

## TWP2. TOWARD AN INTEGRATED MODELLING OF THE MEDITERRANEAN SYSTEMS

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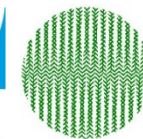
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A\*Midex  
Initiative d'excellence Aix-Marseille



IRD  
Institut de recherche  
pour le développement



INRA  
Institut National de la Recherche Agronomique



## Context

Representing the impact of global change on the Mediterranean socio-ecological system

this requires modelling:

- to evaluate potential impacts
- to assess different response strategies (i.e. the sustainability of scenarios of future developments)
- to provide policy-relevant scientific information

Several modelling activities are currently being developed by OT-Med institutes



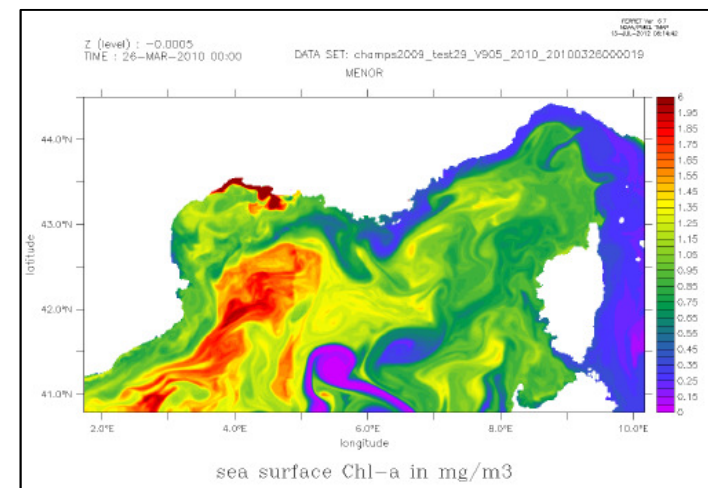
$$\frac{d \text{Earth}}{dt} = F(\text{Earth})$$

## The ocean:

Mediterranean Institut of Oceanography (MIO)

- Simulating 3D ocean circulation from meso-scale to basin scale
- Testing hypotheses on the functioning of marine ecosystem
- Computing matter budget and carbon sequestration
- Simulating the consequences of anthropogenic and climate pressure at the ecosystem level (top-down vs bottom-up)
- Exploring species dynamics, distributions and interactions
- Testing the sensitivity of ecosystem indicators

*Spring chlorophyll concentration  
(Melika Baklouti)*



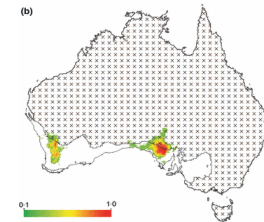
## The land:

Centre Européen de Recherches et d'Enseignement en Géosciences de l'Environnement (CEREGE)

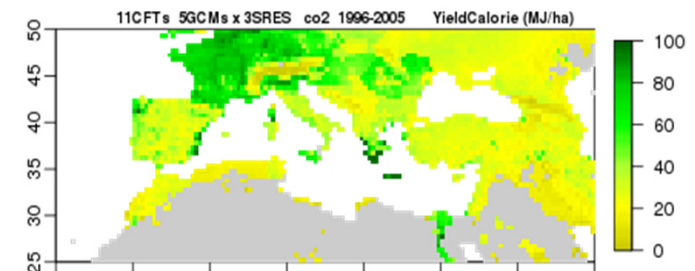
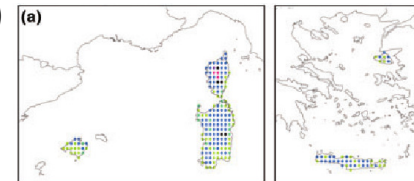
Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale (IMBE)

- Reconstructing past climate and vegetation
- Predicting species & biome shifts under global change
- Carbon balance dynamics and its dependence on land use and land management
- Estimating future food production and its impacts on GHG emissions, water use, soil degradation
- Understanding the interactions between agriculture and biodiversity
- Approaching sustainable management of agro-ecosystems through the estimation of multiple services and dis-services

*Future climate suitability of Banksia cuneata (Kriticos et al.)*



*(Gritti et al.)*



*food calories production (Bondeau et al.)*

## The people:

Groupe de Recherche en Economie Quantitative d'Aix-Marseille (GREQAM)

