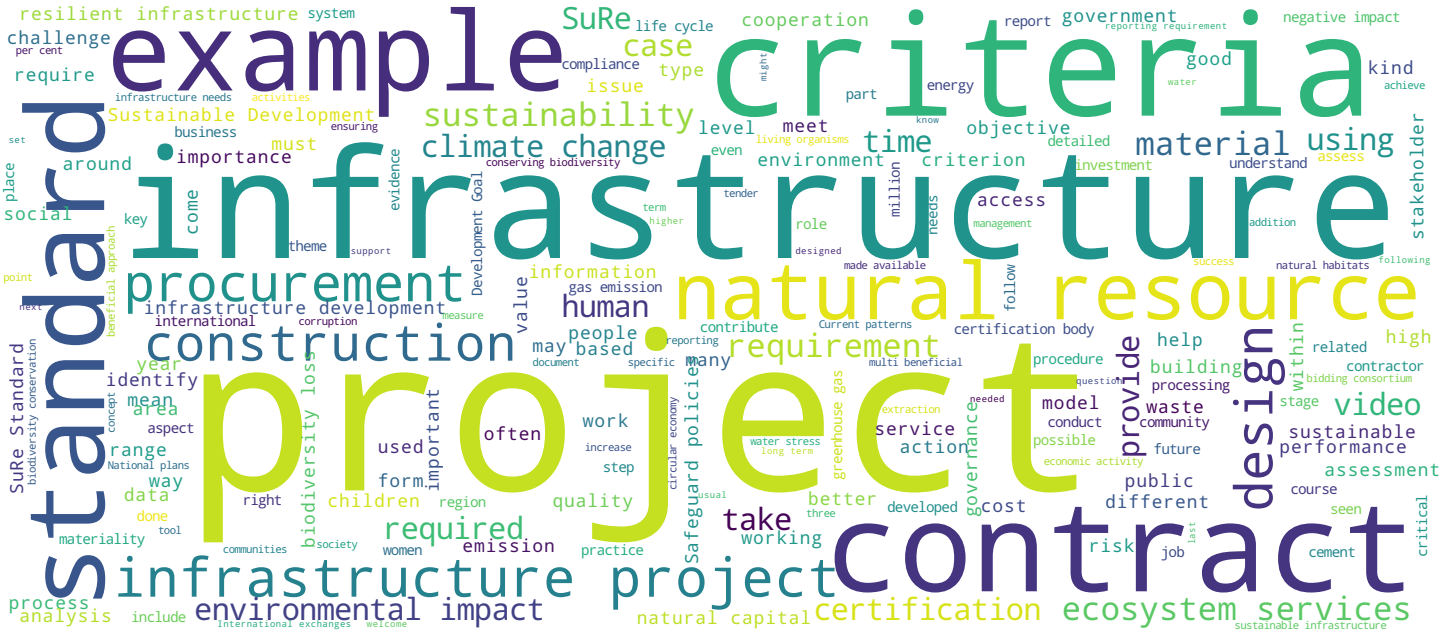
Infrastructure and the Environment (Pt 2)

Building expertise on sustainable and resilient infrastructure

Prof. Dr. Bruno Oberle & Dr. Katharina-Maria Rehfeld

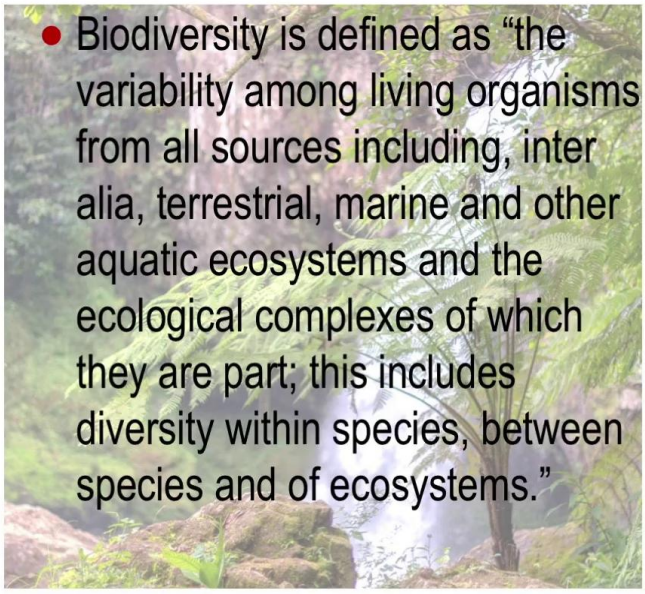


Search MOOC

Video

Biodiversity and Infrastructure: Eco-services

Global21



Biodiversity is defined as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.” The importance of this definition is that it draws attention to the many dimensions of biodiversity.

