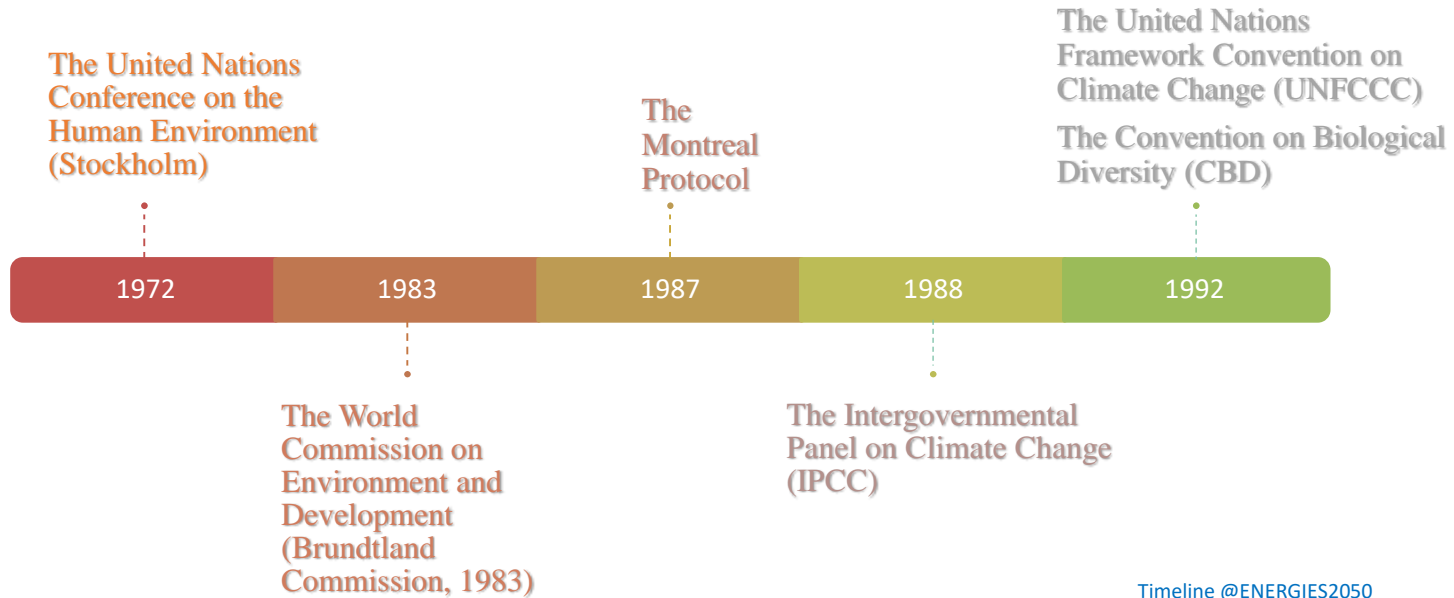


Source: <https://www.artsy.net/artwork/shepard-fairey-sun-paper-print-and-global-warming-two-works>

II. What is a multilevel climate governance?

2.1 International climate governance

The beginning of the negotiations



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The United Nations Conference on the Human Environment (Stockholm)

- Environment Program (UNEP) was created in Stockholm, Sweden, where the 1st international summit on the environment was held. This UN-convened conference marked a turning point in the development of international environmental policy. It led to the creation of commitment which coordinate the global efforts to promote sustainability and safeguard the natural environment.



Source: <https://www.unep.org>

The Montreal Protocol

- Created in 1987, implemented in 1989. Its success in reversing the negative trend has been a monumental accomplishment.
- Phasing out and later prohibit the use of ozone-depleting elements such as



<https://www.cbc.ca/radio/quirks/dec-14-saving-the-ozone-helped-climate-change-extra-solar-comet-great-auk-extinction-and-more-1.5391393/when-we-saved-the-ozone-layer-we-saved-ourselves-from-even-worse-climate-change-1.5391408>

The United Nations Framework Convention on Climate Change (UNFCCC)

- The Convention is a binding treaty that sets out a framework for action to address climate change.
- The objective of the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system.



Source: <https://www.lse.ac.uk/granthaminstitut/explainers/what-is-the-un-framework-convention-on-climate-change-unfccc/>

The Convention on Biological Diversity (CBD)

- The United Nations Environment Programme (UNEP) took bold steps in November 1988 by gathering the Ad Hoc Working Group of Experts on Biological Diversity.

1972

1983

1987

1988

1992

The World Commission on Environment and Development (Brundtland Commission, 1983)

- The World Commission on Environment and Development, also known as the Brundtland Commission, was established in 1983 by the United Nations.
- The report emphasized the importance of addressing environmental and development issues together, and it laid the groundwork for many of the global environmental agreements that followed. (Brundtland G.H. 1987).



Source: https://twitter.com/iisd_news/status/874732421379444743?lang=zh-Hant

The Intergovernmental Panel on Climate Change (IPCC)

- As a result of the Montreal Protocol's aftermath in 1987, the United Nations, in collaboration with the World Meteorological Organization, established the IPCC in 1988.
- The IPCC is composed of thousands of scientists and experts from around the world who volunteer their time and expertise to assess the latest scientific information on climate change.

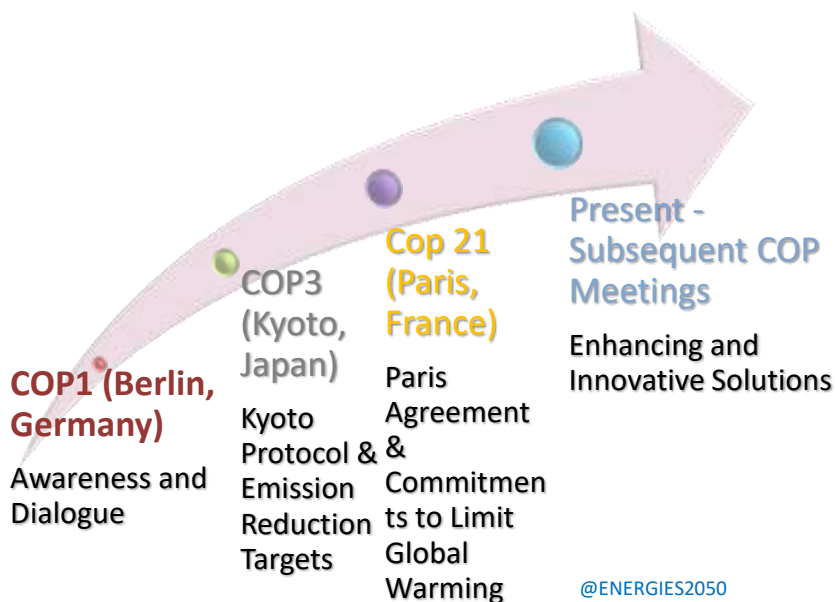


Creation of IPCC in 1988
 - by the IPCC and WMO, endorsed by UN General Assembly
 - to provide assessments of the scientific basis of climate change and to advise on a new of environmental risks to national strategies
 ipcc
 Intergovernmental Panel on Climate Change

II. What is a multilevel climate governance?

2.1 International climate governance

Exploring the Conference Of the Parties (COPs): Shaping the Global Response to Climate Change



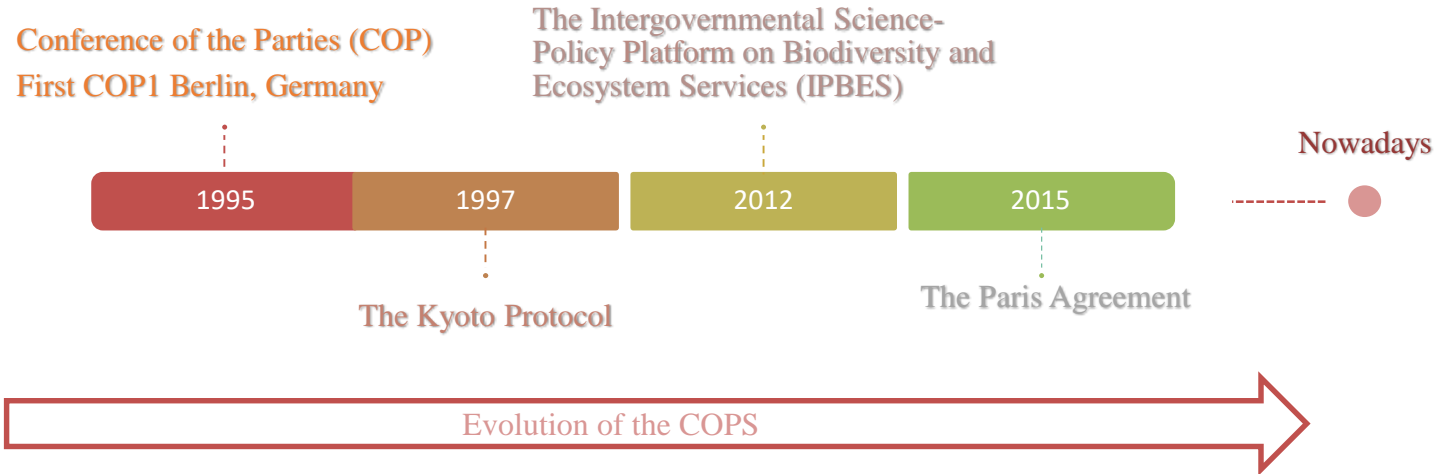
Over the years, the Conference of the Parties has played a crucial role in shaping global climate policies and initiatives. It serves as a platform for countries to negotiate and establish international agreements aimed at reducing greenhouse gas emissions, adapting to climate impacts, and supporting sustainable development.