- Modelling the behaviour of economic agents (agent-based modelling) for reaching well-being maximization
- Comparing the effects of focusing on societal benefits (general interest) or on individual benefits (agent games)
- Simulating the place of the environment (constraint or value)

=> Is fishing compatible with environmental conservation: A stochastic model with an element of self-protection? (*Ami et al.*)

=> On the coordination of European agro-environmental & water internalizing policies

*Mediterranean bluefin tuna stocks collapsing*

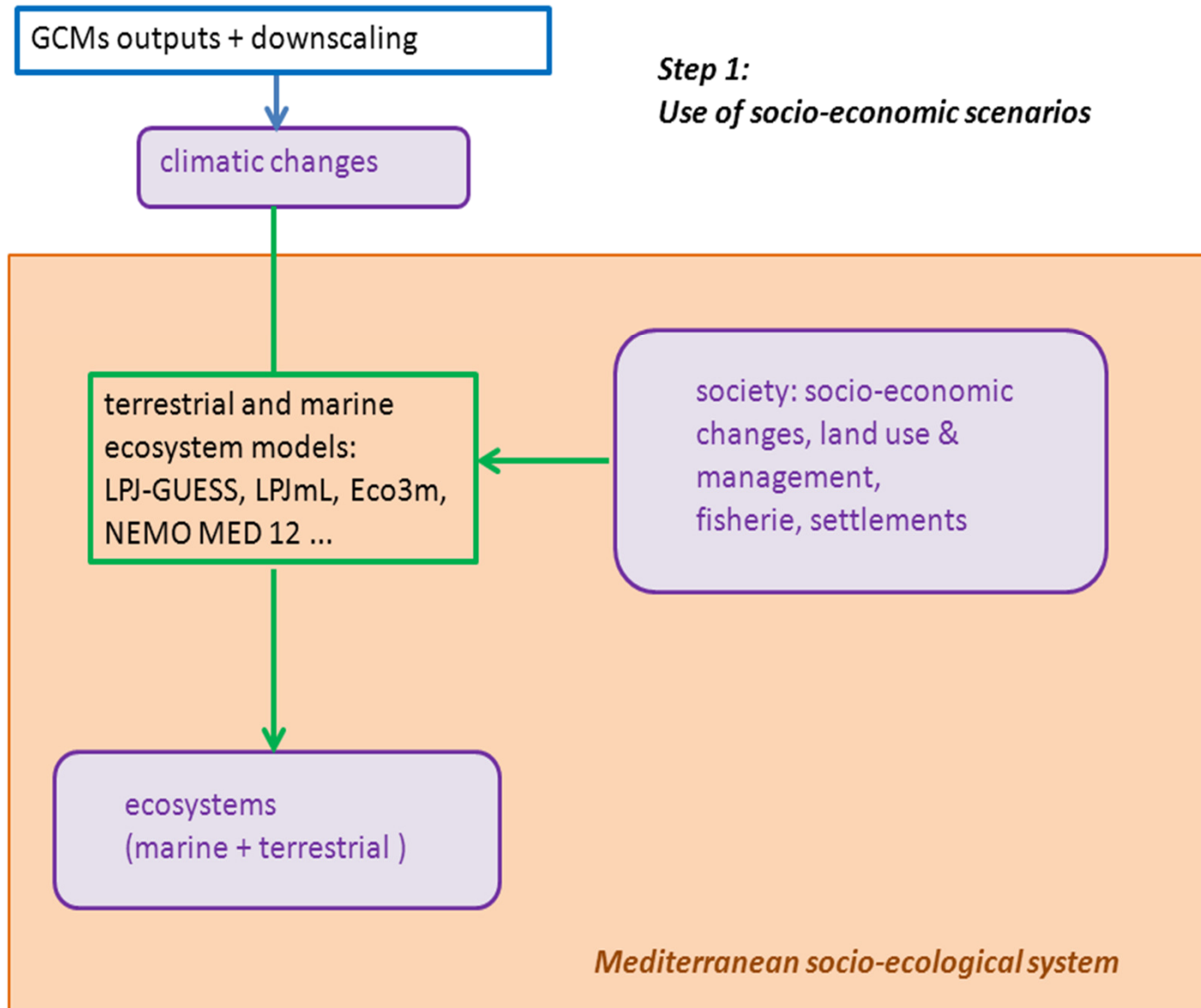


*Irrigation in Plaine de Crau*

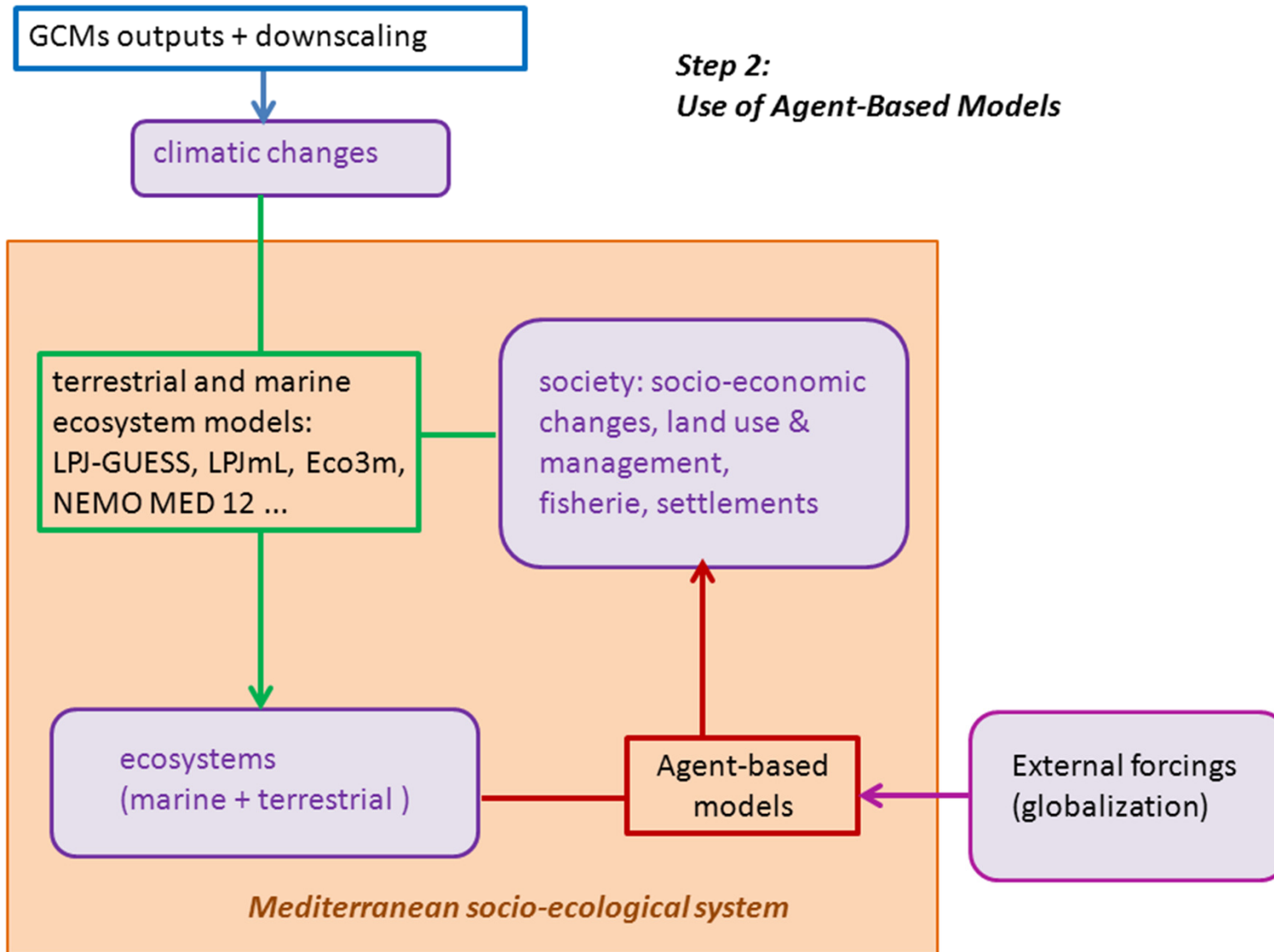


# Objectives

- to create a suitable modelling framework capable of responding to the challenges posed by OT-Med
- to improve and advance existing models inside a coherent context
- to understand the interactions between environmental and social processes as represented by the different models in order to achieve their integration within a single modular framework
- to develop not a monolithic model, but a framework where different models (different formalisms, different programming languages) exchange information
- to connect the modelling framework with the databases developed by TWP1
- to develop a coherent set of scenarios for model evaluation

