Eleven EXEMPLARS

Kim Nicholas, Meriwether Wilson, Ariane Walz

The aim:

At least 2 tools per exemplar, and at least 2 exemplars per tool

Selection Criteria

1. Policy relevance
2. Ecosystem service provision thresholds
3. Fit with key project research questions
4. Illustration of trade-offs
5. Potential for new or improved tool development.

Spatial criteria

- spatial scale
- geographic domain in Europe
- dominant land-use type →diversity of ecosystem services.

Social criteria

- relevance to EU directives and policy
- diversity and types of stakeholders represented
- dominant economic sector

(1) Exemplar on the urban-rural fringe of the Greater Dublin Region
Lead: Marcus Collier

(2) Urban dunes in Barcelona
Lead: Joseph Lascurain

(3) Conservation of cultural landscape, Montado, Portugal
Lead: Margarida Reis

(4) Co-beneficiary management of marine/coastal ecosystems for Blue Carbon, Balearic Islands
Lead: Nuria Marba

(5) Trans-boundary River and wetland management at the Lower Danube
Lead: Maya Todorova

(6) Landscape management and infrastructure development on rural and per-urban areas of the central Alps
Lead: Sandra Lavorel

(7) Wine production and cultural landscapes in Europe
Lead: Kim Nicholas

(8) Multi-scale implementation of environmental policy in Scotland
Lead: M Metzger & Meriwether Wilson

(9) Circum-Mediterranean land abandonment
Lead: Wolfgang Cramer

(10) Pan-European regulative Directives
Lead: Peter Verburg

(11) Global Mechanisms for climate protection and habitat conservation
Lead: Ariane Walz

(1) Exemplar on
the Greater
Lead: Marcu

(2) Urban dunes
Lead: Joseph

(3) Conservatio
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Lead: Marga

(4) Co-beneficia
marine/coas
Carbon, Bale
Lead: Nuria

(5) Trans-bounda
management
Lead: Maya T

1. **Urban-rural fringe of the Greater Dublin Region.** Investigating the potential of incorporating ES/NC factors into the planning and management of expanding cities, with special emphasis on green infrastructure and green innovation. A key issue is the critical thresholds between the provisions of rural versus urban ES, common to all European cities.

2. **Urban dunes in Barcelona.** Investigating the multi-dimensional value of urban dunes based on the ES/NC concepts to enhance cost-effective management with multiple co-benefits, e.g. storm protection and urban/peri-urban recreation.

3. **Conservation of cultural landscapes in the LTER region of Montado in Portugal.** Using the ES/NC concept to combine the practice, productive, ecological as well as cultural aspects of socio-ecological systems to promote improved management of cork trees. Key issues are the effects of climate change, land management and pollution in pushing Montado landscapes toward economic and ecological tipping points.

4. **Co-beneficiary management of marine/coastal ecosystems for Blue Carbon on the Balearic Islands.** Using the ES/NC concepts to quantify the potential and security of the Blue Carbon sink in seagrass meadows by evaluating the co-benefits of management plans. The policy context is key including the EU Habitats Directives, the Framework Directive on Water and the Marine Strategy.

5. **Trans-boundary River and Wetland Management of the Lower Danube.** Investigating how the ES/NC concepts will be used to estimate direct and indirect socio-economic benefits, such as flood mitigation, enhancement of water quality, fishing grounds, and carbon sequestration, across the Romanian-Bulgarian border. This exemplar will optimize the management and governance of a site supported by the WFD and the Habitats Directive.

6. **Effects of landscape management and infrastructure development on rural and peri-urban areas of the central Alps.** Investigating the integration of ES/NC concepts into planning documents and the permit process for infrastructure and peri-urban development. A key issue is to promote cross-sectoral dialogue that optimises land use and management decisions (e.g. agriculture, forestry, tourism and hazard mitigation) including spatial trade-offs between up- and downhill beneficiaries, leading to insights into best practice in governance structures.

7. **Wine production and cultural landscapes in Europe.** Investigating how to communicate responsibly grown and made wines to consumers, including assessing their impacts on ES/NC. This exemplar will further develop, implement, and test two existing instruments to assess life-cycle impacts of vineyard practices.

8. **Multi-scale implementation of environmental policy in Scotland.** Testing a variety of valuation tools and governance instruments with decision-makers and stakeholders applied to issues of land use change, marine stewardship and climate change, from community implementation to the national level. A key issue is the strong Scottish Government support in operationalising the ES/NC concepts.

9. **Circum-Mediterranean agricultural land abandonment.** Analysing policy options that reduce land abandonment and maintain the delivery of ES (i.e. agricultural products, risks of extreme events, semi-natural ecosystem integrity, water availability/runoff, carbon storage) while accounting for the Mediterranean's long legacy of land use history. A key issue is to support the identification of human livelihood risks, as well as the opportunities for sustainable use of ES/NC for Mediterranean people.

10. **Pan-European regulatory Directives.** Investigating policy conflicts and synergies in order to showcase operational methods that improve policy design using the ES/NC concepts. A key issue for EU directives is the trade-off between ecosystem services, leading to policy conflict as well as providing potential for synergies between directives and other policies.

11. **Mechanisms for Climate Protection and Habitat Conservation at the global scale.** Using a multi-scale ES/NC approach to test policy and market instruments for the twin goals of mitigating climate change and reducing habitat loss at the global scale. A key issue is to find balanced solutions that account for the multi-dimensional interactions between climate change, habitat loss and ecosystem functioning.

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1 Urban-Rural Gradient Exemplar (Fingal, Dublin, Ireland)

Significant urban / residential expansion during the economic boom (2000-2007)

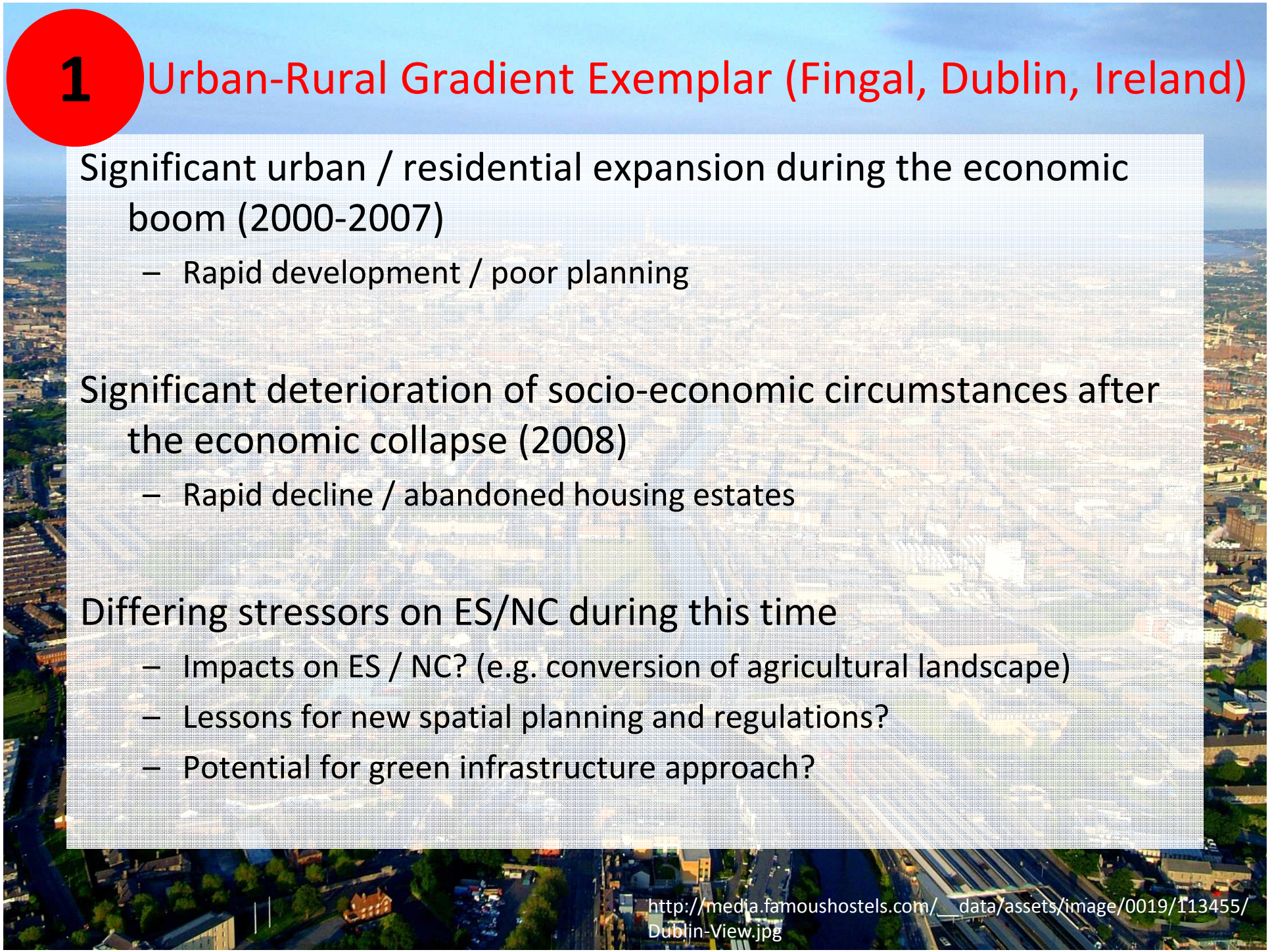
- Rapid development / poor planning

Significant deterioration of socio-economic circumstances after the economic collapse (2008)

- Rapid decline / abandoned housing estates

Differing stressors on ES/NC during this time

- Impacts on ES / NC? (e.g. conversion of agricultural landscape)
- Lessons for new spatial planning and regulations?
- Potential for green infrastructure approach?



http://media.famoushostels.com/__data/assets/image/0019/113455/Dublin-View.jpg

1 Urban-Rural Gradient Exemplar (Fingal, Dublin, Ireland)

Instruments?