- **COP 1 to COP 2:** We start our journey in 1995 with COP 1 held in Berlin, Germany. These early conferences focused on raising awareness about climate change and fostering dialogue between countries.
- **COP 3 and the Kyoto Protocol:** In 1997 COP 3 in Kyoto, Japan, led to a groundbreaking agreement - the Kyoto Protocol. It set binding emission reduction targets for developed countries and introduced mechanisms like emissions trading.
- **COP 21 and the Paris Agreement:** Fast forward to 2015, where COP 21 in Paris, France, witnessed the adoption of the historic Paris Agreement. This agreement brought together nearly all nations in a commitment to limit global warming and enhance climate resilience.
- **The present period** represents subsequent COP meetings focused on enhancing implementation, increasing ambition, and exploring innovative solutions.

II. What is a multilevel climate governance?

2.1 International climate governance

The evolution of the negotiations: Highlighted events



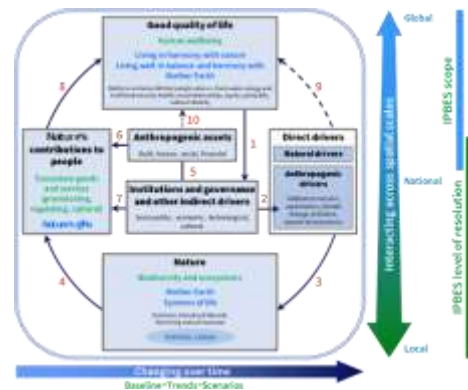
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Conference of the Parties (COP): First COP1, Berlin, Germany (1995)

- The COP is a key platform for advancing global climate and biodiversity governance. COPs are annual meetings that bring together representatives from member countries of the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD) to discuss the latest developments in these fields and negotiate solutions to global environmental challenges.
- The first COP meeting was held in Berlin. Significant meetings since then have included COP3 where the Kyoto Protocol was adopted, COP11 where the Montreal Action Plan was produced, COP15 in Copenhagen and COP17 in Durban where the Green Climate Fund was created.



Source: <https://www.thenationalnews.com/uae/environment/2021/11/12/which-countries-have-hosted-cop-and-what-have-they-achieved/>



Source: https://upload.wikimedia.org/wikipedia/commons/4/4c/The_IPBES_Conceptual_Framework.svg

Established in Panama City, in 2012 by 94 Governments. The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)** is an independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.

1995

1997

2012

2015

Cop3 – The Kyoto Protocol (1997)



The UNFCCC was signed at the 1992 'Earth Summit' in Rio de Janeiro, Brazil.
Photo: UN Photo/Michos Tzovaras

The Kyoto Protocol was adopted based on the scientific consensus that global warming was occurring and that human-made CO₂ emissions were driving it.

World leaders agreed to commit to reduce emissions of greenhouse gases in industrialized countries and laid the foundation of **the carbon market**.

The Paris Agreement PA (2015)

- The Paris Agreement is a **legally binding international treaty on climate change**. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015.
- The PA works on a **five-year cycle** of increasingly ambitious climate carried out by countries. Since 2020, countries have been submitting their national climate action plans, known as nationally determined contributions (NDCs). Each country engaged in the elaboration of its national NDC to meet international agreements



Source: <https://www.realinstitutoelcano.org/en/analyses/the-paris-agreement-five-years-on-are-congratulations-in-order/>

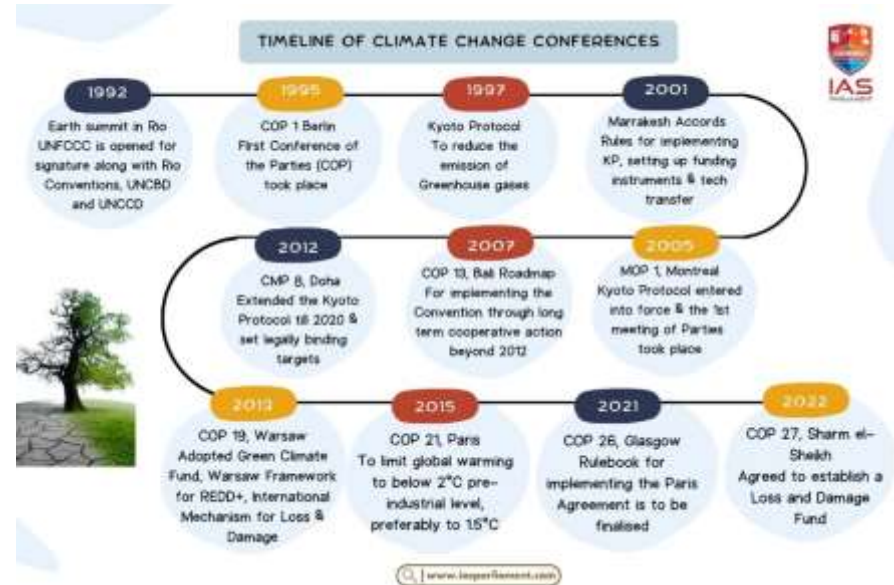
II. What is a multilevel climate governance?

2.1 International climate governance

In addition to negotiations between countries, the COP meetings also provide space for non-governmental organizations, scientists, youth representatives, and civil society to engage in discussions and influence climate policies. The involvement of diverse stakeholders is crucial in driving comprehensive and inclusive climate action.

As a young student, you have a unique perspective and an important role to play in the global effort to combat climate change. The evolution of the Conference of the Parties reflects the growing recognition of the urgent need for climate action and the collective determination to address this global challenge.

By staying informed and engaging in discussions around climate change, you can contribute to raising awareness, advocating for sustainable practices, and inspiring others to take action. Remember that your voice and actions matter, and together we can create a more sustainable and resilient future for our planet.



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II. What is a multilevel climate governance?

3. National climate governance

Introduction

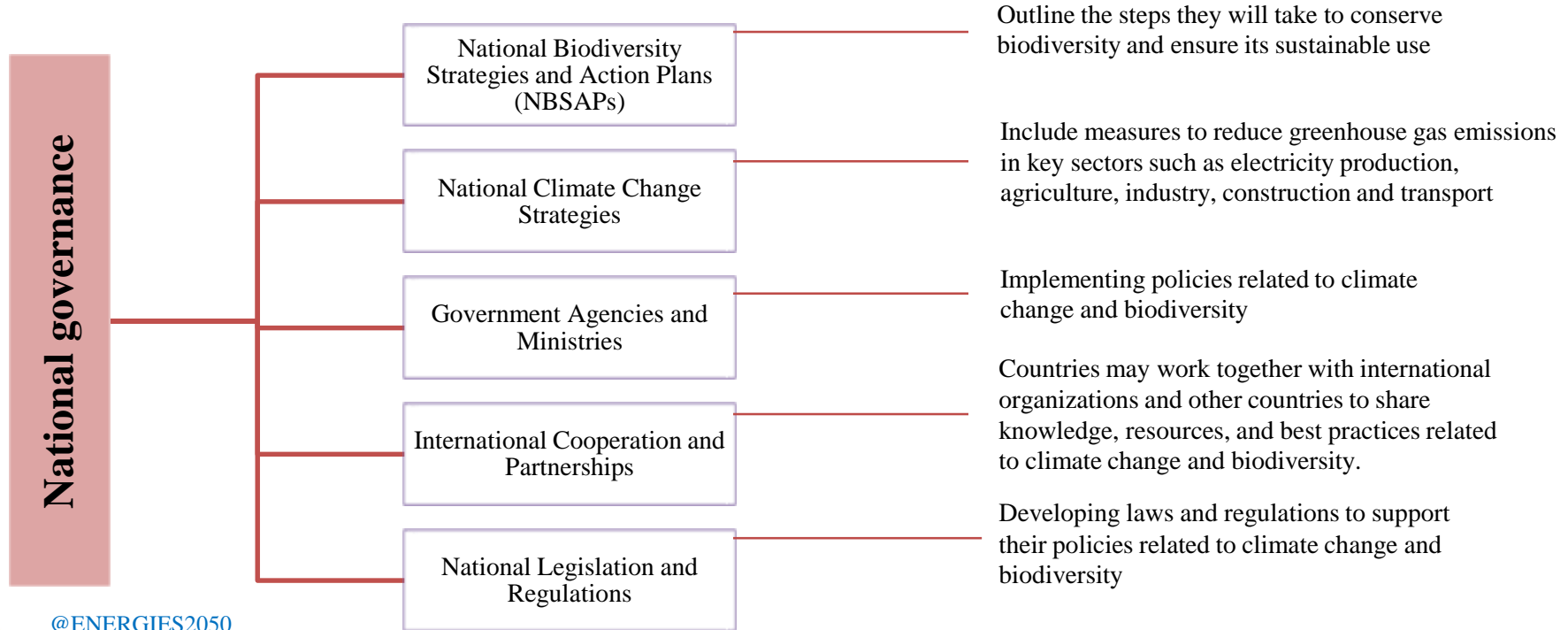
Climate change and biodiversity loss are pressing global issues that require a concerted effort from all nations to address. To effectively tackle these issues, countries must organize themselves at a national level to meet international agendas

