Ecosystem services – role of regulatory processes in rural areas

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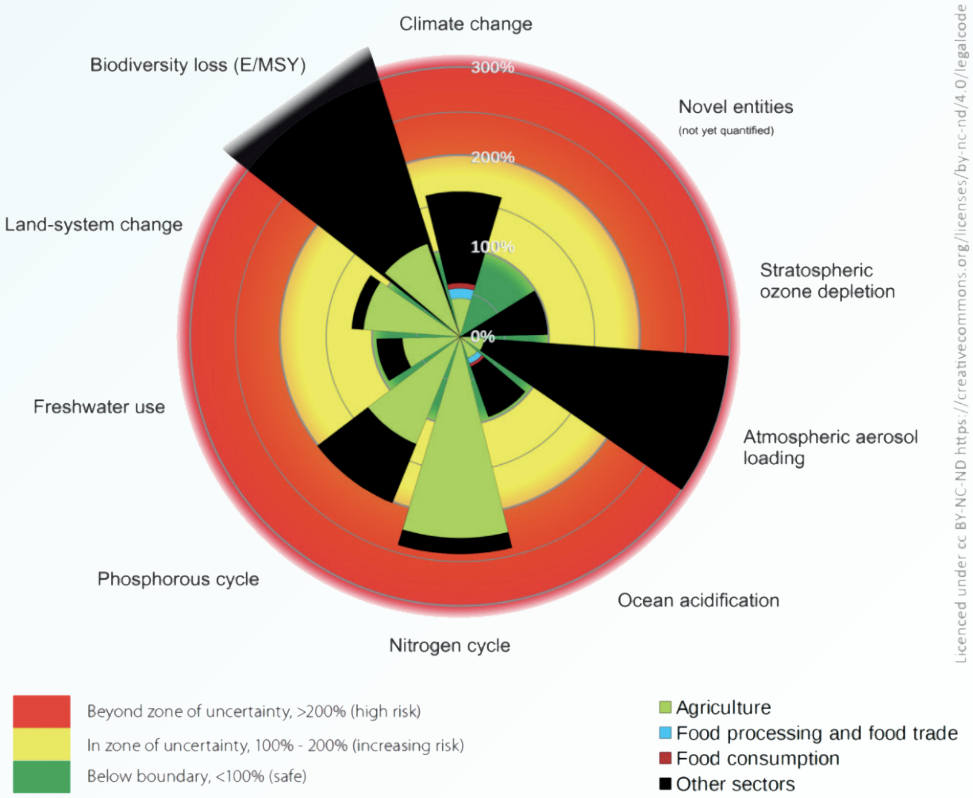
The state of the planet

Human activities re-shaped the globe and its nature, introducing changes, which fires back both health of the planet and in consequence, human health and well-being. By irrational and limitless conversion of land into production system (either through agriculture or any other sector – industry, housing, etc.) and ignoring the synergic impact of variety human actions over decades, we finally cross planetary boundaries – thresholds securing our existence.



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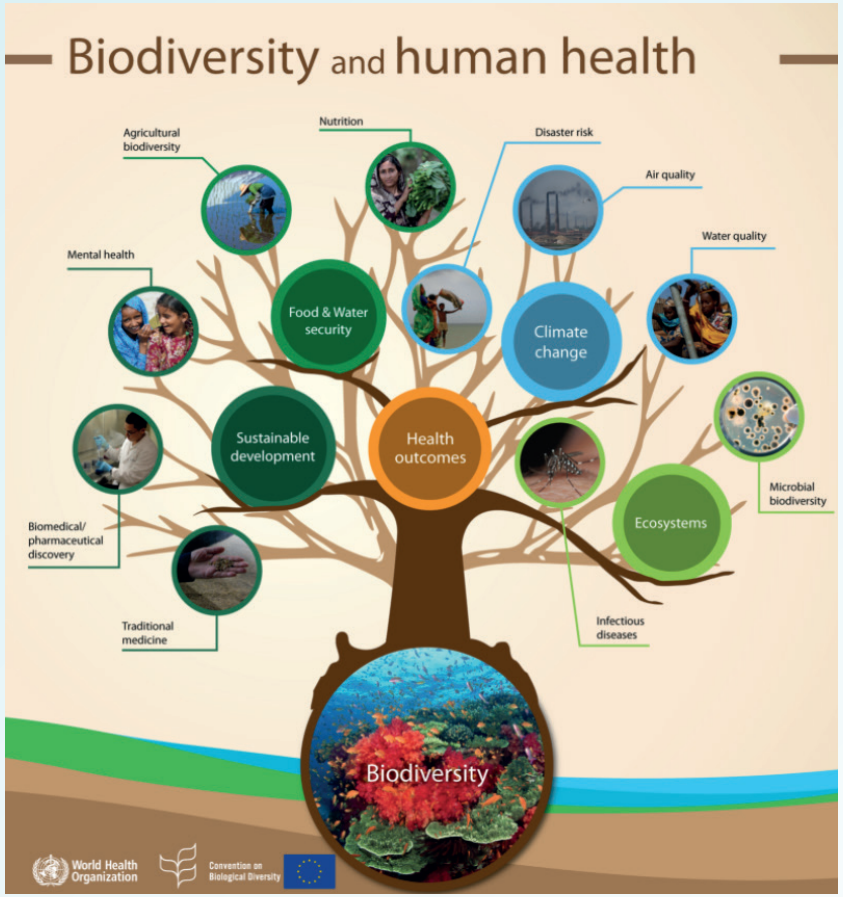
The picture presents the explicit impact of agriculture itself, and sectors related / supporting it, on global ecosystems. The most dramatic is biodiversity loss, aerosol emissions that stimulate climate change and tremendous load of nutrients, which deteriorate quality of water resources and threaten soil vitality.

SOURCE | http://www.nutrition-impacts.org/media/2017_TMeier_planetary_boundaries_agriculture_nutrition.pdf

Why biodiversity and the state of the planet matter?



Biodiversity should be considered twofold: as a genetic diversity within species and as a variety of species.

The first one is critical for every single species to survive. It differentiates between individuals making population, as a whole, more resistant to pressures. To keep this type of diversity high, we must secure connectivity between habitats – forests, meadows, water bodies, to allow animals and plants to migrate and mix.

The second one is critical to keep the functions of nature, which we depend on, stable in time: pollination, O2 production, CO2 capture, soil formation, climate regulation, food production, air/water/soil purification, etc.

Each function is served by a number of species, each playing own particular role in the process. What is even more complicated the species and processes influence one another. As we don't know the complete roles of all species and the network of interactions, loss of biodiversity imposes a serious risk to our existence.

