TWP2. TOWARD AN INTEGRATED MODELLING OF THE MEDITERRANEAN SYSTEMS

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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

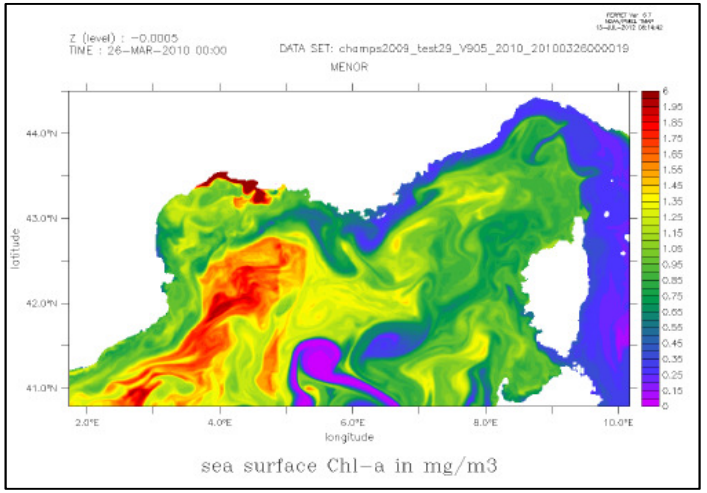
Several modelling activities are currently being developed by OT-Med institutes

$$\frac{d}{dt} = F\left(\right)$$

Modelling Activities

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 anthopogenic and climate pressure at the ecosystem level (top-down vs bottom-up)
- Exploring species dynamics, distributions and interactions
- Testing the sensitivity of ecosystem indicators



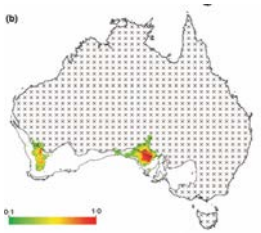
Spring chlorophyll concentration (Melika Baklouti)

Modelling Activities

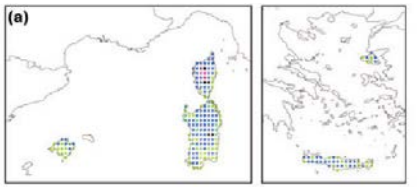
The land:
Centre Européen de Recherches et d'Enseignement en Géosciences de l'Environnement (CEREGE)
Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale (IMBE)

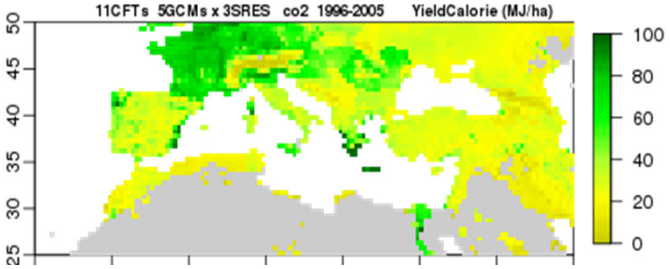
- Reconstructing past climate and vegetation
- Predicting species & biome shifts under global change
- Carbon balance dynamics and its dependence on land use and land management
- Estimating future food production and its impacts on GHG emissions, water use, soil degradation
- Understanding the interactions 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.)

