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Session 2 - Ecosystem services definitions, concepts, categories, & methods

Dr. Blal Adem Esmail
Institute of Geography | Transformation Metropolitaner Regionen | @PlacesLab | @blal_adem

Guiding questions

- How has the ecosystem services concept evolved?
- How can ecosystem services be defined?
- How can ecosystem services be conceptualized?
- What does the diversity of ecosystem services definitions and concepts mean for decision-making?

- Notes on “**Hands-on Environmental Urban Planning**”

ECOSYSTEM SERVICES

HUMAN WELL-BEING

FLOW

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Defining Human Wellbeing

What are the constituents of human wellbeing for you? List up to 5 keywords...

1. …
2. …
3. …
4. …
5. …

Defining Ecosystem Services

What benefits does nature provide us with? List up to 5 keywords...

1. …
2. …
3. …
4. …
5. …

Your peers ideas of human wellbeing and benefits from nature

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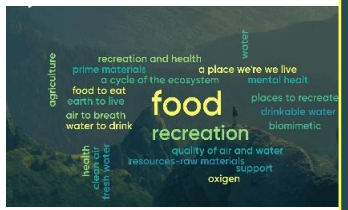
2022

13-15 MSc. Students
Bochum, South Africa

2020

12-12 Ba. Students
Durban, South Africa

2020



6-9 MSc. Students
san Jose, Costa Rica

2019

27- 40 MSc. Students
Stockholm, Sweden

2019

19-22 MSc. Students
Genova, Italy

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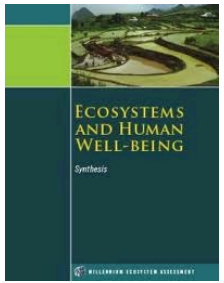
Ecosystem services definitions

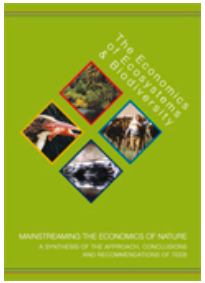
"… the benefits that people obtain from ecosystems" **MA, 2005**

"..the direct & indirect contributions of ecosystems to human well-being" **TEEB, 2010**

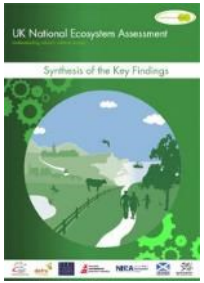
"Nature Contribution to People", **IPBES, 2019**



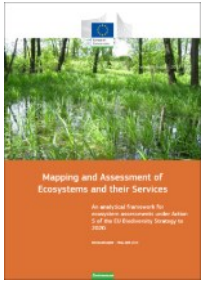
MEA



TEEB

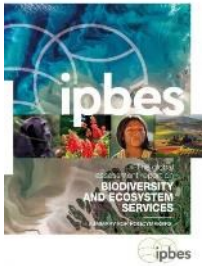


UK NEA



MAES

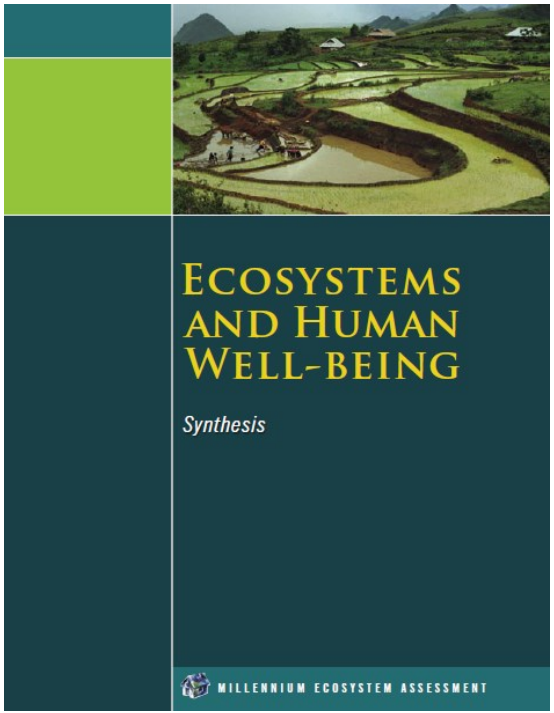
TEEB-DE



IPBES

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

Millennium Ecosystem Assessment 2005

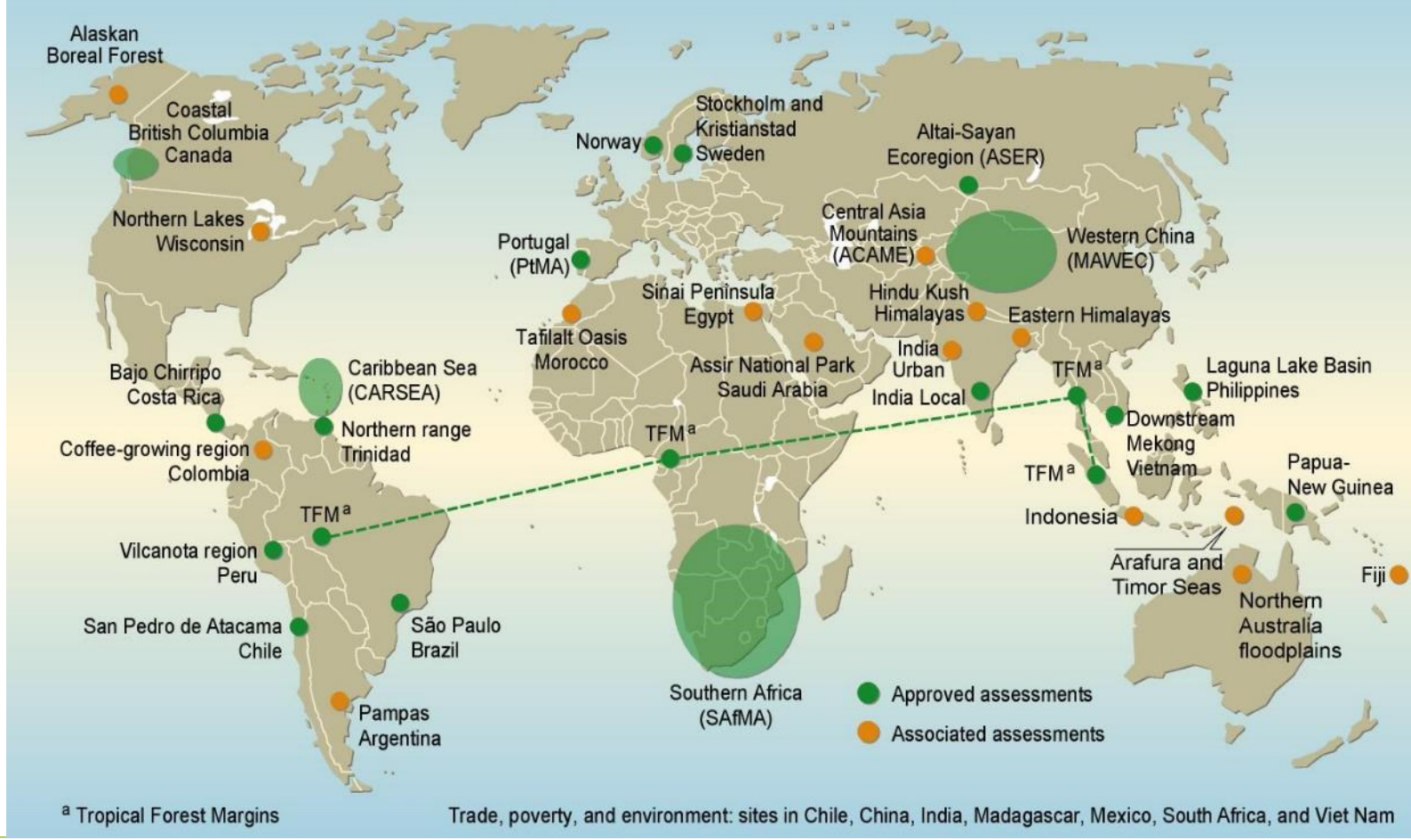


The Millennium Ecosystem Assessment was called for by UN Secretary-General Kofi Annan in **2000**. Governments supported the establishment of the assessment through three international conventions, and the MA was initiated in **2001**.

