

WP2. SERVICES PROVIDED BY THE MEDITERRANEAN ECOSYSTEMS

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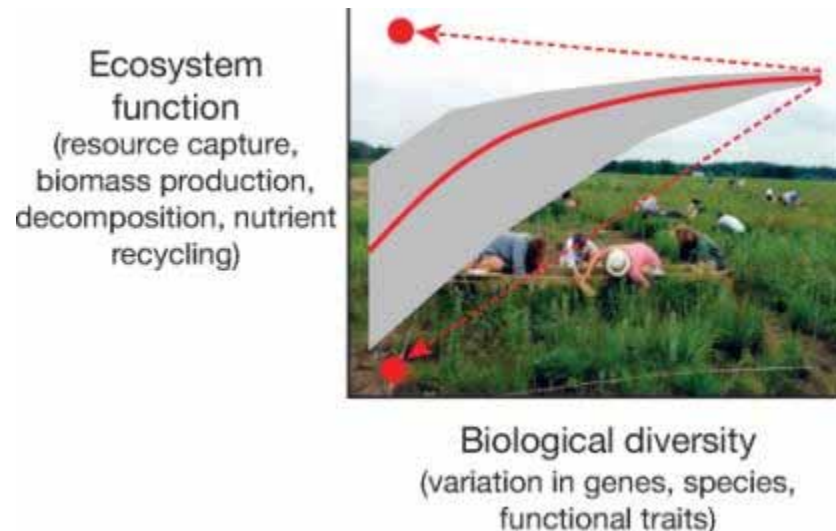
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Background

The Mediterranean region is one of 34 global biodiversity hot spots.
Due to multiple global change drivers, biodiversity is declining at an alarming rate.

| Organisms | Nr species | % of world | % endemic |
|------------------|------------|------------|-----------|
| land flora | 30 000 | 28% | ~43% |
| marine flora | 860 | 10.9% | ~28% |
| land vertebrates | 1 910 | 4.3% | ~21% |
| marine fauna | 11 600 | 6.2% | ~27% |



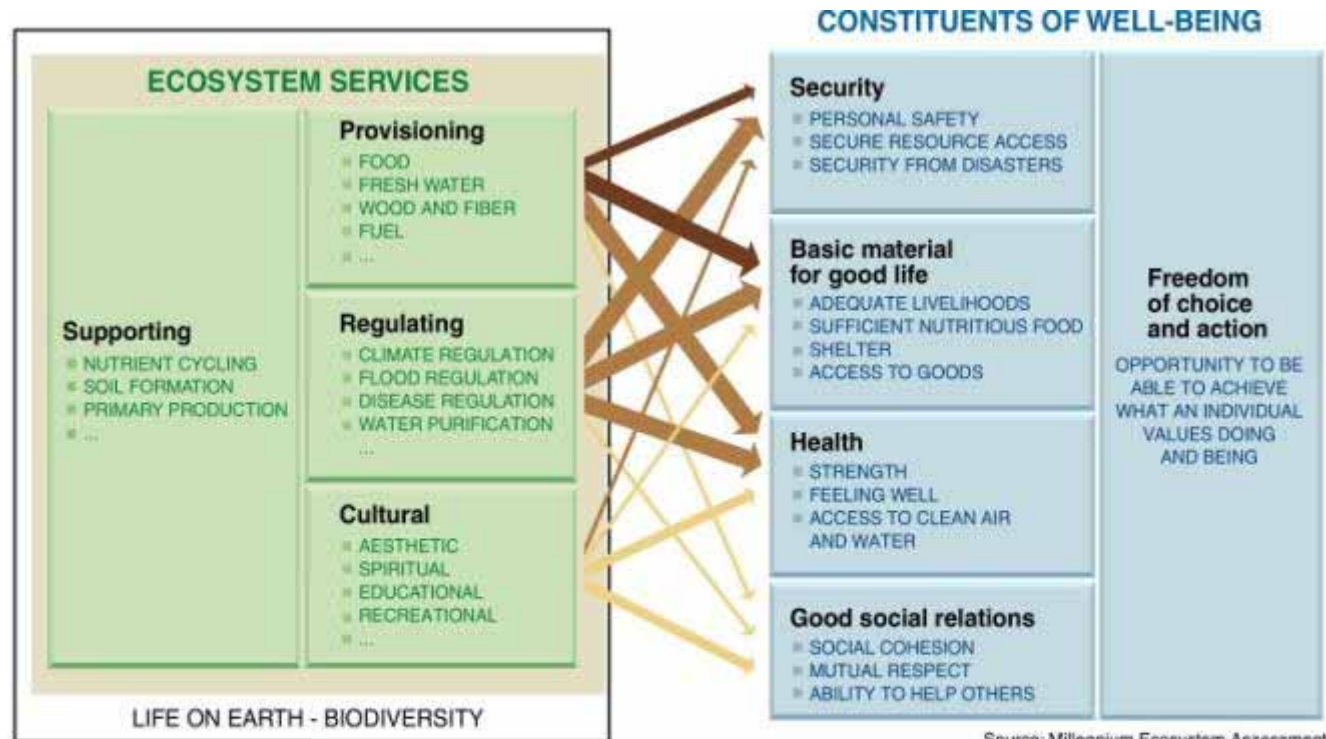
Biodiversity loss reduces the efficiency by which ecological communities capture biologically essential resources, produce biomass, decompose and recycle biologically essential nutrients.