Modelling Activities

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.)*

Mediterranean bluefin tuna stocks collapsing

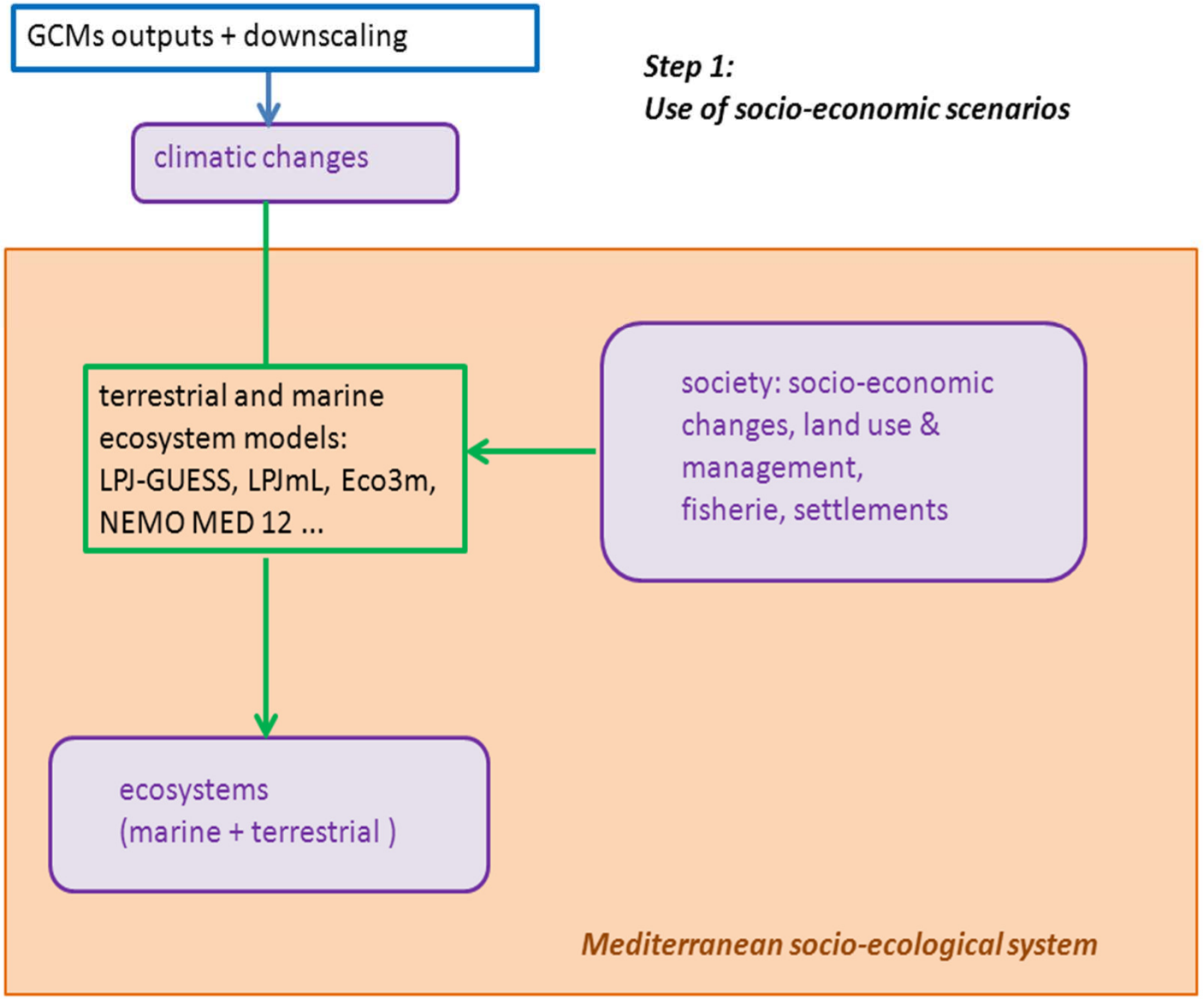
=> On the coordination of European agro-environmental & water internalizing policies

