Green Infrastructures and Essential Variables Workflows towards SDG15

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ICEI 2018, Jena - Germany

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

SDG target 15.9 :

"By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts "

Indicator 15.9.1:

"Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020"

Strategic Plan for Biodiversity 2011-2020

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Aichi target 2:

"By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems."

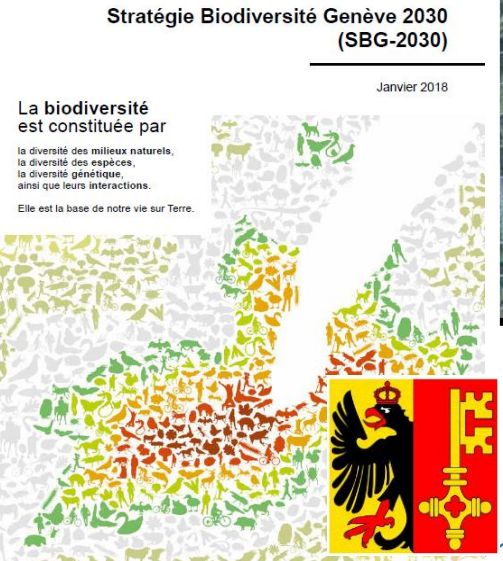
Implementing SDG 15.9 and Aichi 2 through Green Infrastructures (GI)

GI as nature-based solutions for climate change adaptation and biodiversity preservation

A **strategically planned network of natural and semi-natural areas.** They can be used as a tool for landscape planning to provide natural and cost-effective alternatives to ‘’grey’’ infrastructures (EEA, 2014).

Green Infrastructures are implicated in biodiversity conservation objectives from local to global scales

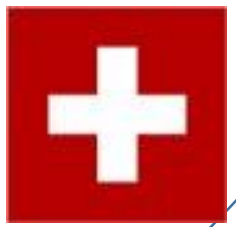
SUSTAINABLE DEVELOPMENT GOALS



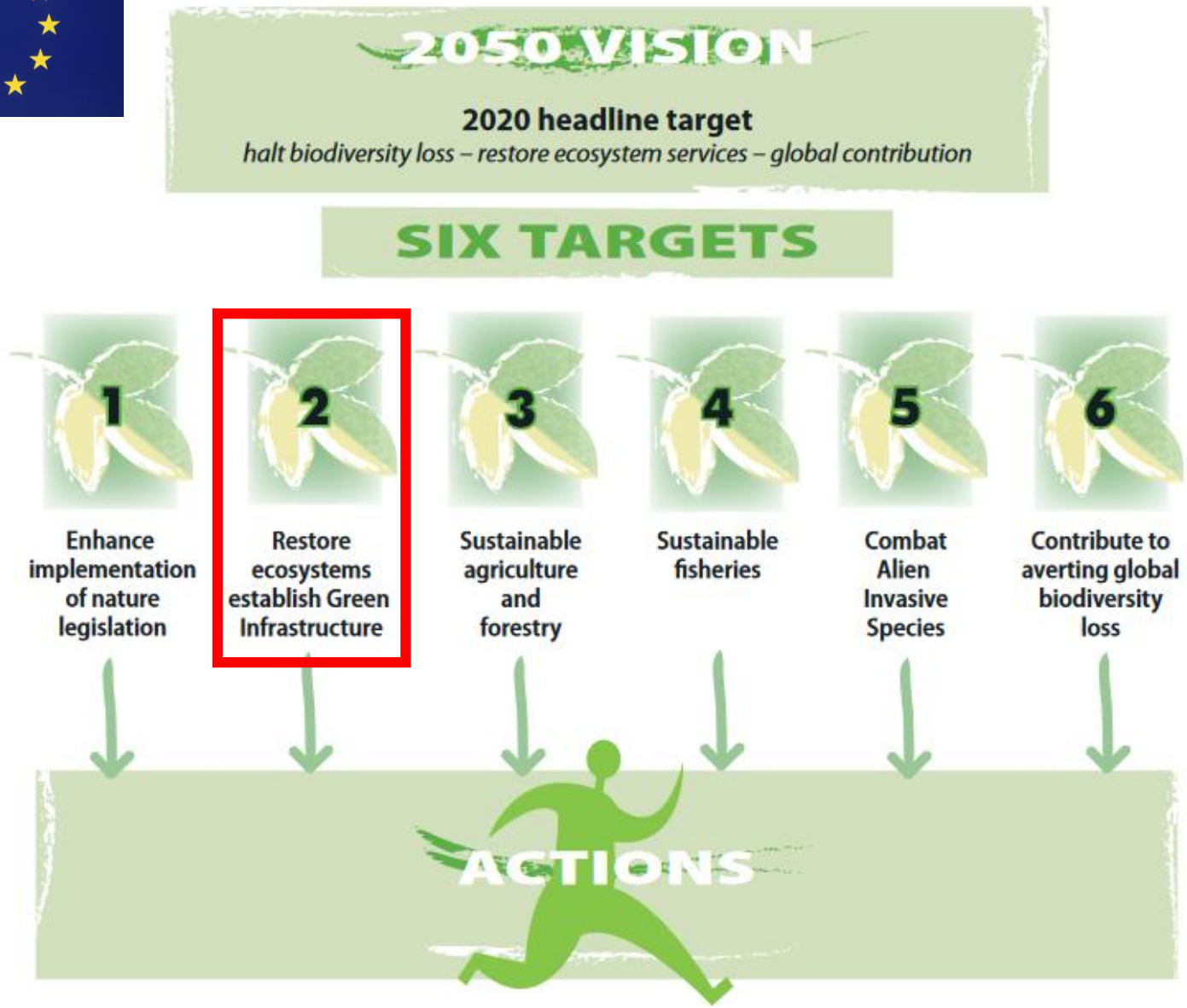
United Nations Decade on Biodiversity

UN environment
United Nations Environment Programme

Convention on Biological Diversity



Structure of the EU 2020 Biodiversity Strategy



Target 2 Maintain and restore ecosystems and their services

By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems.

Action 6 Set priorities to restore and promote the use of green infrastructure

6a) By 2014, Member States, with the assistance of the Commission, will develop a strategic framework to set priorities for ecosystem restoration at sub-national, national and EU level.

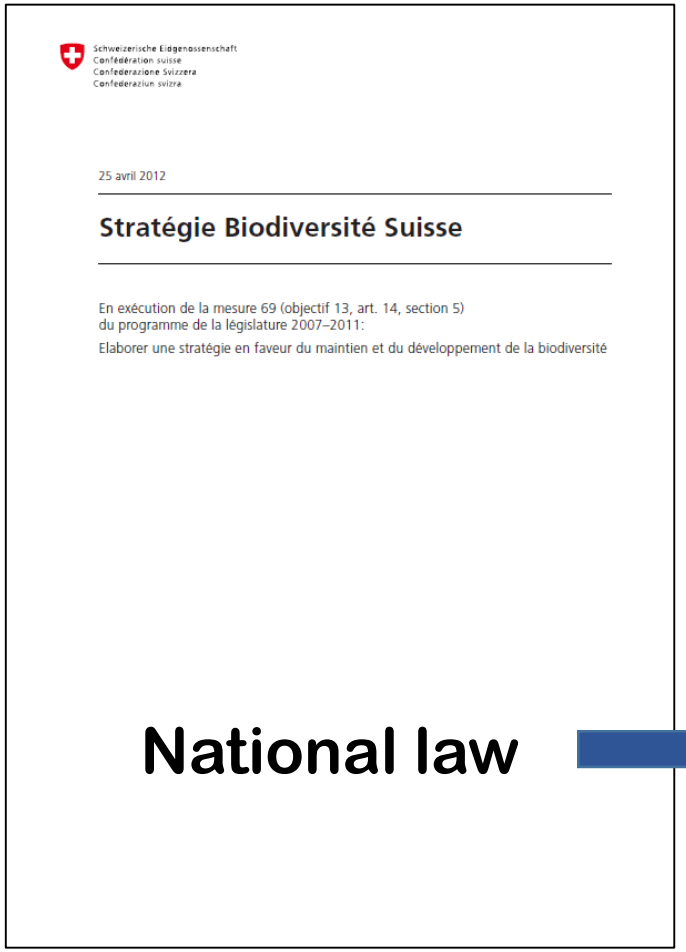
6b) The Commission will develop a Green Infrastructure Strategy by 2012 to promote the deployment of green infrastructure in the EU in urban and rural areas, including through incentives to encourage up-front investments in green infrastructure projects and the maintenance of ecosystem services, for example through better targeted use of EU funding streams and Public Private Partnerships.