Notes

Summary

0m 05s

Biodiversity and Infrastructure: Eco-services

Global21

- Every biota can be characterized by its
  - Taxonomy
  - Ecological Diversity
  - Genetic Diversity

It explicitly recognizes that every biota can be characterized by its taxonomic, ecological, and genetic diversity and that the way these dimensions of diversity vary over space and time is a key feature of biodiversity.

Notes

Summary

0m 31s

Biodiversity and Infrastructure: Eco-services

Global21

- Biodiversity includes all ecosystems—managed or unmanaged.

Biodiversity includes all ecosystems—managed or unmanaged. Sometimes biodiversity is presumed to be a relevant feature of only unmanaged ecosystems, such as wildlands, nature preserves, or national parks. This is incorrect. Managed systems—be they plantations, farms, croplands, aquaculture sites, rangelands, or even urban parks and urban ecosystems - have their own biodiversity.

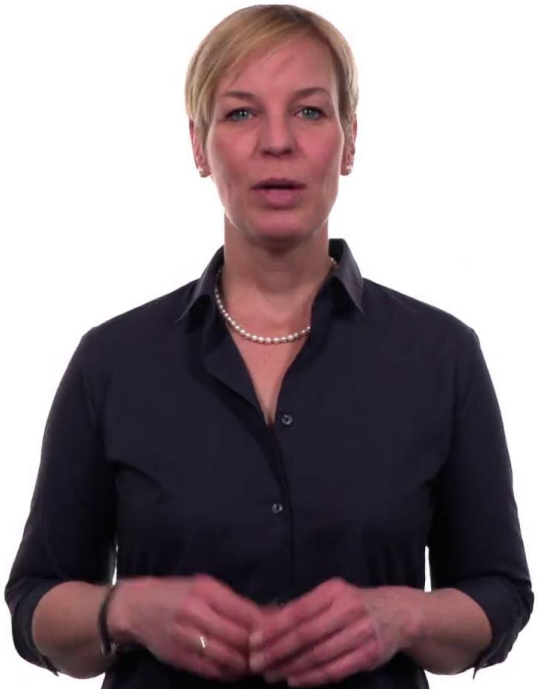
Notes

Summary

0m 48s

Biodiversity and Infrastructure: Eco-services

Global21



- Ecosystem services

The layer of living organisms - the biosphere - through the collective metabolic activities of its innumerable plants, animals, and microbes physically and chemically unites the atmosphere, geosphere, and hydrosphere into one environmental system within which millions of species, including humans, have thrived. Breathable air, potable water, fertile soils, productive lands, bountiful seas, the equitable climate of Earth's recent history, and other ecosystem services are manifestations of the workings of life. It follows that large-scale human influences over this biota have tremendous impacts on human well-being. It also follows that the nature of these impacts, good or bad, is within the power of humans to influence. The Millennium Ecosystem Assessment defined four categories of ecosystem services that contribute to human well-being, each underpinned bybiodiversity: - Provisioning services - for example wild foods, crops, fresh water and plant-derived medicines; - Regulating services - for example filtration of pollutants by wetlands, climate regulation through carbon storage and water cycling, pollination and protection from disasters; - Cultural services - for example recreation, spiritual and aesthetic values, education; - Supporting services - for example soil formation, photosynthesis and nutrient cycling.

Notes

Summary

1m 19s

Biodiversity and Infrastructure: Eco-services

Global21

- The flows of ecosystem services = *Dividend* that society receives from natural capital.

The concepts of ecosystem services and natural capital can help us recognize the many benefits that nature provides. From an economic point of view, the flows of ecosystem services can be seen as the 'dividend' that society receives from natural capital. Maintaining stocks of natural capital allow the sustained provision of future flows of ecosystem services, and thereby help to ensure enduring human well-being.