SOURCE | https://www.cbd.int/health/stateofknowledge.shtml

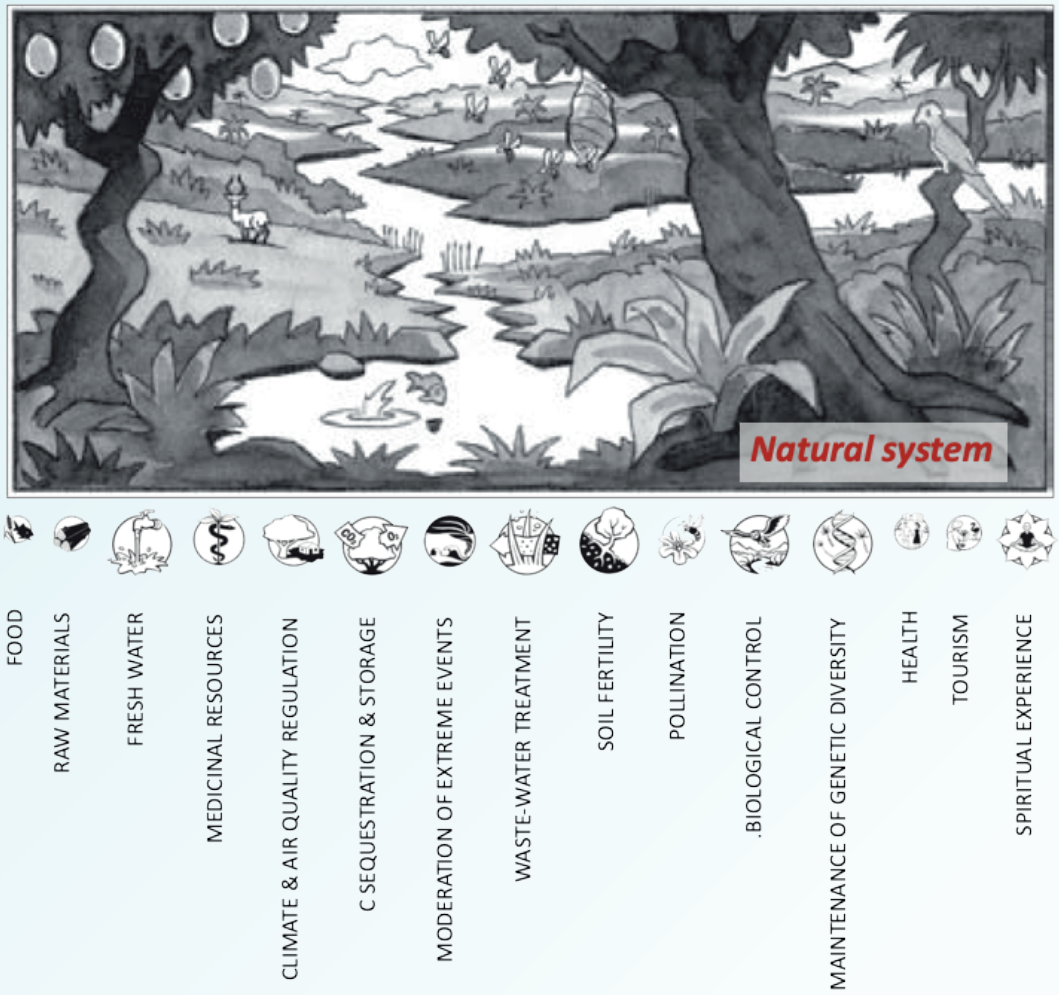
Global challenges to be met acting locally

The cascade of dependencies of our wealth on ecosystems' health is well illustrated by the SDG (Sustainable Development Goals) „wedding cake" figure.

The basis for absolutely all aspects of human life and well-being is good condition of terrestrialand aquatic ecosystems.

This can be achieved by reducing pressure on ecosystems alongside with leaving space to nature.

Ecosystem services of natural systems



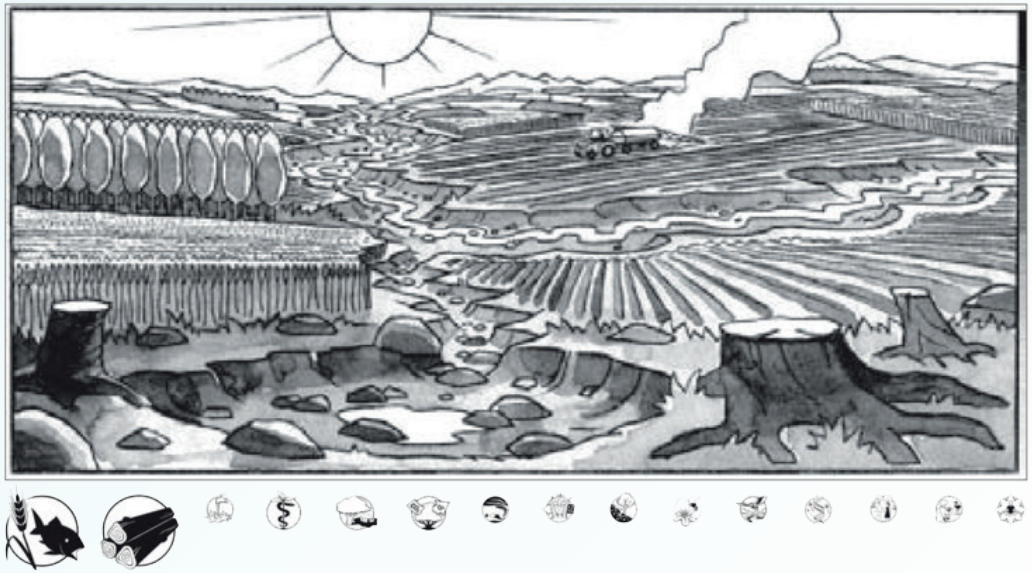
Different types of ecosystems provide diverse ecosystem service bundles.
The characteristic feature of natural systems is provision of broad variety of goods and services at the same time, all of them at relatively high level.

The goods and services of nature which are not, but potentially can be, used by people form a stock – NATURAL CAPITAL.

IMPOSING PRESSURES ON NATURE REDUCES STOCK, EVEN IF IT DOES NOT HAVE AN IMMEDIATE IMPACT ON SERVICE DELIVERY.