- CSO Data / Depravation Index? – population and socio-economic change
- MOLAND? – land cover change
- Landscape Character Assessment? – spatial planning policies

Partners?

- Fingal County Council
- Urban Institute Ireland (MOLAND)

http://media.famoushostels.com/__data/assets/image/0019/113455/Dublin-View.jpg

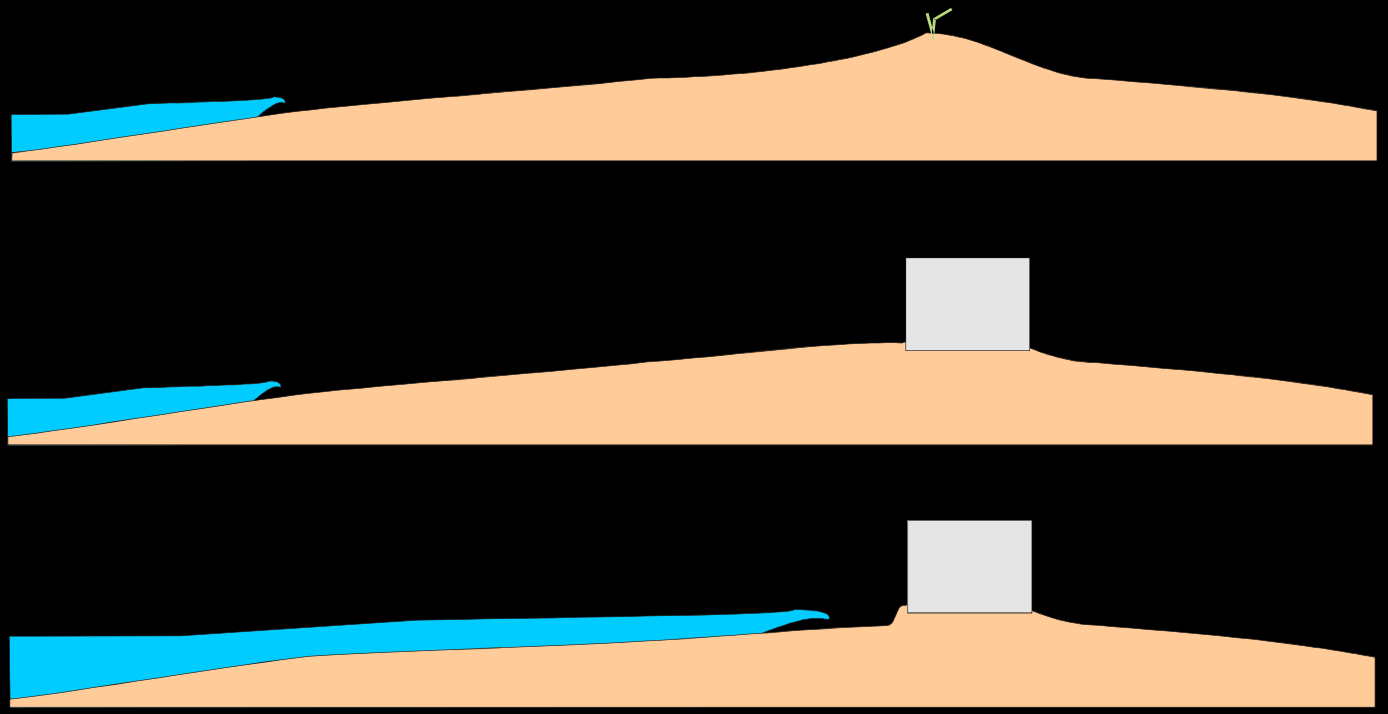
Hybrid dunes in urban areas on Mediterranean coast

A very initial (and a bit freaky) proposal

2

The problem:

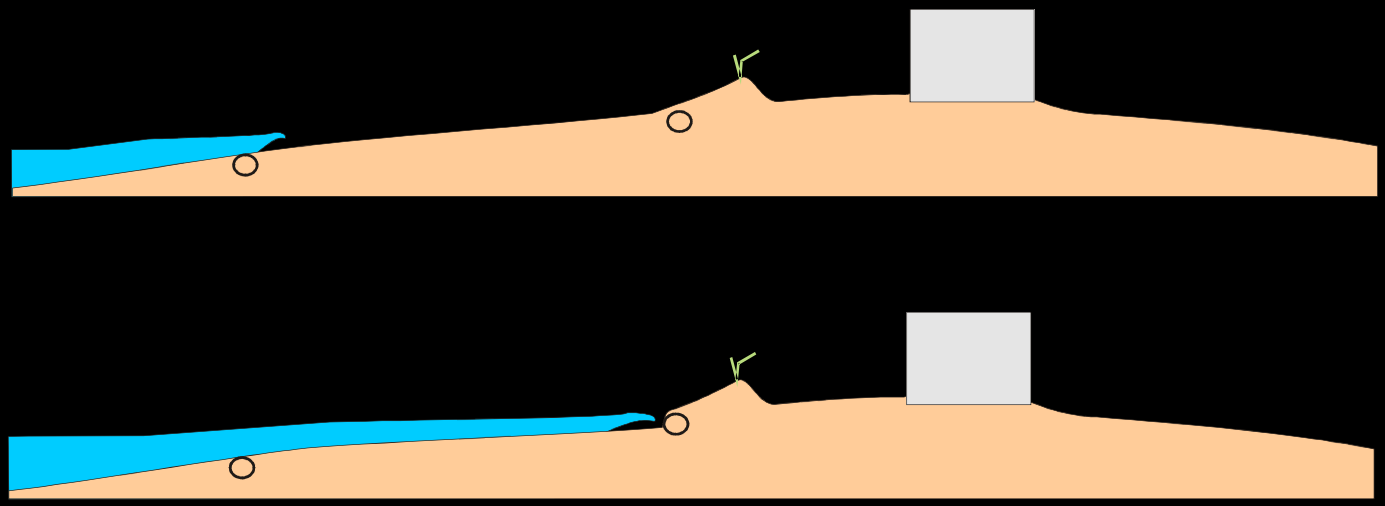
2



The dune ecosystem disappeared by housing and building of hotels and tourist infrastructure.
Climatic change and lack of dune protection leads to an increasing problem of storm surges with sand disappearance and increasing risk to existing buildings and infrastructures.

2

Our urban proposal:



"Hybrid"(*) dunes (with some support of geotextiles and knowledge on coastal dynamics).

(*) The name was coined by Kim Nichols.

What region?

2

First idea is the **Barcelona Metropolitan area**, but would be nice to extend to, minimum, the **EU med coast (or at least Spain, France and Italy)**.
The idea of urban beaches is easily transposed to any med beach under intense tourist use (or densities over 1 person X 16m2 of usable sand).

What problem?

Hybrid dunes as an efficient tool **to protect coastline** from abrasion (regression) due to storm surges. Dunes as **ES-NC and Green infrastructure protecting coastline** from a process also related to climatic change.
Problems mainly related to the difficulty to intervene in an area which is strongly governed by central governments. Local communities would be able to invest and intervene but not allowed by a rigid and centralised governance system.

Research needs:

We need to show **real projects with good results with hybrid dunes**.

- Are there specific ways of modifying the soil around *Ammophila arenaria* to improve downward root growth?
- What is the relationships with specific beach profiles and dynamics and placement of soft artificial structures?
- **What are promising artificial ways of rejuvenation of artificial fixed dunes?** (key issue on dune management in BCN).

….

TOOLS TO BE USED

2

Information:

The role of **crowdsourcing** to inform of dune response on storm events along the EU Med coasts
QR codes “in situ” to inform visitors.
Information and meta analysis about existing projects.
Information about the research needs previously cited.
Location of troubled beaches. Google Earth works nice!

