H2020 Project ECOPOTENTIAL: Improving future ecosystem benefits through Earth Observations

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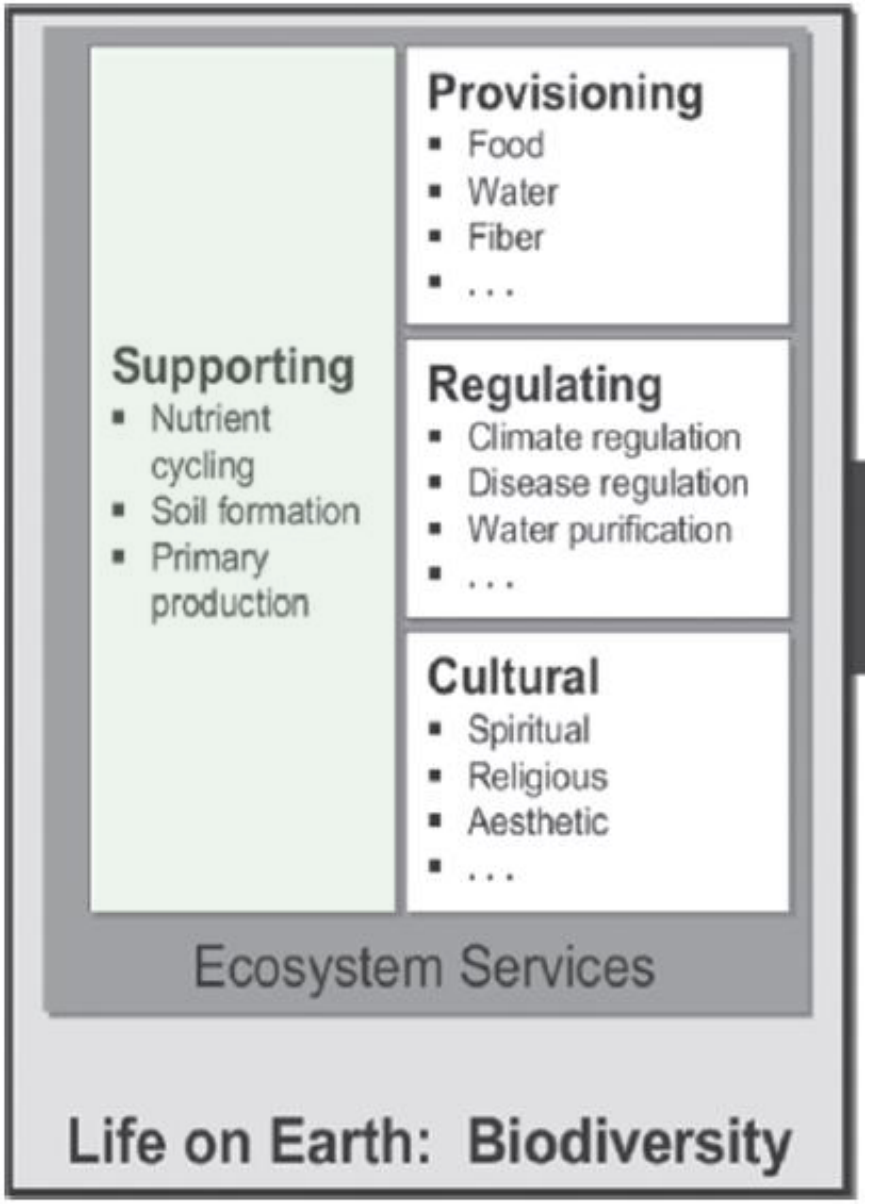
Ecosystem Processes (EP)



Ecosystem Services (ES): "the functions and products of ecosystems that benefit humans, or yield welfare to society"
Millennium Ecosystem Assessment, 2006