SOURCE | TEEB FOR LOCAL AND REGIONAL POLICY MAKERS (http://www.teebweb.org)

Agriculture is one of main ecosystem service governors

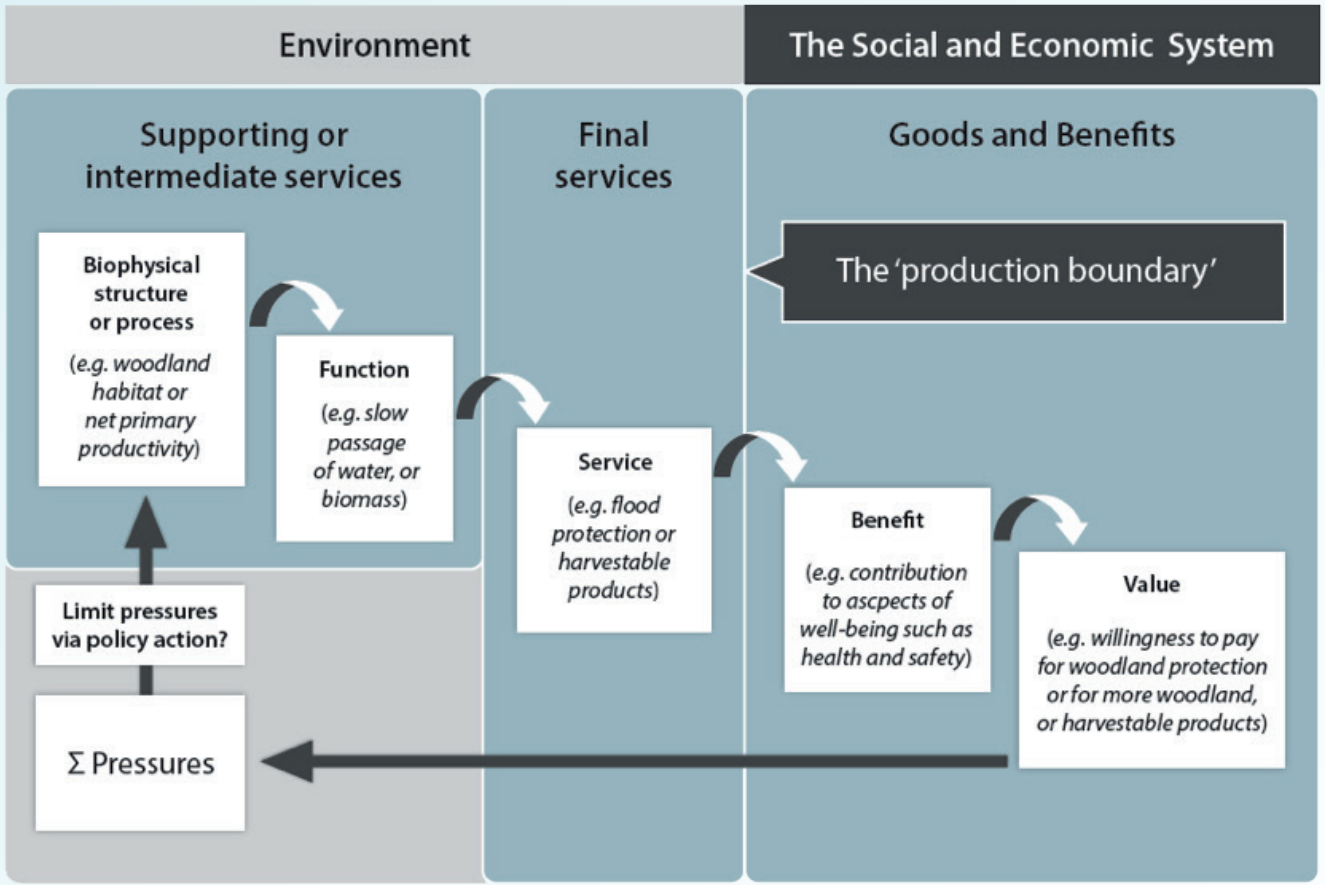


Sustainable agriculture increases production of food and raw materials, not that high and seasonally distributed in natural ecosystems, however supports delivery of all ecosystem services in long-term.

Currently promoted industrial agriculture executes only those two goods at the costs of all the other services, while the demand for all of them remains high. It means that keeping the demanded level of pollination, habitat provision, medicinal products, air or water purification, water retention, etc. is unrealistic, that in turn affect agriculture. It eliminates services which it depends on.

SOURCE | TEEB FOR LOCAL AND REGIONAL POLICY MAKERS (http://www.teebweb.org)

Ecosystem structure vs services



The relationship between structure of ecosystems, their operation, service provision and benefits to society, can be illustrated as a cascade, with all the consequences of mismanagement also following the pattern.

SOURCE | Potschin and Haines-Young, 2016

How to learn how much we depend on nature?

There is several methods to monetary value ecosystem services.

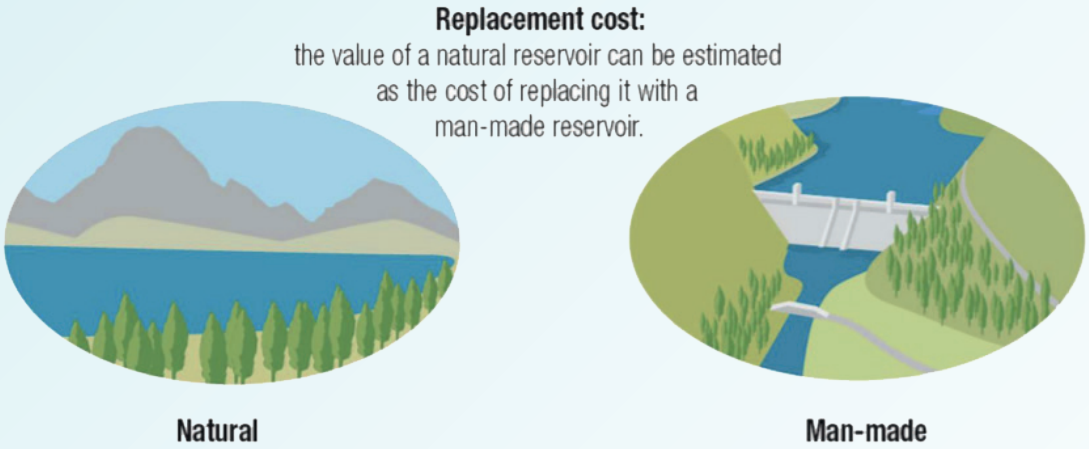
The easiest refers to goods: food, material, which have market value.

The more dfficult is assessment of value of regulatory services. To learn how much „work” of ecosystems goes unnoticed and is undervalued, one can calculate avoided costs or replacement costs.

Avoided Cost – services allow society to avoid costs that would have been incurred in the absence of those services (e.g. waste treatment by wetland habitats avoids health costs)

Replacement Cost – services could be replaced with man-made systems (e.g. restoration of the watershed costs less than the construction of a water purification plant, sewage transportation system, sludge utilization, and all the annual operating and maintenance works etc.)

