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Climate Change Mitigation and Resilience Building

Module 4: Climate Change and Ocean Health

Duration: 1 Hour

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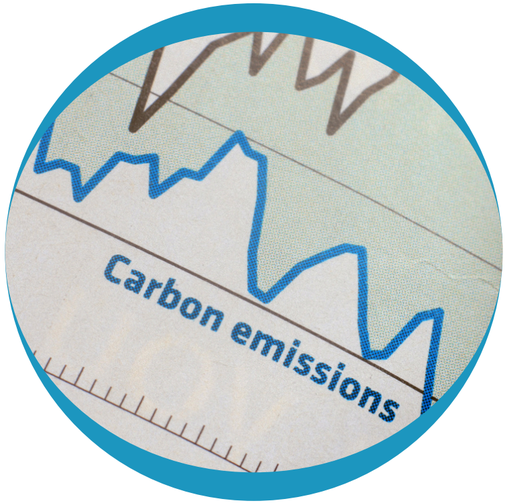
Mitigation Strategies

The sustainability of life on Earth is under increasing threat due to human-induced climate change → Greenhouse gas emissions reductions have been achieved in response to climate actions:

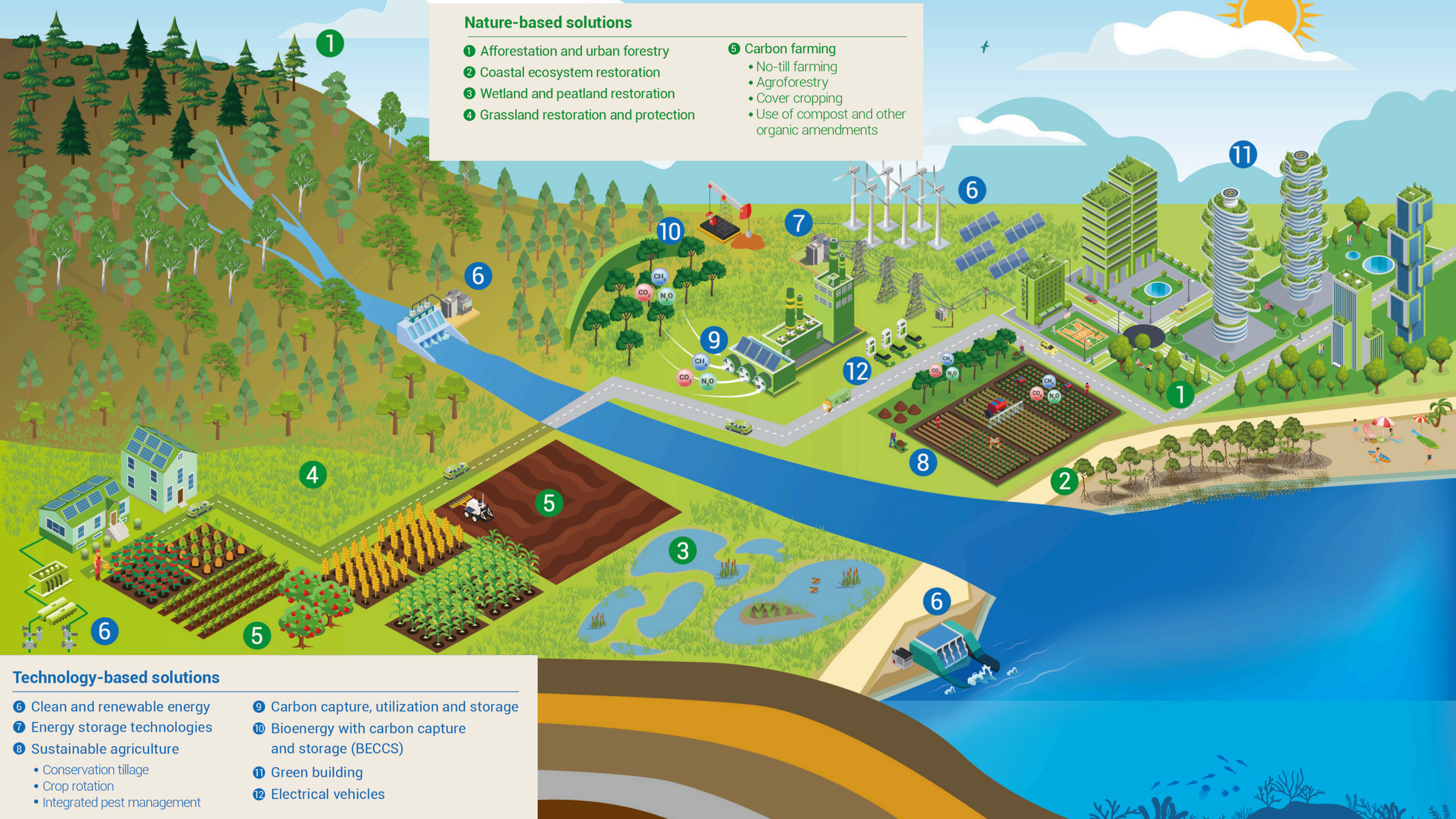
- I.E. **Financial incentives** to promote renewable energy, carbon taxes and emissions trading, removal of fossil fuel subsidies, and promotion of energy efficiency standards.