Irrigation in Plaine de Crau

Objectives

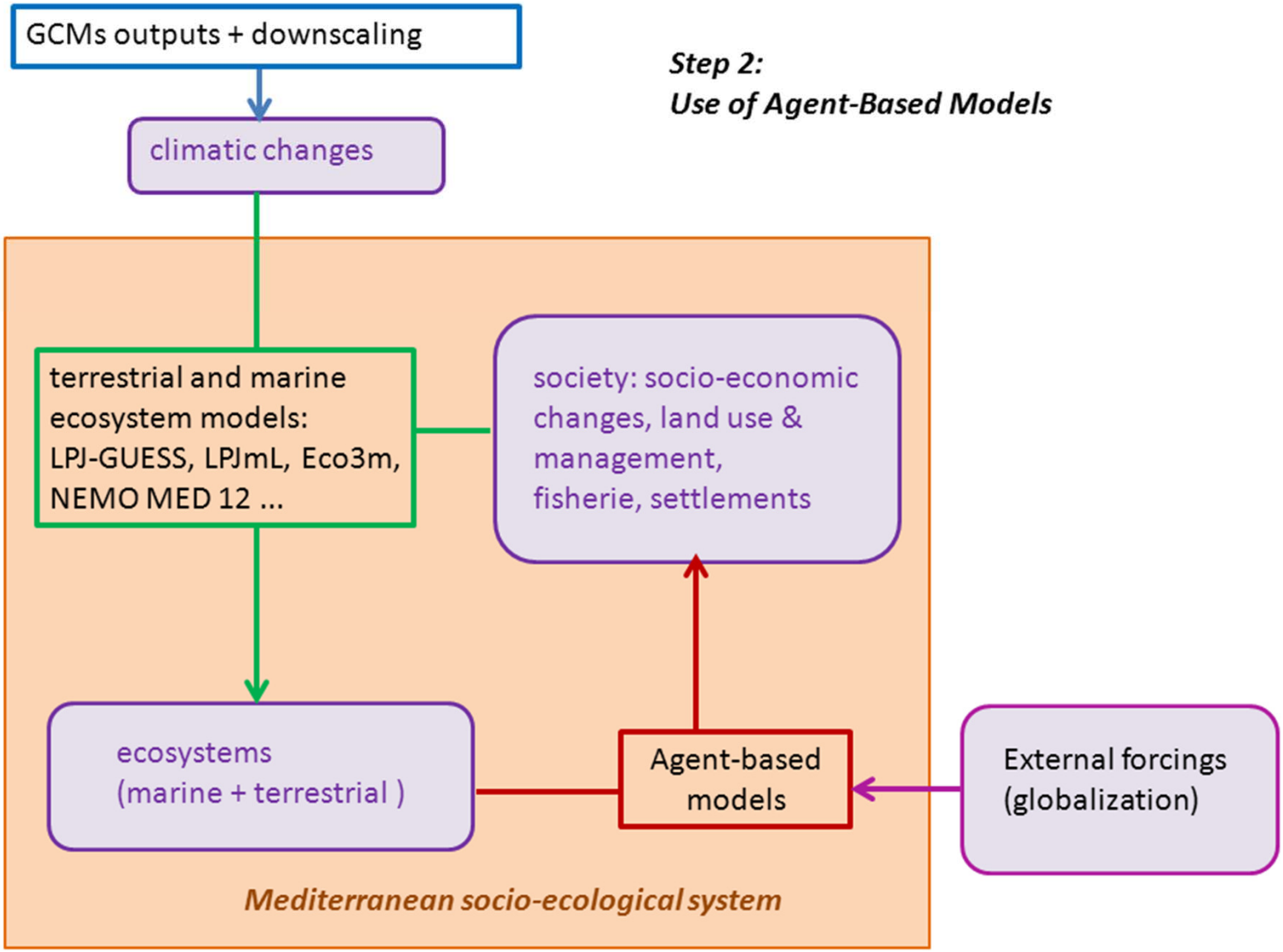
- to create a suitable modelling framework capable of responding to the challenges posed by OT-Med
- to improve and advance existing models inside a coherent context
- to unterstand the interactions between environmental and social processes as represented by the different models in order to achieve 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