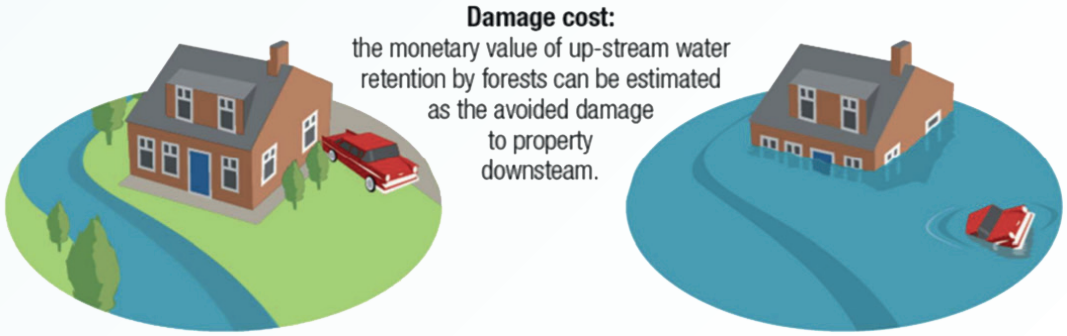
How to learn how much we depend on nature?



In order to store water or prevent flooding people dam rivers and create reservoirs. Despite the building costs, barriers on rivers impact water availability downstream, fisheries, habitats of fauna and flora including species important for medicine, culture, local economy.

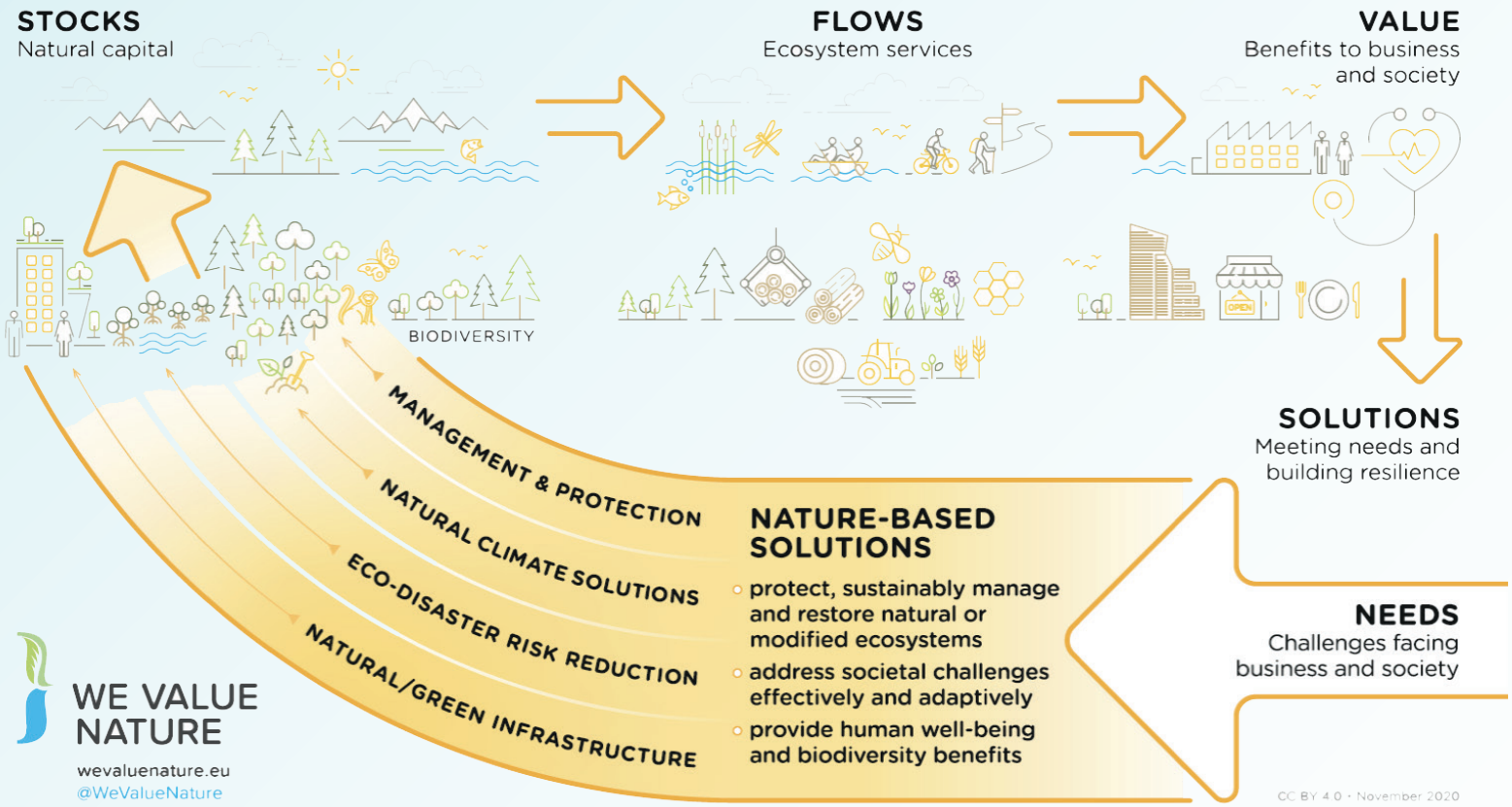
Additionally reservoirs negatively impact water quality, the self-purification processes are not efficient and reservoirs trap many pollutants.

Flood prevention by technical means is costly and does not consider variation in water fluxes, which is one of characteristics of climate change. When dealing with high uncertainty, it is more economic and efficient to relay on self-adapting systems, like ecosystems. Leaving floodplains untouched, and catchment hot-spots protected secures infrastructures downstream.