Many decision-making processes take place at the national level or the subnational level (meaning a country's territorial divisions), especially on the creation of programmes, public policies and regulations. It is mainly at these levels that climate action is implemented. Actors from various levels and subject areas are involved in the dialogue and negotiation processes, regardless of the decision maker's level of authority. These national and subnational decision-making spaces are opportunities for public participation, which youth organizations can take advantage of.

II. What is a multilevel climate governance?

3. National climate governance

At the national level, countries can use governance mechanisms to align their policies and initiatives with international agendas related to climate change and biodiversity.



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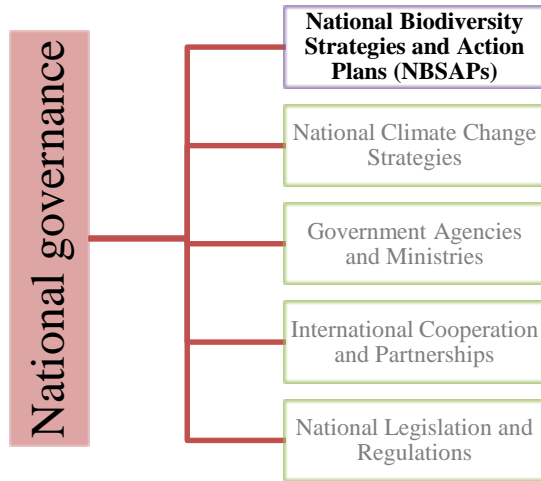
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A **National Biodiversity Strategies an Action Plan (NBSAP)** is a process by which countries can plan to address the threats to their biodiversity. Governments formulate NBSAPs that provide a roadmap for biodiversity conservation and sustainable use. These strategies include measures to protect and restore ecosystems, conserve endangered species, promote sustainable land and water management practices, and engage local communities and indigenous peoples in biodiversity conservation efforts.

Mainstreaming NBSAPS

« Mainstreaming »: the integration of the conservation and sustainable use of biodiversity in both cross-sectoral plans such as sustainable development, poverty reduction, climate change adaptation/mitigation, trade and international cooperation, and in sector-specific plan such as agriculture, fisheries, forestry, mining, energy, tourism, transport and others. It implies changes in development models, strategies and paradigms.

➤ *Biodiversity policy should not be seen as independent of sectoral and cross-sectoral policies. But rather sectoral and cross-sectoral policies should be seen as the vehicle through which crucial biodiversity goals need to be attained while, and to maintain, and enhance human wellbeing. Sectoral strategies can form important components of biodiversity.*

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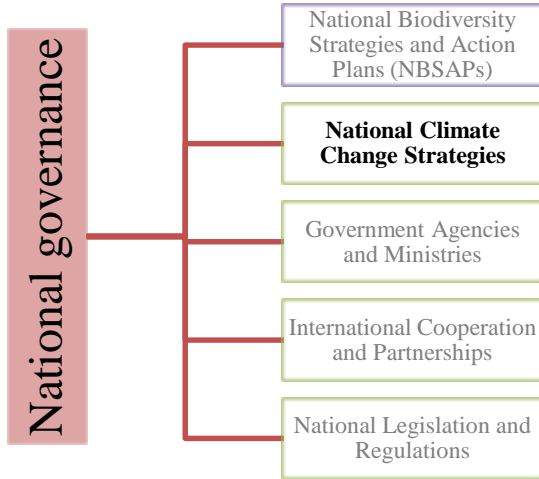
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What is a National Climate Plan?

Definition: A national climate plan outlines a country's strategy and actions to mitigate climate change and adapt to its impacts.

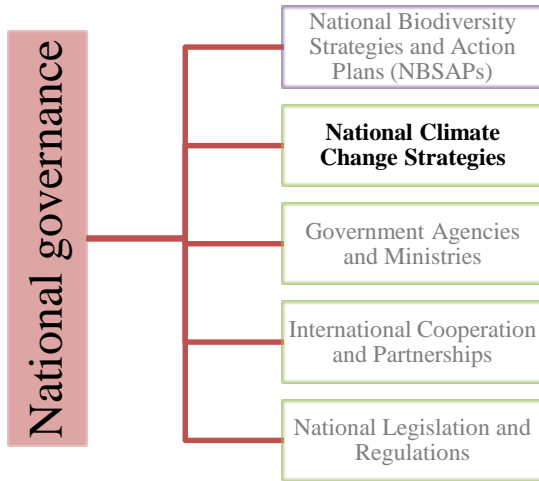
Goals: Discuss the primary goals of a national climate plan, such as reducing greenhouse gas emissions, transitioning to clean energy sources, protecting ecosystems, and promoting sustainable practices.

Importance: Highlight the significance of a national climate plan in tackling global warming, promoting environmental stewardship, and ensuring a sustainable future.

The national climate plan places a strong emphasis on transitioning from fossil fuels to renewable energy sources such as solar, wind, hydro, and geothermal. This shift is crucial for reducing greenhouse gas emissions, mitigating climate change, and promoting sustainable energy systems.

II. What is a multilevel climate governance?

3. National climate governance



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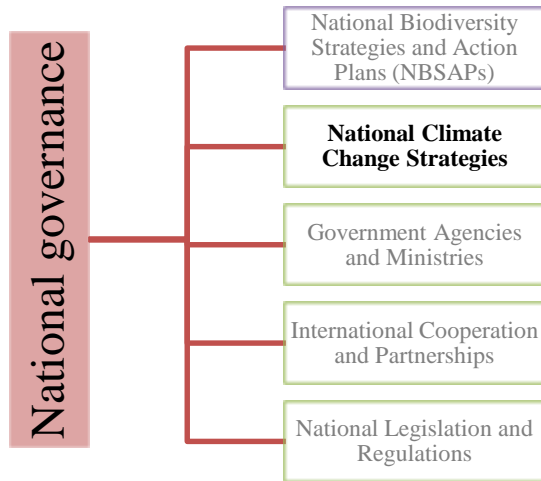
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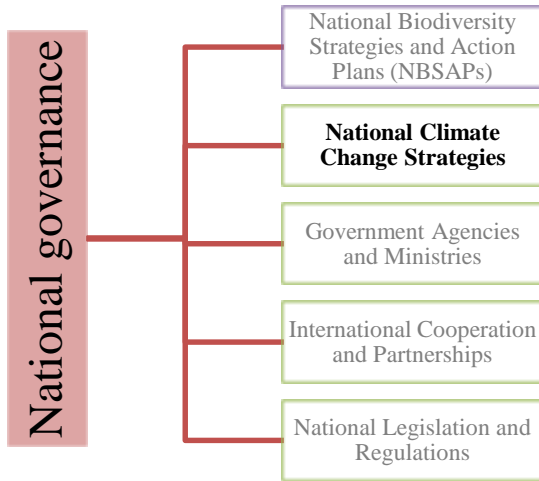
Regulatory Frameworks: The national climate plan may introduce or enhance regulatory frameworks that facilitate the integration of renewable energy sources. This can include streamlining permitting processes, establishing renewable portfolio standards, and implementing feed-in tariffs. Such regulations create a favorable environment for the development and deployment of renewable energy projects, making it easier for investors and energy providers to embrace clean energy alternatives.

Research and Development: The national climate plan often allocates resources for research and development in the renewable energy sector. This funding supports innovation and the advancement of renewable technologies, making them more efficient, cost-effective, and accessible. It encourages scientists, engineers, and entrepreneurs to develop new solutions and improve existing renewable energy systems.

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II. What is a multilevel climate governance?