http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/2020%20Biod%20brochure%20final%20lowres.pdf

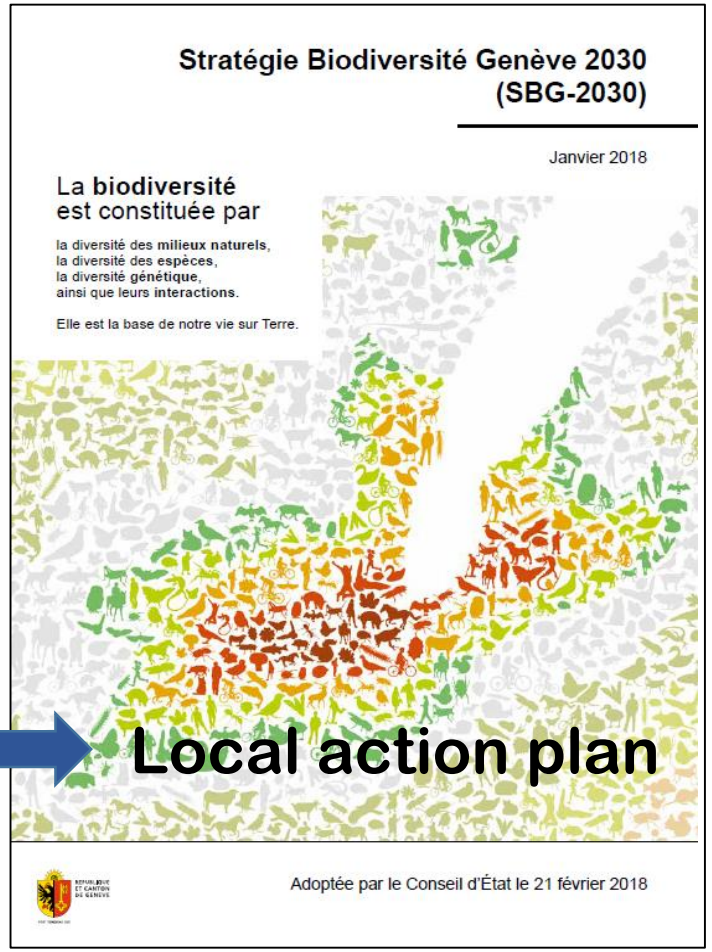
The EU Biodiversity Strategy to 2020, European Union, 2011.

Implementation of SDG 15.9 and Aichi target 2 in Switzerland

Biodiversity strategy established in 2012 for Switzerland, and in 2018 for the canton of Geneva



National law



Local action plan

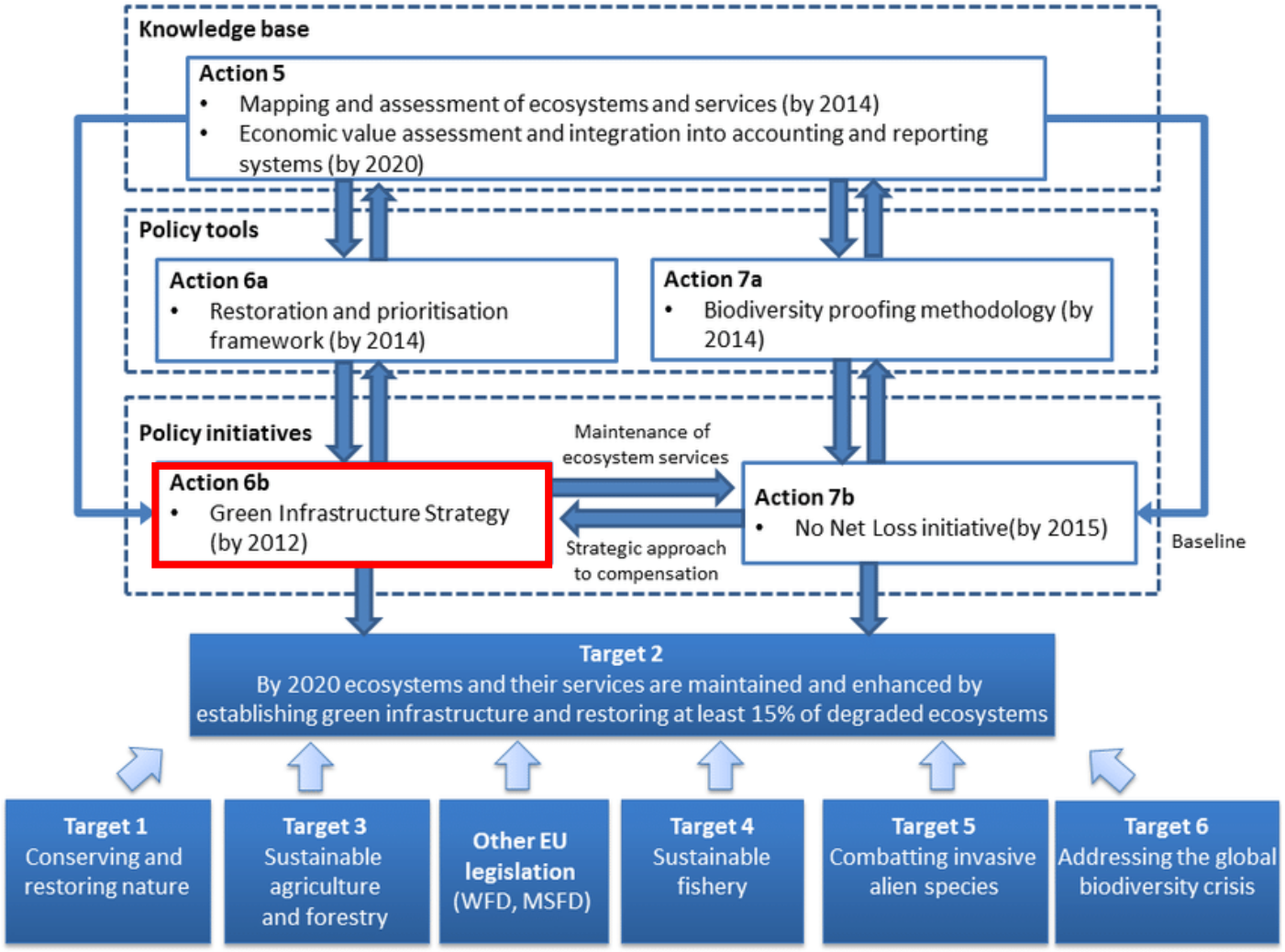
Swiss Biodiversity strategy - 10 objectives

1. Sustainable use of biodiversity
2. Creation of a green infrastructure
3. Improve species' status
4. Maintain and enhance genetic diversity
5. Reexamine financial incentives
6. Assess ecosystem services
7. Develop and spread knowledge
8. Develop biodiversity in urban areas
9. Reinforce international engagement
10. Monitor the evolution of biodiversity

Geneva Biodiversity strategy - 12 key domains

1. Green infrastructures
2. Protected areas
3. Forests
4. Trees
5. Rivers and lakes
6. Agricultural areas
7. Constructed areas
8. Fauna and flora
9. Sensitization
10. Capacity building
11. and 12. Administrative and analytical tools

Implementing Green Infrastructures supports other sustainable development objectives