The MA was coordinated by the UNEP, and it was governed by a multi-stakeholder board that included representatives of international institutions, governments, business, NGOs, and indigenous peoples.

The objective of the MA was to **assess the consequences of ecosystem change for human well-being** and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being.

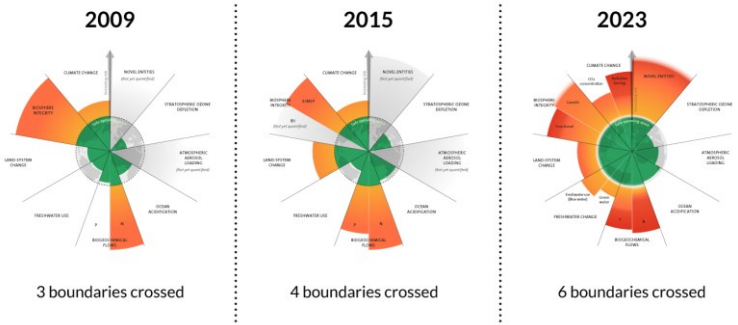
2001 start
1.360 experts
$24 milioni cost
2005 results

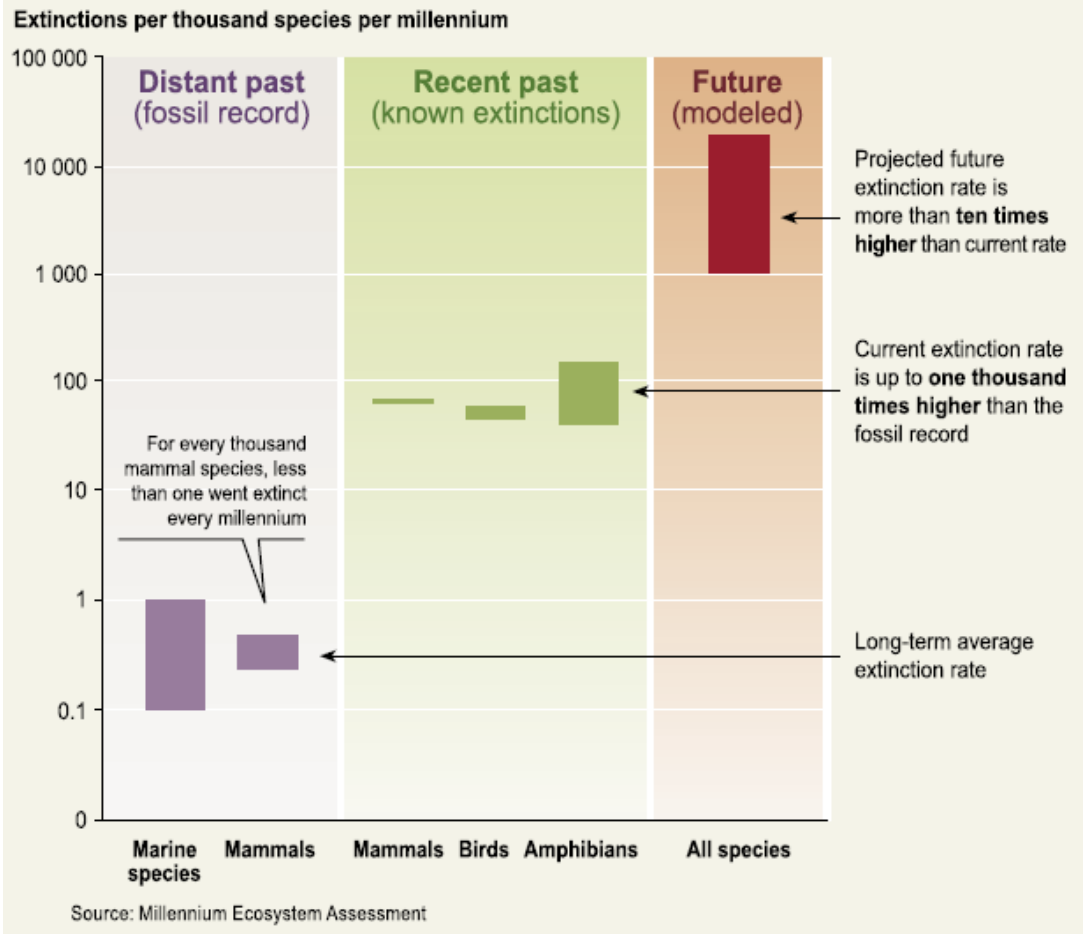


Biodiversity Loss

Current extension rate is **one thousand times higher** than the fossil record

Projected future extension rate is more than **10 times higher than current rate**





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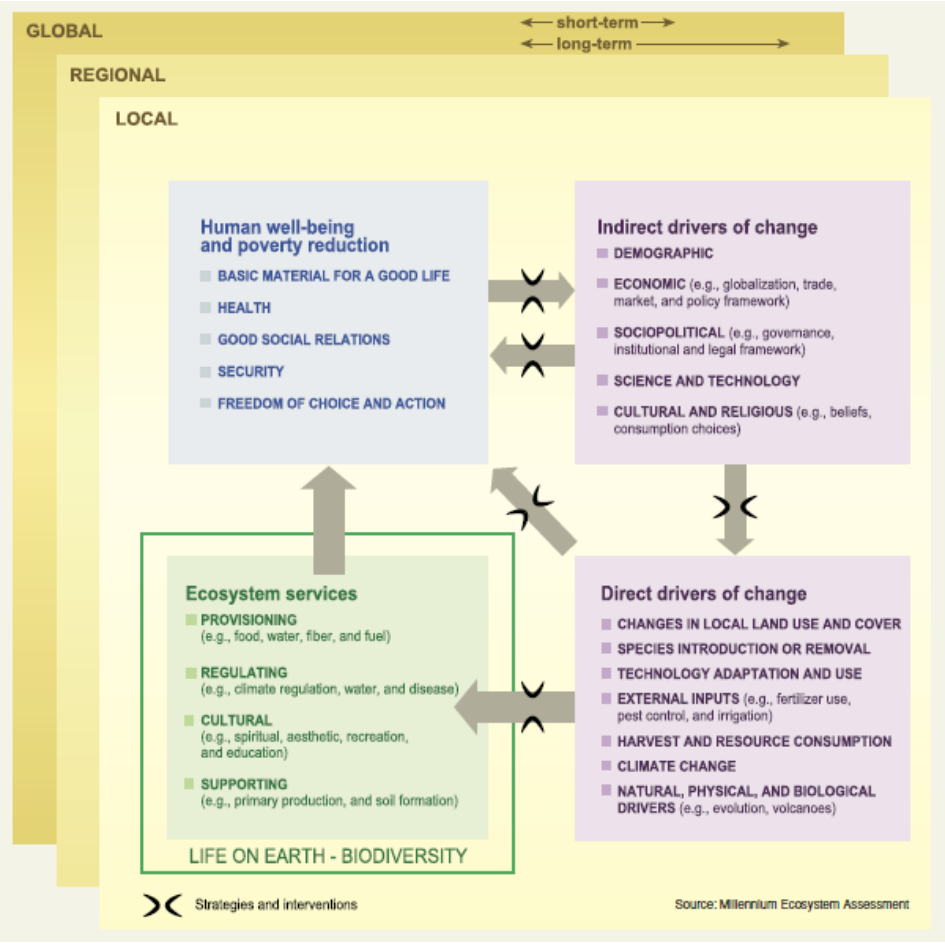
Underling causes