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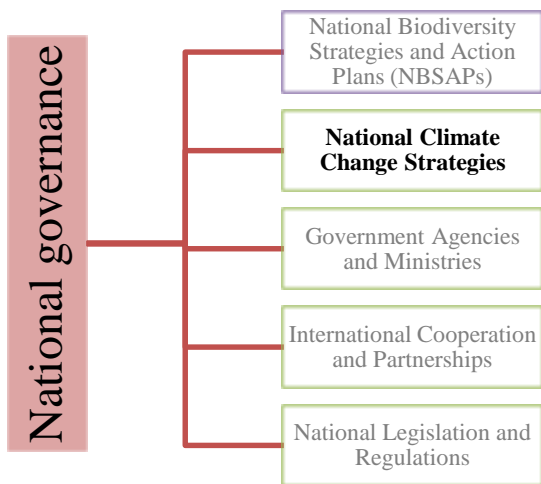
Infrastructure Development: To enable the transition to renewable energy, the national climate plan may prioritize the development of infrastructure required for renewable energy generation and distribution. This can involve building new transmission lines, upgrading electrical grids to accommodate intermittent energy sources, and establishing charging infrastructure for electric vehicles. By investing in infrastructure, the plan ensures that renewable energy sources can be effectively harnessed and integrated into the existing energy system.

Public Awareness and Education: The national climate plan often includes initiatives to raise public awareness about the benefits of renewable energy and the urgency of transitioning away from fossil fuels. It emphasizes the importance of energy conservation, energy efficiency measures, and the role individuals can play in supporting the transition. Public education campaigns, outreach programs, and partnerships with educational institutions help to foster a culture of sustainability and renewable energy literacy.

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II. What is a multilevel climate governance?

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Renewable Energy Targets: The national climate plan sets specific targets for renewable energy generation, aiming to increase the share of renewable sources in the overall energy mix. These targets provide a clear direction and sense of urgency for transitioning away from fossil fuels. They often include milestones for the adoption of renewable energy technologies and the reduction of dependence on fossil fuel-based power generation.

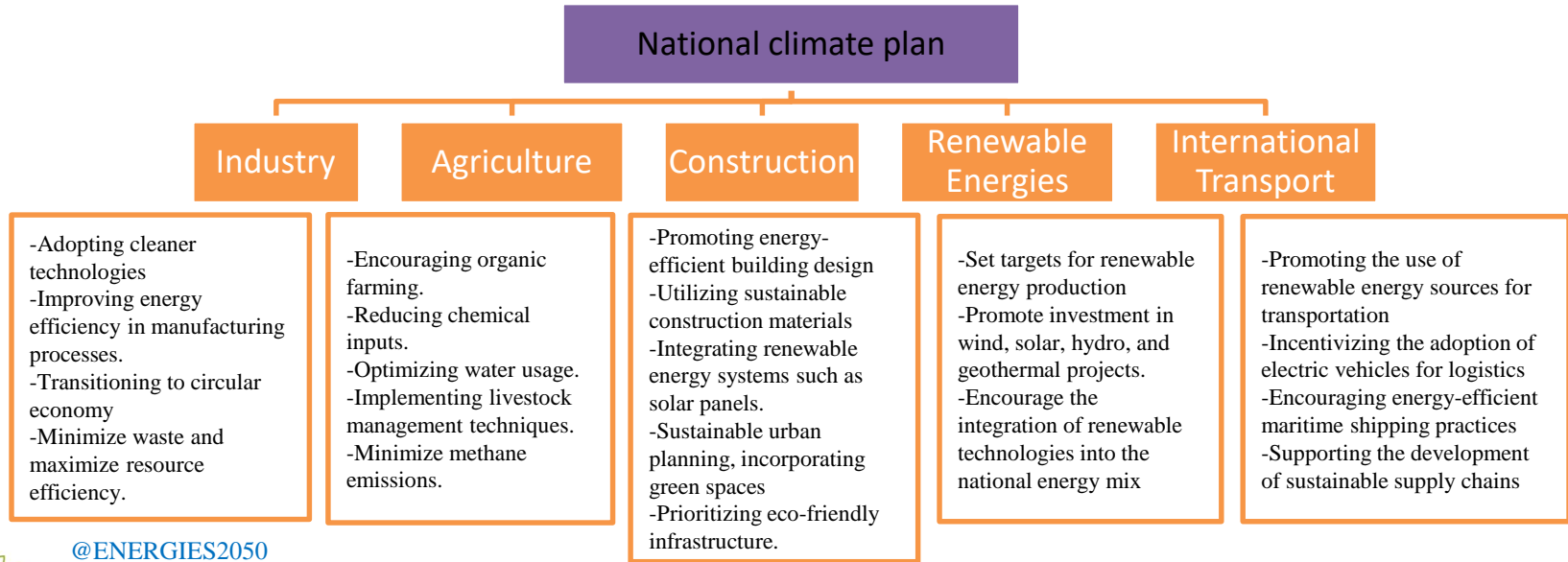
Incentives and Financial Support: The national climate plan typically includes financial incentives and support mechanisms to encourage the adoption of renewable energy technologies. These incentives can include tax credits, subsidies, grants, and low-interest loans. By making renewable energy more financially attractive, the plan helps to overcome the initial cost barriers associated with transitioning from fossil fuels.

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II. What is a multilevel climate governance?

3. National climate governance

National climate plans play a crucial role in addressing climate change by outlining strategies that encompass various sectors of the economy. Let's explore how national climate plans highlight key sectors such as industry, agriculture, construction, renewable energies, and international transport, while also incorporating incentives and financial support.



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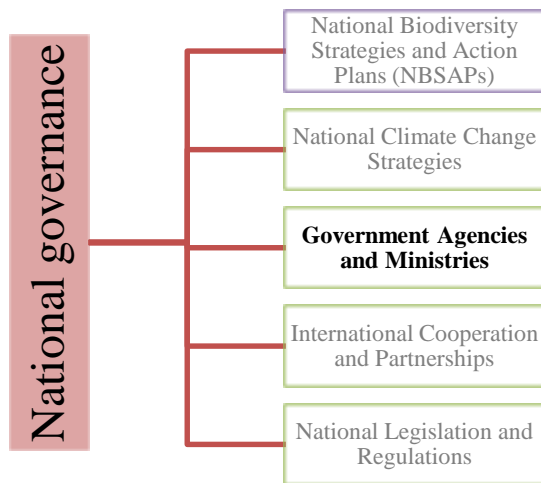
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Policy Development: Establish frameworks, laws, and regulations that promote sustainable practices, set emission reduction targets, and protect biodiversity hotspots.

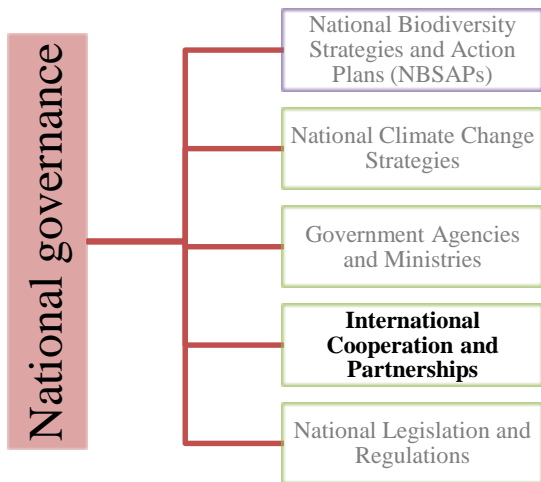
International Commitments: Take international commitments to reduce greenhouse gas emissions, preserve biodiversity, and promote sustainable development globally.

Climate Change Mitigation: Implement measures to reduce greenhouse gas emissions and mitigate climate change. This includes promoting renewable energy sources, improving energy efficiency in industries and buildings, adopting cleaner transportation systems, and supporting research and development of low-carbon technologies. Governments also establish emission reduction targets and monitor progress towards meeting these targets.

Climate Change Adaptation: Develop strategies and plans to adapt to the impacts of climate change. This involves identifying vulnerabilities, assessing risks, and implementing measures to enhance resilience in sectors such as agriculture, water resources, infrastructure, and coastal areas. Adaptation efforts may include building climate-resilient infrastructure, implementing early warning systems, and facilitating community-based adaptation initiatives.

II. What is a multilevel climate governance?

3. National climate governance



Governments participate in international agreements, such as the Paris Agreement on climate change and the Convention on Biological Diversity and collaborate with other nations to address global environmental challenges. They make commitments to reduce greenhouse gas emissions, enhance climate resilience, and protect biodiversity.