EEA technical report no2, 2014

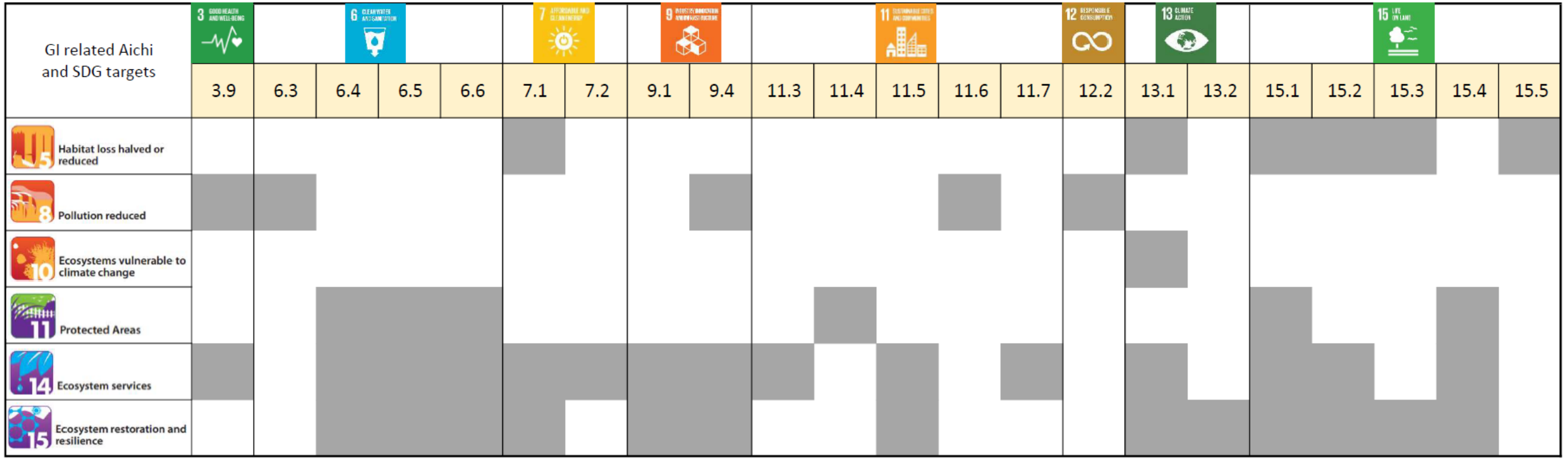
Implementing Green Infrastructures supports other sustainable development objectives

United Nations Decade on Biodiversity

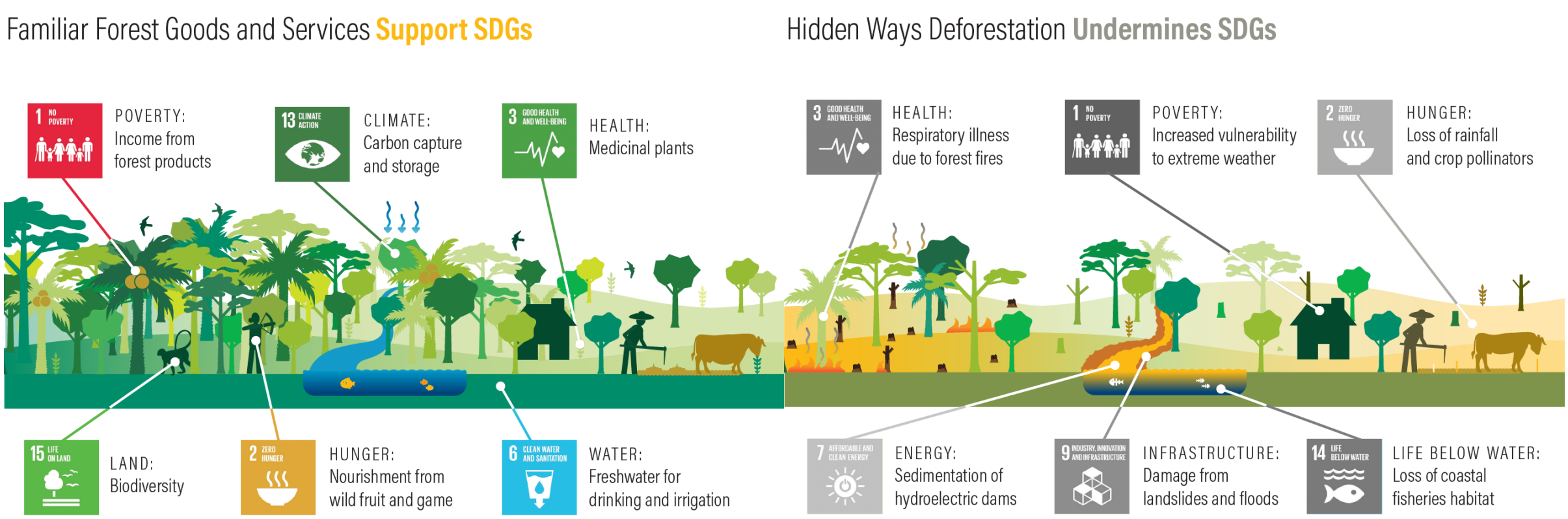
Aichi 5, 8, 10, 11, 14, 15

SUSTAINABLE DEVELOPMENT GOALS

SDG 3, 6, 7, 9, 11, 12, 13, 15



Examples of forest supporting SDGs and the costs of inaction



Source: Why Forests? Why Now? (Center for Global Development, 2016).

WORLD RESOURCES INSTITUTE

Mapping green infrastructures

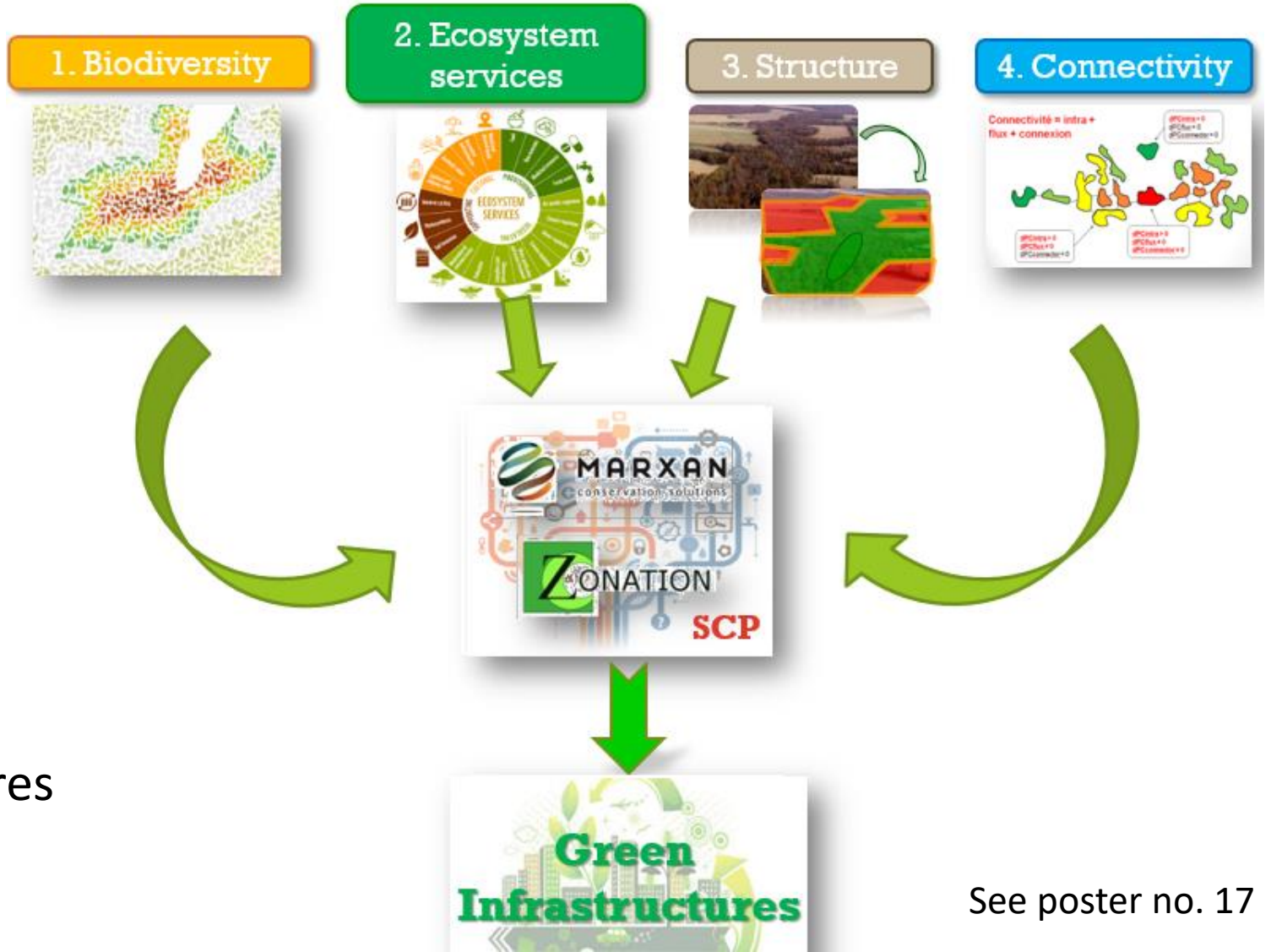
GI are composed of:

> Core areas for **biodiversity**

> Multi-functional areas that support multiple land uses and **ecosystem services**

> **Buffer zones** that improve the ecological quality (**structure**) of a landscape

> Natural and semi-natural features acting as wildlife **corridors**

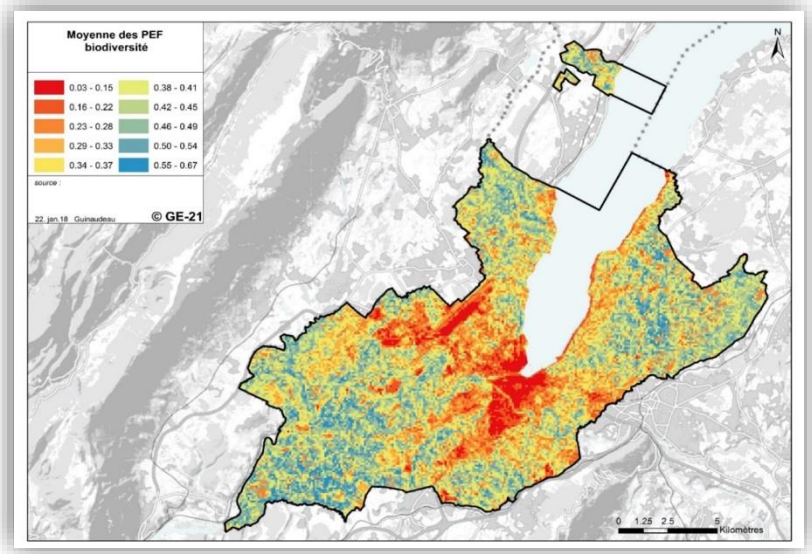


See poster no. 17

Biodiversity – species distribution

Biodiversity has many aspects

- Species richness
- Genetic diversity
- Habitat and landscape heterogeneity
- Rarity and impact of species on their enviornment



Benjamin Guinaudeau, GE21

GE-21

How do we qualify biodiversity?

- Species distibution models, habitat types
- Sampling bias (protected areas, commun species…)
- Red list bias (rare in one country but not others…)

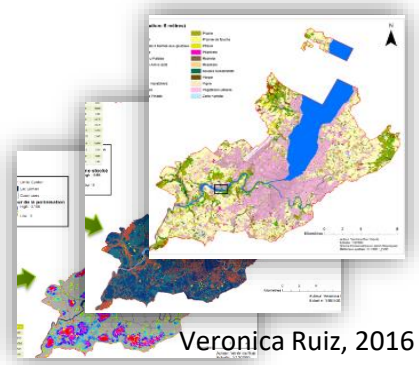
Species distribution data

Natural habitats map

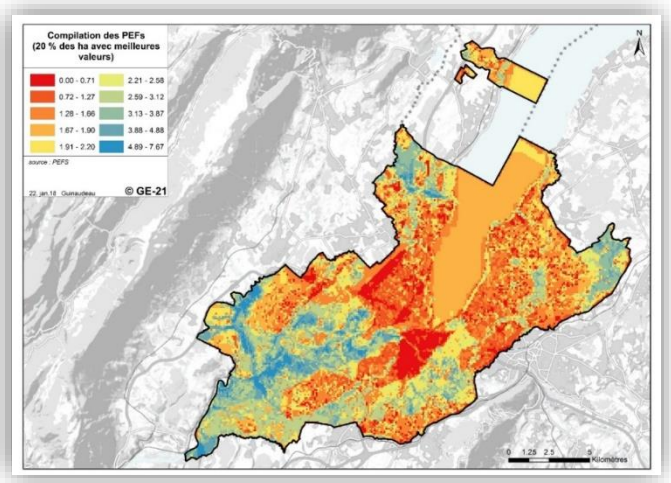
Ecosystem services

How to measure ecosystem services potential?

- Modelling the distribution of services based on biophysical attributes of land cover classes (InVEST), or using ES indicators.