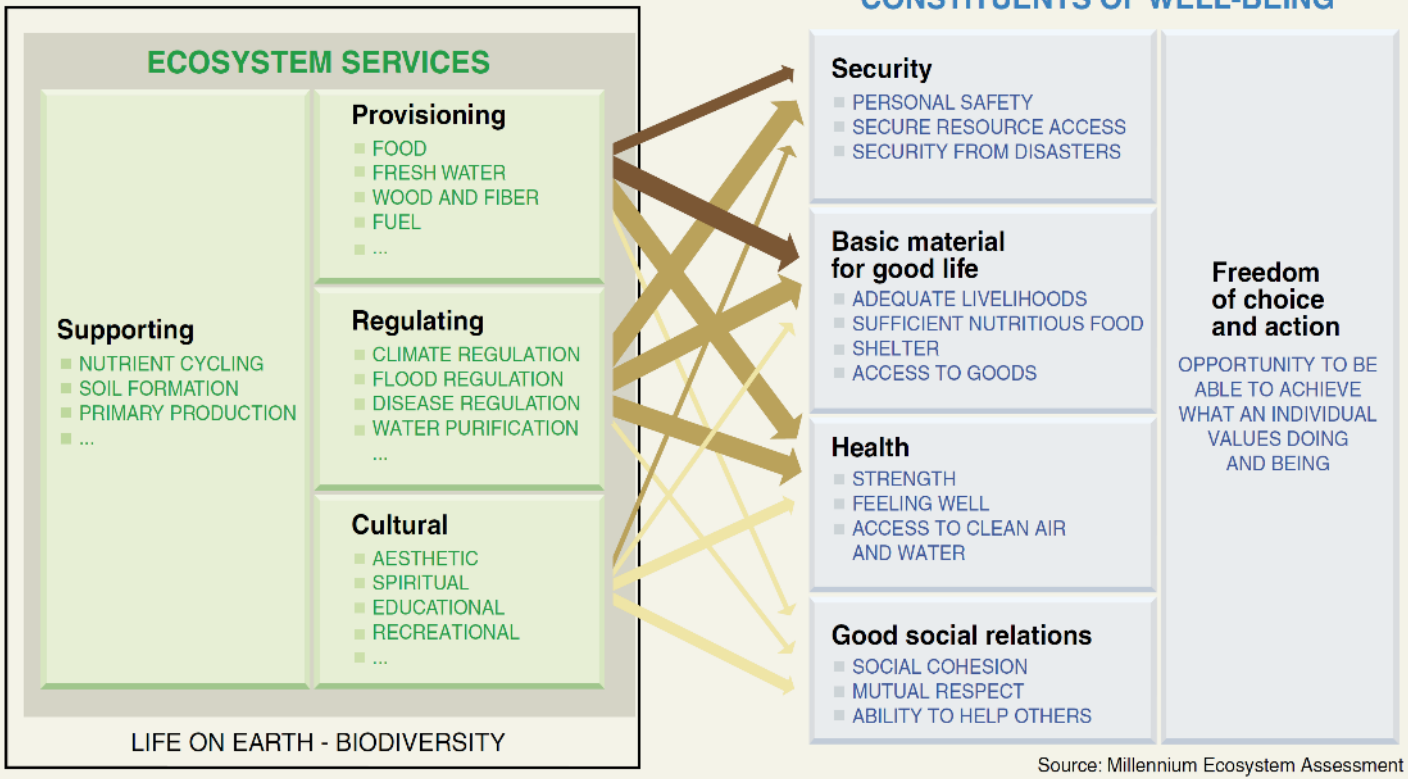
E.g. Direct drivers:

- Changes in local land use and cover
- External inputs
- Climate change
- …

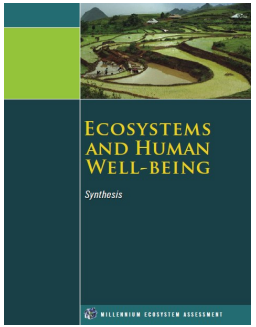
E.g. Indirect drivers:

- Demographic
- Globalization, trade, market, policy
- Beliefs, consumption choice
- ….





Source: Millennium Ecosystem Assessment



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Categories of ES

Four categories:

- Provisioning
- Regulating
- Cultural
- Supporting

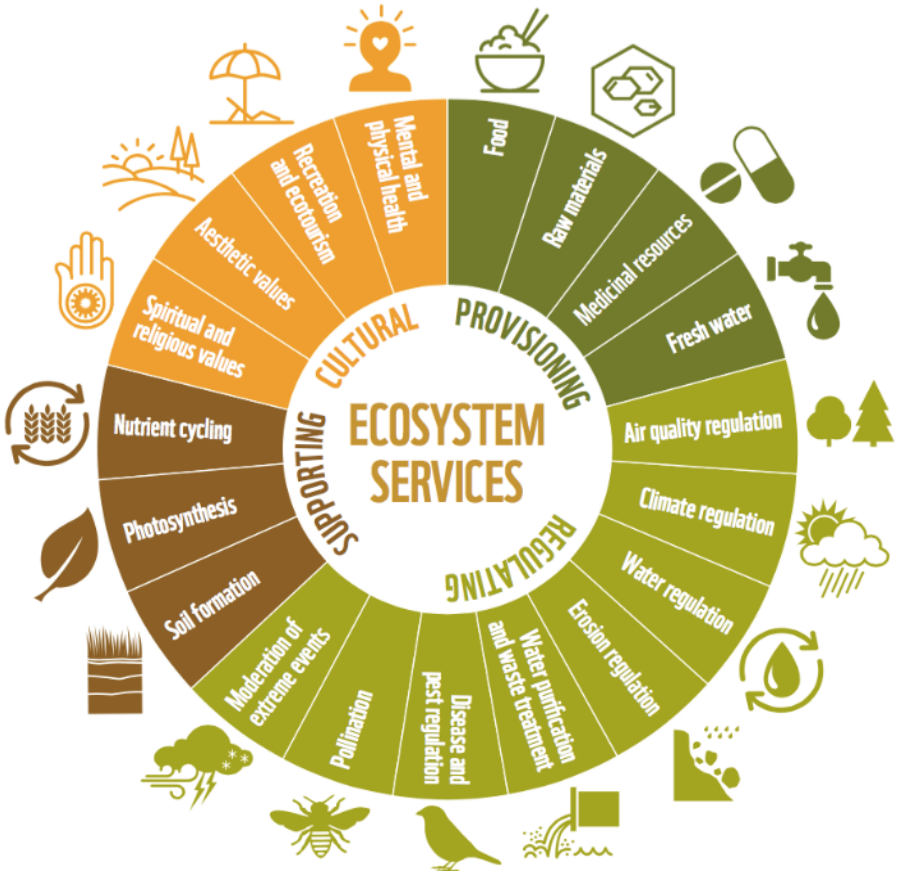


image: wwf.org

Provisioning ES

The goods obtained from ecosystems, including, for example:

- **genetic resources,**
- **food and fiber,**
- **fresh water,**
- **etc.**

image: wwf.org

Regulating of ES

The effects produced by ecosystems in the regulation of environmental and climatic variables:

- control of the quality of environmental components (water, air, soil),
- regulation of water flows,
- control of the spread of diseases,
- limitation of soil erosion,
- etc.

image: wwf.org

Cultural of ES

The cultural ecosystem services include the intangible benefits that people get from contact with nature, including :

- **recreation and aesthetic,**
- **spiritual and psychological benefits**
- **etc.**

image: wwf.org

Supporting ES

The basis for the provision of all other services and define the capacity of ecosystems to provide a habitat suitable for life, ensuring the maintenance of genetic diversity, nutrient recycling and soil formation.