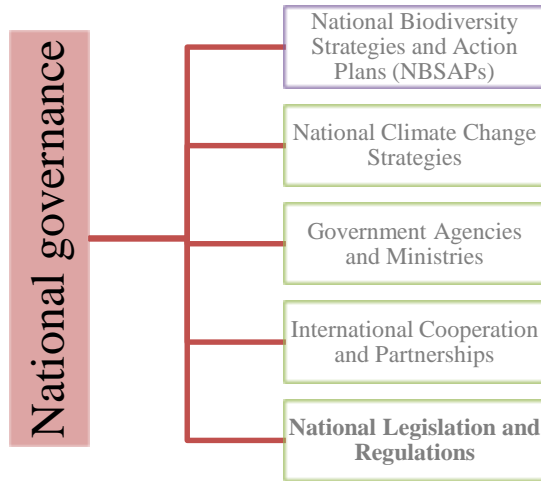
International organizations can play an important role in helping to reduce environmental impacts by **contributing to agenda-setting**, capacity building, as well as **managing and linking** scientific networks to intergovernmental or governmental processes.

The goal of international cooperation is to **reduce human pressure on sustainability** and orienting this activity toward a more harmonious relationship between meeting human needs and environmental quality. In the process of **encouraging collaboration**, it is important to understand that the positions of the stakeholders are born out of specific social and political contexts. The views and positions of the stakeholders are shaped by this context and ultimately inform the compromises that are necessary to gain political support.

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II. What is a multilevel climate governance?

3. National climate governance



Governments enact laws and regulations to enforce environmental standards, promote sustainable practices, and protect natural resources. This includes legislation on emissions reduction, renewable energy promotion, sustainable land use, wildlife protection, and environmental impact assessment. Governments monitor compliance, enforce penalties for violations, and establish mechanisms for public participation in decision-making processes.

Creating framework laws, regulations or public policies on climate change: these processes can generate dialogue and consultations that may inform the development and regulation of standards. They regulate climate governance at the national level and set out duties and rights that people can claim on climate action. For example, to create Peru's framework law on climate change and its regulations, dialogues (promoted by the Ministry of the Environment and different organizations) were held with multiple actors and sectors, including young people.

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II. What is a multilevel climate governance?

4. Local realities

The respect of international climate agreements is a crucial issue for the protection of the environment and the fight against climate change. To ensure effective action, international climate agreements require rigorous implementation at the national, regional and local levels.

National governments can work with local governments to develop greenhouse gas emission reduction strategies that reflect local needs and priorities. To meet the targets for reducing greenhouse gas emissions set out in such agreements, local authorities must enact practical policies and measures. Regional and municipal administrations have the authority to implement measures that encourage sustainable transportation, renewable energy, and reduction of greenhouse gas emissions across key industries.



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II. What is a multilevel climate governance?

4. Local realities

Local and territorial strategies, action and initiatives play a crucial role in addressing climate change and biodiversity loss. These actions are often implemented at the regional, city, or community level and contribute to the overall efforts to achieve global goals. Furthermore, territorial strategies are typically developed through a participatory and iterative process that involves various stakeholders and takes into account the unique characteristics and needs of a specific region. Here are the key steps involved in creating territorial strategies:

- **Stakeholder Identification:** Identify the relevant stakeholders who should be involved in the strategy development process. This may include local government officials, community representatives, businesses, civil society organizations, academic institutions, and other key actors.
- **Diagnosis and Analysis:** Conduct a comprehensive analysis of the territorial context, including socio-economic, environmental, and demographic factors. Assess the strengths, weaknesses, opportunities, and threats of the region. This analysis helps identify the challenges, assets, and potential development pathways.
- **Vision and Objectives:** Establish a shared vision for the future development of the territory. Define specific objectives that reflect the desired outcomes and address the identified challenges. These objectives should align with regional, national, and international development frameworks and priorities
- **Action Plan Development:** Based on the identified objectives, develop an action plan that outlines the strategies, activities, and projects to achieve the desired outcomes. The action plan should include clear timelines, responsible parties, and indicators to measure progress.



II. What is a multilevel climate governance?

4. Local realities

Examples of local strategy and governance

The local Agenda 21

The Local Agenda 21 is a program that emerged from the United Nations' Agenda 21, which was adopted at the Earth Summit in 1992. It focuses on sustainable development at the local level and encourages local governments to develop action plans and strategies to address environmental, social, and economic challenges within their communities. It promotes collaboration and engagement among local government officials, community representatives, NGOs, businesses, and other stakeholders. It encourages participation in decision-making, planning, and implementation of sustainable development initiatives. Furthermore, it serves as a strategic frameworks to guide local policies, programs, and projects. These plans address various issues, such as waste management, energy efficiency, transportation, biodiversity conservation, social inclusion, and economic development.

The PCAET (France) or Climate local Plan (such as Government of Mayor in EU)

The PCAET (Plan Climat-Air-Énergie Territorial) plays a significant role in local governance by providing a framework for addressing climate change, air quality, and energy issues at the territorial level. It is a strategic document that guides the actions and policies of local authorities to achieve sustainable development and climate objectives. Moreover, the role of this plan is to define an action plan that outlines the measures, projects, and initiatives to be implemented to achieve the stated objectives. This includes identifying priority sectors, setting emission reduction targets, promoting renewable energy, improving energy efficiency, and enhancing air quality.



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II. What is a multilevel climate governance?

4. Local realities

Civil society

Civil society plays a pivotal role in our collective efforts to address climate change and improve multilevel governance. Its active participation and engagement are crucial in alerting, implementing, and mobilizing actions that promote greater ambition and ensure transparency and accountability in public decision-making processes.

Civil society serves as a critical counterweight to balance the interests of various stakeholders, including governments and corporations, and advocate for the protection of the environment and the well-being of communities. Through their expertise, advocacy, and grassroots movements, civil society organizations contribute to shaping policies, raising awareness, and holding decision-makers accountable for their actions.

In conclusion, civil society plays a vital role in increasing ambition, improving public decisions, and enhancing multilevel governance in the context of climate change. Its active involvement, alertness, implementation efforts, mobilization, and advocacy bring about positive change and foster a more sustainable and equitable future. By supporting civil society initiatives and actively participating as engaged citizens, we can collectively accelerate the transition to a low-carbon, resilient society while ensuring the protection of our planet and the well-being of present and future generations.

II. What is a multilevel climate governance?

4. Local realities

Conclusion

The evolution of the national framework for local climate-energy planning marks a significant milestone in our collective journey toward a sustainable and resilient future. This framework acknowledges the essential role that local communities play in addressing climate change and empowers them to take meaningful action. By understanding the evolution of this framework, we can appreciate the progress made in recognizing the importance of local planning, integrating climate and energy considerations, and fostering community engagement.

The evolution of the national framework also reflects the continuous improvement and flexibility needed in addressing climate change. As our understanding of the issue deepens, new technologies emerge, and societal needs evolve, the framework adapts to ensure its relevance and effectiveness. We can engage in local planning processes, advocate for ambitious targets, and contribute our ideas and talents to finding innovative solutions. Moreover, we can educate ourselves and others, raise awareness, and foster a sense of urgency about the need for climate action.

III. Net Mitigation - Industrialized vs. Developing Countries

1. Introduction

In this chapter, we're going to talk about something called net mitigation.

What is Mitigation?

It's all about how countries work together to reduce the amount of greenhouse gases we release into the atmosphere. Today, we'll focus on the differences between industrialized and developing countries in this process. We'll also learn about the principle of shared but differentiated responsibility and why it's important. So, let's dive in and explore this topic together!

III. Net Mitigation - Industrialized vs. Developing Countries

2. Working Together for a Greener Future: Net Mitigation and Shared Responsibilities

So, net mitigation is a fancy term that means reducing the total amount of greenhouse gas emissions. Different countries contribute to emissions in different ways, and it's important that we all work together to address climate change.

Industrialized countries, which are more developed and have historically contributed a lot to greenhouse gas emissions, have a greater responsibility to take action. They have been working on reducing emissions by using cleaner energy sources, being more efficient with energy, and implementing regulations to limit pollution.

On the other hand, **developing countries** face their own challenges. They are still working on building infrastructure and improving their economies. They also need to find ways to develop while minimizing their emissions. That's where **the principle of shared but differentiated responsibility** comes in. It recognizes that all countries have a responsibility to act, but it also acknowledges that some countries need more support. Industrialized countries have to provide assistance to help developing countries with their own mitigation efforts. This includes sharing technology, providing financial support, and helping them build capacity to tackle climate change.

III. Net Mitigation - Industrialized vs. Developing Countries

2. Working Together for a Greener Future: Net Mitigation and Shared Responsibilities

Remember the Paris Agreement?

This agreement which was agreed upon by countries all around the world, also recognizes the shared but differentiated responsibility principle. It encourages every country to set their own goals for reducing emissions, called Nationally Determined Contributions (NDCs). This way, each country can consider their unique circumstances and work towards reducing emissions in a way that fits their needs and aspirations.