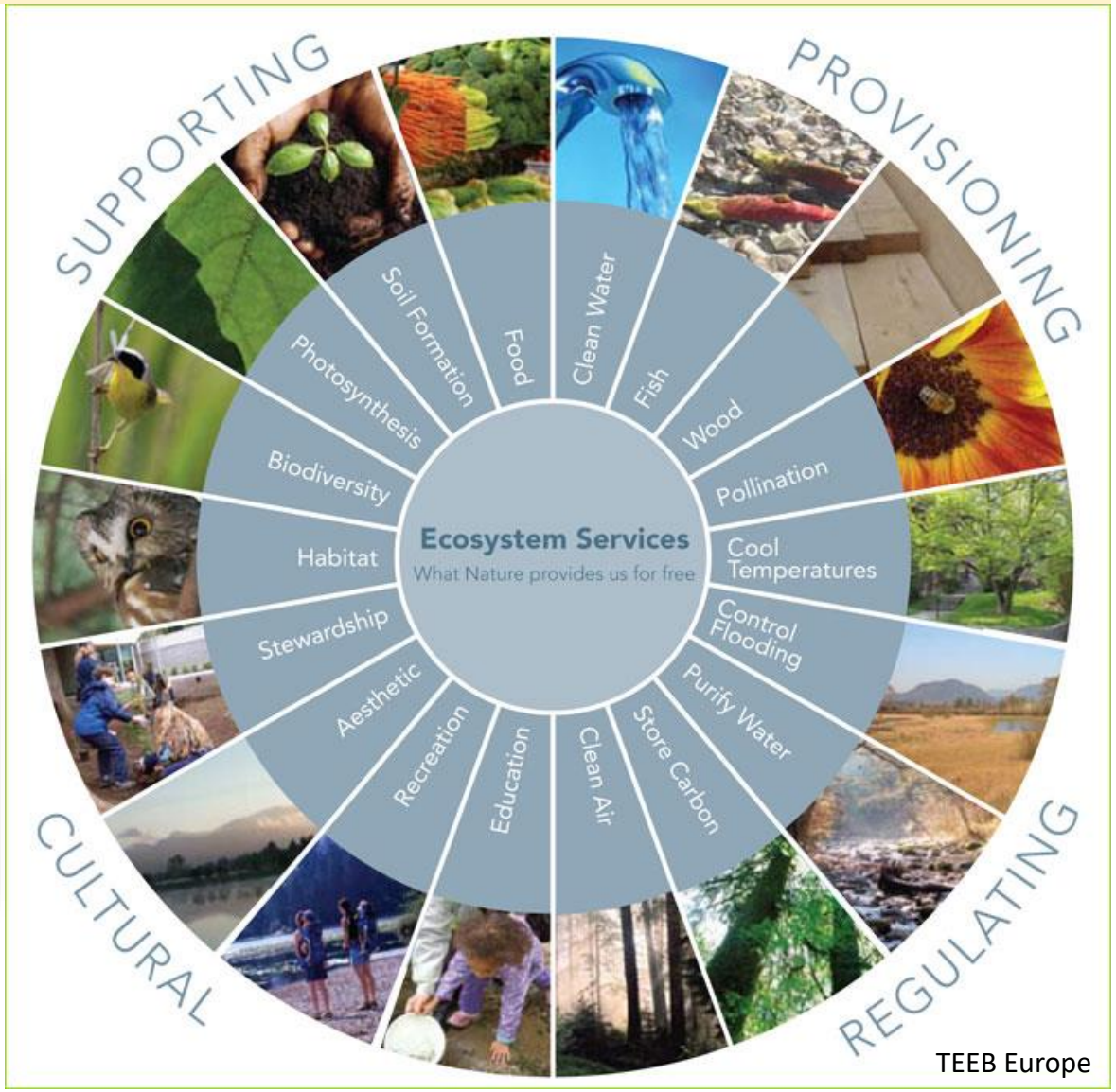


Veronica Ruiz, 2016



Benjamin Guinaudeau, GE21

Spatial distribution of services

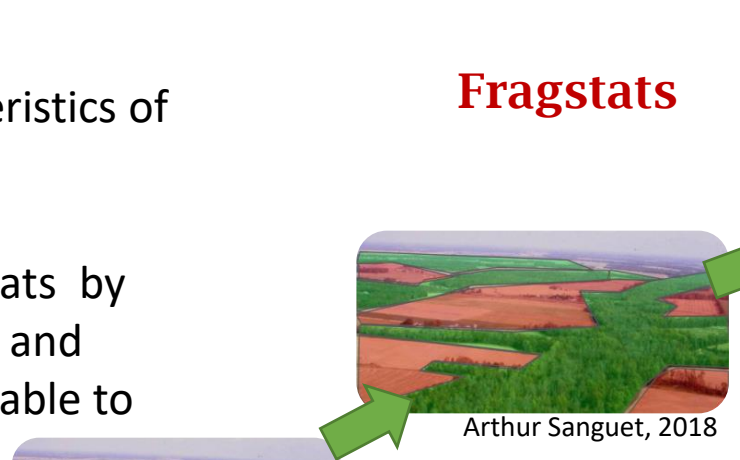


TEEB Europe

Landscape structure

Landscape structure: organisation and spatial characteristics of a landscape.

Fragmentation: the isolation of patches of natural habitats by anthropic elements. Provoques the loss of connectivity and enhances edge effects at the detriment of areas favourable to biodiversity.(Cordova-Lepe *et al.*, 2018)



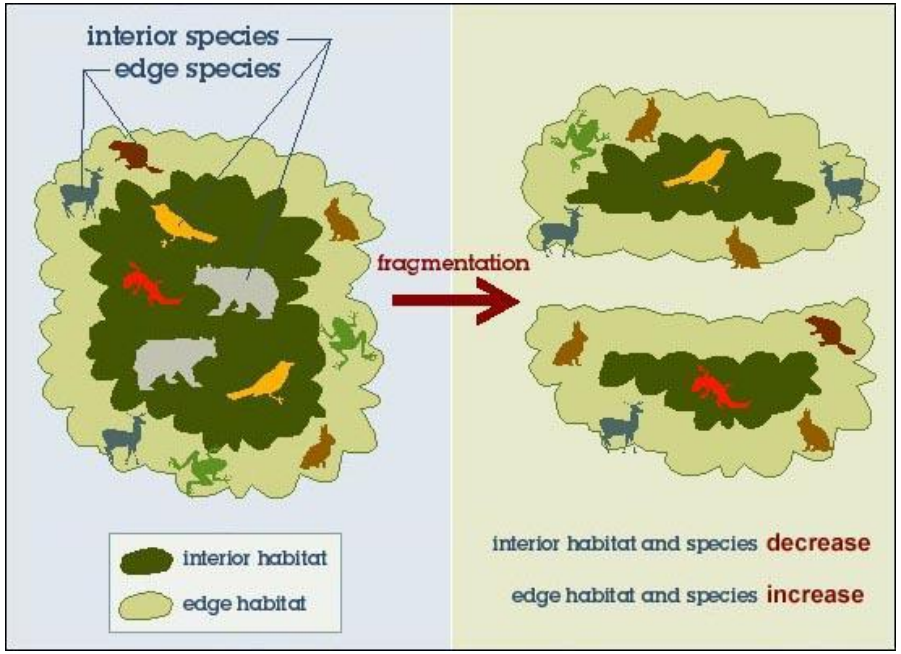
Arthur Sanguet, 2018

Jérémie Huguenin, 2015

How to study landscape structure?

Qualification of the capacity of land cover to host biodiversity in a sustainable way (for species survival, and reproduction).

Calculate naturality or fragmentation indexes and/or using softwares such as Fragstat.



Defenders of Wildlife : https://defenders.org

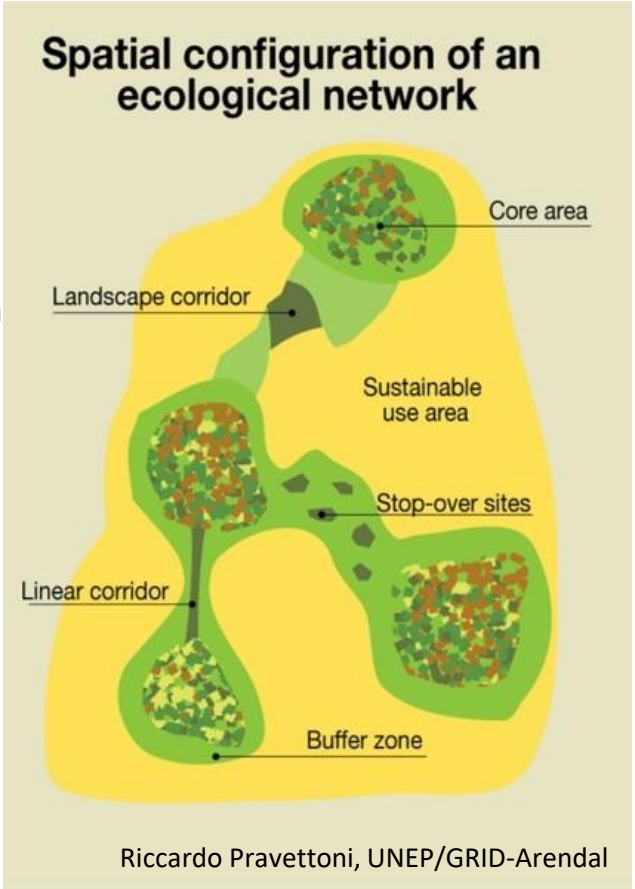
Landscape connectivity

Landscape connectivity:

- Use of landscape structure by organisms.
- Different species use landscape structure differently and have various connectivity requirements.
- Must allow migrations and daily movements of species between natural habitats. Particularly important in the context of climate change and spreading of urbanization (Haddad & Josh, 2006)

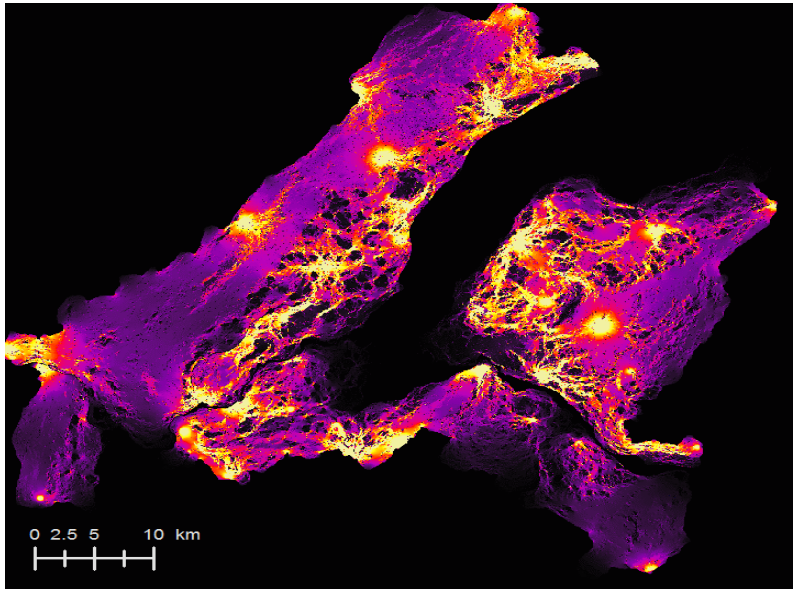
How to study connectivity?