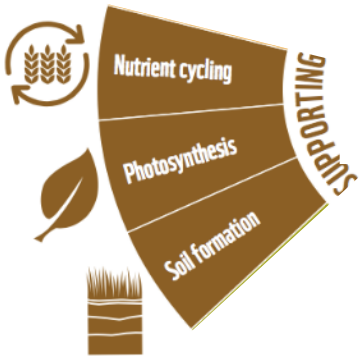
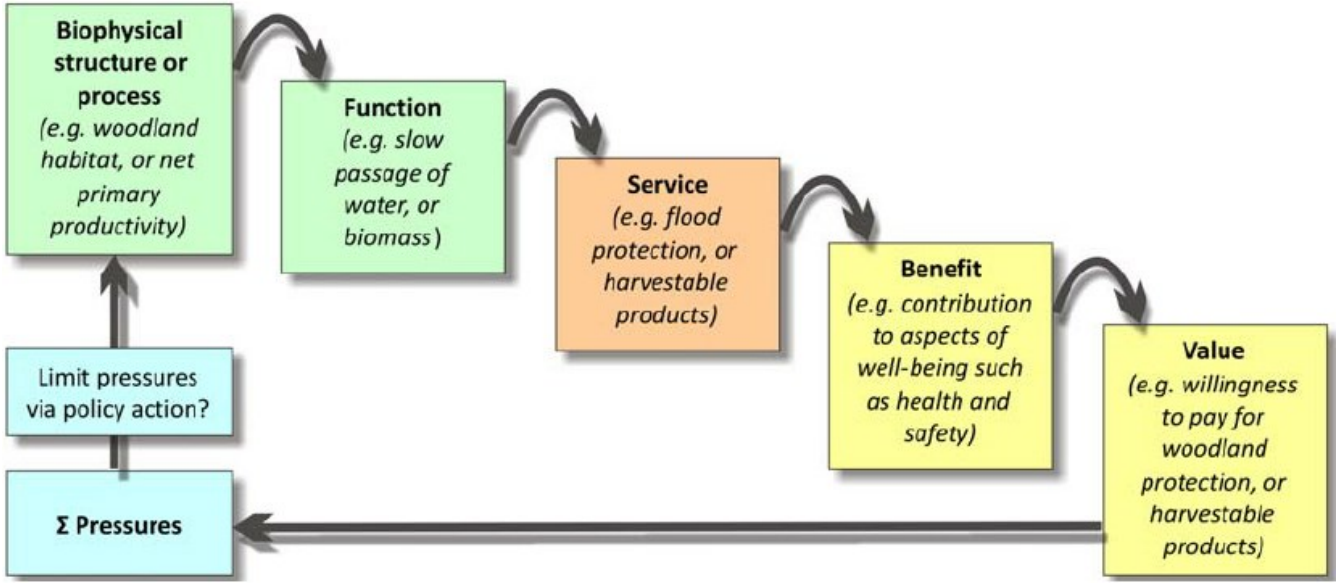


image: wwf.org

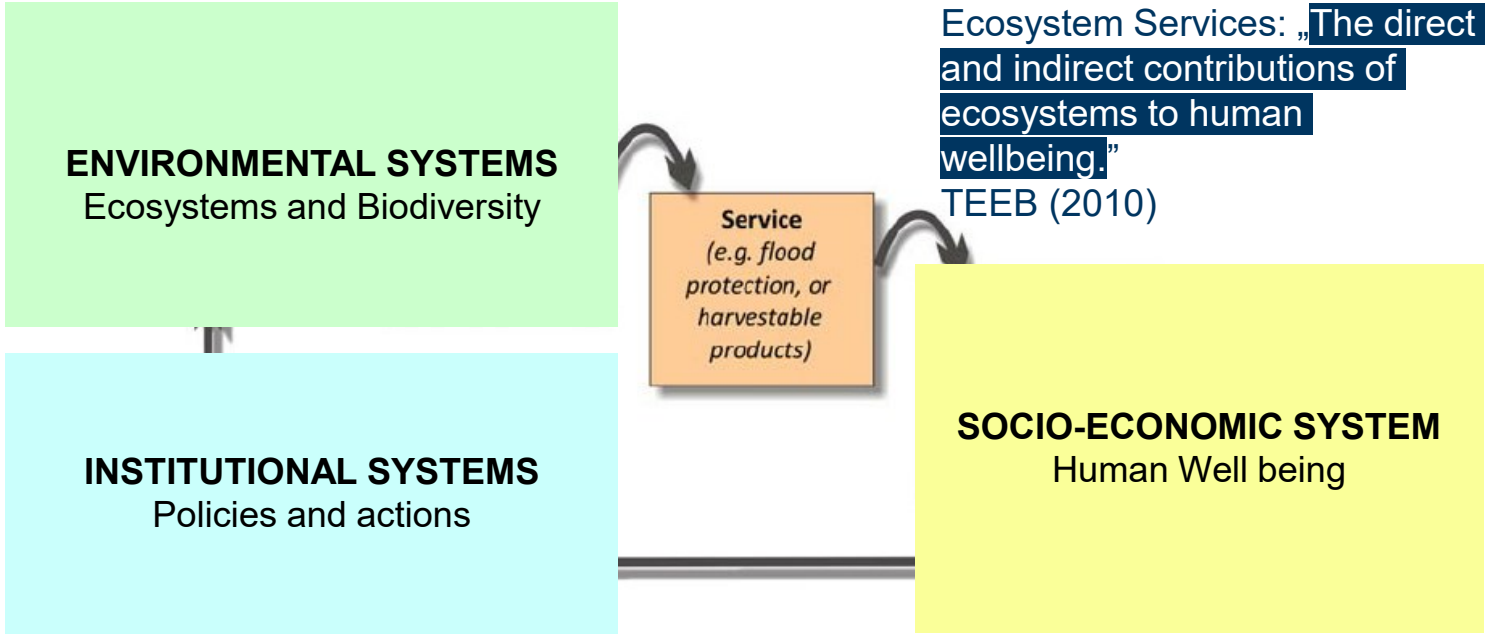
Cascade model

"..the direct & indirect contributions of ecosystems to human well-being" TEEB, 2010



Haines-Young, R., & Potschin, M. (2010). The links between biodiversity, ecosystem services and human well-being. In D. Raffaelli & C. Frid (Eds.), Ecosystems ecology: a new synthesis (pp. 110–139). Cambridge University Press. http://doi.org/10.1017/CBO9780511750458

Cascade model



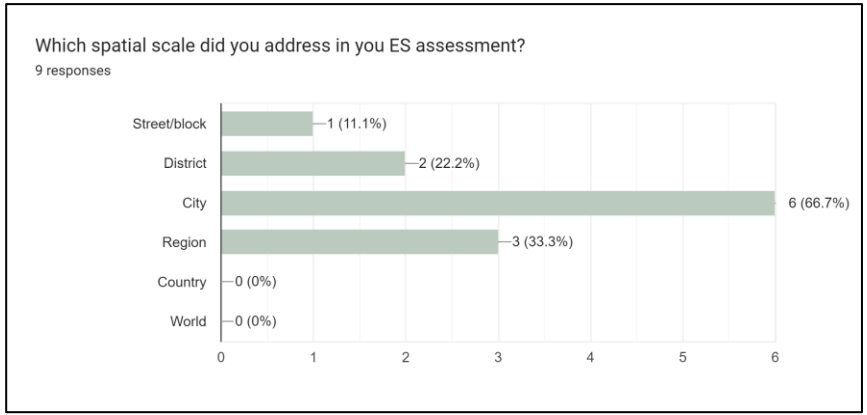
Ecosystem Services: „The direct and indirect contributions of ecosystems to human wellbeing."
TEEB (2010)