Notes

Summary

2m 58s

Ecosystem Service	Value
Food, fibre and fuel	Lescuyer (2007) values the provisioning services of Cameroon's forests at US$ 560 for timber, US$ 61 for fuelwood, and US$ 41-70 for non-timber forest products (all values per hectare per year).
Climate regulation	Lescuyer (2007) values climate regulation by tropical forests in Cameroon at US$ 842-2265 per hectare per year.
Water regulation	Yaron (2001) values flood protection by tropical forests in Cameroon at US$ 24 per hectare per year. Van Beukering et al. (2003) estimate the NPV of water supply from the Leuser Ecosystem (comprising approximately 25,000 km^2 of tropical forest) at US$ 2,42 billion.
Groundwater recharge	Kaiser and Roumasset (2002) value the indirect watershed benefits of the 40,000 hectare Ko'olau watershed, in Hawaii, at US$ 1.42-2.63 billion.
Pollination	Priess et al. (2007) value pollination services provided by forests in Sulawesi, Indonesia, at 46 Euros per hectare. Ongoing forest conversion is expected to reduce pollination services and thus coffee yields by up to 18% and net revenues per hectare by up to 14% over the next two decades.
→*Existence values*	Horton et al. (2003) use contingent valuation to estimate the →*willingness to pay* of UK and Italian households for protected areas in the Brazilian Amazon at US$ 46 per hectare per year. Mallawaarachchi et al. (2001) use choice modelling to value natural forests in the Herbert river District of North Queensland at AU$ 18 per hectare per year.

In this table you see a short overview on analyses that tried to estimate the value of ecosystem services. Paus the video to have a more detailed look.

Notes

Summary

3m 25s

Biodiversity and Infrastructure: Eco-services

Global21

SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

Since the beginnings of civilization, developing infrastructure and conserving biodiversity have been at odds. Just as ancient civilizations expanded and fell, in part due to the imbalances they created in the natural habitats and ecosystems that fed and fuelled them, globalized societies today face the same challenges, but greatly exacerbated. Large infrastructure projects are destroying ecosystems from the Mekong to the Amazon. At the same time, infrastructure are key factor in their country's economic development, through the direct and indirect fiscal growth stimulus it can provide. Infrastructure is also crucial for the attainment of the UN Sustainable Development Goals (SDGs) and is recognized as such in SDG 9: "Industry, Innovation & Infrastructure; Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation." At the same time, the conservation of biodiversity underpins all the SDGs, and no long-term development can be envisaged unless the diversity of natural habitats and ecosystems is systematically included in the development, industrial and innovation policies.

Notes

Summary

3m 37s

Biodiversity and Infrastructure: Eco-services

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

Convention on Biological Diversity

This is recognised in SDG 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) and 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss). The Convention on Biological Diversity (CBD), which came into force in 1993, is the global policy framework for action to maintain biodiversity for future generations.

Notes

Summary

4m 47s

If infrastructure development is to make a real contribution to conserving biodiversity, conservation and infrastructure development plans have to intertwine throughout the infrastructure development cycle through: - Assessment of infrastructure needs - Integrated master planning at the appropriate scale - Environmental and social safeguards - Procuring and contracting - Financing - Construction - Operation - Decommissioning Determining infrastructure needs - what public assets and services need to be made available, for whom and by when - is critical, for it questions the need to build assets in the first place. The pivotal question facing policy-makers is “What services do we need to provide for our citizens?” as opposed to ”What infrastructure do we need to finance and build?” For it indeed might be more astute to upgrade existing infrastructure or look at alternative methods of service delivery rather than build new assets from scratch.

Notes

Summary

5m 04s

Biodiversity and Infrastructure: Measures & Policies

Global21

- Safeguard Policies
  - identify & assess
  - implement plans
  - reduce negative impacts
  - enhance positive impacts
  - consulting stakeholders
  - reduce risks

Governments, cities and investors face numerous challenges when they plan or invest in infrastructure: conventional project finance valuation methodologies ignore a range of material risks, intangibles and externalities. Governments and cities seek information on how to maximize economic and social returns of infrastructure projects. Different tools and approaches allow this type of analysis. We will present the Sustainable Asset Valuation (SAVi) in the fourth week of this MOOC. Safeguard policies are designed to identify and assess the potential severity of environmental and social impacts on infrastructure and design, and implement plans to both prevent and reduce negative impacts and enhance the pos-itive ones. Safeguard policies also mandate consultation with stakeholders, which in itself presents important opportunities to reduce financial, construction and operating risks as the construction phase gets off the ground. The most important safeguard policies relate to the scope, development and presentation of an environmental impact assessment (EIA) and its corresponding environmental management plan (EMP). In most countries, the bidding consortium awarded the contract is required to conduct this assessment.

Notes

Summary

6m 12s

Biodiversity and Infrastructure: Measures & Policies

- Sustainability and responsible investment are increasingly integrated in the investment process .