SOURCE | https://iwlearn.net/resolveuid/1ed0efc7-0a9f-49c4-9274-552644f5925f

Nature-based solutions



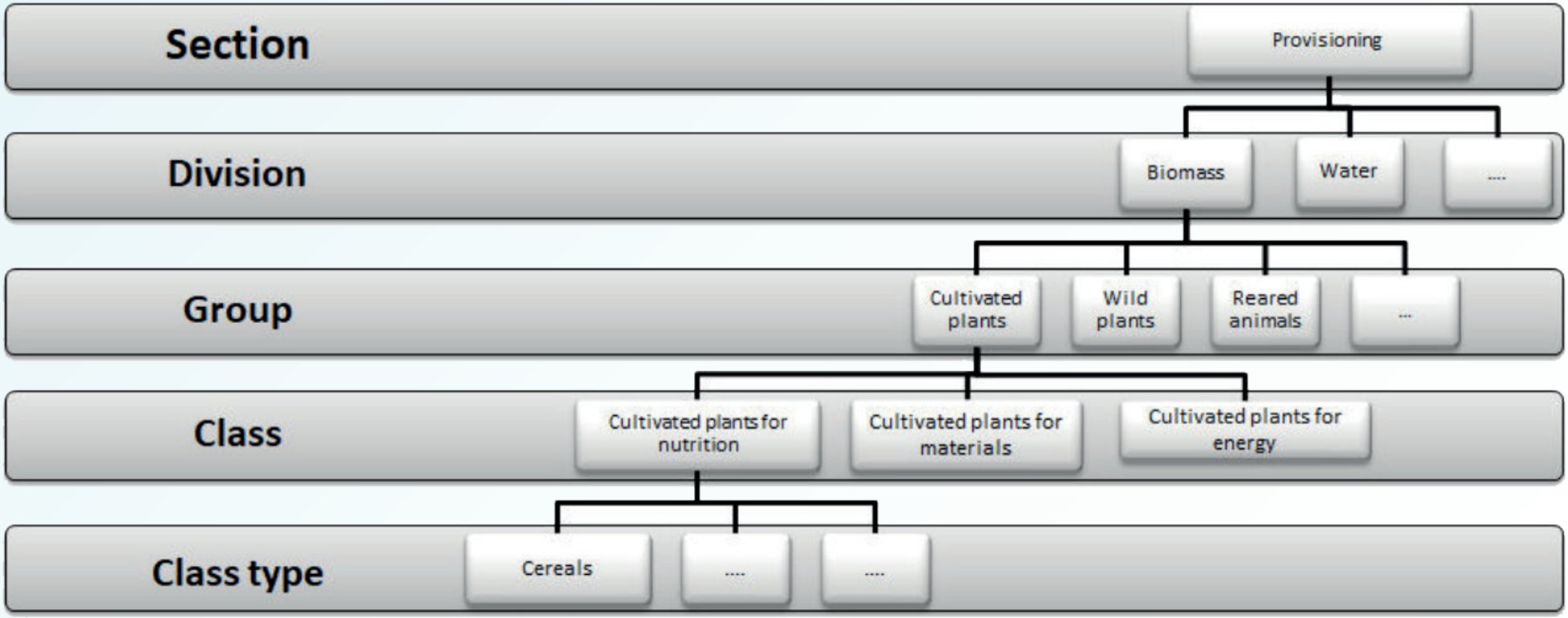
SOURCE | https://wevaluenature.eu/media-item/340

Nature being under heavy pressure from human activities loses its vitality and ability to recover from disturbances (natural or human-induced). Thus, in some cases, it is necessary to support it with Nature-Based Solutions.

Those are actions copied from nature or inspired by it, which are transferred to areas of high ES demand with blue-green infrastructure (green corridors, constructed wetlands, replanted forests, restored rivers etc.). They help to re-build natural capital to meet future needs for ES.

ES Classification

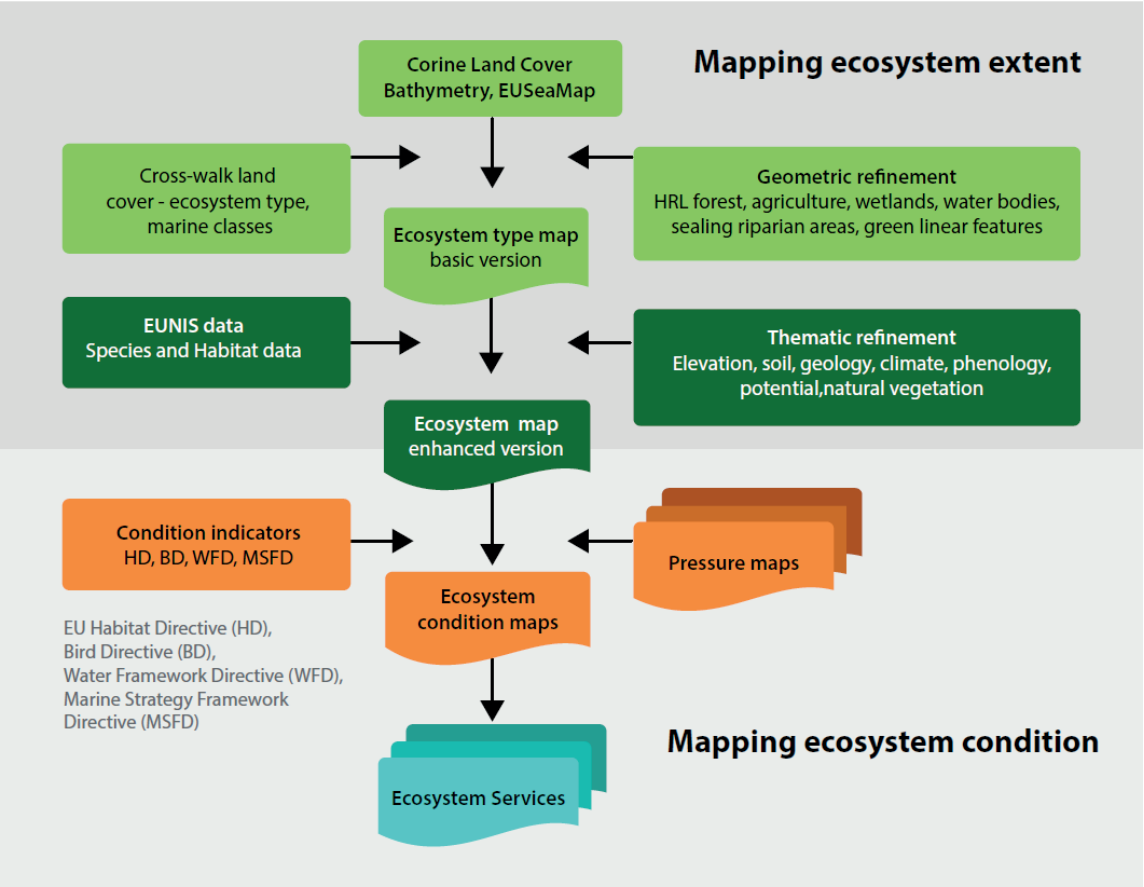
- The Common International Classification of Ecosystem Services (CICES) developed from the work on environmental accounting undertaken by the European Environment Agency (EEA). It include a broad range of identified services delivered by nature.
- Current version is CICES 5.1 (https://cices.eu/resources/)
- The structure:



Quantifying ES

To properly value ES and define human dependencies, it is essential to map the services related to particular land covers (Corine) / ecosystems (EUNIS) using dedicated indicators.