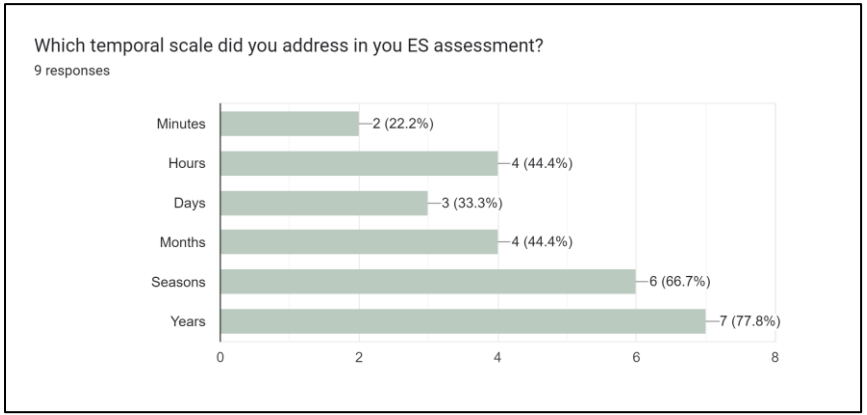
Haines-Young, R., & Potschin, M. (2010). The links between biodiversity, ecosystem services and human well-being. In D. Raffaelli & C. Frid (Eds.), Ecosystems ecology: a new synthesis (pp. 110–139). Cambridge University Press. http://doi.org/10.1017/CBO9780511750458

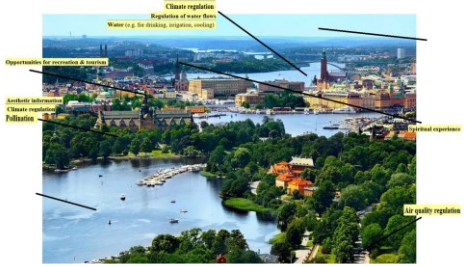
Your assignment: Collages

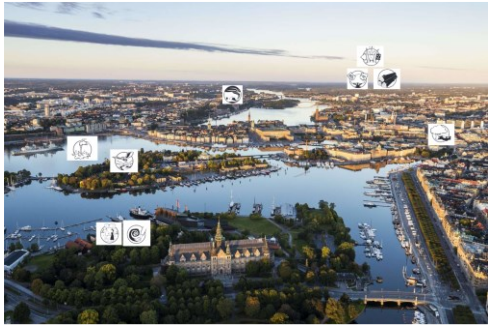
	Provisioning	Regulating	Cultural	Supporting	Spatial scale	Temporal scale
Demir Zerin	4	2	2	2	City	Y
Sefkow Stephan	0	3	0	3	City	Mo, S
May Julius	1	4	3	1	District, City	Mi, Hrs, D, Mo, S, Y
Althaus Leon	3	3	more that 7	3	Region	Mi, Hrs, D, Mo, S, Y
Cullen Richard	6	4	4	4	Street/block, City	Hrs, S
Olegário Gabriel + Alozie Ikechukwu	4	4	4	4	City	Hrs, D, Mo, S, Y
Dahlems Maximilian	2	6	6	5	District	Y
Magin Nils	3	3	2	0	City, Region	S, Y
Lensker Jonas	4	3	3	1	Region	Y
Lee Kwang Joo						
Rosenloecher Thomas						
Total	**24**	**32**	**31**	**23**		

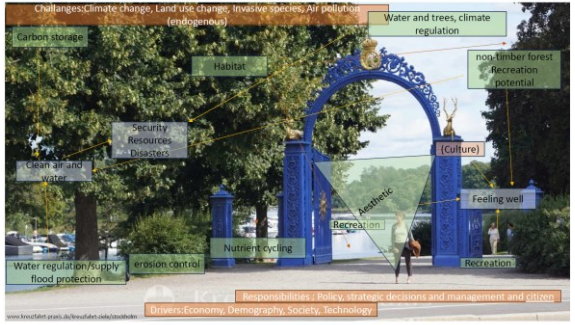
Your assignment: Collages











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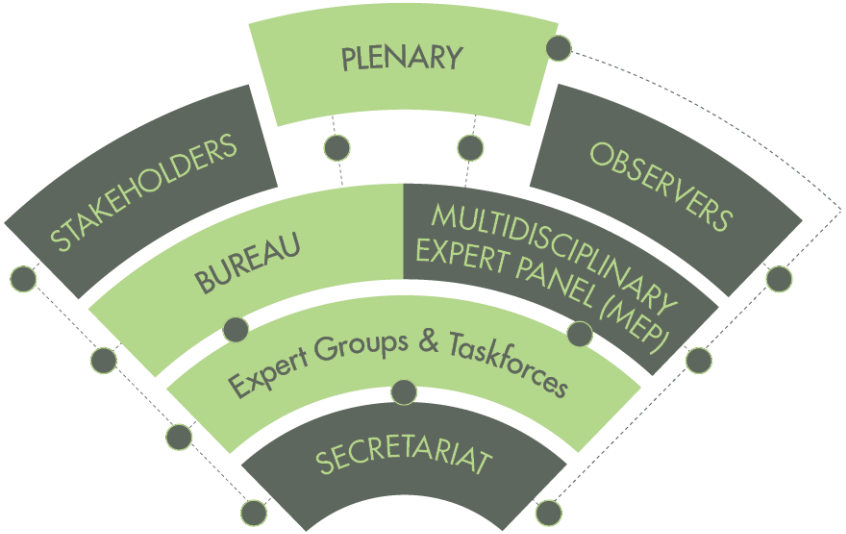
IPBES

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services is an **intergovernmental** organization established to improve the interface between science and policy on issues of **biodiversity** and **ecosystem services**.

Mission: “to strengthen knowledge foundations for better policy through science, for the conservation and sustainable use of Biodiversity, long-term human wellbeing and Sustainable Development”.

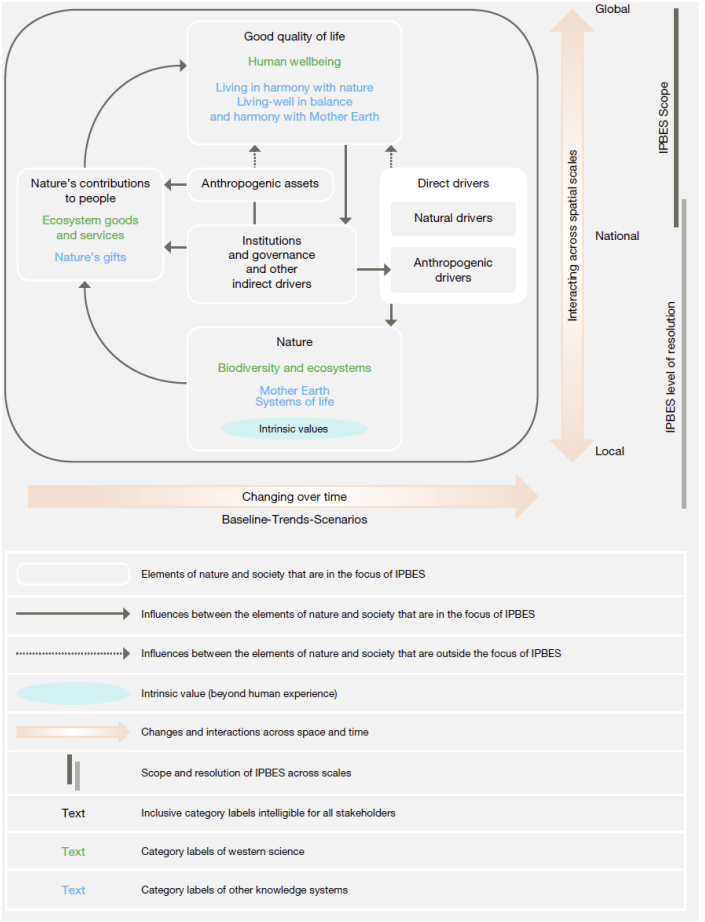


https://ipbes.net/about

The IPBES CF

- A simplified version of the conceptual framework as adopted by the 2nd Meeting of the IPBES Plenary
- Provides structure and comparability to the assessments at different spatial scales, themes, and in different regions.
- Developed through a transparent and participatory process and explicitly considers diverse scientific disciplines, stakeholders, and knowledge systems, including indigenous and local knowledge.