Carbon Pricing

Renewable Energy

Green Infrastructure


Nature-based solutions
1 Afforestation and urban forestry
2 Coastal ecosystem restoration
3 Wetland and peatland restoration
4 Grassland restoration and protection
5 Carbon farming
• No-till farming
• Agroforestry
• Cover cropping
• Use of compost and other organic amendments
Technology-based solutions
6 Clean and renewable energy
7 Energy storage technologies
8 Sustainable agriculture
• Conservation tillage
• Crop rotation
• Integrated pest management
9 Carbon capture, utilization and storage
10 Bioenergy with carbon capture and storage (BECCS)
11 Green building
12 Electrical vehicles

Nature-based Solutions

Protection and utilization of natural carbon-sink resources are critical strategies to mitigate the impact of climate change. Natural carbon sinks are ecosystems that trap and store carbon dioxide from the atmosphere, such as forests, wetlands, and oceans.

- **Sequester** carbon and **mitigate** climate change impacts

For example, **Wetland restoration** can help to enhance carbon sequestration in coastal ecosystems.

Technology-based Solutions

The expansion of the world population, globalization, and rapid industrialization rely on exploiting and consuming fossil fuels which are hydrocarbon-containing materials.

Emits toxic chemicals, causing harmful effects on ecosystems and human health, and generating GHGs contribute to global warming

- **Renewable energy sources**, such as biomass, geothermal resources, solar, water, and wind, are natural resources that can be converted into these types of clean energy
- **Carbon capture, utilization, and storage** (**CCUS**) is a process that involves capturing CO2 emissions from industrial processes or power generation, utilizing the captured CO2, and storing the remaining CO2 in geological formations or long-term storage facilities.


01
Marine and coastal zone ecosystems:
•Wetland restoration
•Coral reef protection
•Coastal zone land use planning
•Construction of sea walls
•Creation of early warning systems for extreme weather events
02
Natural terrestrial ecosystems:
•Forest conservation and restoration programs
•Reducing human stressors on ecosystems
•Restoring degraded habitats,
•Promoting biodiversity,
•Facilitating ecological connectivity
03
Agricultural ecosystem:
•Crop diversification
•Soil and water conservation
•Organic farming
•Agroforestry adoption
•Integrating pest management
04
Urban ecosystem:
•Implementing and managing urban forests
•Developing rain gardens and bioswales
•Greening walls and roofs
•Increasing street permeability
05
Address and plan for environmental change:
•Zero waste
•Zero net emission
•Zero pollution
•Zero net land degradation
•Risk management planning
CO2

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Resilience

> The capacity of social, economic and environmental systems to cope with a hazardous event, responding in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation.

- Focused on **measures of mitigation and damage protection** from continual or gradual climate impacts and in some cases, extreme weather events.

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What is ecosystem-based adaptation?

I.E. Coastal Flooding

Some coastal ecosystems that can act as cost-effective seawalls combatting the two primary threats of rising seas: **coastal flooding and shoreline disintegration**.

- Mangroves and coral reefs cause:
  - Waves to break before they hit the shore
  - Lowering both the force and height of the swell
  - In the process reducing the likelihood of the sea breaching over into people's land

Town of Kisakasak

- Seawater had been creeping into people's farms and killed the crops. However, villagers fought back and reforested hundreds of hectares of mangroves.

★ SUMMARY

- **Resilience**: The capacity to cope with a hazardous event or trend or disturbance, responding in ways that maintain their essential function while also maintaining the capacity for adaptation, learning and transformation.
- **Mitigation**: The sustainability of life on Earth is under increasing threat due to human-induced climate change. This perilous change in the Earth's climate is caused by increases in carbon dioxide and other greenhouse gases.
  - ⟶ Protection of natural carbon-sink resources
  - ⟶ Technology-based solutions for climate change mitigation
- **Ecosystem-based Adaptation (EbA)**: The strategy of using nature as a defence against climate impacts

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References

"Seawater is coming into our farms and killing the plants." (2019, March 12). UNEP. https://www.unep.org/news-and-stories/story/seawater-coming-our-farms-and-killing-plants

Bahadur, A., & Doczi, J. (2016, January 10). Unlocking resilience through autonomous innovation. https://doi.org/10.13140/RG.2.1.1033.9605

Climate Change Resilience in the Built Environment 2022—Page 20. (2022). Ipaper.io. https://viewer.ipaper.io/worldgbc/climate-change-resilience-in-the-built-environment-2022/?page=20

Environment, U. N. (2021, June 4). Ecosystem-based Adaptation. UNEP - UN Environment Programme. https://www.unep.org/topics/climate-action/adaptation/ecosystem-based-adaptation

IPCC. (2018). Summary for Policymakers. Global Warming of 1.5°C, 3–24. https://doi.org/10.1017/9781009157940.001

Wang, F., Harindintwali, J. D., Wei, K., Shan, Y., Mi, Z., Costello, M. J., Grunwald, S., Feng, Z., Wang, F., Guo, Y., Wu, X., Kumar, P., Matthias Kästner, Feng, X., Kang, S., Li, Z., Fu, Y., Zhao, W., Ouyang, C., & Shen, J. (2023). Climate change: Strategies for mitigation and adaptation. The Innovation Geoscience, 1(1), 100015–100015. https://doi.org/10.59717/j.xinn-geo.2023.100015

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THANK YOU

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