Biodiversity increases the stability of ecosystem functions through time.

(Cardinale et al. 2012)

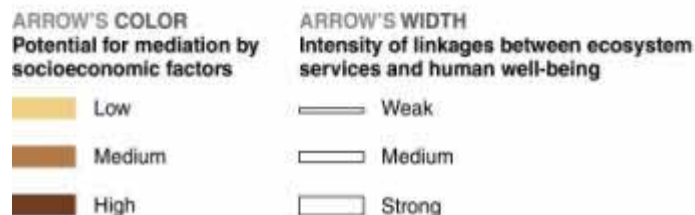
Background

Ecosystem services from land and ocean are crucial for economy and human well-being in the Mediterranean.



The capacity of ecosystems to provide services is connected to biodiversity.

Numerical tools, based on process-based simulation models and spatial data bases, permit the assessment of past, current and future ecosystem service provisioning.

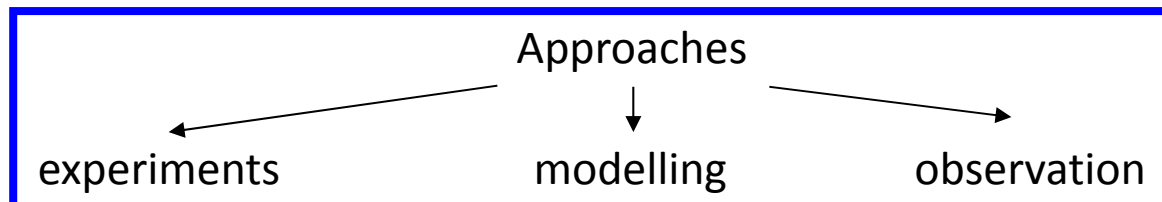


Source: Millennium Ecosystem Assessment

Objectives

Biodiversity, ecosystem functioning, and ecosystem service provisioning will be studied in relation to the Mediterranean's high biodiversity and its evolution:

1. at the level of local adaptive processes, by analyzing the role of environmental stresses
2. at the level of macro-ecological processes recorded over much broader temporal and spatial scales
3. non-adaptive shorter-term evolutionary processes (demographic fluctuations, connectivity) will also be taken into account
4. at the level of interaction between ecosystem functioning and the human sphere



Objectives

Particular attention will be paid to:

- **marine biodiversity** and the functioning of marine trophic webs up to exploited resources;
- **forest biodiversity**, linked to the specificity and current dynamics of Mediterranean forests;
- **soil biodiversity**, playing a major role in ecosystems and agro-systems functioning;
- **urban biodiversity** and its relationships with **coastal development**, increasing human impacts and the importance of invasive species;

Implementation

Marine biodiversity and the functioning of marine trophic webs up to exploited resources:

- Marine ecosystem functioning until exploited resources
- Marine environment management

Actions

- responses of trophic webs in terms of community structure, functioning and adaptation with regard to climatic forcing and direct human impacts;
- setup a long-term observation of diversity structure of the main planktonic communities in Gulf of Lion;
- understand and forecast jellyfish blooms in coastal regions;
- effectiveness of Marine Protected Areas (MPA): effects of marine reserves on biodiversity, fisheries and ecosystem restoration;
- artificial reefs as tools for environment rehabilitation.