The main elements of the IPBES framework : Nature, Anthropogenic assets (e.g. infrastructure), Nature's contributions to people, Drivers of change, and Good quality of Life.



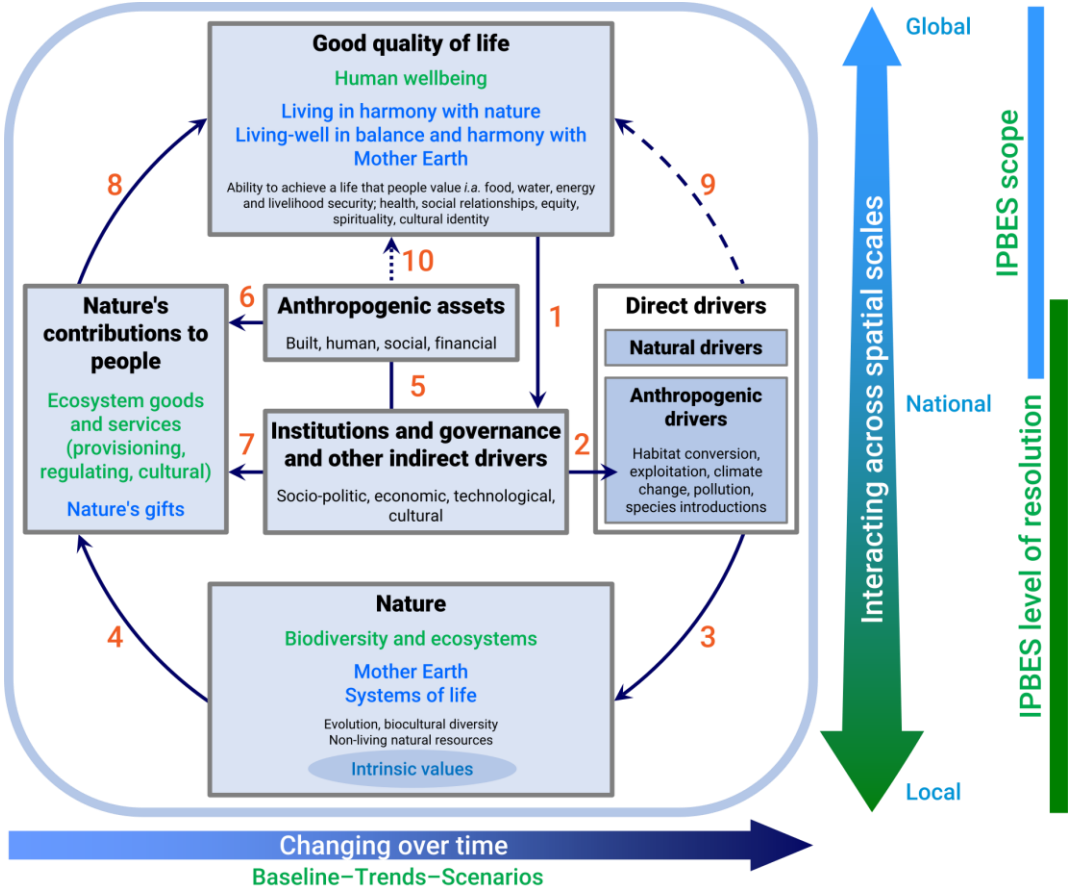
IPBES regional assessment Europe and Central Asia, 2018

Group discussion

Three breakout groups:

- Arrow 1-2-3
- Arrows 4-7
- Arrows 8-10

All reflect on Spatial-temporal scales



Group discussion

Arrow 1: A society's achievement of good quality of life directly influence institutions & governance systems & other indirect drivers

Arrow 2: Institutions and governance systems and other indirect drivers are the root causes of the direct anthropogenic drivers that affect nature

Arrow 3: Direct drivers are the immediate cause of changes in nature

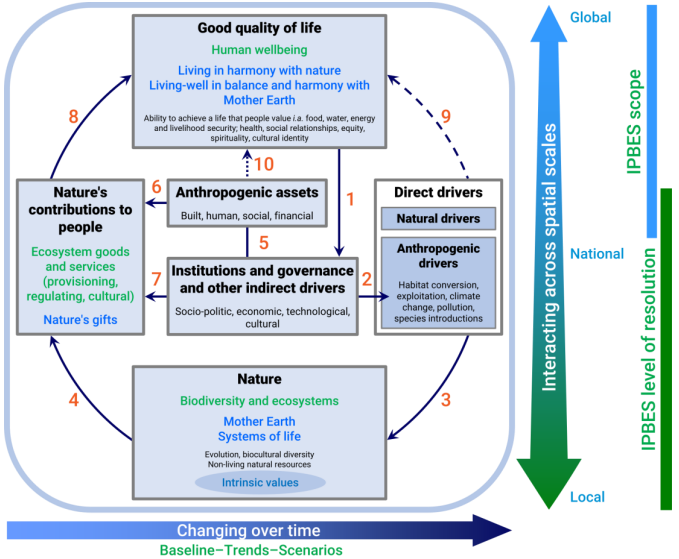
Arrow 4: Direct drivers of change affect the supply of NCPs

Arrow 5, 6, 7: Institutions and governance systems and other indirect drivers affect the interactions and balance between nature and anthropogenic assets

Arrow 8: NCPs affect how people achieve a good quality of life

Arrow 9: Direct drivers can have direct impacts on the quality of life

Arrow 10: Anthropogenic assets directly affect the possibility of achieving a good quality of life through the provision of and access to food, water, energy and livelihood security; health, social relationships, equity, spirituality, and cultural identity



Direct & indirect drivers (IPBES 2018)

Indirect drivers

- Indirect influence on ecosystems and natural capital
- The underlying cause of human activity (DRIVERS)

Direct drivers

- Direct influence or force of change on ecosystems & natural capital, tangible
- Environmental pressures (PRESSURES)

IPBES 2018

Direct drivers

Natural resources extraction	Climate change	Land use change	Pollution	Invasive alien species
• Fishing, hunting • Water • Minerals and fossil fuels	• Change in temperature, precipitation • Change in sea level • Frequency of extreme events • CO2 concentration • Ocean circulation	• Agriculture • Forestry • Protected areas • Traditional uses • Urban development	• Nutrient pollution • Acidification	• Terrestrial and marine • Freshwater