- Calculate cost of movement and ecological barriers to connect core areas for biodiversity.
- Favourable habitats and ecological barriers vary between species. The choice of species must be representative of main groups (mammals, amphibians, birds, insects, nocturnal species…).



Riccardo Pravettoni, UNEP/GRID-Arendal

CIRCUITSCAPE.ORG

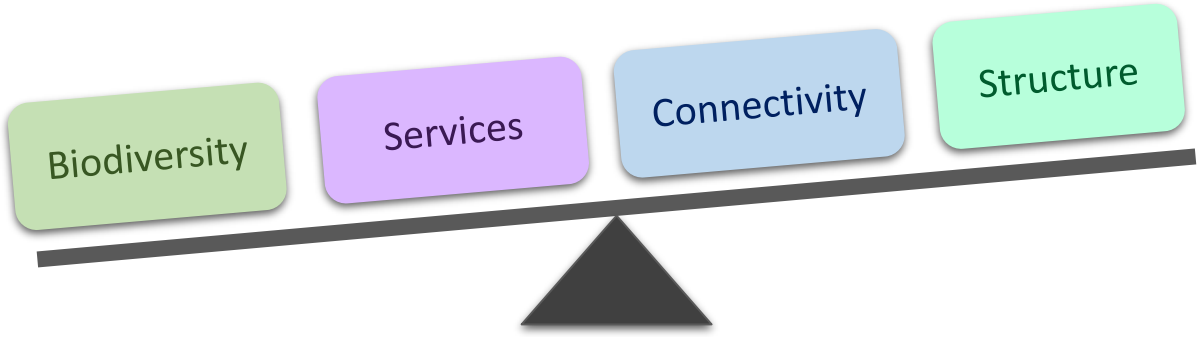


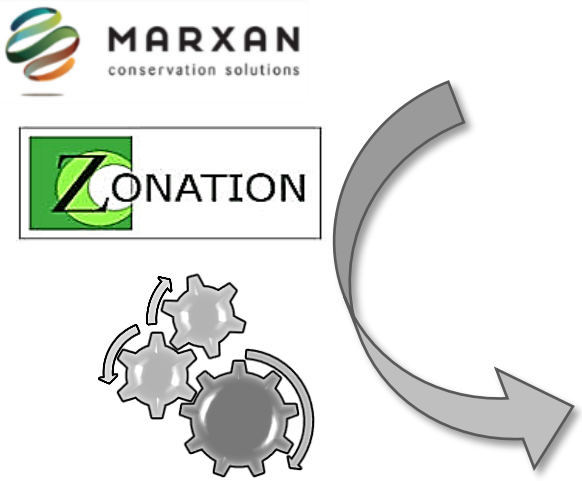
Loreto Urbina, master 2017

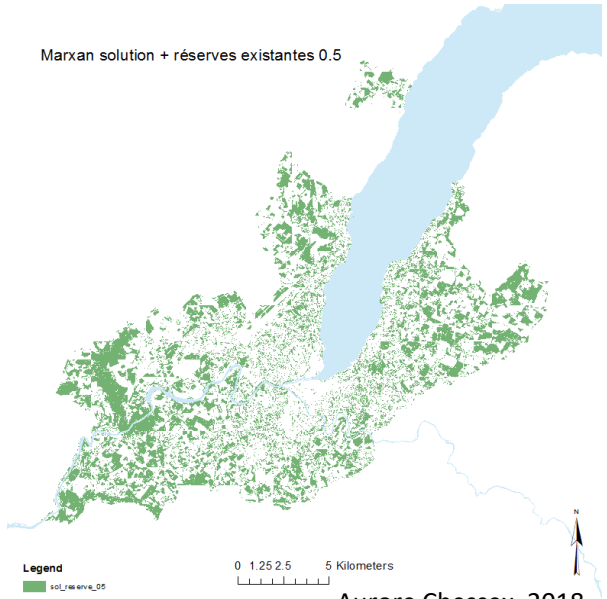
Prioritization

Creating a GI map to identify most important areas to preserve biodiversity and ES.

- Attributing a weight to each pillar according to conservation objectives.
- Taking into account socio-economic data such as landscape planning projects, the cost of land and private land.
- Modeling different future scenarios to predict the effects of climate change and urbanization.







Aurore Chessex, 2018

Bottlenecks in implementing national GI

- **Access to reliable data** -> improving data sharing and interoperability
- Increasing size and complexity of data sources -> improving data-processing capacities
- Elaboration and iteration of softwares -> APIs
- Knowledge transmission -> collaboration, stakeholders involvement

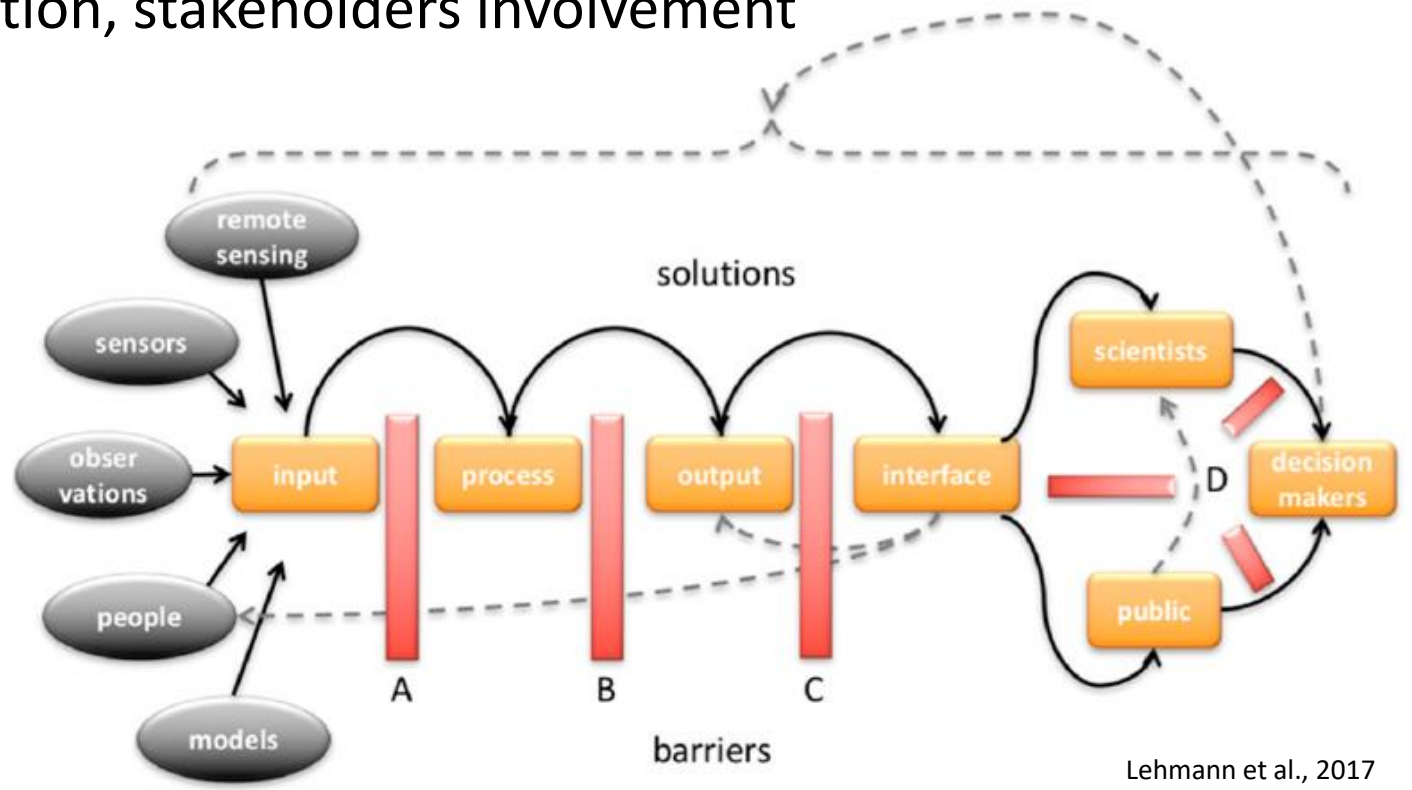
sustainability

MDPI

Case Report

Lifting the Information Barriers to Address Sustainability Challenges with Data from Physical Geography and Earth Observation