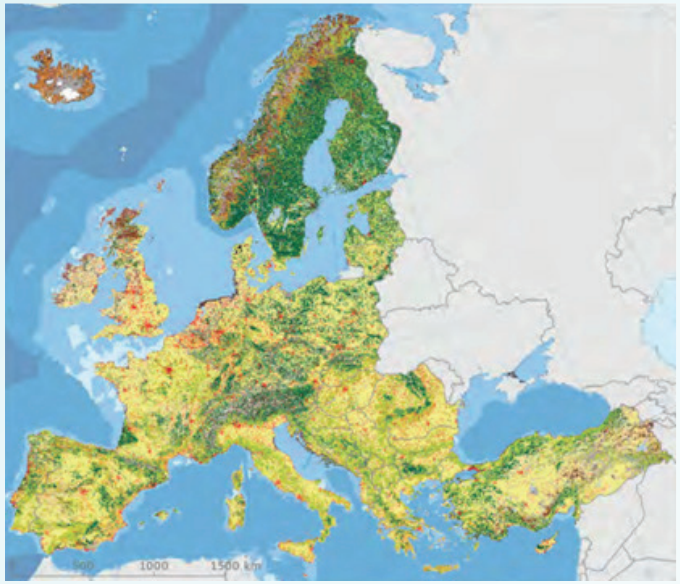
Indicators enable assessement of ecosystem conditio and its ability to deliver services.



SOURCE | Burkhard B, Maes J (Eds.) (2017)

Quantifying ES

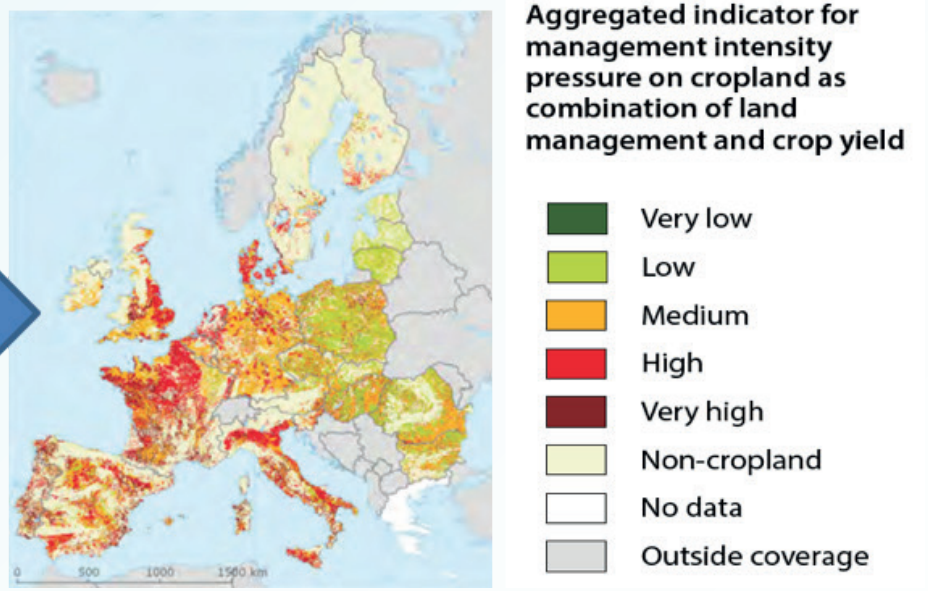
Ecosystem map



Ecosystem map of Europe Version 2.1 (http://www.eea.europa.eu/data-and-map/data/ecosystem-types-of-europe).

indicator

Ecosystem condition



Map of European cropland conditions

SOURCE | Burkhard B, Maes J (Eds.) (2017)

Quantifying ES

Mapping and quantification of ES is critically important for improvement of land and resource management.

For example proper management can trigger a cascade of positive processes leading to increased capture of CO_2 and its transformation into high quality soils. Unproper management increases emissions of CO_2 not only from human activities but also degrading ecosystems.

Wetlands are the best stores of CO_2, preventing further temp. raise and climate change:

- the calculated carbon stocks of soils in the active floodplains amount to 549 million tCO_2;
- and in the inactive floodplains to 774 million tCO_2 equivalent.
- peatlands cover only 7% of the floodplains,
- they contain 70% of the carbon stock.

BUT

- In in the inactive floodplains intense land use is causing peatland degradation resulting in emissions of 2.53 million tCO_2 equivalent per year;
- The cost of these carbon emissions ranges between €35 million per year (based on a market price for carbon of €13.82 per tCO_2) up to €177 million per year (based on calculations on the potential global economic costs associated with climate change.

Consequently …

• considering the conservative estimate of 15-30 t CO_2 emissions/ha/yr from temperate grassland or cropland, to be reduced to 1-3 t CO_2 emissions/ha/yr from re-wetted peatlands (IPCC estimates)

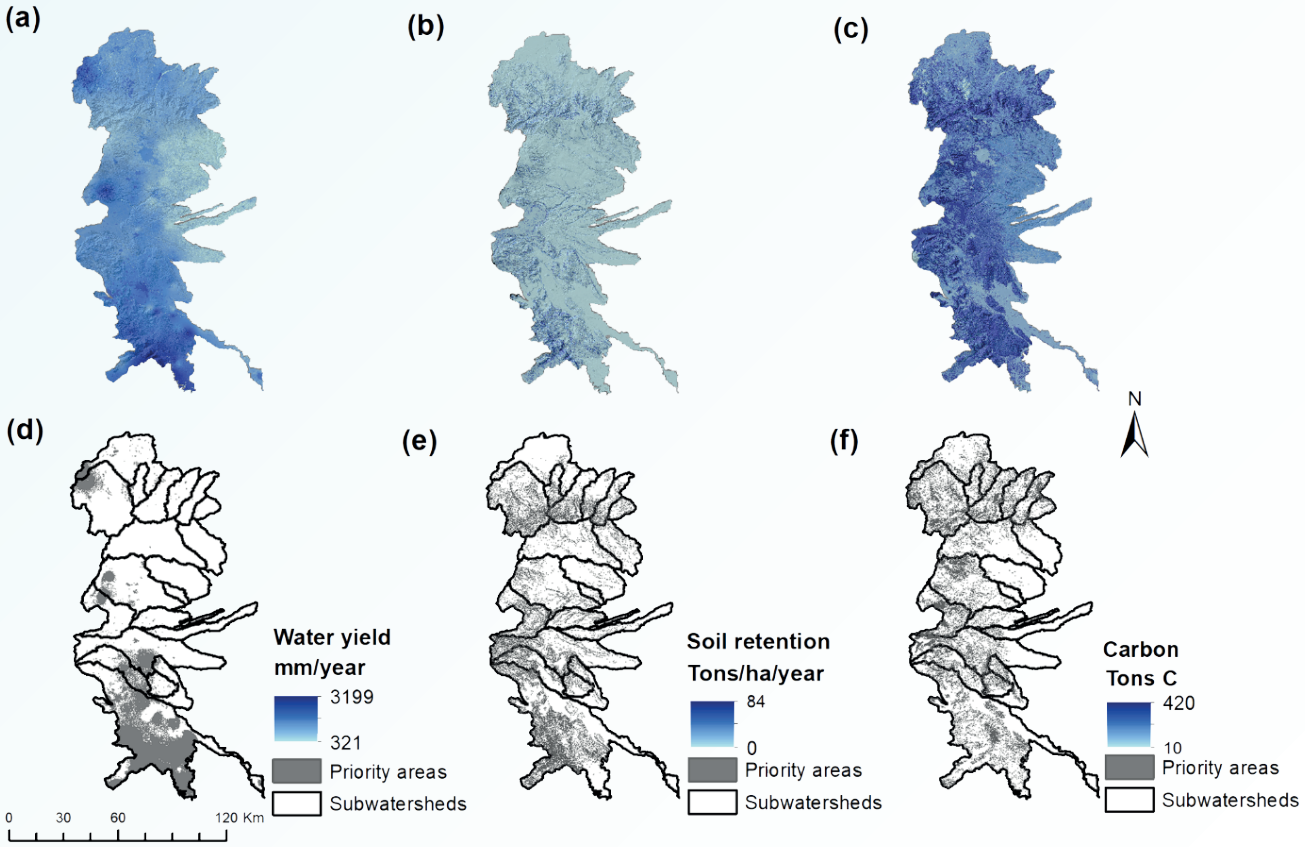
Re-wetting of 50 ha results in avoided yearly CO_2 emissions of 700 – 1350 t