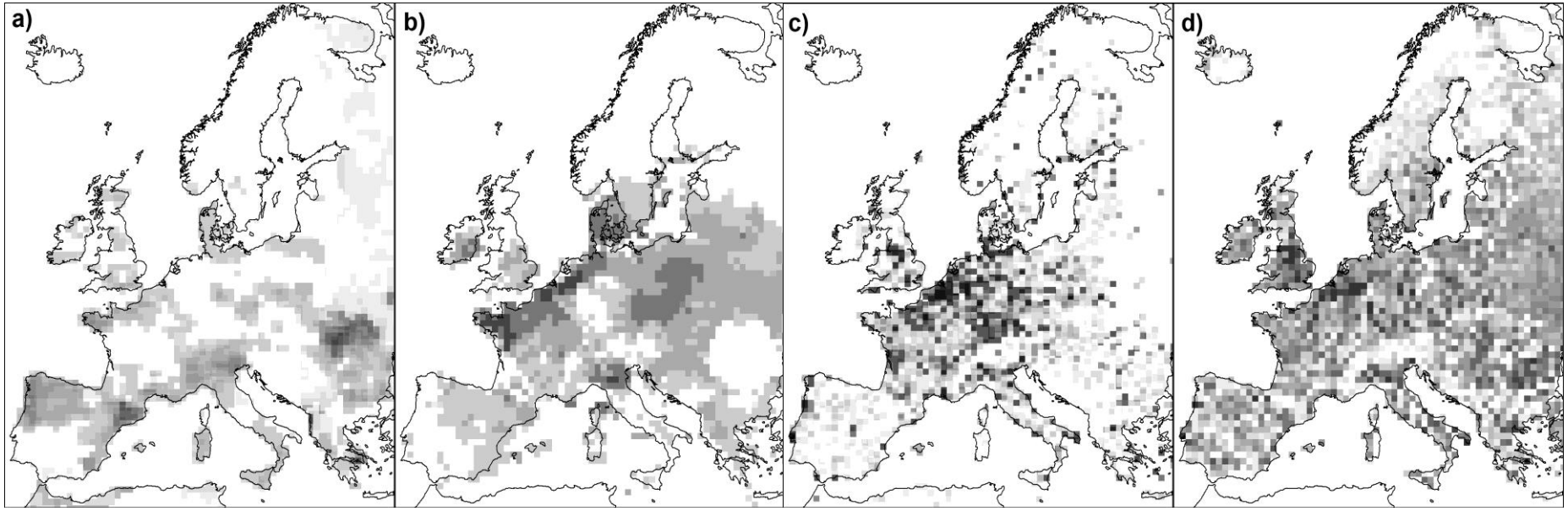
Ecosystem Services: Origins, Contributions, Pitfalls, and Alternatives

Sharachchandra Lele[a,#], Oliver Springate-Baginski[b], Roan Lakerveld[c], Debal Deb[d], and Prasad Dash[e]

Conservation and Society 11(4): 343-358, 2013

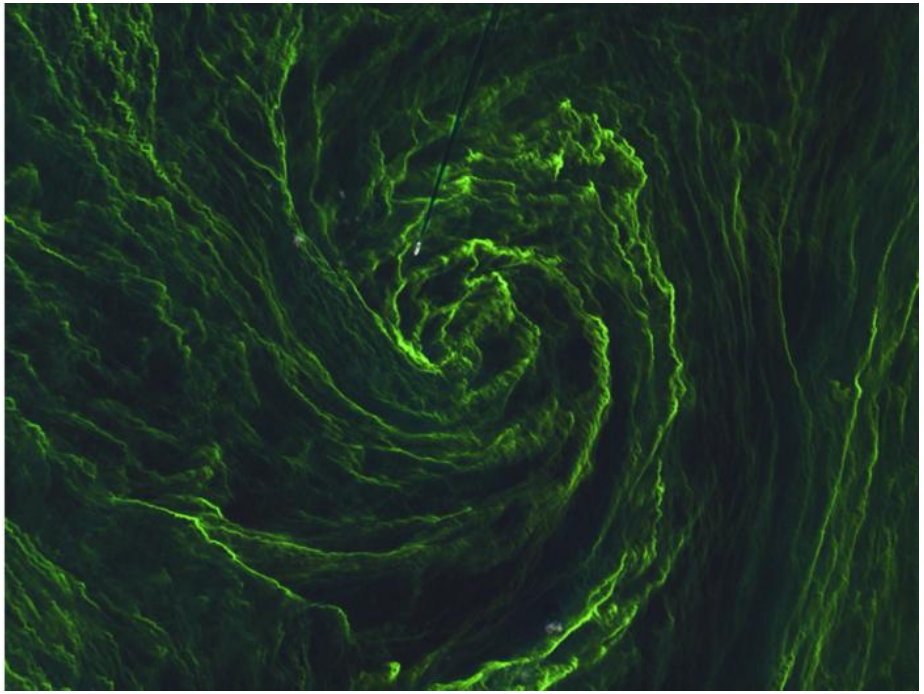
Loss of ecosystem services: a major issue of the Anthropocene