Anthony Lehmann [1,*], Rebecca Chaplin-Kramer [2], Martin Lacayo [1], Grégory Giuliani [1,3], David Thau [4], Kevin Koy [5], Grace Goldberg [6] and Richard Sharp Jr. [2]



Lehmann et al., 2017

Essential Variables (EV) help lower implementation barriers

- Essential Variables are “a minimal set of variables that determine the system’s state and developments, are crucial for predicting system evolution, and allow to define metrics that measure the trajectory of the system” (ConnectinGEO)

- EVs contribute to a more coordinated, effective and efficient way to monitor environmental systems

Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Environmental Sustainability

Essential Variables help to focus Sustainable Development Goals monitoring

Belinda Reyers[1,2,3], Mark Stafford-Smith[4,2], Karl-Heinz Erb[5], Robert J Scholes[6] and Odirilwe Selomane[3,7]

GEOESSENTIAL
ERA-PLANET

Essential Variables workflows for resource efficiency and environmental management

Addressing the need for reliable data sources to monitor environmental conditions and progress towards policy targets

EO and socio-economic data

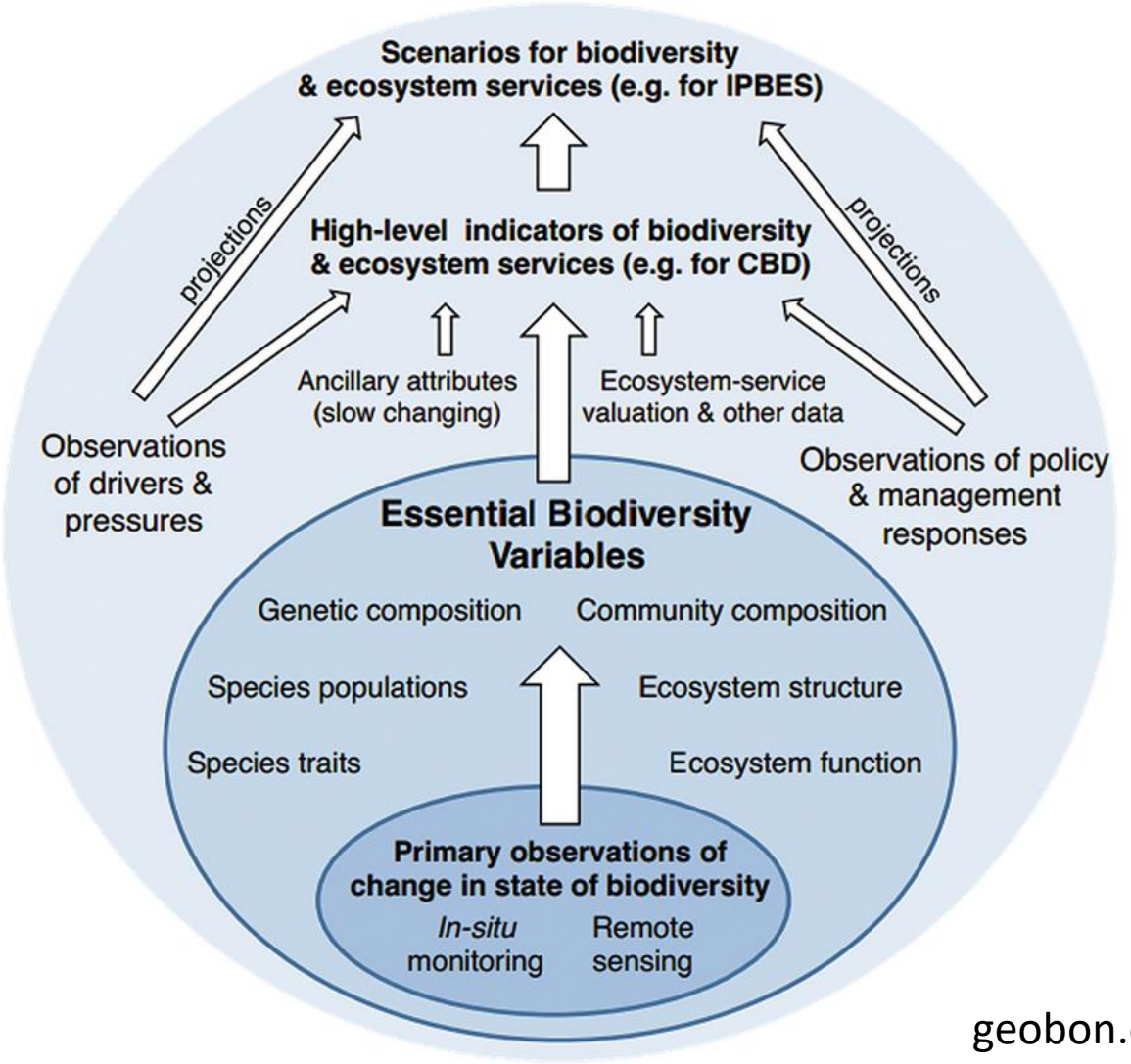
Essential variables

policy relevant indicators

sustainable development targets and scenarios

www.geoessential.net

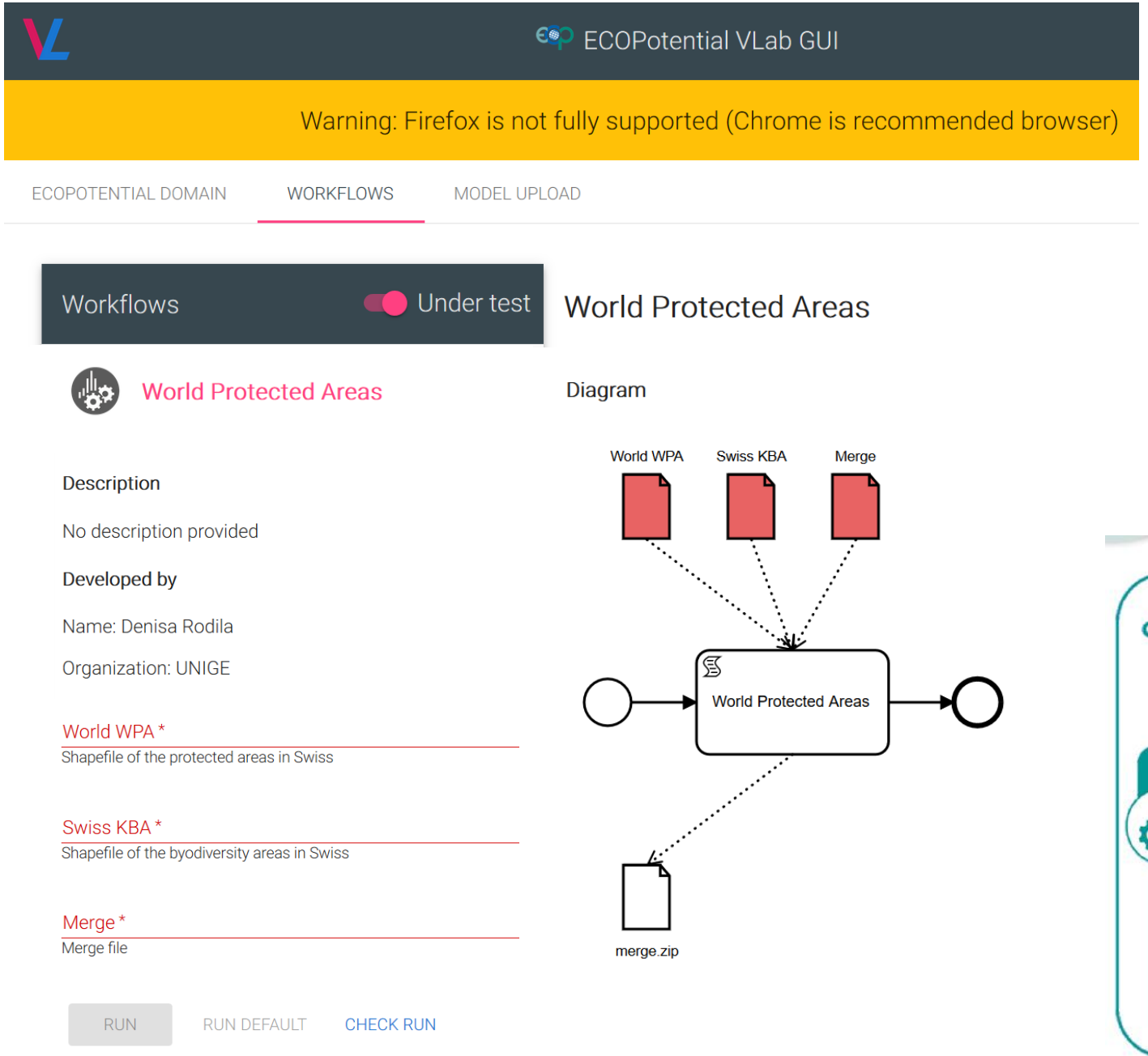
Essential Biodiversity Variables (EBV)