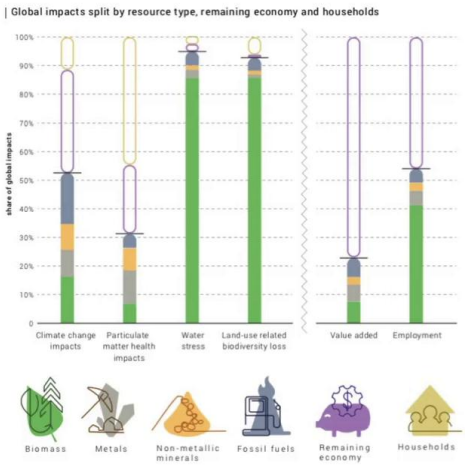
In the case of large projects such as hydroelectric dams, tunnels, motorways and railways, bidding consortiums can be required to conduct a preliminary EIA and include impact prevention and mitigation measures in their bids. The procurement phase is critical to the deployment of sustainable infrastructure, as it encompasses the point at which governments publicly announce that they intend to deploy the design and construction of assets and funding and financing arrangements are in place, and that formal tenders will be launched to identify and contract the bid-der that offers optimum value for money (VfM). Sustainability and responsible investment are increasingly integrated in the investment process of MDBs. Especially in the case of developing countries, MDBs have important leverage when it comes to how the local project is planned and designed. Mainstreaming biodiversity conservation in the project cycle should be a requirement for projects to have access to their capital and to receive any form of assistance. MDBs have a wide range of financial instruments at their disposal beyond loans (e.g., partial credit guarantees, political risk guarantees, liquidity facilities, currency risk management), which could be made available and/or priced differently depending on the environmental foot-print of the project.

Notes

Summary

7m 30s

Infrastructure and natural resources



UNEP (2019): Global Resources Outlook
https://papersmart.unon.org/resolution/uploads/spm_gro19_english_final_18.01.2019.pdf

Current patterns of linear economic activity depend on a permanent throughput of materials that are extracted, traded and processed into goods, and finally disposed of as waste or emissions.

Notes

Summary

8m 51s

Infrastructure and natural resources

Global21

- Over the past five decades
  - global population x 2
  - extraction of materials x 3
  - gross domestic product x 4
- The extraction and processing of natural resources accounts for more than 90 % of our biodiversity loss and water stress and approximately half of our climate change impacts.

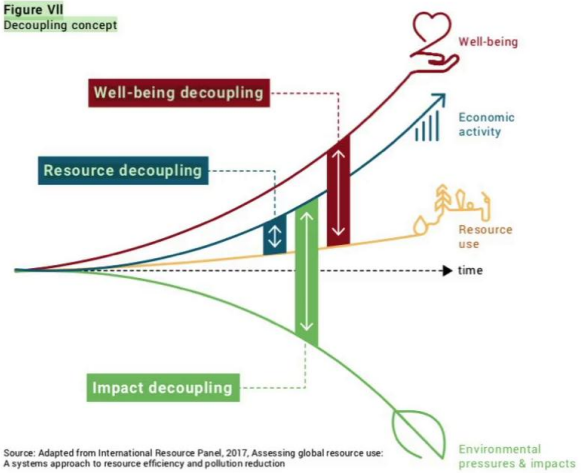
Over the past five decades, our global population has doubled, the extraction of materials has tripled and gross domestic product has quadrupled. The extraction and processing of natural resources has accelerated over the last two decades, and accounts for more than 90 per cent of our biodiversity loss and water stress and approximately half of our climate change impacts. Historical and current patterns of natural resource use are resulting in increasingly negative impacts on the environment and human health. Resource extraction and processing to materials, fuels, and food make up about half of the total global greenhouse gas emissions and more than 90 per cent of biodiversity loss and water stress. The use of natural resources and the related benefits and environmental impacts are unevenly distributed across countries and regions.

Notes

Summary

9m 04s

Figure VII
Decoupling concept



Source: Adapted from International Resource Panel, 2017, Assessing global resource use: A systems approach to resource efficiency and pollution reduction

The decoupling of natural resource use and environmental impacts from economic activity and human well-being is an essential element in the transition to a sustainable future. Achieving decoupling is possible and can deliver substantial social and environmental benefits, including repair of past environmental damage, while also sup- porting economic growth and human well-being. Policy interventions, environmentally sound technologies, sus- tainable financing schemes, capacity-building, and pub- lic–private partnerships can all contribute.