Laboratories and partners involved

**MIO, IMBE, MERMEX,
BIODIVMEX, Prog Recif Prado**



Implementation

Mediterranean soils: modelling and management

Actions

- reconstruct the impacts of land use and past climate changes on soil properties during the last 50 and 2000 years, using isotopic signatures for the TWP1 observation areas;
- improve soil models by coupling geochemical and C-N-ecosystem models and adapting them to the Mediterranean zone;
- compare soil model to the agroecosystems model (TWP2);
- integrate soil quality and services into decision making and adaptation strategies (WP3).



Laboratories and partners involved

CEREGE, GSE, BIODIVMEX, IMBE,
SICMED, Equipex ASTER-CEREGE

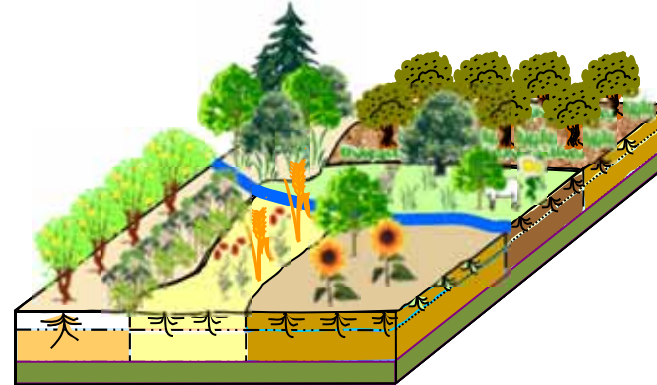


Implementation

Agriculture and forest modelling and dynamics

Actions

- estimate the basin-wide impacts of land ecosystem changes by first adapting the global LPJmL model to the Mediterranean region
- then use LPJmL to estimate ecosystem services (food, fibre, water), against different assumptions for ecosystem management, agriculture types



Laboratories and partners involved

IMBE, GSE, GREQAM,
PIK (Potsdam, Germany)

Implementation

Biodiversity management

Actions

- compile all geo-referenced information about Mediterranean ecosystems, along with existing protected areas and the major threats for them
- identify gaps in spatial patterns and ecosystem functioning
- estimate biodiversity-related ecosystem services for key regions, as well as across the entire Mediterranean basin
- compare biogeographic and historical data (phylogeographic) to understand the evolution of biodiversity affected by global change
- expand conceptual basis to marine biodiversity



Laboratories and partners involved

IMBE, MIO, BIODIVMEX



Implementation

Urban biodiversity and its relationships with coastal development and human impacts

Actions

- compile all information about Mediterranean urban ecosystems
- estimate biodiversity-related ecosystem services for key cities, as well as across the entire Mediterranean basin
- estimate the effects of urbanisation on an individuals and populations
- estimate the impacts and the importance of invasive species in urban ecosystems
- study the mechanisms of adaptation and the origin of phenotypic variability and their effects on the selective value



Laboratories and partners involved

IMBE, BIODIVMEX, GREQAM



Laboratories involved

- Centre Européen de Recherche et d'Enseignement en Géosciences de l'Environnement (CEREGE), UMR 7330, Aix-en-Provence (climate and continental environment sciences)
- Géochimie des Sols et des Eaux (GSE), UR 1119, Aix-en-Provence (soil science)
- Groupement de Recherche en Economie Quantitative d'Aix-Marseille (GREQAM), UMR 7316, Marseille (economics)
- Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale (IMBE), UMR 7263, Aix-en-Provence & Marseille (ecology and biodiversity)
- Mediterranean Institute of Oceanography (MIO), UMR 7294, Marseille (oceanography)

Programs & Partners

- **BioDivMex** (BioDiversity of the Mediterranean Experiment)
- **HyMeX** (Hydrological cycle in the Mediterranean Experiment)
- **MerMeX** (Marine Mediterranean Experiment)
- **SICMed** (Continental Surfaces and Interfaces in the Mediterranean area)
- Programme Recif Prado