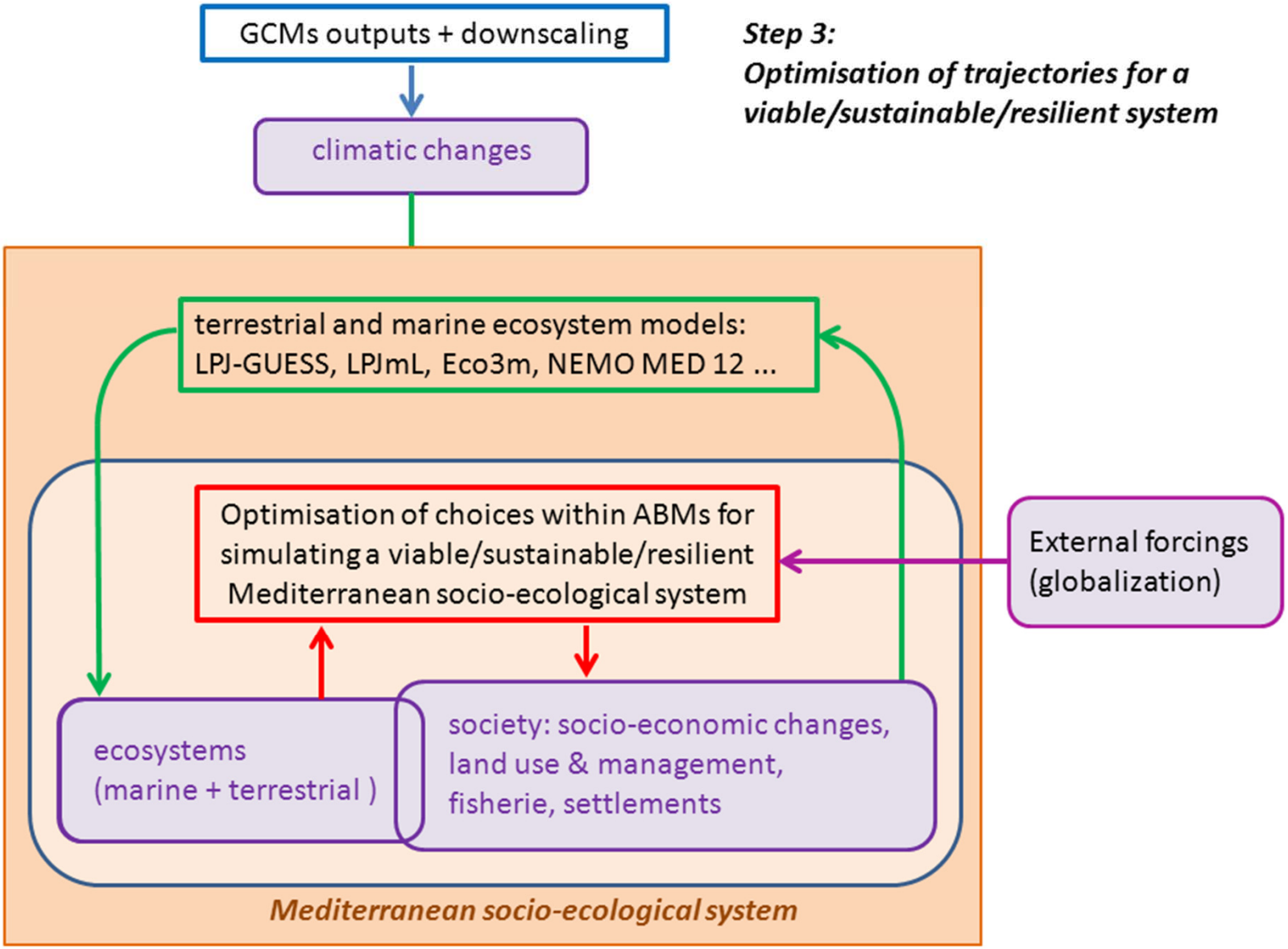


Step 1:
Use of socio-economic scenarios

Implementation

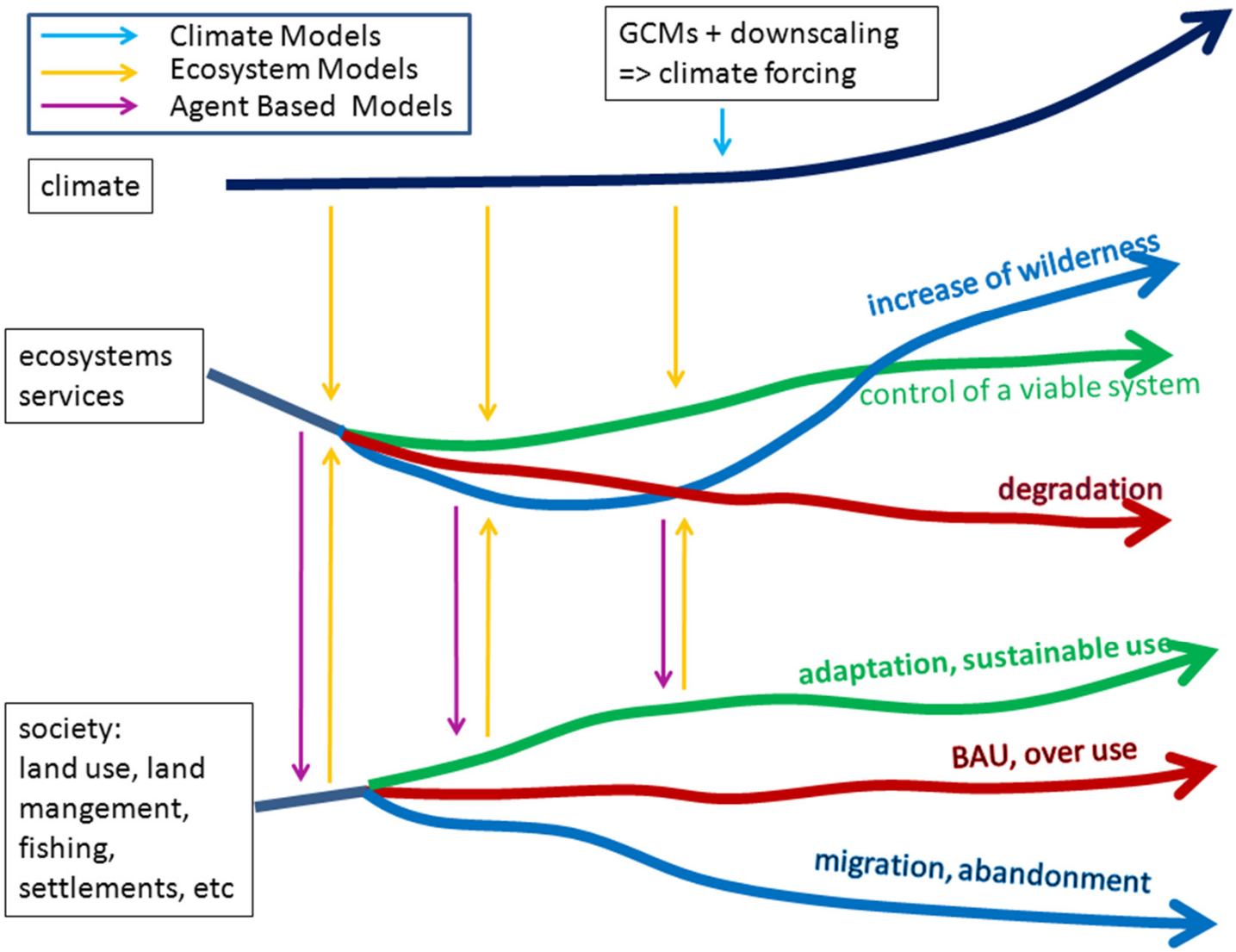


Implementation



Step 3:
Optimisation of trajectories for a viable/sustainable/resilient system

Socio-ecological Modelling



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)