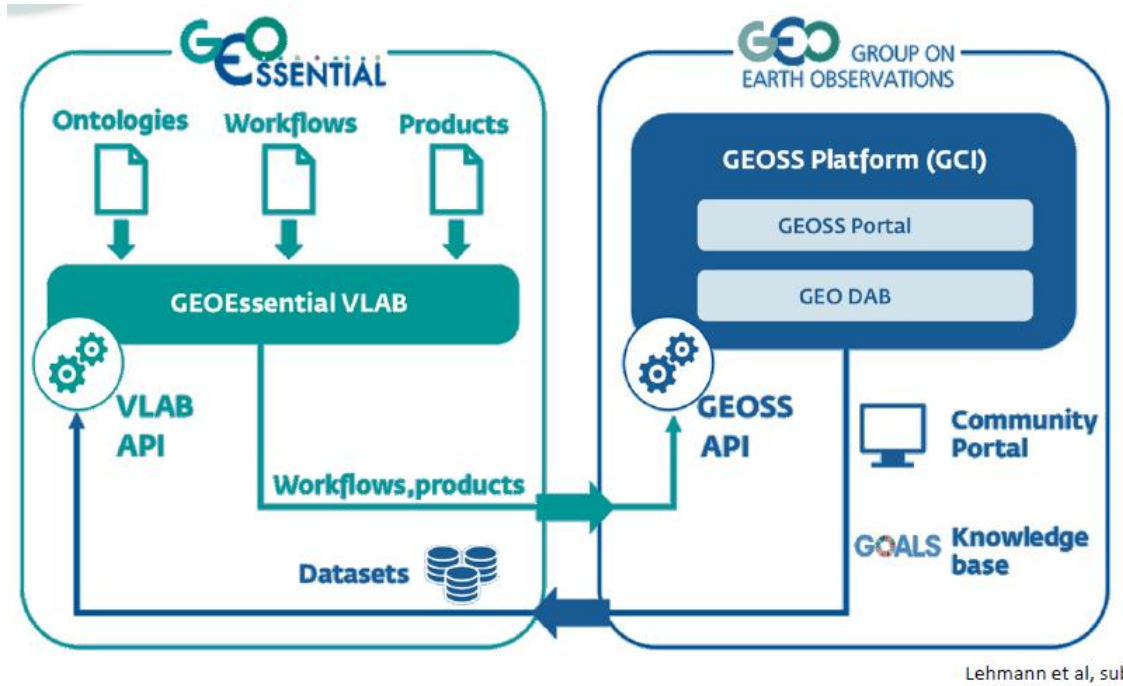


EBV classes	Candidates
Genetic composition	Co-ancenstry Allelic diversity Population genetic differentiation Breed and variety diversity
Species populations	Species distribution Population abundance Population structure
Species traits	Phenology Body mass Natal dispersion distance Migratory behavior Demographic traits Physiological traits
Community composition	Species richness Species interactions
Ecosystem function	Net primary productivity Secondary productivity Nutrient retention Disturbance regime
Ecosystem structure	Habitat structure Ecosystem extent and fragmentation Ecosystem composition by functional type

geobon.org

Virtual Laboratory

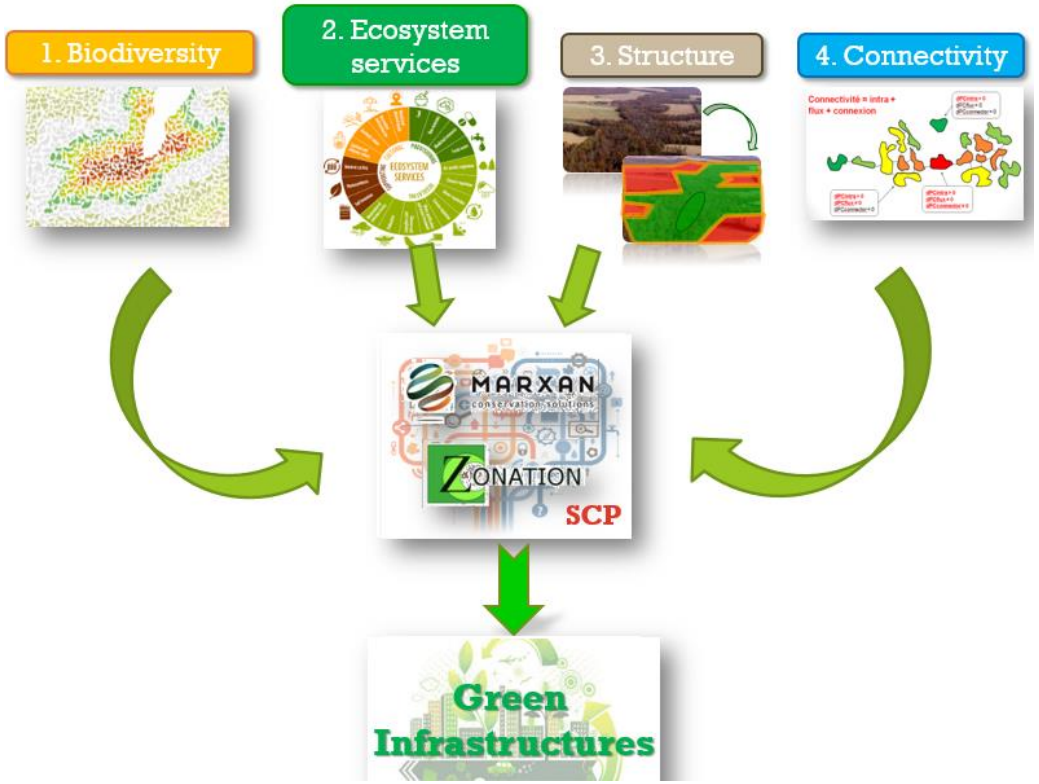




Lehmann et al, submitted

https://vlab.geodab.eu/ Developed by CNR

How can EO and EVs scale up the framework and help build GI across different scales?



Work in progress and expected outputs

- Identify most relevant EBVs and EVs for monitoring GI.

- Develop workflows based on EO and EVs to create a method to create comparable GI maps and assess GI across different scales and resolutions, and through time.

- Produce GI maps to support authorities make well-informed decisions for land planning.

  -> Enhance the role of protected areas by adding the value of the ES they provide

  -> Where to allocate the 17% of protected areas for the maximum biodiversity benefits?

  -> Are the current protected areas in the optimal areas?

Contact: erica.honeck@unige.ch

Thank you!

Related poster: *"Identification of Green Infrastructures in Switzerland and its implementation at different scales"* - Arthur Sanguet

GEO Essential project: http://www.geoessential.eu

GEOEssential portal (under construction): https://geoessential.unepgrid.ch/

ERA-PLANET: http://www.era-planet.eu/

Acknowledgments: Arthur Sanguet, Martin Schlaepfer, Benjamin Guinaudeau, Nicolas Wyler, Pascal Martin, Bertrand von Arx, Loreto Urbina, Veronica Ruiz