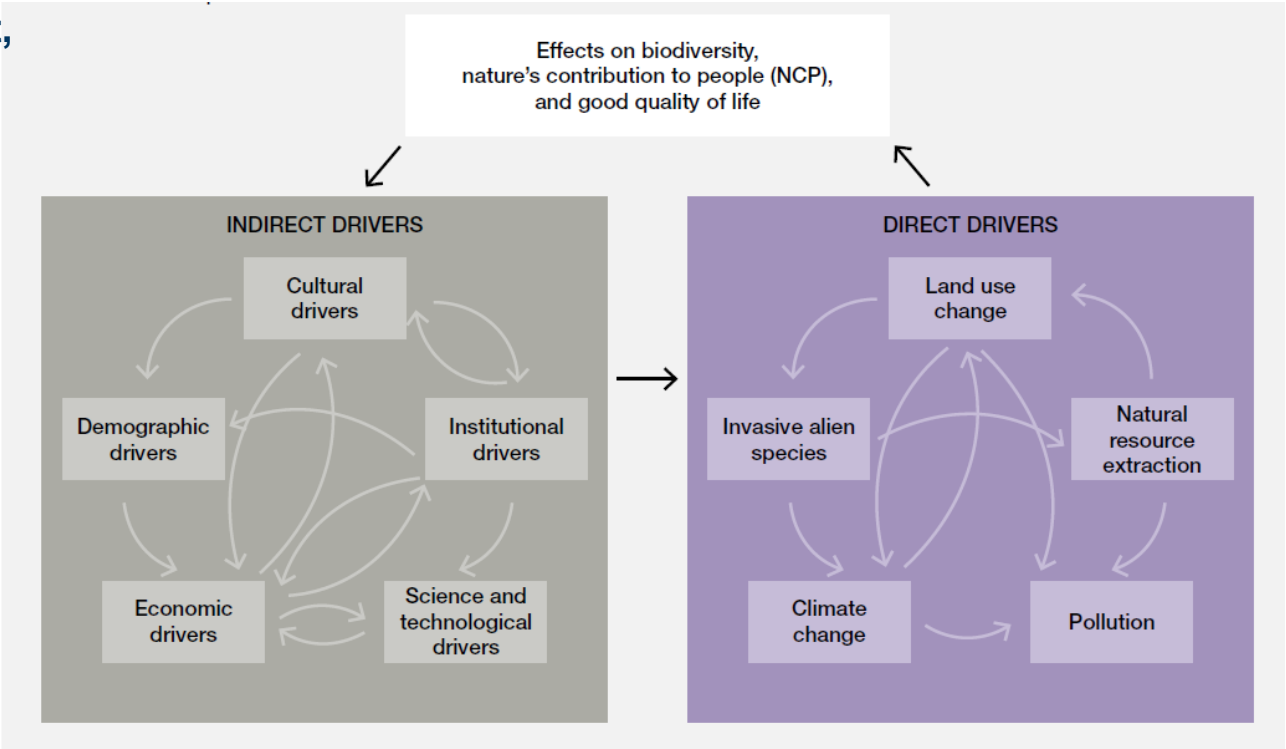

Indirect drivers

Institutional	Demographic	Economic	Cultural	Science & technological
• Regulations • Environmental policy • Conflicts	• Population • Urbanization • Migration	• Globalization • GDP • Ecological financial reform	• Awareness, knowledge • Values, beliefs, social norms • Cultural capital • Social capital	• New Technologies • Innovation

Driving forces: Interactions

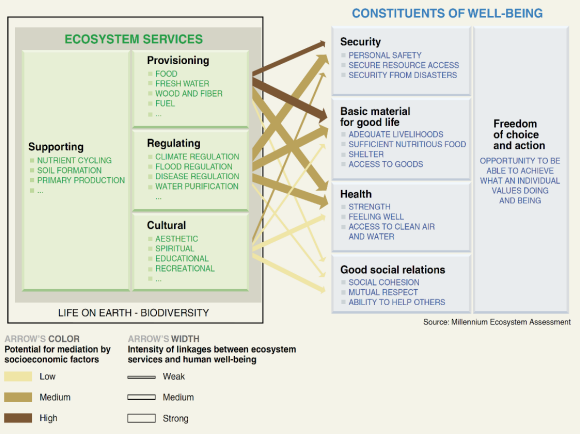
Drivers, indirect and direct, interact at different levels and in different ways.

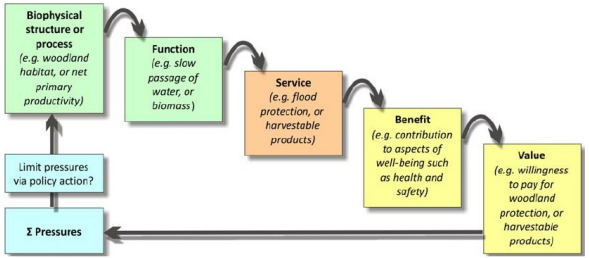
- E.g. Knowledge and awareness of change in BD and NCPs can influence indirect drivers and make adaptation possible