What's a NDC ?

Here's how it works -> They're an important part of global efforts to combat climate change. NDCs are like personal goals that countries set for themselves to reduce greenhouse gas emissions and build a more sustainable future. So, let's dive into this topic and explore how NDCs can make a positive impact on our planet! They focus on reducing greenhouse gas emissions, adapting to climate change impacts, and supporting sustainable development. NDCs empower each country to take responsibility and play their part in addressing the global challenge of climate change.

III. Net Mitigation - Industrialized vs. Developing Countries

2. Working Together for a Greener Future: Net Mitigation and Shared Responsibilities

So, net mitigation is all about reducing greenhouse gas emissions worldwide. Industrialized countries, having contributed a lot to emissions in the past, have a bigger responsibility to act. They have been making progress by using cleaner energy and implementing regulations. Developing countries face their own challenges and need support to develop sustainably while minimizing their emissions. The principle of shared but differentiated responsibility helps ensure fairness and cooperation.

Good news !! By working together and sharing resources, we can make a difference in addressing climate change.

As students, you can contribute to the NDCs by raising awareness, adopting sustainable practices in our daily lives, and advocating for climate action. By understanding the importance of NDCs and taking action, we can help create a better and greener future for ourselves and generations to come. So, let's embrace the power of NDCs and work together to make a positive impact on our planet. Together, we can build a sustainable and resilient world that we are proud to inherit.

III. Net Mitigation - Industrialized vs. Developing Countries

3. Adaptation: Embracing Resilience for a Changing World

In this part, we're going to talk about an important aspect of addressing climate change: **Adaptation**.

While we've to make efforts to reduce greenhouse gas emissions through mitigation, it's equally important to prepare for the changes that are already happening and will continue to occur. Adaptation focuses on building resilience and finding ways to cope with the impacts of climate change. So, let's dive into this topic and explore why adaptation is crucial in creating a sustainable and secure future.

As our planet experiences the effects of climate change, we witness shifts in weather patterns, rising sea levels, extreme weather events, and changes in ecosystems. These changes pose significant challenges to our communities, economies, and natural resources. Adaptation is about proactively preparing for and managing these challenges.

Adaptation involves adjusting and finding innovative solutions to cope with climate change impacts.

It encompasses various aspects, such as strengthening infrastructure to withstand extreme weather events, developing early warning systems for natural disasters, protecting biodiversity and ecosystems, and implementing water and agriculture management strategies that consider changing conditions.



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III. Net Mitigation - Industrialized vs. Developing Countries

3. Adaptation: Embracing Resilience for a Changing World

One of the key principles of adaptation is building resilience. Resilience means being able to bounce back and recover from disturbances or changes. It involves enhancing the capacity of communities, systems, and natural resources to withstand and adapt to climate-related impacts.

By investing in resilience-building measures, we can reduce vulnerabilities and protect ourselves from the risks associated with climate change. Furthermore, adaptation is not just a task for governments and organizations; it requires the involvement of individuals, communities, and businesses. Everyone has a role to play in adapting to the changing climate. This can involve adopting sustainable practices in our daily lives, conserving water and energy, supporting local initiatives, and promoting community resilience through education and awareness.

While adaptation is crucial, it's important to remember that it does not replace the need for mitigation efforts. Mitigation aims to reduce greenhouse gas emissions to prevent further climate change. However, given the existing and projected impacts of climate change, adaptation is necessary to address the changes that are already underway.



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III. Net Mitigation - Industrialized vs. Developing Countries

3. Adaptation: Embracing Resilience for a Changing World

In conclusion, adaptation plays a vital role in our response to climate change. It involves preparing for and managing the impacts that are already occurring and will continue to intensify.

Through adaptation, we build resilience, protect communities and ecosystems, and find innovative solutions to the challenges posed by climate change.

As we strive for a sustainable future, it's essential to continue efforts in both adaptation and mitigation. By combining these approaches, we can create a more resilient and secure world for ourselves and future generations. Let's embrace adaptation as an integral part of our journey towards a sustainable and thriving planet.

Remember, each one of us has the power to contribute to adaptation efforts in our own unique ways. Together, we can make a difference and shape a future that is better equipped to face the challenges of a changing climate.



IV. Climate change & biodiversity: Urban environment

1. Acting within the governance ecosystem

How different levels of governance should effectively address the Climate Crisis.



Cities and territories are at the forefront of the climate agenda

Source: <https://globalriskinsights.com/2021/07/the-role-of-cities-in-climate-governance/>

IV. Climate change & biodiversity: Urban environment

1. Acting within the governance ecosystem

Areas where cities can enhance sustainability include:

- **Mobility:** Cities may promote bicycle and scooter use by building segregated bike paths. They might also offer bike rentals, increase shuttles to transport hubs and initiate walkability programmes. Moreover, cities could electrify urban vehicle fleets by subsidizing car purchases through deals with car companies.
- **Energy efficiency:** Cities can curtail energy consumption through smart building programmes. They may provide tax breaks and subsidies for building renovations and incentivise domestic generation sources like solar panels and geothermal pumps.
- **Green growth:** The urban green transition could bolster growth and provide payoffs at the national level. According to the [OECD](#), green urban growth could lower the costs associated with national environmental targets through improved transportation and land-use. A [World Economic Forum](#) report suggests such initiatives can attract multinational firms committed to net-zero targets.



IV. Climate change & biodiversity: Urban environment

2. Cities & Biodiversity

Climate change impact on urban area:

The impacts of climate change are often more pronounced in urban areas, particularly due to the **urban heat island effect**, increased risk of **flooding** and **reduced air quality**. Strategies to adapt to the impacts can be put forward by the cities, such as implementing urban drainage systems, promoting urban greening, creating cooling zones, and planning land use according to climate risks.

The importance of biodiversity

Biodiversity has become a major issue in the organization of the implementation of international climate agreements at the local and territorial level, and cities are increasingly seeking to promote the presence of nature in the city to strengthen their resilience to the impacts of climate change and improve the quality of life of their citizens.

IV. Climate change & biodiversity: Urban environment

2. Cities & Biodiversity



“Nature-based solutions involve the protection, restoration or management of natural and semi-natural ecosystems; the sustainable management of aquatic systems and working lands such as croplands or timberlands; or the creation of novel ecosystems in and around cities or across the wider landscape. People and nature, together (beige band), co-produce outcomes which benefit society (blue band) and, in turn, the ecosystems on which people depend (blue arrows). While the ultimate goal of NbS is to support sustainable development, including human health and wellbeing, the ecosystems that provide NbS must be healthy and functional if these benefits are to be sustained over the long-term. Hence, to qualify as a NbS, an action must sustainably provide one or more benefits for people while causing no loss of biodiversity or ecological integrity compared to the pre-intervention state. “

Source: <https://www.naturebasedsolutionsinitiative.org/what-are-nature-based-solutions/>

IV. Climate change & biodiversity: Urban environment

2. Cities & Biodiversity – About resilience

Working with nature to **strengthen urban resilience** can be cost-effective for addressing climate adaptation and mitigation while bringing out broader benefits for biodiversity, communities, and the local economy.

Nature-based solutions like urban park development and river restoration are found to lead to an **estimated 67% increase in species richness**. Achieving both resilience and biodiversity outcomes requires an integrated approach covering protection (local habitats that are still in good ecological conditions), restoration (of degraded ecosystems), or creation of new interventions if needed (Figure 2). These NBS need to be purposefully planned, designed, monitored, and maintained. Below are some practical steps for maximizing the biodiversity outcomes of an NBS.

Moreover, nature in the city is not only a question of biodiversity, it also concerns **the quality of life** of city dwellers and the services provided by biodiversity that contribute to the sustainability of urban life. This is why urban biodiversity is important because it also **provides ecosystem services** and contributes to the quality of life of citizens.



Source: <https://blogs.worldbank.org/sustainablecities/nature-based-solutions-resilient-cities-and-restoring-local-biodiversity>

IV. Climate change & biodiversity: Urban environment

2. Cities & Biodiversity – About Integration strategies

Today, cities are at the dawn of a new era. In fact, if we talk about the biodiversity in the urban area, this increase interest to city dwellers and public authorities, who see many benefits in urban biodiversity: quality of life, economic, social and educational tools, solutions to global warming...

This work requires taking into account, protecting and developing biodiversity in the city in a sustainable way while integrating the social and economic aspects of the city. Moreover, nature in the city is not only a question of biodiversity, it also concerns the quality of life of city dwellers and the services provided by biodiversity that contribute to the sustainability of urban life.