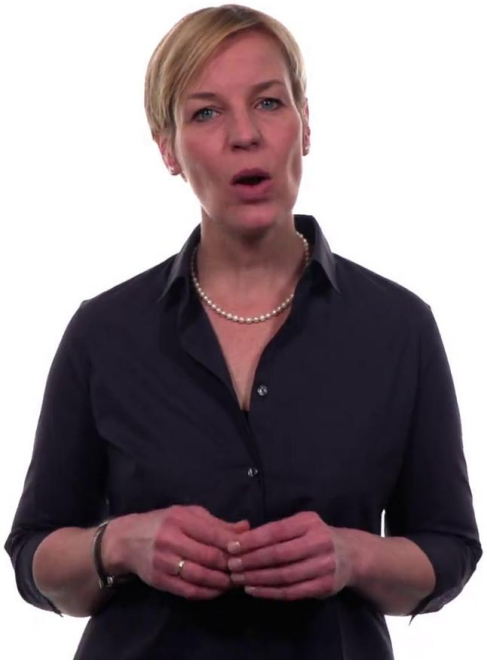
Notes

Summary

9m 56s

Infrastructure and the use of natural resources

Global21



- Indicators and targets
- National plans
- Policy mixes
- Sustainable financing

The multi-beneficial approach includes the following policymaking considerations: - Indicators and targets. Regular reporting on the metrics of resource use and efficiency across all levels of governance can inform policy development. National resource ef- ficiency targets are an important first step, but international targets for sustainable lev- els of global resource consumption are also needed. - National plans. Backed by evidence and analysis and the engagement of stakehold- ers, national plans can identify priorities and lay out a coordinated path to achieving na- tional targets. - Policy mixes. The success of the resource efficiency strategy is contingent on a combi- nation of policy actions – the integration of natural resources legislation with biodiversi- ty and climate policies, for example. - Sustainable financing. Cost estimates for meeting the Sustainable Development Goals and the Paris Agreement commitments run to trillions of dollars per year for the next dec- ade or more.6 Governments can provide tax incentives and bonds for environmental pro- jects, and private sources can provide financing tools that are accessible at the local level. - Unlocking the resistance to change.

Notes

Summary

10m 33s

Infrastructure and the use of natural resources

Global21

- Indicators and targets
- National plans
- Policy mixes
- Sustainable financing
- Unlocking the resistance to change
- Policies for the circular economy
- Leapfrogging

Progress towards sustainability likely entails the phasing out of certain industries and the jobs they provide. Targeted government sup- port in the form of education and training programmes can help people adjust to the changing labour market. The revenue raised from any environmental taxes that support new programmes can help mitigate these and other negative distribution effects. - Policies for the circular economy. The circular economy promotes the retention of value and the reduction of environmental impacts while simultaneously reducing costs and and creating economic opportunities. Policy considerations include establishing an ef- fective infrastructure for waste management and recycling, incentivizing extended product life cycles and intelligent product design, and ensuring that current regula- tions create no barriers to the development or adoption of value-retention processes. - Leapfrogging. Industrializing countries can leapfrog old technologies and bypass the resource-intensive pathway of development paved by high-income, industrialized coun- tries. By using the most advanced technologies they need substantially fewer natural resources to meet their development demands - International exchanges and cooperation.

Notes

Summary

11m 52s

Infrastructure and the use of natural resources

Global21

- Indicators and targets
- National plans
- Policy mixes
- Sustainable financing
- Unlocking the resistance to change
- Policies for the circular economy
- Leapfrogging
- International exchanges and coorperation

In addition to their contributions to the other elements of policymaking, international exchanges and cooperation can help ensure fair competition in international trade. Exchanges and shared experiences can help countries navigate common obstacles, and cooperation can help compensate for une- qual burdens, responsibilities and capabilities.

Notes

Summary

13m 15s

Conclusion

This multi-beneficial approach offers policymakers a range of choices for developing comprehensive strategies to respond effectively to the challenges of what has been a relentless demand for resources. The consequences of that demand are apparent, the stakes are high and the need for action is urgent. But the reasons for hope and optimism are compelling. Infrastructure development, which is mostly driven by population growth and the increasing urbanisation, leads to a threatening of the fundamental parts of the Earth' System. In this video we have especially looked at the relationship between infrastructure and climate chance, biodiversity and the use of natural resources. In the following videos, you will understand why and how sustainable and resilient infrastructure can help to relieve those challenges.

Notes

Summary

13m 37s