Decision making tools:

Decision trees to identify and group dune and beach coastal dynamics.
Legal and policy instruments which could lead to local stakeholders empowerment. Ways to get permit to act on a very centralized and interventionist legal and administrative environment.
Trade-offs between trampling and intensive use of sand beaches. Mainly when local businesses are paying for the project.
Information and decision processes leading to at least partial crowd-founding of the projects.

Implementation and management instruments:

Resource hub with state of the art information about ongoing projects.
Decision trees to asses needs of artificial rejuvenation of dune ecosystem.
Policy suitability of the local stakeholders participation and funding of projects.
Data elicitation and **social media instruments** to show the benefits of this strategy.

2

Lead partner: José Lascurain.

Local partners: it depends on the geographical extent of the project.
Probably the minimum is: **Metropolitan Area of Barcelona Administration**.
They have held an international workshop on dune management organized by Jose a couple of years ago.
If necessary a local engineering company and a lawyer specialized on environmental management.

Other formally part of OPERAs?

I would be very happy if could count with:

- **Kim Nicholas** (who coined the term hybrid dune).
- **Wolfgang Cramer** (as we had a conversation on the idea of extending the project to a wider geographical area).

Things to discuss!!!!

LTER montado

PORTUGAL

Conservation of a Cultural Lands

3

Geographic Scale: Regional

Location: W Mediterranean

Land Cover: Forest & agriculture

Sectors: Forestry, agriculture & tourism

LTER montado PORTUGAL

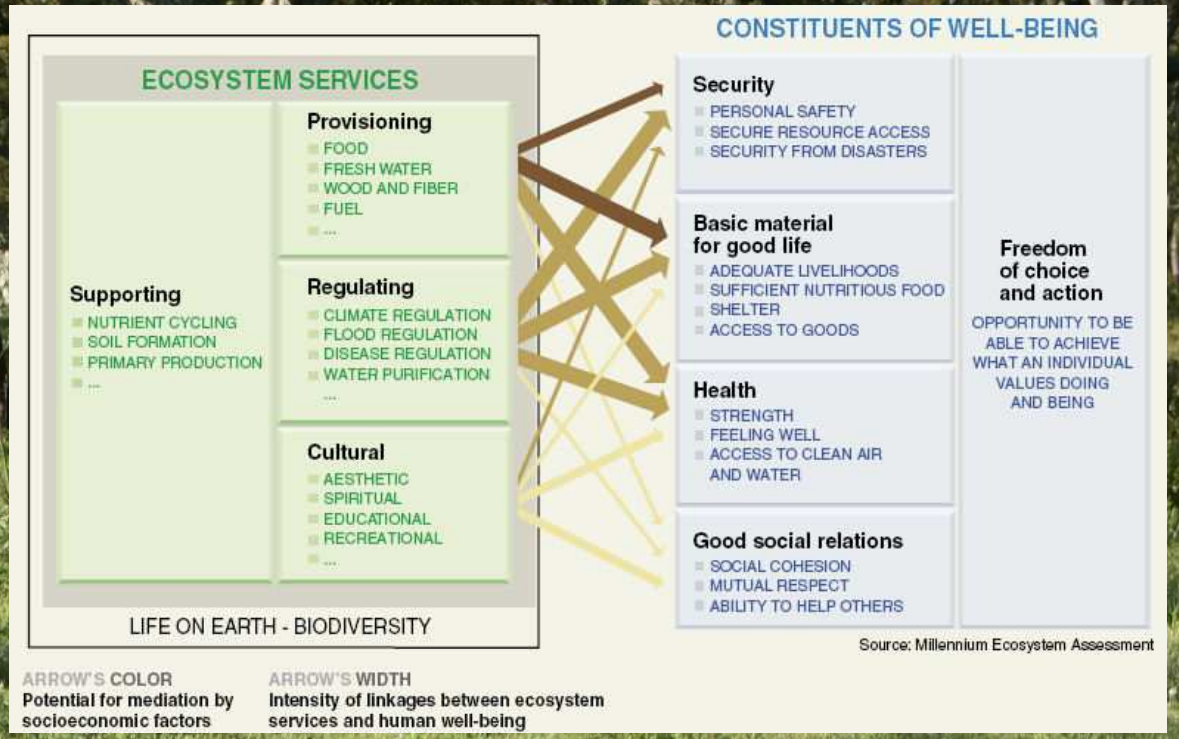
3

Conservation of a Cultural Landscape

The ecological and the cultural heritage of the cork trees is a key asset of the Montado landscape.

Climate change, changes in rural land management and pollution are threats pushing this traditional landscape towards an economic as well as ecologic tipping point.

Bringing the ES/NC concept into practice; productive, ecologic and cultural aspects of socio-ecological system will be combined to **promote an improved management and landscape conservation.**



LTER montado PORTUGAL

3

Conservation of a Cultural Landscape

Responsible partner: Margarida Santos-Reis (FFC-UL)

Potential OPERA partners: Wolfgang (Marseille), Sandra Lavorel (French mountains)

Local partners: New University of Lisbon (UNL – public participation), Companhia das Lezírias (largest multi-use state-farm in Portugal), local municipalities

Instruments 1: Info tools and data

Mapping (land-use services), monitoring and early warning (ongoing studies)

Instruments 2: Decision making tools

Valuation and participatory decision

Instruments 3: Implementation and management

Instruments, labeling and certification

Natural Carbon sinks in the coastal zones: seagrass management and climate change mitigation

4

Dominant Mediterranean seagrass: *Posidonia oceanica*

- Mediterranean endemic
- Dominant ecosystem in sandy areas between 1-40 m depth
- Extension in the Mediterranean
50 000 km^2 (Balearic Is.: ≈ 600 km^2)
- Marine angiosperm
- Clonal plant
- very slow growth rate (1- 6 cm yr-1)
- clones are extremely long living; some clones have persisted for ~ 100 000 years

Photograph: Manu San Félix

Long-term C_{org} burial in seagrass soils is two orders of magnitude higher in coastal marine than terrestrial ecosystems