Loss of ES: a problem at continental scale with local modulation and multiple drivers



Climate Change Pollution Land Cover Change Biodiversity Response

Need for high-res monitoring and modelling of ecosystem processes (supporting services) that underpin ES



Algal bloom in the Baltic Sea
ESA, Sentinel-2 image – 10 m resolution
http://www.esa.int/spaceinimages/Images/2015/09/Eye_of_an_algal_storm

Ecosystem monitoring – LTER
Lake Leynir, Gran Paradiso National Park
2747 m a.m.s.l.

Crucial role of Protected Areas:

Areas of natural ecosystems in a matrix of heavily anthropically modified environments

Providers of ES that are specific of weakly anthropized / natural environments

Treasure chests of biodiversity

Source / refuge areas for the surrounding environments

Areas with large amounts of quantitative data (eg, Long-Term Ecological Research sites)

Ecopotential: What protected areas?
28 protected areas

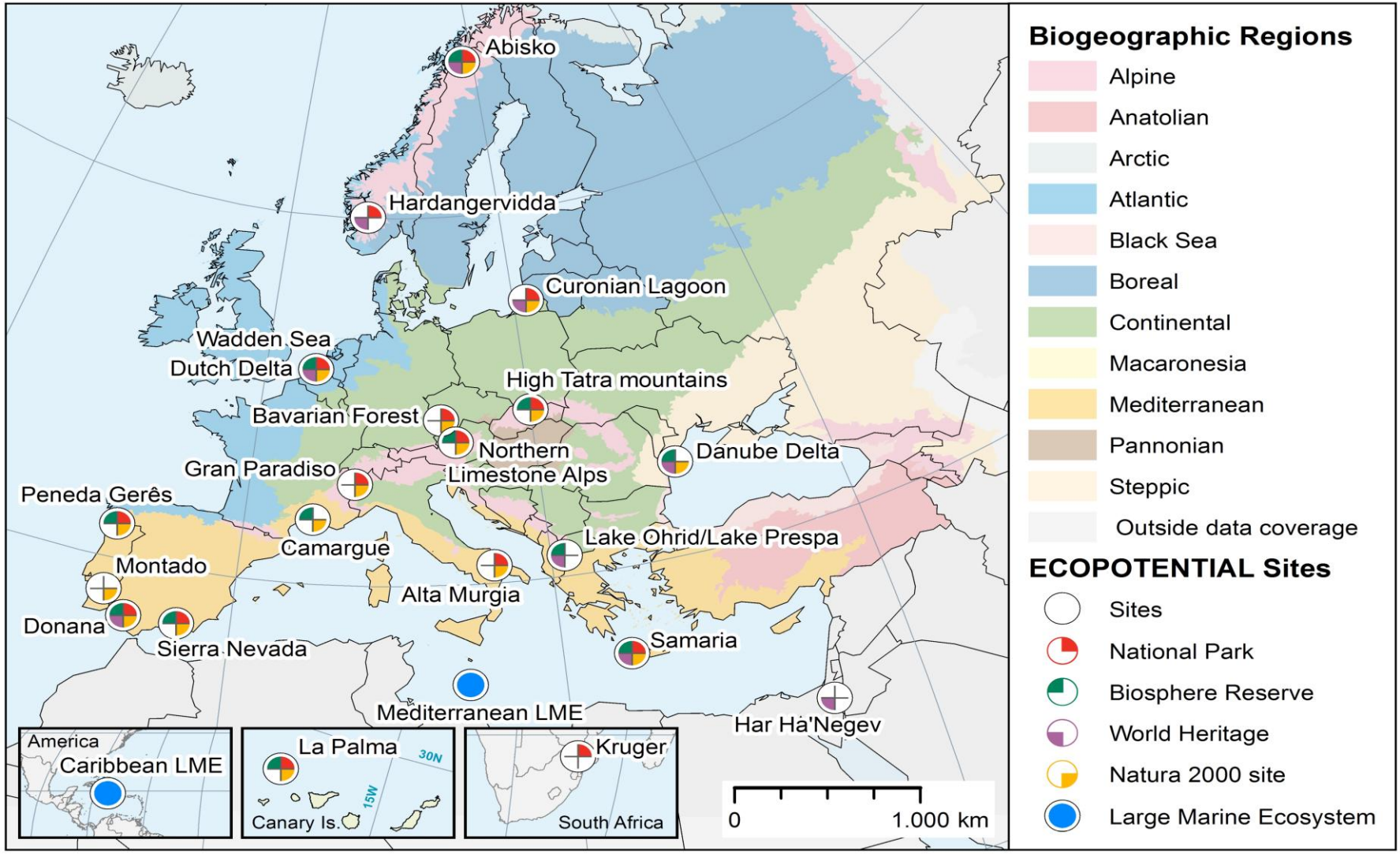
ECOPOTENTIAL sites cover **terrestrial protected areas** over:

- spatial gradients in Europe
- climatic gradients in Europe
- **biogeographical regions in Europe**
- major ecosystem types
- and one outlayer ecosystem of iconic importance (Kruger NP, SA) for cross-continental implementation

Two Large Marine Ecosystems are included:

- Mediterranean Sea
- Carribean Sea

Location and protection status of the Protected Areas in ECOPOTENTIAL and European biogeographic regions



Mountain Ecosystems

Gran Paradiso,
Italian Alps

Foto C Beierkuhnlein

Arid / Semiarid Ecosystems

Negev Desert, Israel

Foto C Beierkuhnlein

Coastal Ecosystems

Danube Delta, Romania

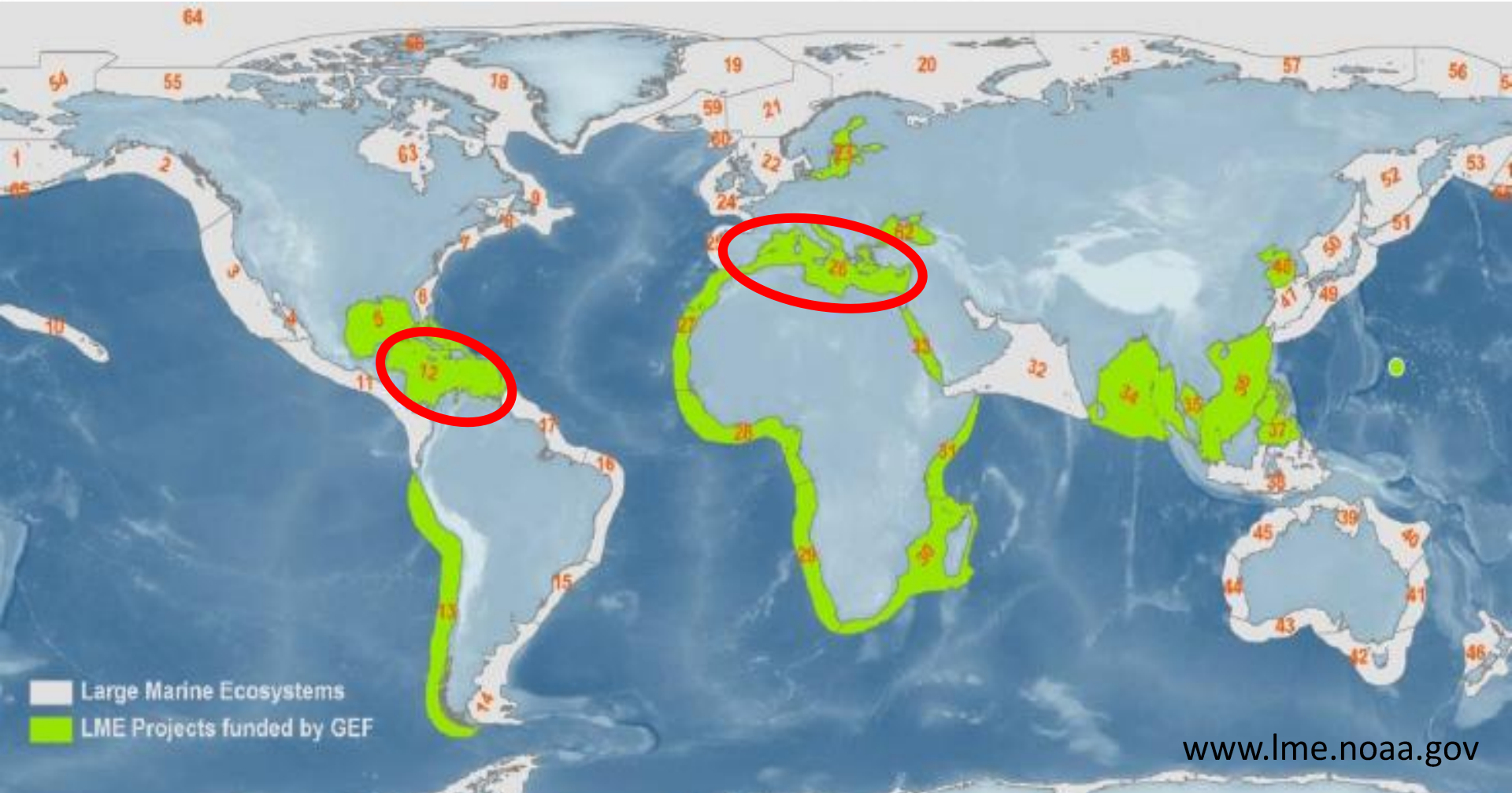
Foto Elena Pleskevich Wikimedia Commons

Large Marine Ecosystems

Two UNESCO LMEs are included.

Intergovernmental Oceanographic Commission

United Nations Educational, Scientific and Cultural Organization



ECOPOTENTIAL Partners

Università del Salento

EURAC research

CSIC
Consejo Superior de Investigaciones Científicas

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marine biodiversity exploitation & conservation

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UAB
Universitat Autònoma de Barcelona

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NIOZ

umweltbundesamt

Starlab
Living Science

Earth and Environmental Science

museum für naturkunde berlin

TOUR DU VALAT

Deltares

ARATOS TECHNOLOGIES

iDiv
German Centre for Integrative Biodiversity Research (iDiv)
Halle-Jena-Leipzig

CESBIO

UNESCO

LSE
THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

UNIVERSITAS BERGENSIS

terradue 2.0

UNEP

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ETH zürich

Environmental and Water Agency of Andalusia
REGIONAL MINISTRY OF ENVIRONMENT AND SPATIAL PLANNING

UBO
université de bretagne occidentale

UNIVERSITÉ DE GENÈVE

H2020 ECOPOTENTIAL Project: Improving Future Ecosystem Benefits through Earth Observations