IV. Climate change & biodiversity: Urban environment

2. Cities & Biodiversity – About Integration strategies

We can mention different approaches:

- **The ecosystem approach**, which aims to understand the interactions between the biotic and abiotic elements of an ecosystem. This approach makes it possible to consider the impacts of urbanization on ecosystems and to promote practices aimed at maintaining or restoring their functioning.
- **The ecological resilience approach**, which considers the capacity of ecosystems to resist disturbances and adapt to environmental changes. This approach promotes practices to strengthen the resilience of urban ecosystems to the impacts of climate change.
- **The integrated natural resource management approach**, which aims to coordinate the management of natural resources (such as water, soil, biodiversity) to ensure their sustainability. This approach promotes the coordinated management of natural resources in cities, taking into account their interdependence and their role in providing ecosystem services.



Ecosystem-based approaches (IUCN, 2020)

Source: https://tu-dresden.de/bu/umwelt/cipsem/unep-unesco-bmu/aktuelles-kursjahr/sc84?set_language=en

IV. Climate change & biodiversity: Urban environment

3. Examples around the world – Inspiring initiatives

The **High Line in New York City** is a park built on an elevated railway line, which has become a haven for plants and wildlife in the midst of a bustling urban environment.

This project is a unique urban park that was built on a disused elevated railway line on Manhattan's west side. The park has been praised for its innovative design, which incorporates many features that promote biodiversity and serve as a nature solution for the city.

One of the key features of the High Line that promotes biodiversity is its extensive planting of native plants and grasses. The park is home to over 500 species of plants, many of which are native to the region. These plants provide habitat and food for a wide range of insects, birds, and other wildlife, helping to support local biodiversity. In addition to its plantings, the High Line also incorporates a number of design features that serve as nature solutions for the city.

Source: <http://www.newyorkhotellbokning.se/top-sightseeing/>



Urban parks and green spaces



IV. Climate change & biodiversity: Urban environment

3. Examples around the world – Inspiring initiatives

The **Bosco Verticale in Milan, Italy**, translates to "Vertical Forest," is a pair of residential towers in Milan, Italy, that are covered in a total of 900 trees and over 20,000 plants. The towers have been designed as a nature solution for the city, providing a unique and innovative way to promote biodiversity in an urban environment.

Moreover, the trees and plants on the towers help to create a microclimate, improving air quality and reducing the urban heat island effect. They also provide habitat for birds and insects, helping to support local biodiversity. Additionally, the towers include rainwater harvesting and irrigation systems, which help to conserve water and reduce the impact of the development on local ecosystems.



Green roofs and walls



Source: <https://www.dailymail.co.uk/travel/escape/article-9381807/Our-guide-new-wonders-world-Golden-Bridge-Vietnam-Dubais-Frame.html>

IV. Climat change & biodiversity: Urban environnement

3. Examples around the world – Inspiring initiatives

Urban agriculture

- **The Green Streets program in Toronto, Canada**

The Green Streets program in Toronto, Canada is a community-led initiative that aims to increase the city's green infrastructure and biodiversity. The program involves transforming residential streets into green spaces by planting native plants and trees, and reducing impervious surfaces such as concrete and asphalt. The program was launched in 1991 and has since transformed over 1,000 residential streets in Toronto.

The program is run by the non-profit organization Green Thumbs Growing Kids, which works with local residents to plan and implement the green street projects. The program is supported by the city government, which provides funding and technical assistance.

The Green Streets program has several goals related to biodiversity and ecological health. First, by planting native plants and trees, the program aims to create habitats for pollinators, birds, and other wildlife. Second, by reducing impervious surfaces, the program helps to mitigate the urban heat island effect and reduce stormwater runoff, which can contribute to water pollution and flooding. Third, by engaging local residents in the planning and implementation of the green street projects, the program builds community resilience and enhances social cohesion.



Source: <https://www.toronto.ca/legdocs/mmis/2017/pw/bgrd/backgroundfile-107515.pdf>

IV. Climat change & biodiversity: Urban environnement

3. Examples around the world – Inspiring initiatives

Restoration of degraded urban areas

- **The Los Angeles River Revitalization Project, USA**

Restoring degraded urban areas can provide habitat for wildlife and increase biodiversity in cities. The Los Angeles River Revitalization Project is a multi-decade, multi-billion-dollar effort aimed at restoring the natural habitats and ecosystem of the Los Angeles River.

The project is one of the largest and most ambitious urban river restoration efforts in the United States and is seen as a nature-based solution to combat biodiversity loss in the region. For many years, the Los Angeles River was a concrete-lined channel that served as a flood control mechanism, with little regard for the natural ecosystems and wildlife that once thrived along its banks. The river was also heavily polluted, with sewage, trash, and other pollutants contributing to poor water quality.



Source <https://www.wired.com/2016/08/7-cities-transforming-rivers-blights-beauties/>



Source: <https://wilderutopia.com/sustainability/land/la-river-urban-ecosystem-makeover-in-transition/>

IV. Climat change & biodiversity: Urban environnement

3. Examples around the world – Inspiring initiatives

Community involvement

- **The Urban Biodiversity and Citizen Science project in London, United Kingdoms**

Community involvement is a critical component of efforts to fight against biodiversity loss in urban areas. When local communities are engaged in conservation efforts, they can provide valuable support for biodiversity conservation and management, as well as help to create a sense of shared ownership and responsibility for the natural areas around them.

Community involvement is a vital component of efforts to fight against biodiversity loss in urban areas. By engaging local residents in conservation efforts, it is possible to build support for conservation management, create a sense of shared responsibility for the natural areas around us, and promote a more sustainable and resilient future for our cities and communities.

The Urban Biodiversity and Citizen Science project in London, UK is a community involvement project that aims to fight against biodiversity loss in urban areas. The project uses citizen science methods to engage local residents in monitoring and mapping biodiversity across the city. Through the project, community members are trained to collect data on wildlife populations, habitat quality, and environmental conditions using a range of tools and techniques. This data is then used to inform local conservation management strategies and to build a better understanding of the biodiversity and ecological processes in urban areas.



Source: <https://www.dailymail.co.uk/news/article-9736937/Gardens-Natural-History-Museum-set-transformed-3-2million-National-Lottery-grant.html>

V. Why is the environmental education important ?



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1. Environmental education



1 – Source Chap 6
Environmental education

V. Why is the environmental education important ?

1. Environmental education

Climat change, Biodiversity & Education

Climate change and biodiversity loss are pressing environmental issues that affect our planet in profound ways. Informing students about these issues can inspire them to take action and become environmental stewards who are committed to preserving our planet's natural resources. Integrating climate change and biodiversity education into the school curriculum can be an effective way to do this (Dalelo, A. 2012).

Environmental education is a critical component of building a sustainable future for our planet. By increasing awareness and understanding of environmental issues, we can inspire individuals and communities to take action to protect and conserve the natural world. Climate change and urban biodiversity are two of the most pressing environmental challenges facing our world today. As our global climate continues to shift and human populations grow and urbanize, it is more important than ever to educate young people about these issues and empower them to take action.

Schools are ideal settings for environmental education, as they provide opportunities to reach a wide range of young people and to integrate environmental learning across disciplines. By teaching about climate change and urban biodiversity in schools, we can help students understand the impact of human activities on the environment, and the ways in which we can work to mitigate these impacts.



Source: <https://blogs.ntu.edu.sg/hp331-2013-nurh0030/suggested-solutionsapproches/environemental-education/>

V. Why is the environmental education important ?

1. Environmental education

Raising awareness through innovation

One innovative approach to teaching about climate change and urban biodiversity is through the use of school sheets. These are specially designed worksheets that provide students with a structured framework for collecting and analyzing data on local plant and animal species, as well as climate and soil conditions.

What is a school sheet?

A school sheet, also known as a worksheet or activity sheet, is a printed or digital document provided to students by teachers as a learning resource. It typically contains a set of questions, exercises, or tasks related to a specific topic or subject that students are expected to complete. School sheets serve as supplementary materials to reinforce concepts taught in class, promote critical thinking and problem-solving skills, and provide opportunities for independent or group work. They can be used for practice, assessment, or as a means of organizing and presenting information in a structured format. School sheets can cover a wide range of subjects, including math, science, language arts, social studies, etc.

By engaging in hands-on field work and data collection, students can develop a deeper understanding of the complexity of local ecosystems and the ways in which they are impacted by climate change and human activity.

The school sheets are designed to include a range of activities, including a biodiversity checklist section, a phenology observation section, a soil and habitat analysis section, a climate data section, and a reflection section.

By using these sheets, students can collect and analyze data on a range of environmental variables, and use this data to develop hypotheses about the relationships between climate change, urbanization, and biodiversity loss.

They can also use the data to develop conservation strategies, such as designing green spaces or promoting sustainable urban agriculture.