4

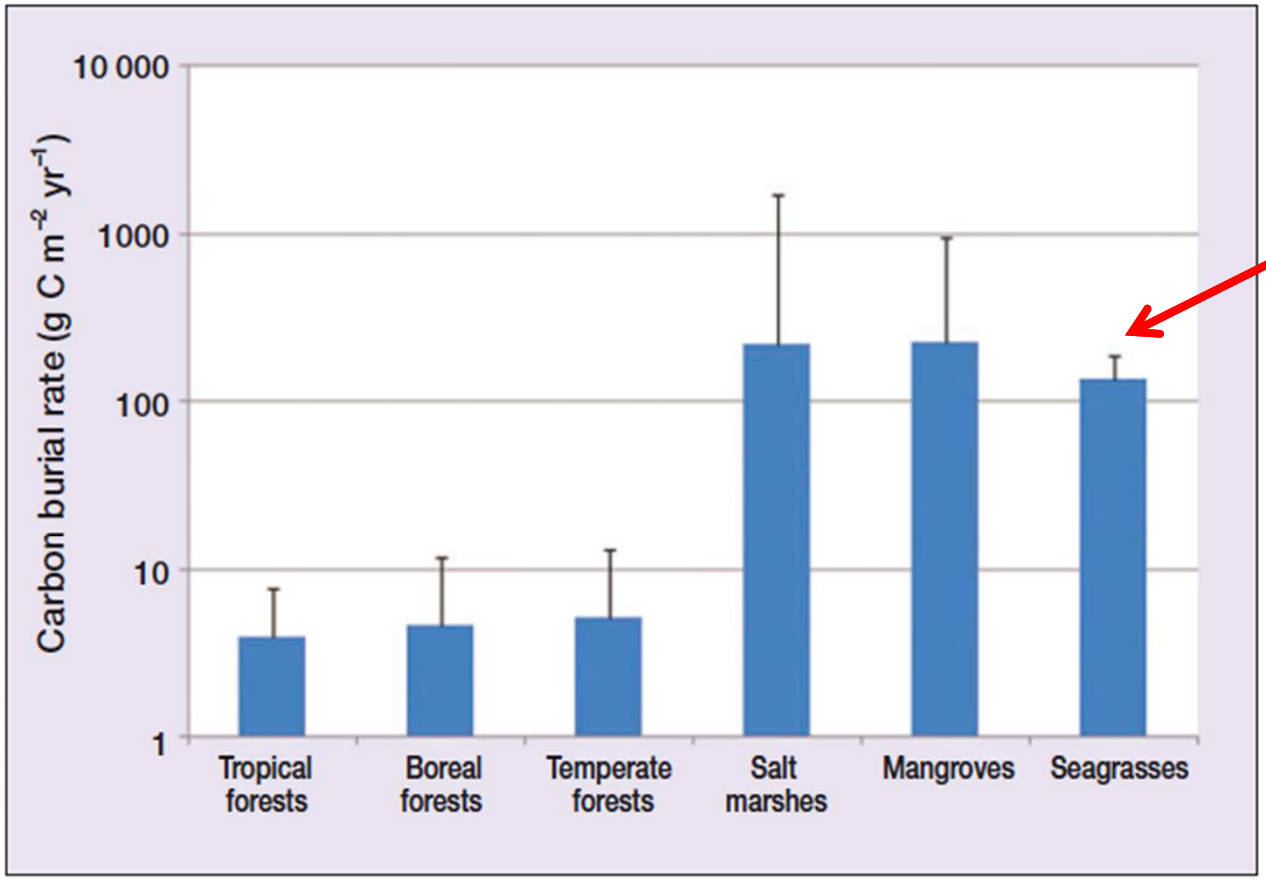


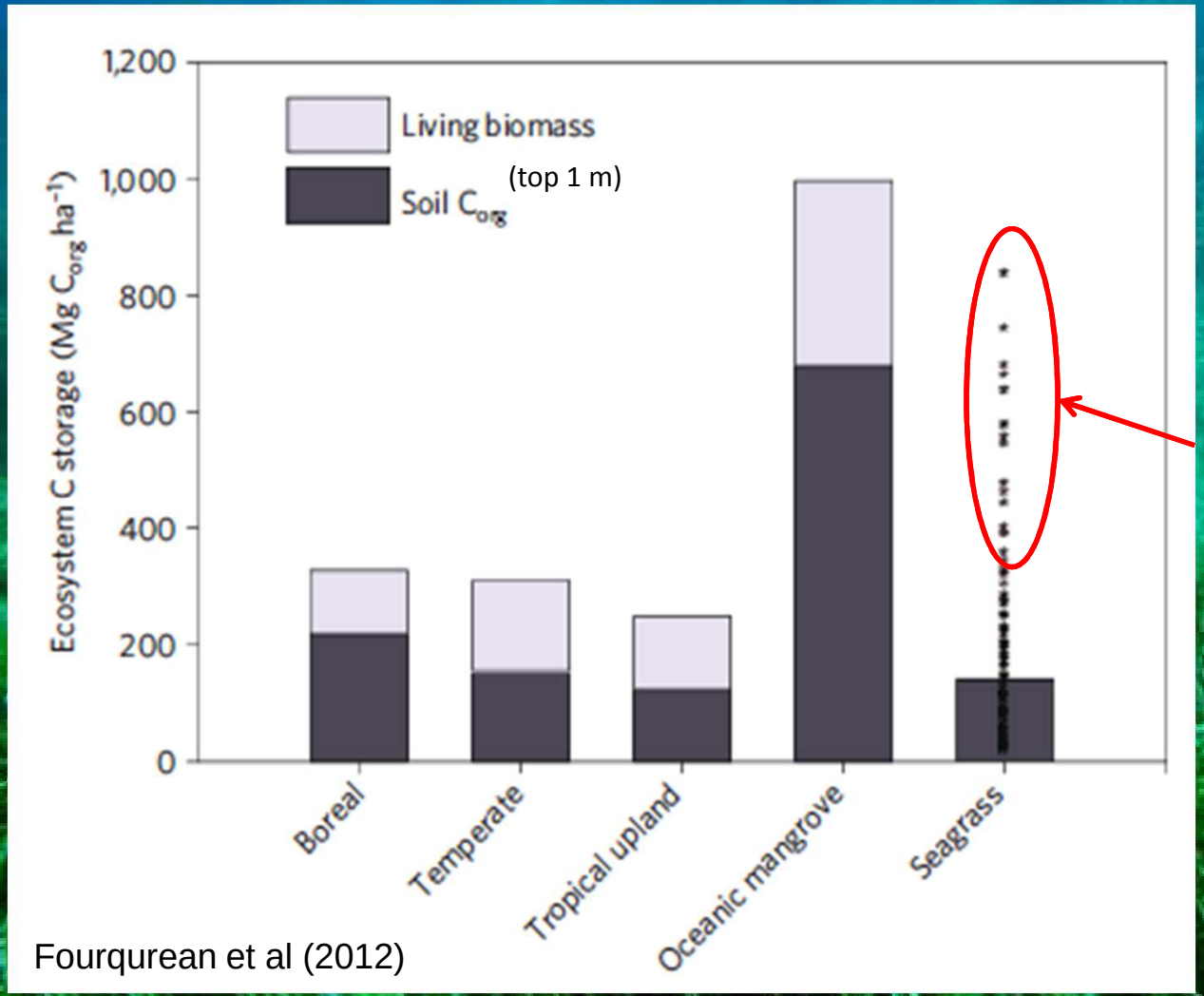
Figure 5. Mean long-term rates of C sequestration (g C m^{-2} yr^{-1}) in soils in terrestrial forests and sediments in vegetated coastal ecosystems. Error bars indicate maximum rates of accumulation. Note the logarithmic scale of the y axis. Data sources are included in Tables 1 and 2.

138 gC m^{-2} yr^{-1}

Globally, seagrass meadows bury 10 % of total Corg buried in the ocean (Duarte et al 2005)

McLeod et al (2011)

Seagrass meadows are hot spots of C storage

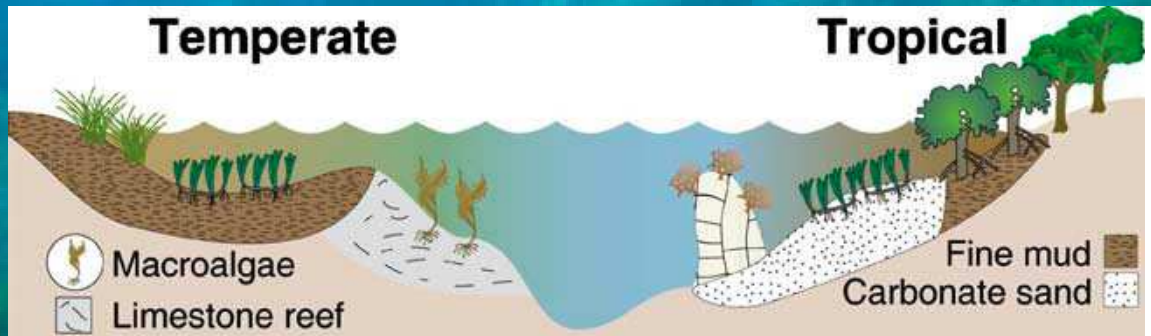


Fourqurean et al (2012)

Carbon stocks (per area) in seagrass meadows can be much higher than in terrestrial ones and, unlike on land, the largest pool remain in the soil.

Seagrass Corg soil deposits can be larger than those estimated here (e.g. 5 m thick deposits have been documented in P. oceanica meadows, Lo Iacono et al 2008).

Seagrass ecosystems rank amongst the most threatened marine habitats



Ecosystem	Area (10^6 ha)	Loss (% year^{-1})	Value (US$ ha^{-1} year^{-1})
Seagrass	18	2–5	19 004
Salt marsh	140	1–2	9 990
Mangrove	15	1–3	9 990
Coral	62	4–9	6 075
Tropical forest	1 900	0.5	2 007

Duarte et al 2008 Estuaries and Coasts

The loss of *P. oceanica* meadows compromises the carbon sink function, not just by decreasing carbon sequestration but enhancing the risk of carbon emissions from stored C deposits.

- *P. oceanica* meadows provide **additional ecosystem services**: e.g. coastal protecti beach sand production, water transparency, nutrient cycling, water oxigenation
- *P. oceanica* meadows are protected by **EU directives (Habitat, WFD, Marine Strategy)**, **national and regional legislation, international conventions (Barcelona Biodiversity Convention)**
- **Protected marine areas** in the Balearic Island region:
  * 1 Biosphere Reserve (the entire island of Menorca)
  * 1 meadow is part of a UNESCO heritage
  * several marine Sites of Community Importance (SCI) with marine reserves
  * 1 Spanish National Park

Research questions to address in OPERAs

- To assess the carbon sink capacity of seagrass meadows of the Balearic Islands
- To investigate the security of these carbon sinks and their role in climate change mitigation
- To evaluate the effect of seagrass management polices on carbon sink security and its co-benefits (i.e. conservation of other seagrass ES)
- To assess the economic cost of *P. oceanica* protection vs value of carbon sink/emissions in seagrass meadows, including co-benefits of protection

INSTRUMENTS

- Info tools and data: mapping, monitoring, data compilations

- Decision making tools: trade off listed above

- Implementation and management instruments: legislation (EU directives (Habitat, WFD, Marine Strategy), national and regional), and marine protected areas

PARTICIPANTS

- Exemplar Responsible: CSIC (Núria Marbà, Carlos M. Duarte, Inés Mazarrasa)

- Exemplar partners: IVM (Jan Vermaat), Univ. Edinburg (Meriwether Wilson), others?