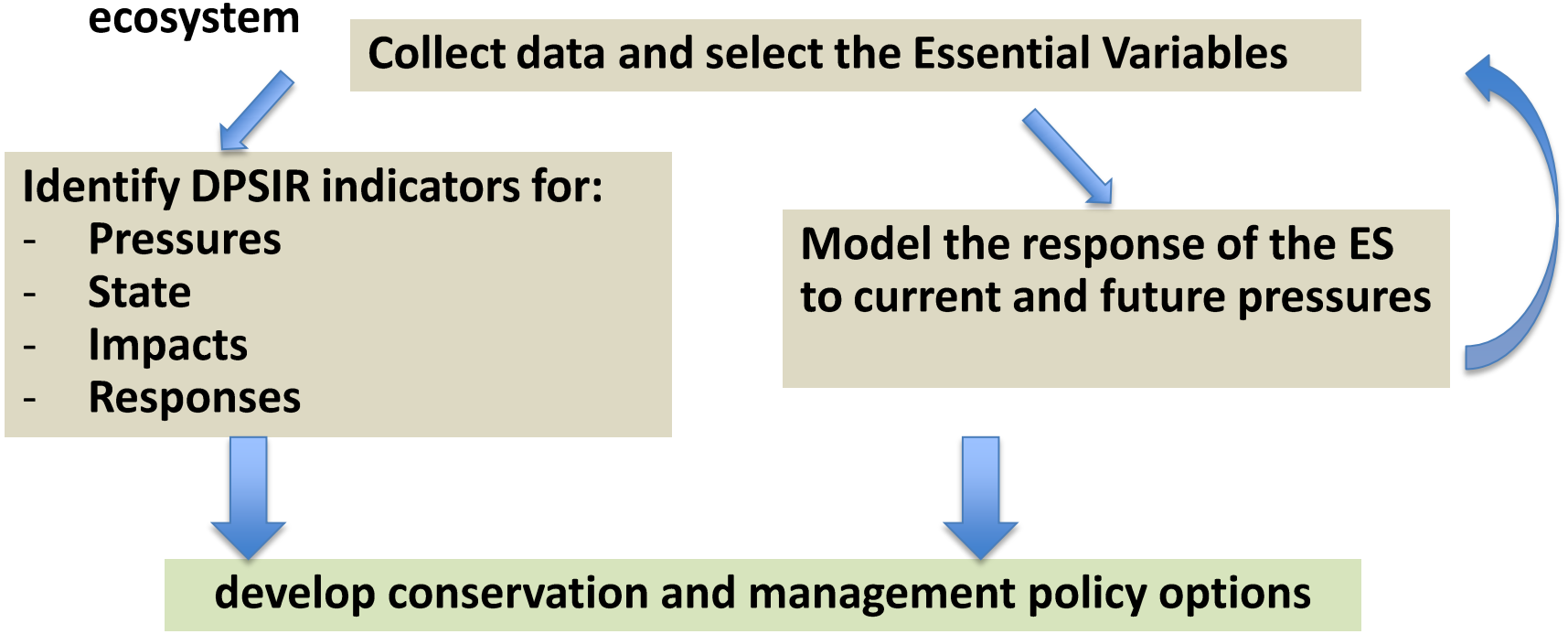
- Focus on ecosystem services
- Use EO data (satellite and in situ)
- Build models capable of including EO data
- Assess the current state and estimate the future evolution of ecosystem services
- Define policy options and the requirements of future protected areas
- Develop capacity building strategies
- Make all results available to the community, contributing to GEO and GEOSS

ECOPOTENTIAL provides support to GEO and GEOSS

GROUP ON
EARTH OBSERVATIONS

ECOPOTENTIAL: The storylines (as an ITERATIVE process!)