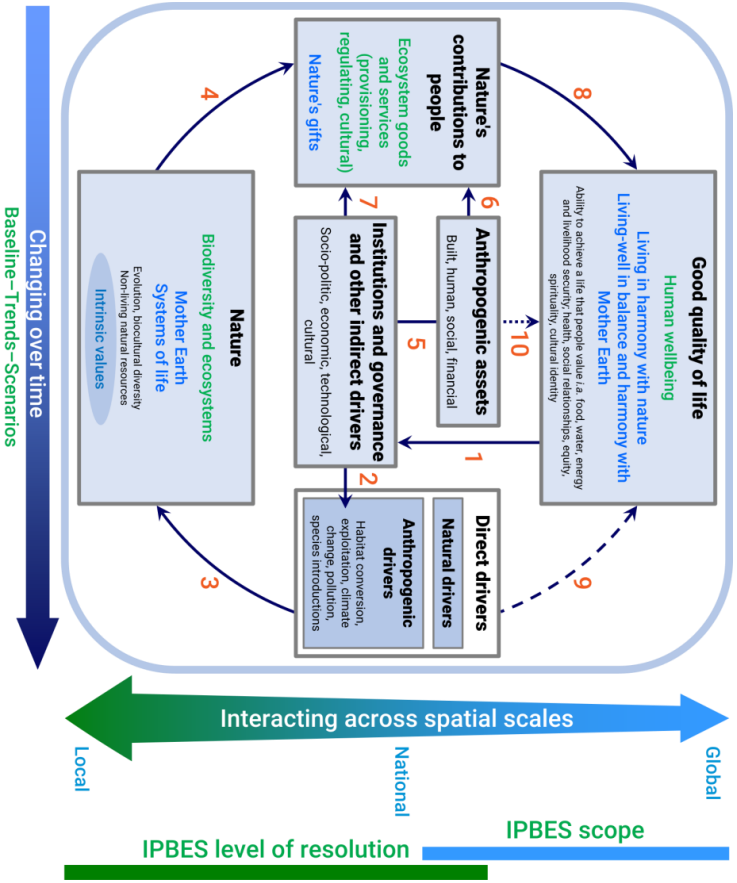


IPBES 2018

Group discussion







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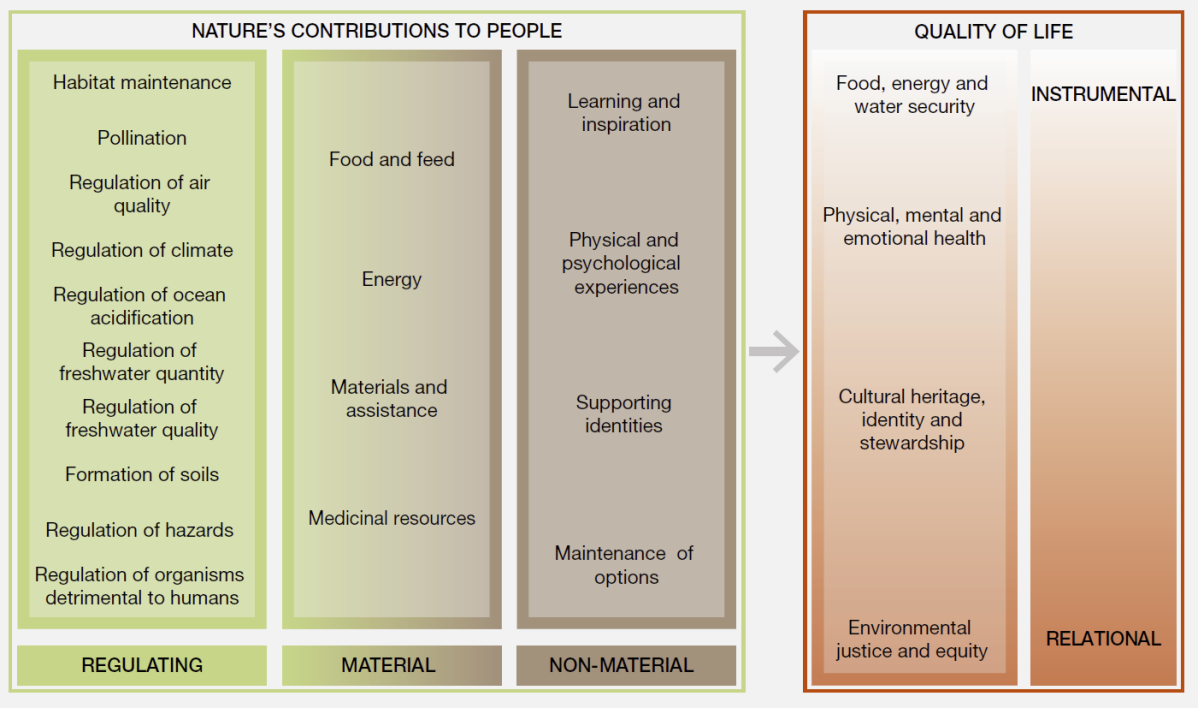
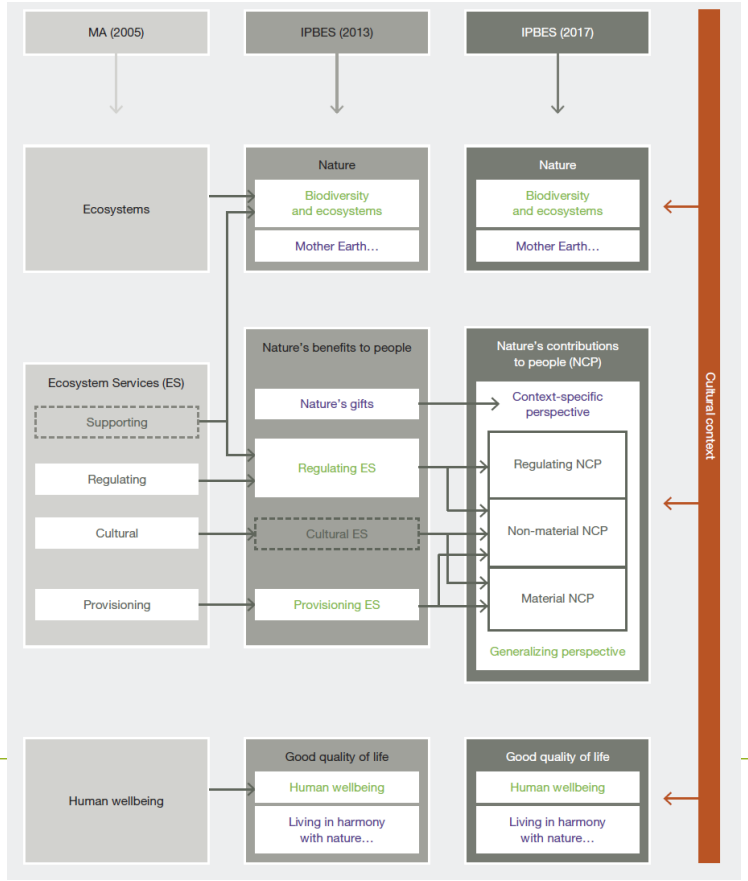
ES and NCPs

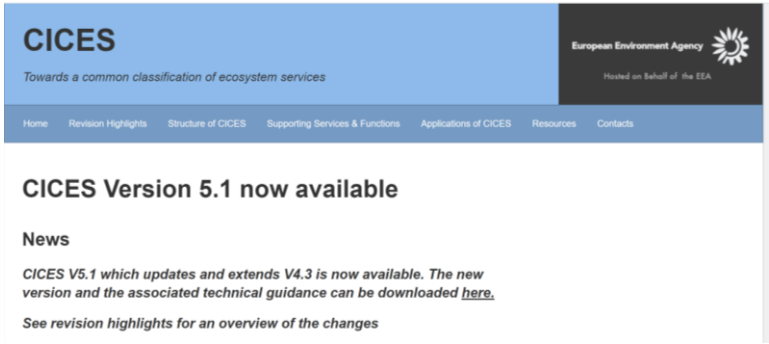
ES through the lens of NCPs, which embodies both the scientific concept of ecosystem goods and services, and the notion of nature's gifts from indigenous and local knowledge systems.

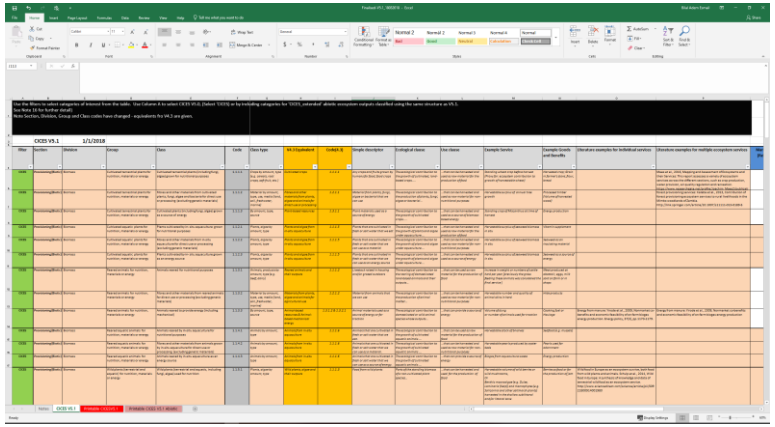


IPBES regional assessment Europe and Central Asia, 2018

Group discussion







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Hands-on Environmental Urban Planning

Task: Analyze the Skarpnäck district and map existing **problems**, focusing in of the **4 key socio-environmental challenges:**

CH 1: Urban heat island

CH 2: Loss of biodiversity

CH 3: Flooding risks

CH 4: Social cohesion & Quality of life

Source:

- Stockholm City Plan, 2018 + Vision
- Geodatabase
- Relevant publication – Literature review

Thank You

PLACES Lab - blal.ademesmail@rub.de

Suggested readings

- Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC. (Only the preface is needed: https://www.millenniumassessment.org/documents/document.356.aspx.pdf)
- Haines-Young, R. & M. Potschin 2010. The links between biodiversity ecosystem services and human well-being. In: Raffaelli, D. & C. Frid (Eds.). Ecosystem Ecology: A New Synthesis. Cambridge University Press, Cambridge, 110–139: https://www.nottingham.ac.uk/cem/pdf/Haines-Young&Potschin_2010.pdf
- Diaz, S. et al. (2016): The IPBES Conceptual Framework — connecting nature and people. Current Opinion in Environmental Sustainability 14, 1-15. https://doi.org/10.1016/j.cosust.2014.11.002).
- Millennium Ecosystem Assessment (2005) (Chapter 2 of the MA 2003 – A framework for assessment book (https://www.millenniumassessment.org/en/Framework.html). https://www.millenniumassessment.org/documents/document.300.aspx.pdf
- De Groot et al. (2009) Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In: TEEB, The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations. Edited by Pushpam Kumar. Earthscan, London and Washington. Please check especially page 21 and appendix 2 (http://www.teebweb.org/wp-content/uploads/2013/04/D0-Chapter-1-Integrating-the-ecological-and-economic-dimensions-in-biodiversity-and-ecosystemservice-valuation.pdf)
- Haines-Young, R. & M. Potschin 2010. The links between biodiversity ecosystem services and human well-being. In: Raffaelli, D. & C. Frid (Eds.). Ecosystem Ecology: A New Synthesis. Cambridge University Press, Cambridge, 110–139. https://www.nottingham.ac.uk/cem/pdf/Haines-Young&Potschin_2010.pdf)
- Common International Classification of Ecosystem Services – CICES (all information here: https://cices.eu/)
- IPBES, https://www.ipbes.net/sites/default/files/downloads/pdf/ipbes-5-inf-24.pdf
- Burkhard B, Maes J (eds) (2017) Mapping Ecosystem Services. Pensoft Publishers, Sofia, 374 pp. https://ab.pensoft.net/articles.php?id=12837 (Chapter 2)