- Is there established collaboration with local partners, that are not formally part of OPERAs – No, but we will interact with regional and local administrations (e.g Government of the Balearic Islands, Consells insulars, municipalities) and a major ferry company opperating in Spain (Balearia).

Lower Danube exemplar: Persina nature park

The Danube PES project, area map

The main aim of the Danube case is to research and find/ prove the link between Danube ecosystems and a range of environmental benefits for communities in the area, as well as in the Danube river basin, given the application of appropriate set of instruments to safeguard or improve them.

Instruments:
- social valuation
- market-based instruments related to biomass management (work already started on a pilot level) and carbon-based, including PES, offsets
- decision-support instruments to show the value of restoring and managing a wetland, as well as trade-offs between different ecosystem services

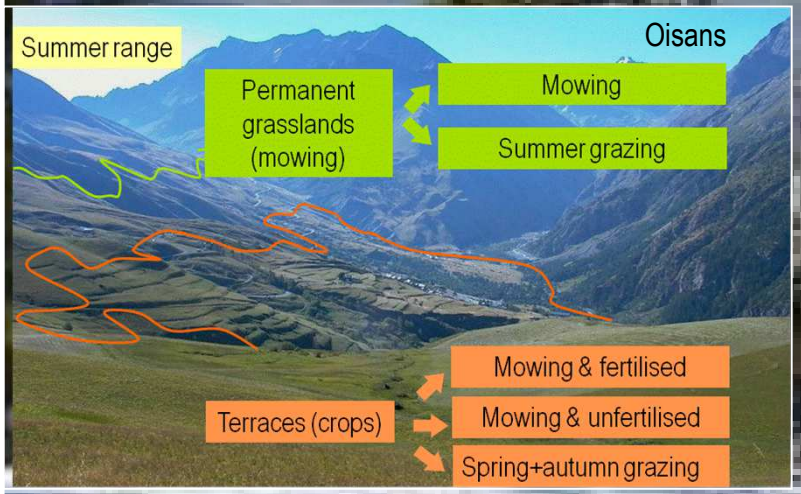
Responsible for the exemplar: WWF

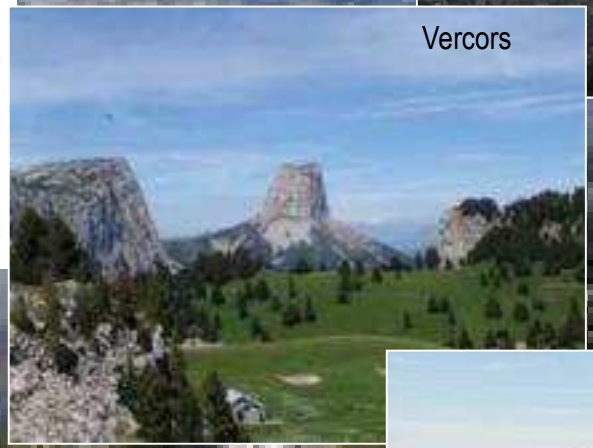
Partners:
- VU University, the Netherlands
- Denkstatt Bulgaria
- TIAMASG, Romania

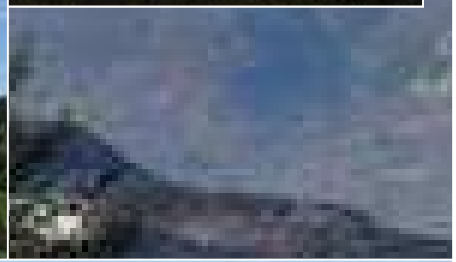
Non-OPERAs partners: 4 local municipalities, Association of Danube Municipalities (Danube basin level), ICPDR, Directorate of Persina Nature Park, local entrepreneurs interested in biomass use, farmers, etc.


6
OPERAs
Central French Alps examplar
Laboratoire d'Ecologie Alpine, Grenoble

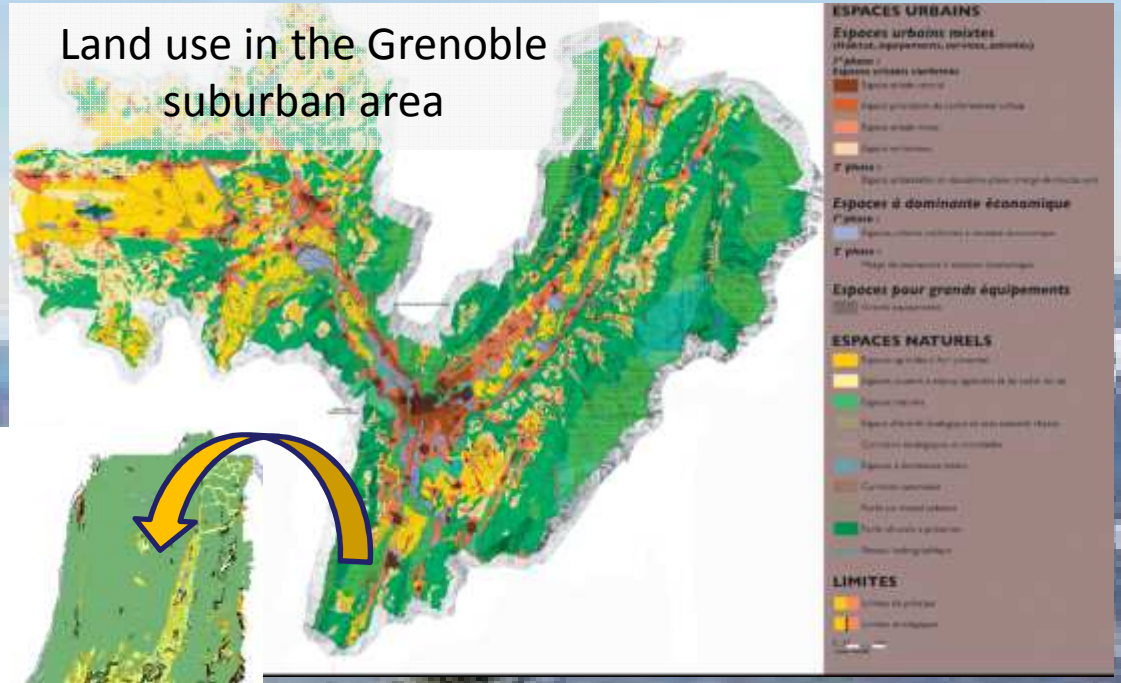
Two contrasted focal areas within the Central French Alps LTSER

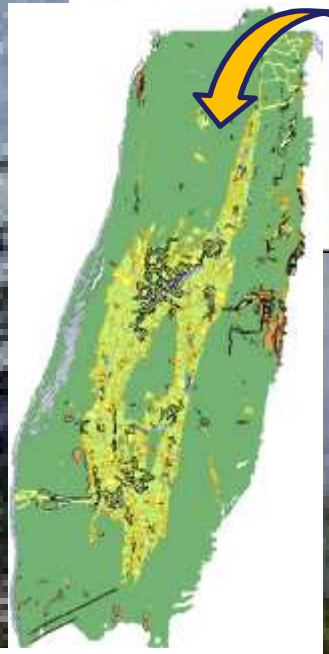




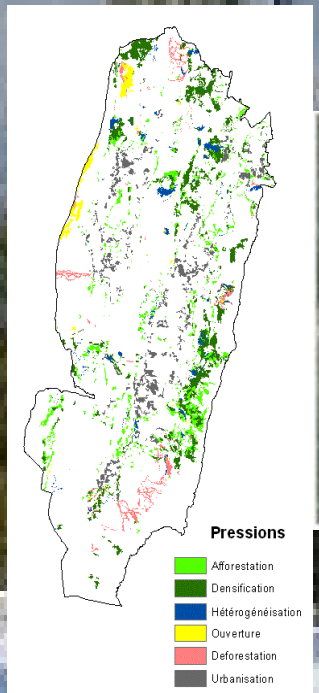


Land use in the Grenoble suburban area

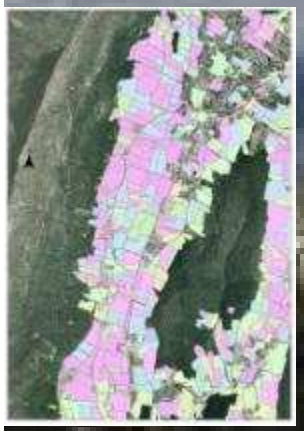




Vercors:
4 Montagnes focal area

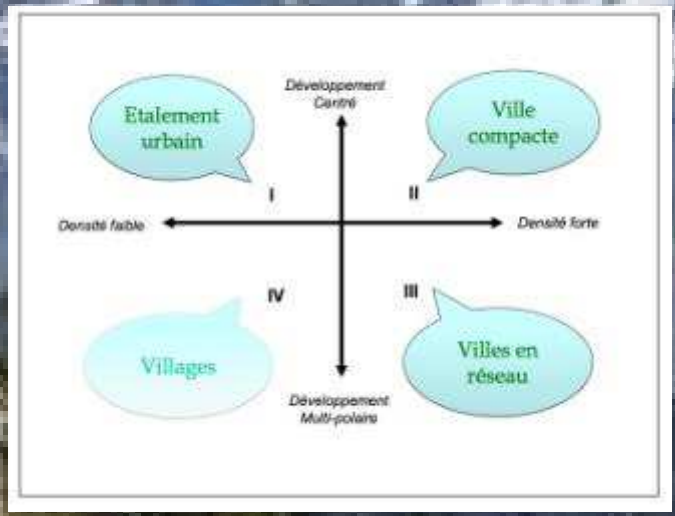


Historical pressures on forests



Detailed grassland management

3 Urban development scenarios as part of the planning process



Main issues in the Central French Alps

Urban / sub-urban development strategies and consequences for biodiversity and ecosystem service provision