- Focus on a given Protected Area and identify the main ESs of interest
- Identify the main and most critical Ecosystem Processes relevant for the ESs
- Identify the most important (abiotic and biotic) control factors on the ecosystem



Always: verify whether EO (remote sensing and in-situ) data are available to estimate indicators! – focus on Essential Variables

ECOPOTENTIAL: Ecosystem Services

Protected area	Threat	Ecosystem Service
Gran Paradiso (CNR)	Land use changes; climate change; natural system modifications; human disturbance.	Nutrition; materials from plants; water; mediation of flows and flood protection; maintenance of physical and biological conditions; gene pool protection; climate regulation; scientific, educational, heritage, cultural, aesthetic values.
Sierra Nevada (UGR)	Climate change; biogeochemical cycle changes; land use changes.	Water; feeding; landscape; geological materials; genetic pool; recreational activities; traditional knowledge; dampening of perturbations; water cycle regulation.
High Tatra (UNEP)	Mass tourism and tourism and sports infrastructure; human settlements (private housing); air pollution; environmental damages caused by historic mismanagement of land.	Surface water; water flow maintenance; flood protection; genetic materials from all biota; wood fuel; mass stabilisation and control of erosion rates; pollination and seed dispersal; soil formation and composition; climate regulation; wild plants and animals; scientific, educational, heritage, cultural, aesthetic values.
Samaria (FORTH)	Overgrazing and uncontrolled fires; poaching and uncontrolled abstraction of endemic species of flora; massive touristic flow.	Water; cultivated crops; reared animals; wild animals; mass stabilisation and control of erosion rates; pollination and seed dispersal; nursery populations and habitats; decomposition and fixing processes; experiential use of plants, animals and land-/seascapes; cultural benefits.

Assessment of ES, ESS, field data, EO data, threats for each Ecosystem type

	Gran Paradiso				
Ecosystem Type	Ecosystem Service	Ecosystem Functions	Available Field Data	Available Remote Sensing Data	Major Threat(s)
Alpine prairies	Recreation; cultural; presence of flagship species (Ibex)	Ibex and chamois population dynamics; primary production; grass quality and vegetation biodiversity; soil moisture; tree encroachment	Available and/or ongoing: Ibex and chamois counts and population structure, meteoclimatic data, vegetation field surveys. Planned: soil moisture measurements, soil-atmosphere fluxes	Satellite estimates of NDVI, aerial photographs	Climate change, changes in precipitation and snow cover, tree encroachment
Altitudinal transects from the Montane to the Alpine belt.	Recreation; cultural; biodiversity conservation	Primary production; invertebrate biodiversity; response of biodiversity to climate change; species turnover	Invertebrate and avian biodiversity surveys since 2006; meteoclimatic data and local temperature data in a large number of sampling plots	Drone images of vegetation structure in the plots; satellite estimates of NDVI	Climate change, human disturbance
High-altitude Alpine lakes	Recreation; cultural; biodiversity conservation and management	Primary production; zooplankton and invertebrate population dynamics	Repeated samples of water quality in several lakes; phytoplankton and zooplankton measurements; estimates of invertebrate and amphibian distribution	Snow cover images	Climate change, pollution, introduction of alien species

ECOPOTENTIAL
Essential Variables for Ecosystems

Essential Biodiversity Variables	Essential Climate Variables	Essential Ocean Variables	Essential Water Variables	Essential Social and Environmental Variables
Species Composition	Precipitation	Sea Surface Temperature	Runoff/streamflow/ river discharge	Population density
Functional groups traits	Temperature	Ocean acidification	Lakes/ reservoir levels	Resource use and management
Ecosystem extent & structure	Irradiance	Zooplankton composition	Glaciers front	Natural-areas accessibility

Outputs:

- Monitoring indicators for ecosystems, biodiversity and ESSs status, trends, supply and demand
- Creation of a unified Essential Variables framework
- Support tools for defining policies of responses

Some examples of indicators:

- Level of biodiversity (Good Environmental Status)
- Level of protection of Key Species
- Habitat diversity
- Connectivity with other areas (protected or not)

www.ecopotential-project.eu

Thank you for your attention