• considering carbon stock in floodplains of 74 to 135 t C/ha for temperate climate zones (for the top 30 cm of soil), which is reduced by drainage by about 30%

Re-connecting of 50 ha of floodplain with a river results in carbon stock increase of ca 1110 – 2025 t within 20 to 40 yrs

Example of ES mapping and assessment

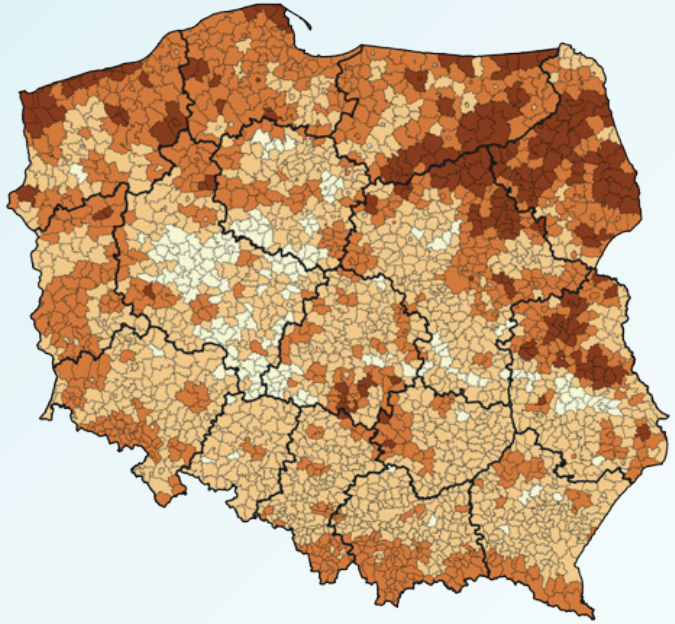
Ecohydrological ecosystem services mapping for Veracruz state, Mexico - modelled spatial distributions of ecosystem service provision (a-c): water yield, soil water retention and carbon sequestration; and associated priority areas (d-f), areas where best practices should be applied in order to keep ecosystem service delivery at demanded level.



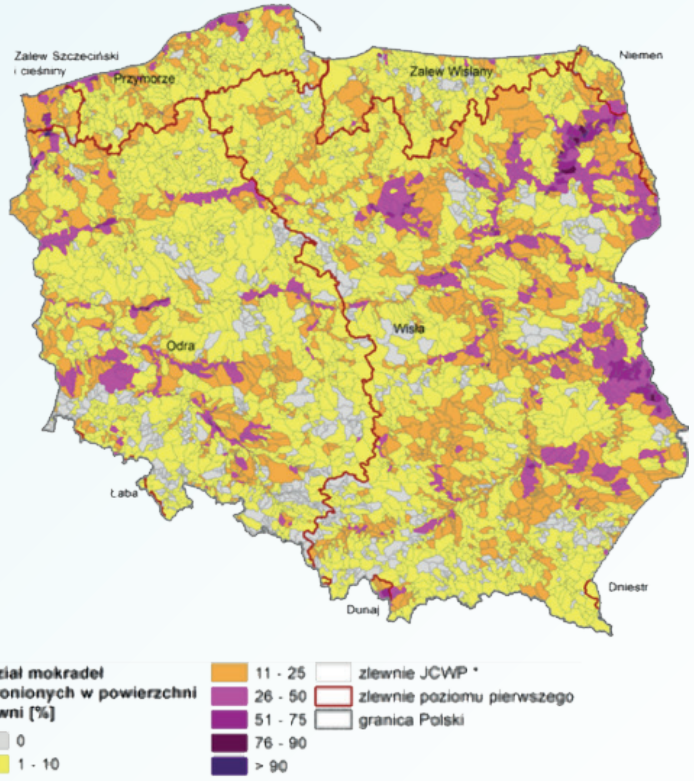
SOURCE | doi: https://doi.org/10.1371/journal.pone.0192560.g002

Example of ES mapping and assessment

Percentage of carbon in the layer down to 20 cm of agricultural land (biodiversity, soil formation, water retention)



Area of protected wetlands / water body area



ECOSERV-POL

Two indices proposed for country-level assessment (Poland) that illustrate areas contributing to such services as: drought prevention, regulation of low flows, habitat provision, C sequestration