Sub-urban spread vs. agriculture

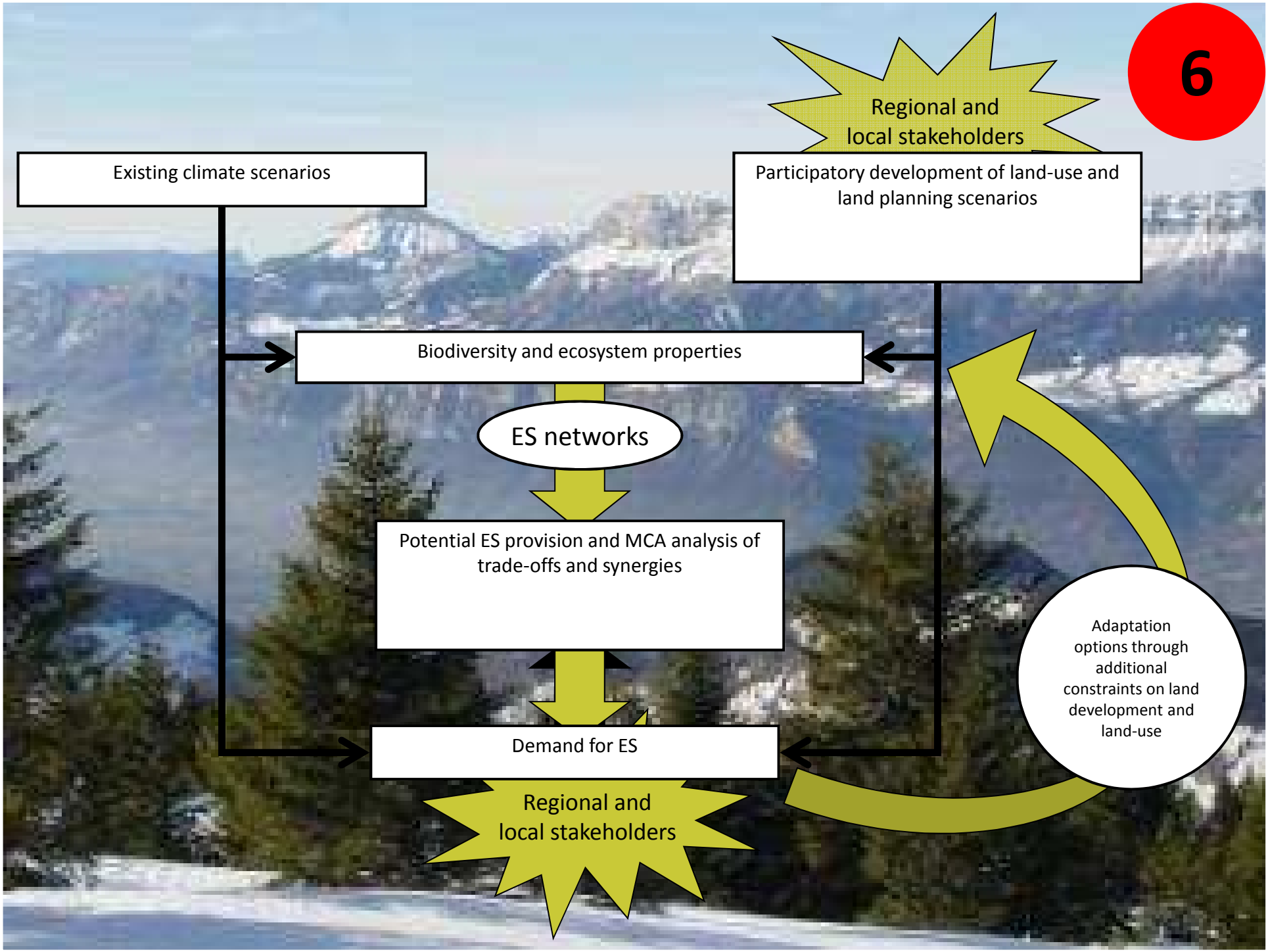
Viability of local agricultural production

Demand for recreation and biodiversity conservation from urban / rurban population

Protection from natural hazards (flooding, rock falls, avalanches…)

Green infrastructure development

- **Planning for multiple, some times conflicting objectives**


6
Regional and local stakeholders
Existing climate scenarios
Participatory development of land-use and land planning scenarios
Biodiversity and ecosystem properties
ES networks
Potential ES provision and MCA analysis of trade-offs and synergies
Adaptation options through additional constraints on land development and land-use
Demand for ES
Regional and local stakeholders

Institution	Main contacts	Relevant sectors	WP1 & WP3			WP2	WP		
			R	G	M		G		
Communauté de communes de Grenoble (Métro)	Hélène Poimboeuf, chargée des questions d'environnement	local government	X						
Communauté de communes du Grésivaudan	Philippe Vieille, vice-président développement durable, Valérie Lacoua, Service Aménagement de l'espace, Alexandre Chalencon, Chargé de développement Tourisme,	local government							X
Conseil Général de l'Isère	Arnaud Callec, responsable du programme d'actions en faveur de la faune, de la flore, et des habitats	loca					X	X	X
Agence d'Urbanisme de la Région Grenobloise (SCOT consortium)	Hugues Merle & Marielle Pezet-Kuhn, Chargés d'études environnement chez AURG								X
AVENIR - Conservatoire départemental des milieux naturels	Roger Marciau, responsable scientifi		X	X	X		X	X	X
Centre d'Etudes Techniques de l'Equipement de Lyon	Virginie Billon, chef de l'	protection	X						X
CRPF - Centre Régional de la Propriété Forestière	Denis Pellissi	Forestry	X		X			X	X
Parc Naturel Régional du Vercors	Jean anglois, evallier, chargé ave, resp. du pôle etton, chargé de mission	Farming, forestry, tourism, biodiversity, tourism			X			X	
ONF - Office National des	ponsable du Service Forêt de e et Jean Claude Sarter, animateur ie à la direction territoriale Rhône-Alpes	Forestry	X		X			X	X
Chambre d'agriculture de l'Isèr	eronique Gitton, conseillère grandes cultures à l'antenne de la Tour du Pin	Farming	X	X			X		X
Adayg (Association de Développement de l'Agriculture dans le Y Grenoblois)	Thiery Loeb, animateur local	Farming		X			X		
Comité Départemental du Tourisme de l'Isère	Karine André, Responsabe Pôle animation et services	Tourism	X						X
Office Municipal du Tourisme de Villars	Dominic Vassal,Directeur				X			X	
Association de Développement Tourisi	Valériane Janet, Directrice				X			X	

Table 2 - Stakeholders who will be involved in the project, per work package (righ-hand side columns). WP1, 3 and 4 are split according to the scale or subsystem in which stakeholders will participate. **R** stands for regional scale, **G** for the Grésivaudan subsystem and **M** for the '4 montagnes' subsystem

Participative process with stakeholders from multiple sectors:
Urban planning, agriculture, forestry, tourism, nature conservation

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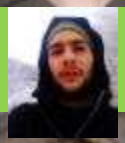
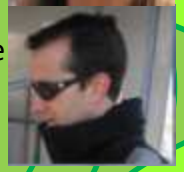
Contributing projects and funders

REGARDS

Lautaret:
Trait-based ecosystem service modelling
Résilience to climate and social change

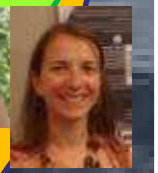


MOUVE:
Vercors – 4 Montagnes
Ecological intensification of livestock production
Trait-based ecosystem service modelling
ES bundles and trade-offs

ESNET
Grenoble peri-urban area
Regional development
Ecosystem Service models
Biodiversity
Green infrastructure