Source: <https://oceanservice.noaa.gov/>



Source: <https://www.leaf.global/our-programme>

2. From theoretical to practical learning



V. Why is the environmental education important ?

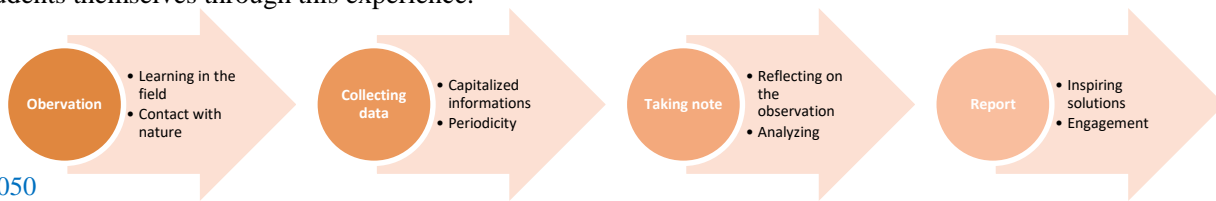
2. From theoretical to practical learning

The pedagogical sheets

- One innovative approach teaching about climate change and urban biodiversity is through experimental field while using school sheets. These are specially designed worksheets that provide students with a structured framework for **collecting and analyzing data on local plant and animal species, as well as climate and soil conditions**. By engaging in hands-on field work and data collection, students can develop a deeper understanding of the complexity of local ecosystems and the ways in which they are impacted by climate change and human activity.
- Through this workshops student will be guide to fill those sheets in every workshop. The purpose of this pedagogical practice is to have the **annual data collect**, as well as experiencing the **evolution** through this observation period.
- Then, students are required to provide their own **report** based on what they observed during this consultation. Those report can be discuss in class and can be **innovative approach** to highlight the **solution and choice proposed** by the students themselves through this experience.



Source: <https://cnre.vt.edu/academics/hands-on-learning/field-experiences.html>



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V. Why is the environmental education important ?

2. From theoretical to practical learning

The pedagogical sheets

- **Climate Data sheet:**

The Climate Data section should be completed at regular intervals throughout the study period, such as **daily or weekly**, to document the climate conditions at each study site over time. By **tracking changes** in temperature, precipitation, wind speed, and other climate factors, students can gain a deeper understanding of how these factors affect plant and animal species in the ecosystem.

They can also identify any **long-term trends or patterns** in the climate data, such as changes in temperature or precipitation levels, and use this information to predict future changes and develop strategies for adaptation and mitigation.

- **Reflection Checklist sheets:**

By using a Reflection Checklist, students can reflect on their **experiences** during the field trip and **consolidate** their learning. They can also identify areas for further research and action, such as developing conservation strategies or advocating for policy changes to address climate change.

By **engaging in reflective practice**, students can develop a **deeper understanding** of the complex relationships between plant biodiversity, climate change, and human actions, and become more **informed and engaged** citizens in the global effort to protect our planet's ecosystems



Source: <https://www.shutterstock.com>

V. Why is the environmental education important ?

2. From theoretical to practical learning

The content of the sheets

- **Soils and habitat analysis sheet**

This sheet could contain a checklist of different soil types and habitat characteristics found in the local area, such as soil moisture, pH, and slope. Students can **record** their observations and **take samples** for further analysis back in the classroom.

The Soil and Habitat Analysis section should be completed at each study site to document the unique characteristics of the soil and habitat. By **tracking** changes in soil type, moisture, and pH level over time, students can gain a deeper understanding of how these factors affect the growth and survival of plant species. Similarly, by **observing** the specific features and species present in the habitat, students can gain insights into the complex interdependencies of plant and animal species in the ecosystem.



VI. Sources



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VI. Sources

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VII. Annexes



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VII. Annexes

- **Sheet content:**

Climate Data sheet:

Details on the content of the Climate Data section of the school sheet:

- **Location:** The location where the climate data was recorded.
- **Date and time:** The date and time when the climate data was recorded, including the year, month, day, and time of day.
- **Temperature:** The temperature at the time of recording, measured using a thermometer or other temperature measuring device.
- **Precipitation:** The amount of precipitation that occurred during the time of recording, measured using a rain gauge or other precipitation measuring device.
- **Wind speed and direction:** The wind speed and direction at the time of recording, measured using an anemometer or other wind measuring device.
- **Humidity:** The relative humidity at the time of recording, measured using a hygrometer or other humidity measuring device.
- **Cloud cover:** The amount of cloud cover at the time of recording, measured as a percentage of the sky covered by clouds.
- **Other observations:** Any other notable observations about the weather or climate at the time of recording.

Location: _____
Date and Time: _____
Temperature: _____
Precipitation: _____
Wind Speed and Direction:

Humidity: _____
Cloud Cover: _____
Other Observations:

Biodiversity sheet

The content of the Biodiversity Checklist section of the school sheet:

- **Species name:** The name of the plant species being observed and recorded.
- **Habitat:** The type of habitat where the plant is located, such as forest, meadow, or wetland.
- **Abundance:** The number of individual plants of that species observed in the area, such as few, some, or many.
- **Height:** The approximate height of the plant, recorded in centimeters or inches.
- **Canopy cover:** The percentage of the area covered by the plant's leaves and branches.
- **Flowering:** The time of year when the plant is flowering, recorded as either early, mid, or late season.
- **Fruit/Seed:** The time of year when the plant is producing fruit or seeds, recorded as either early, mid, or late season.
- **Notes:** Any additional notes about the plant's appearance, behavior, or ecology that may be relevant to the study.

| | Species names | Habitat | Abundance | | | Height | Flowering season | | | Size | Fruit/seed | Notes |
|-------|---------------|---------|-----------|------|------|--------|------------------|-----|------|------|------------|-------|
| | | | Few | Some | Many | | Early | Mid | Late | | | |
| Flora | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Fauna | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Phenology Observation Sheet:

The content of the Phenology Observation section of the school sheet:

- **Date:** The date of the observation.
- **Weather:** The current weather conditions, such as sunny, cloudy, rainy, or windy.
- **Temperature:** The current temperature, recorded in Celsius or Fahrenheit.
- **Leaf buds:** The stage of development of the plant's leaf buds, such as not yet visible, swelling, or fully expanded.
- **Flowers:** The stage of development of the plant's flowers, such as not yet visible, buds, or fully open.
- **Fruits/Seeds:** The stage of development of the plant's fruits or seeds, such as not yet visible, developing, or ripe.
- **Insects:** Any insects observed on or near the plant, recorded by species if possible.
- **Birds:** Any birds observed interacting with the plant, recorded by species if possible.
- **Other Observations:** Any other notable observations or changes in the plant or its surrounding environment.

This table sum up the content of the phenology sheet:

Date: _____

Weather: _____

Temperature: _____

| Observation | Stage of development |
|---------------------------|--------------------------------------------------|
| Leaf buds | Not yet visible / Swelling / Fully expanded |
| Flowers | Not yet visible / Buds / Fully open |
| Fruits/Seeds | Not yet visible / Developing / Ripe |
| Insects | Species and stage of development |
| Birds | Species and behavior observed |
| Other observations | Notable changes in the plant or its surroundings |

Soils and habitat analysis sheet:

Details on the content of the Soil and Habitat Analysis section of the school sheet:

- **Location:** The location of the soil and habitat analysis, such as a specific plot or area within the larger study site.
- **Soil type:** The type of soil at the analysis location, such as sandy, clay, or loamy, as well as the color and texture of the soil.
- **Soil pH:** The pH level of the soil, which can be measured using a soil pH test kit.
- **Soil moisture:** The moisture level of the soil, which can be assessed by feeling the soil and noting whether it is dry, moist, or wet.
- **Habitat features:** The specific features of the habitat at the analysis location, such as trees, shrubs, rocks, or bodies of water.
- **Species observed:** Any plant or animal species observed within the habitat, recorded by species if possible.
- **Other observations:** Any other notable observations about the soil or habitat, such as signs of erosion, human impacts, or the presence of invasive species.

| Species Observed | Plant/Animal | Quantity/Abundance |
|------------------|----------------|--------------------|
| Plants | Species /Names | Num observed |
| Animals | Species name | Num Observed |

Example of a Soil and Habitat Analysis Checklist section that you can use for your project:

Location: _____
Soil Type: _____
Soil Color: _____
Soil Texture: _____
Soil pH: _____
Soil Moisture: _____
Habitat Features: _____

Reflection sheet

This is an example of questions we can include in the reflection section of the sheets:

- What did you observe during your field trip?
- How did your observations compare to your expectations?
- What did you learn about plant biodiversity and climate change?
- How do you think climate change might affect the plants and animals in the ecosystem you studied?
- What actions can you take to help address climate change and protect plant biodiversity?
- What challenges did you encounter during your field trip, and how did you overcome them?
- How can you use the data you collected during your field trip to inform future research and action?

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