Funding sources for pro ES agri-management

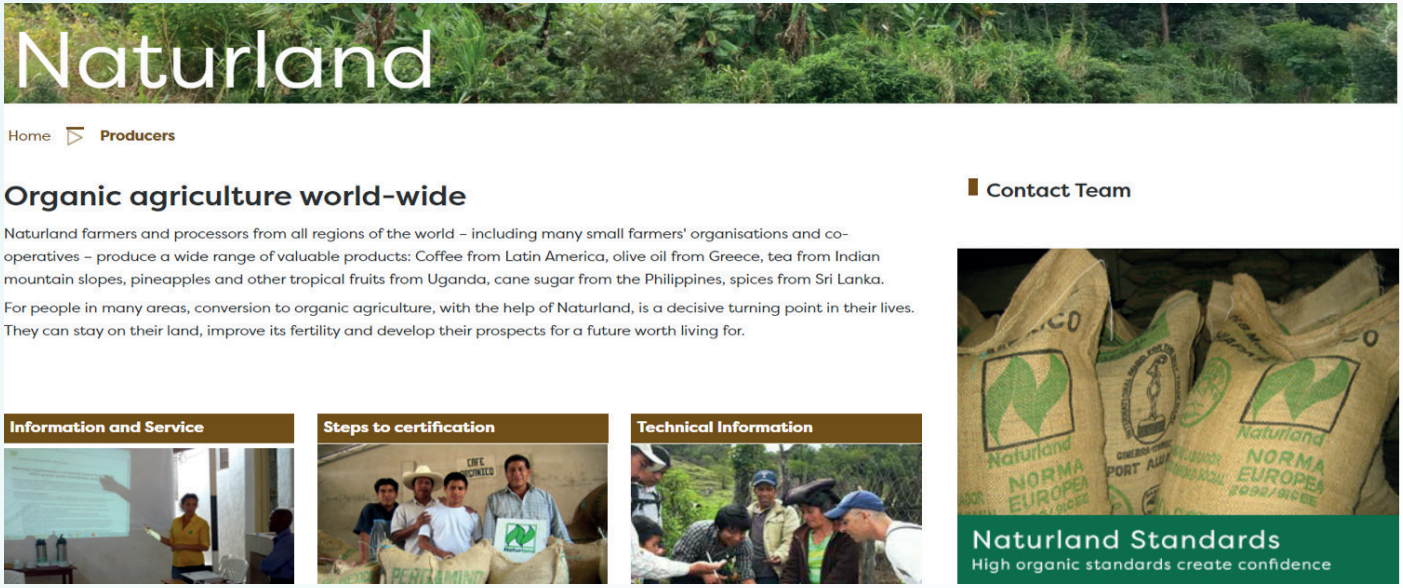
- the CAP 2021-2027,
- Cohesion Funds,
- InvestEU - the Fund combines 13 centrally managed EU financial instruments and the European Fund for Strategic Investments (EFSI) into 1 instrument,
- EIB Natural Capital Financing Facility and Sustainable Awareness Bond:
    - > Equity or debt funds (incl. mezzanine funds) supporting SMEs and mid-caps
    - > Captive funds or investment platforms sponsored by National Promotional
    - > Banks/Institutions
    - > Co-financing
    - > Microfinance
    - > Co-investments.

Ecosystem service banks; e.g. water banks with water use rights;

Trading of offsets from ecosystems, e.g. carbon offsets from wetlands are now eligible to be traded in greenhouse gas markets in the United States. If an interested buyer agrees, it is possible to arrange a pre-sale of carbon credits on the voluntary market, to allow wetland restoration project to move forward with more certainty about future carbon credit revenue.

Can you make a living from natural capital protection and ES delivery? – an example

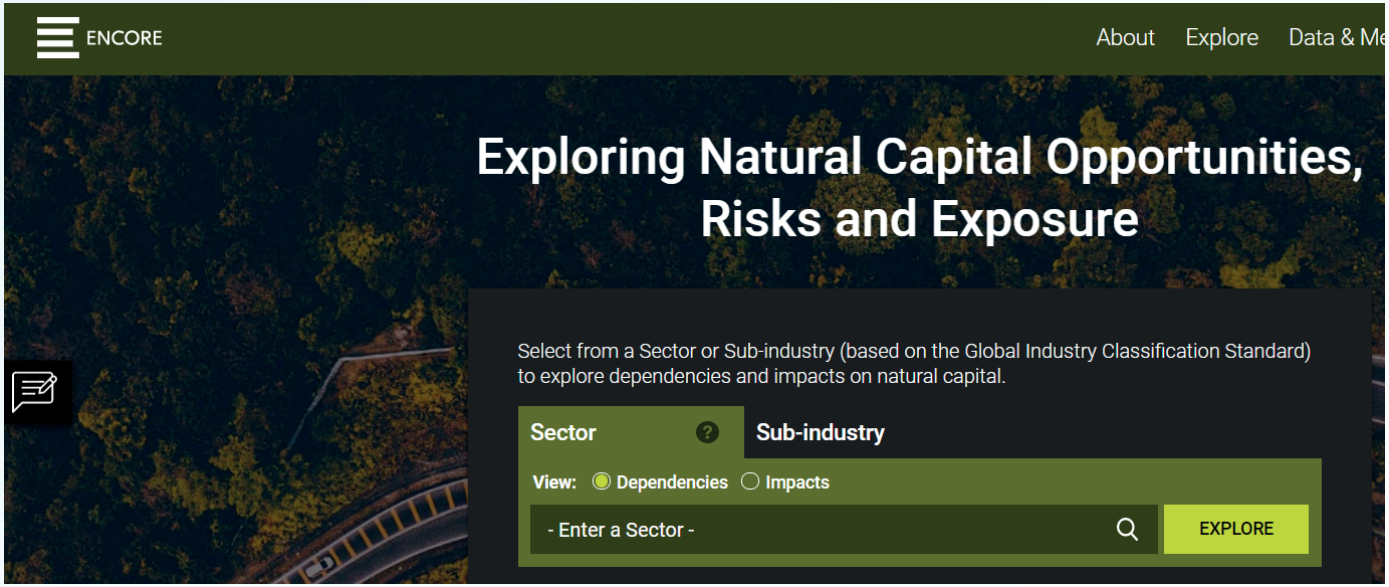
- The major international association for organic agriculture worldwide.
- Along with 100,000 farmers, beekeepers, fish farmers and fishers in 60 countries throughout the world, Naturland promotes organic, social and fair economic activity and international co-operation.
- It links producers, processors, sellers and customers by strict labeling of the products that promote e.g. soil formation, soil biodiversity, landscape diversity, sustainable water use, etc.
- Naturland operates to maximise the opportunities offered through greening value chains and identify investment opportunities.
- Amazingly they build capital on SUPPORTING SERVICES!



Understanding ES dependencies (risks) & impacts - NCFA

The aims of NCFA is:

- To provide the knowledge and tools that help the financial sector and other partners work together to reduce and manage the risks of environmental impacts and dependencies.
- To drive innovation and develop the practical solutions required to establish the foundation for sustainable long-term economic growth.
- The Natural Capital Declaration (NCD) formalises commitment of more than 40 financial institutions from around the world to the integration of natural capital considerations into financial sector reporting.
- The tool to estimate business linkages to ES is available here.



NATURAL CAPITAL FINANCE ALLIANCE
Finance sector leadership on natural capital

Ecosystem services – role of regulatory processes in rural areas

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Waterdrive Interreg Baltic Sea Region EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND WITH FINANCIAL SUPPORT OF THE RUSSIAN FEDERATION