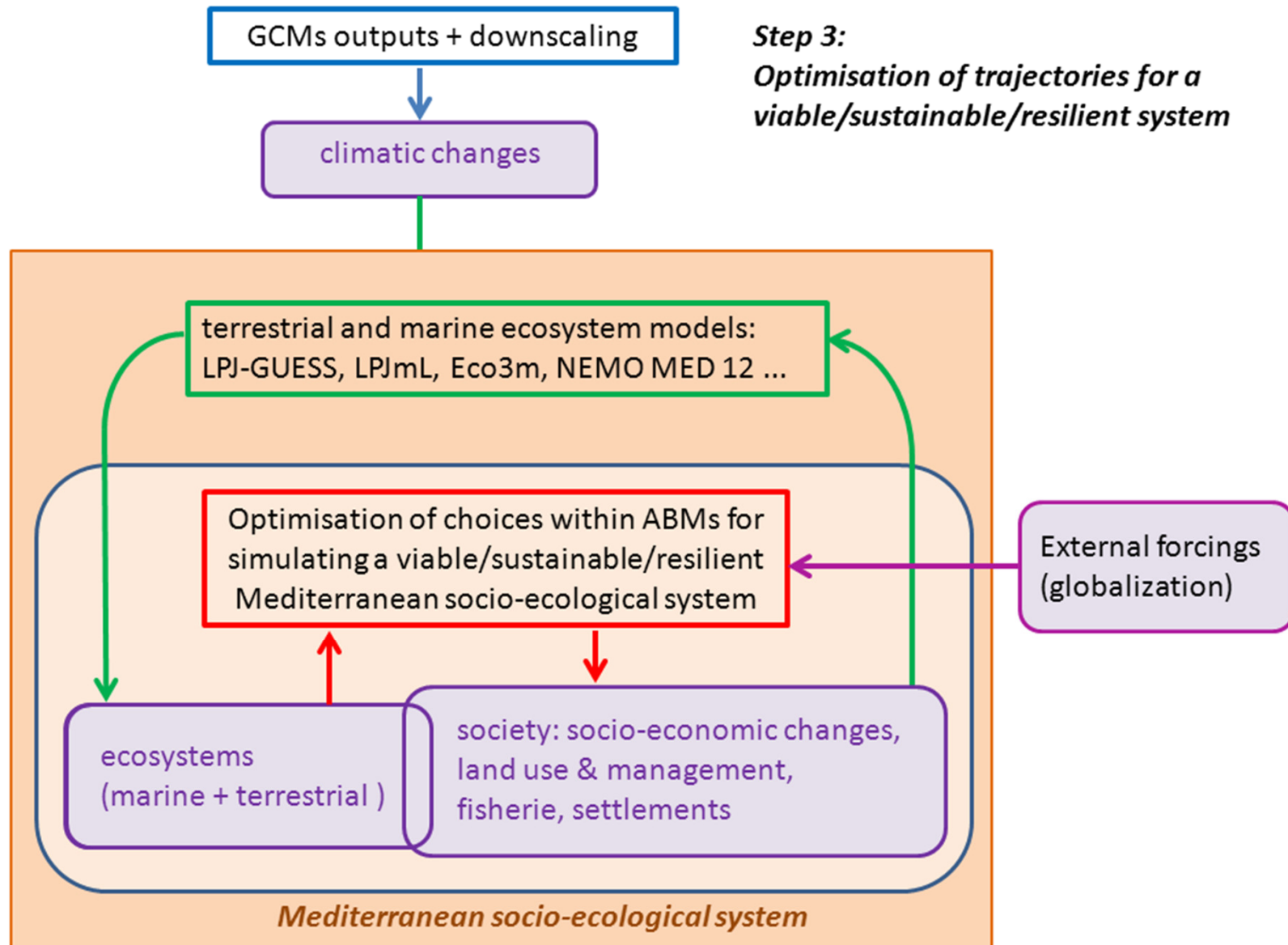


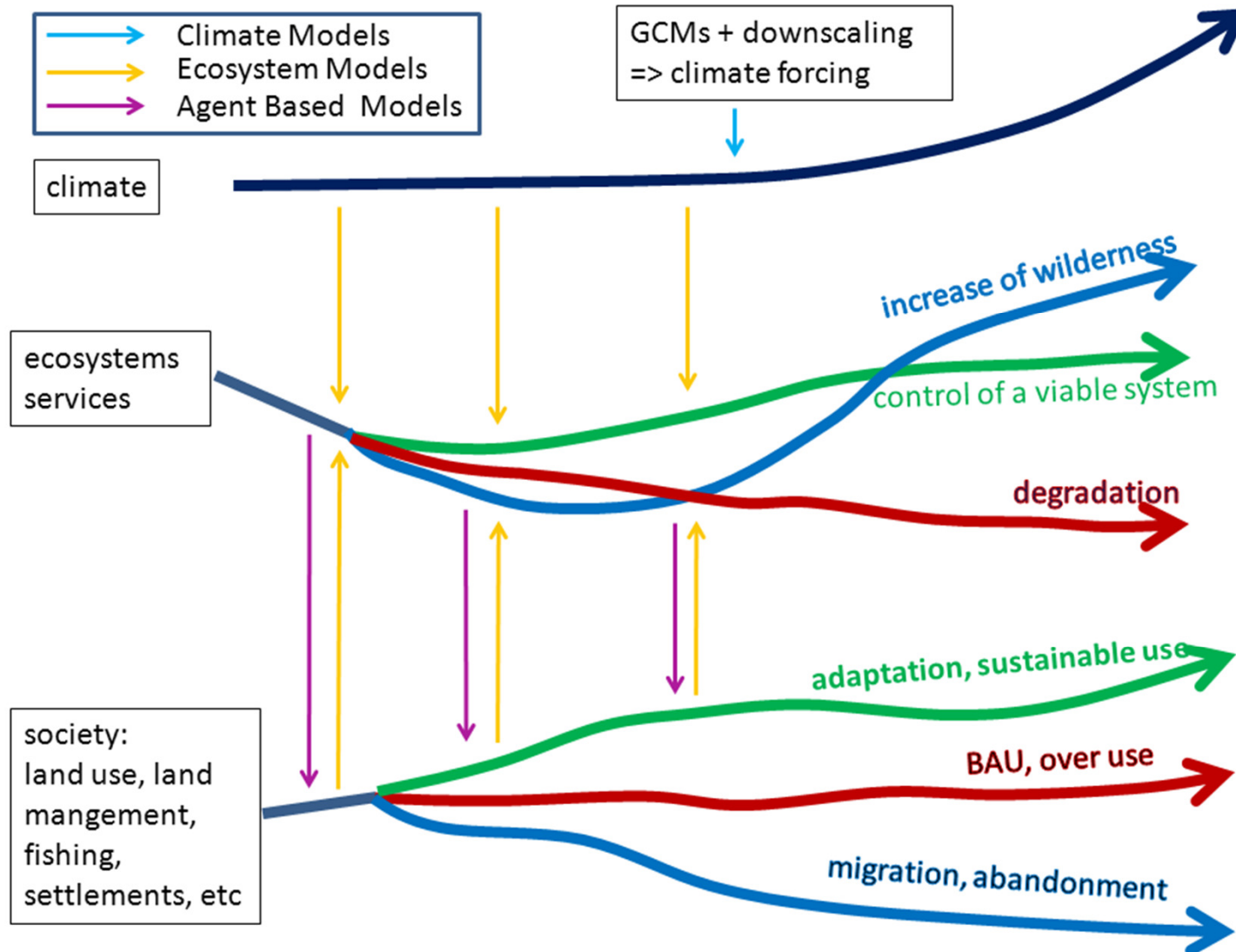
# Implementation





# Implementation





## 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)
- 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

- Several French, European and other international partners
- Various EU-Projects, e.g., Operational Potential of Ecosystem Research Applications (OPERAs), Impact of increased CARbon dioxide and temperatuRE on marine diatom communities (ICARE)