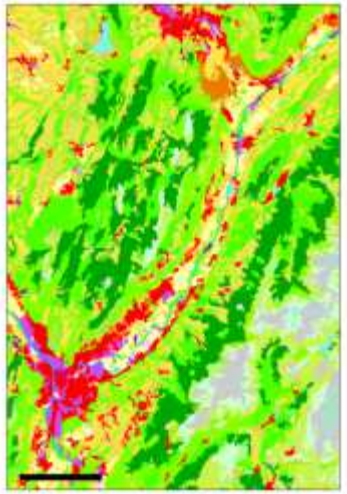
CONNECT

French Alps
Biodiversity: taxonomic, phylogenetic, functional
Ecosystem Service models
Conservation strategies



Instruments – InvESt ecosystem service model

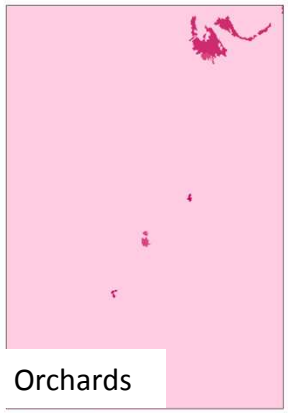
Grésivaudan valley focal area



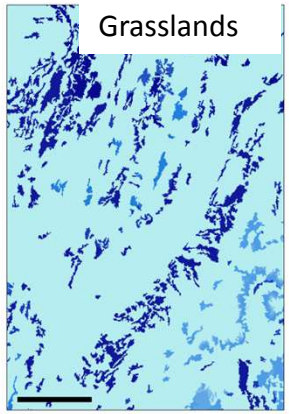
Land use

Biomass production

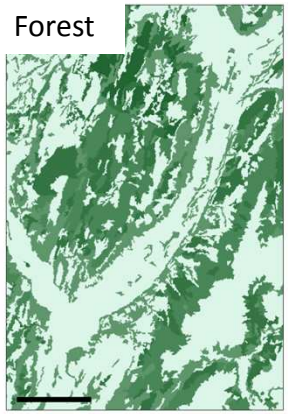
Crops



Orchards

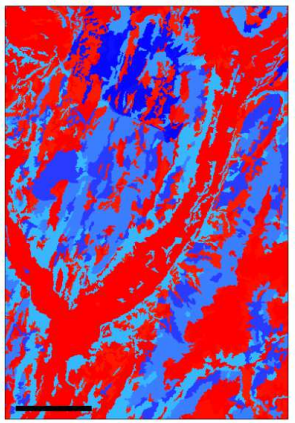


Grasslands



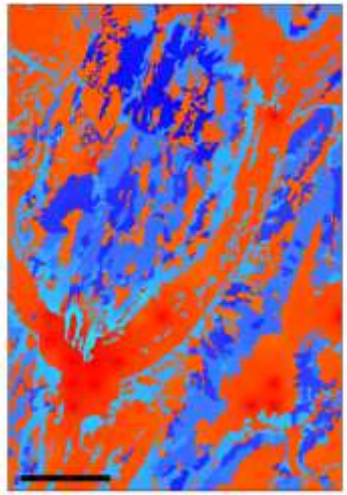
Forest

Biomass C stocks

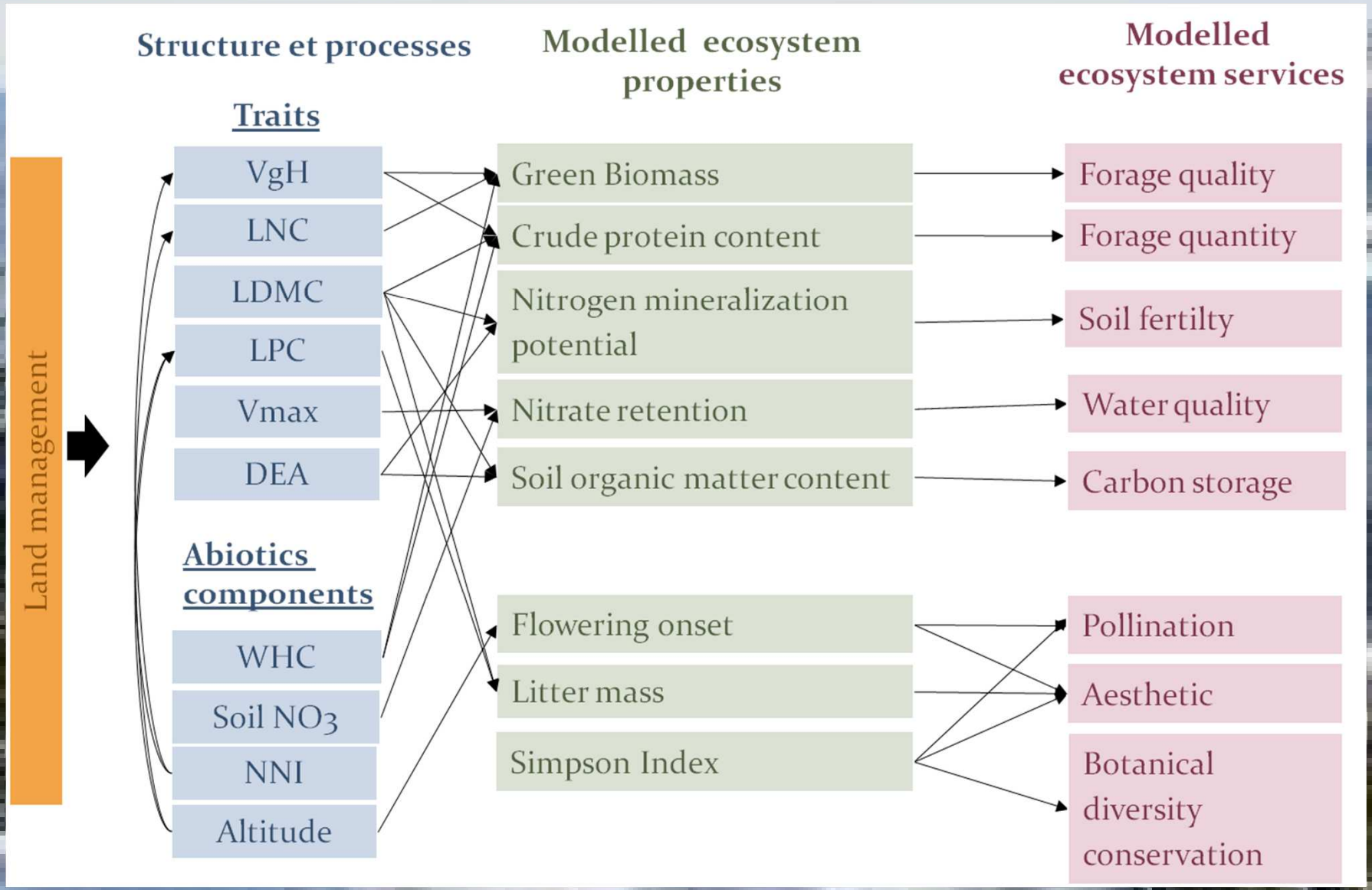


Soil C stocks

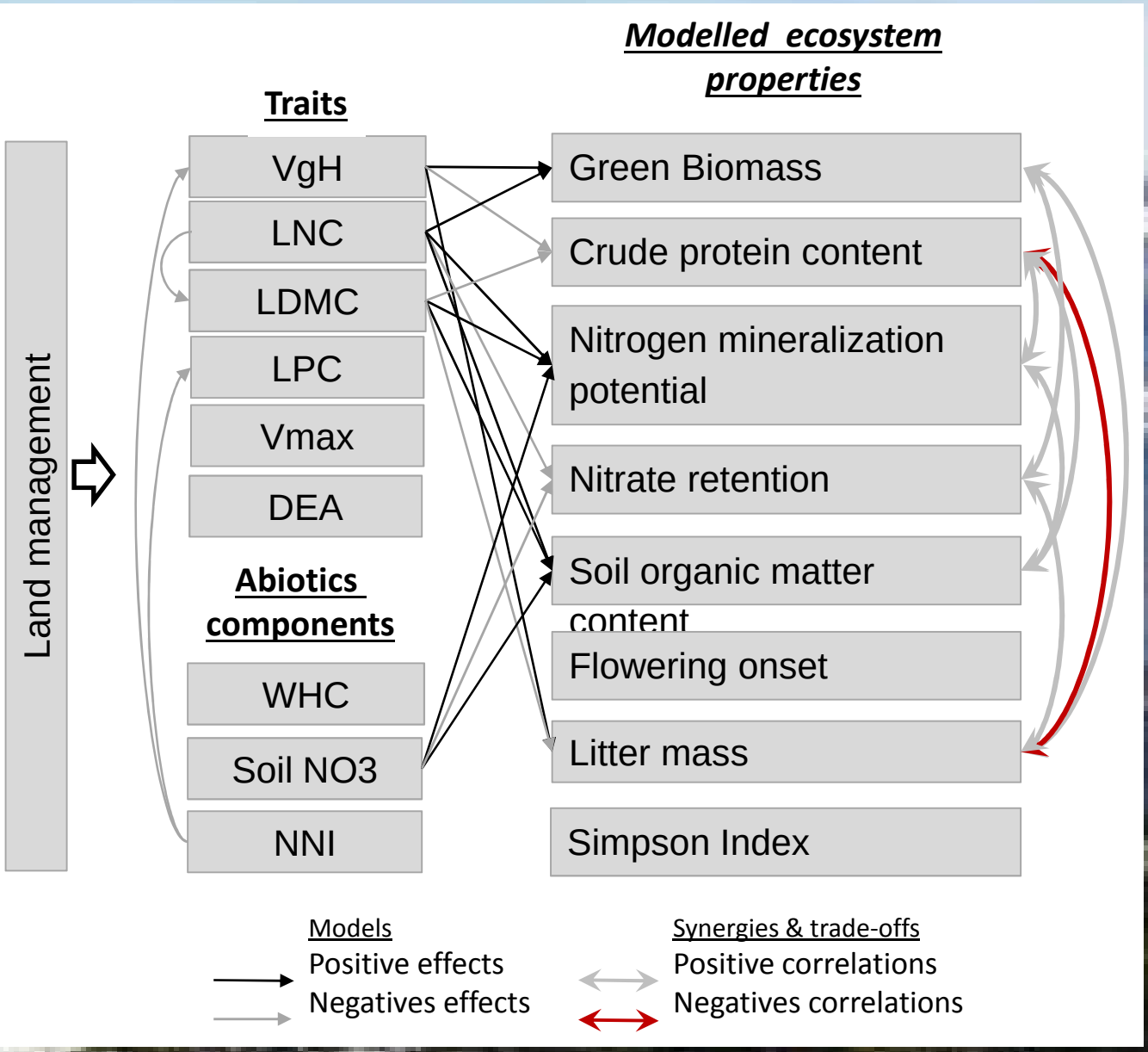
Total C stocks



Instruments – Trait-based ecosystem service models

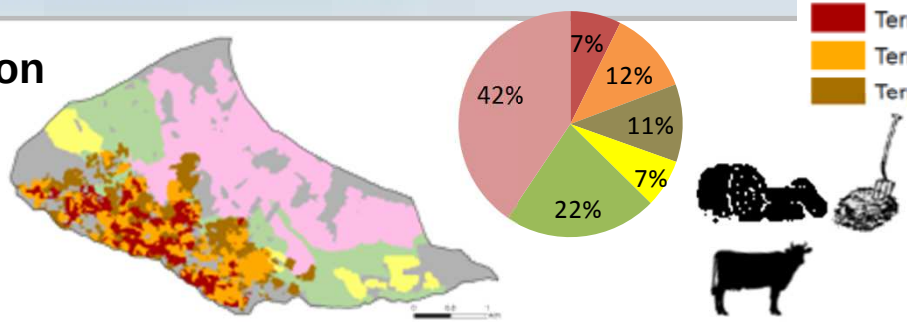


Mechanistic trade-off analysis



Lamarque, Lavorel et al. in revision

Current situation

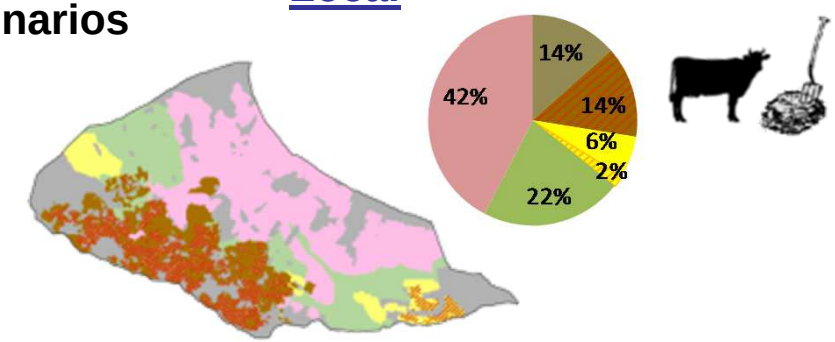


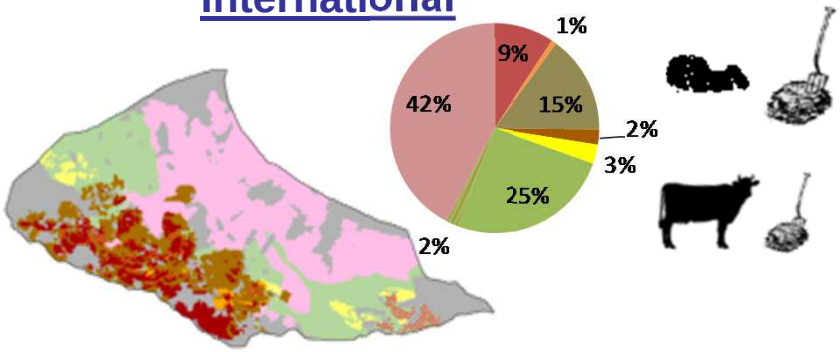
Future scenarios

Local

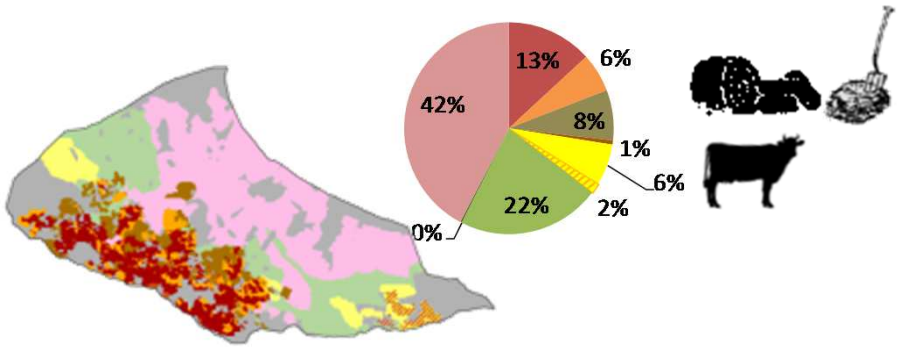
International

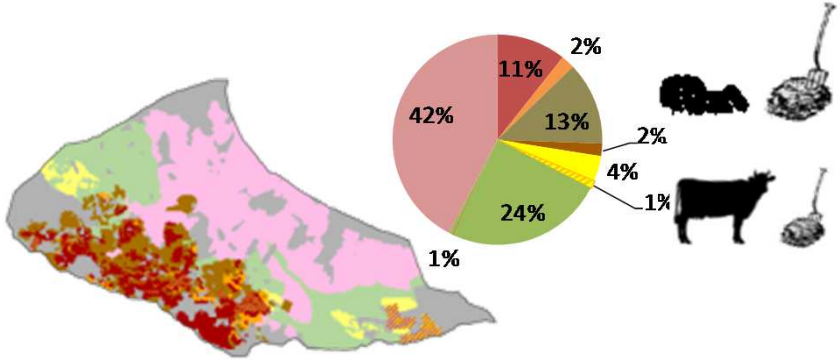
Drastic





Intermittent





Lamarque et al, submitted

Instruments to be developed in OPERAs

Remote sensing to parameterise functional models of ecosystem services

MCDA and other trade-off analysis methods

3D visualisation – coll. ETH

Biodiversity offsets and habitat banking

Certification and other labels

…

Wine Production and Cultural Landscapes in Europe

7

Kim Nicholas
Lund U

Marc Metzger
U Edinburgh

Marcus Lindner
EFI

Dariya Hadzhiyska and Boyan Rashev Denkstatt

Exemplar Goals: (part of Step 1 of Blueprint, Seppelt et al. 2012)

- Engage stakeholders around vineyard sustainability
- Develop and test instruments
- Encourage best practices in vineyard management and winery practices
- Limit vineyard expansion and direct expansion away from most sensitive biodiversity areas

Targets

- Maintain and enhance vineyard ES such as C sequestration and biodiversity habitat
- Maintain and enhance economically viable wine industry in traditional regions
- Maintain and enhance social traditions and sustainable tourism in wine regions

Difficult fieldwork conditions!

Analysis: Further develop, implement, & test 2 instruments to assess life-cycle impacts of vineyard practices through the value chain, and communicate these to the consumer

- Marcus Lindner, EFI: Material Flows Analysis using ToSIA (Tool for Sustainability Impact Assessment)
- Dariya & Boyan, denkstatt: Life Cycle Analysis tools

Scotland: supporting multi-scale implementation of environmental policy

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Scotland: supporting multi-scale implementation of environmental policy

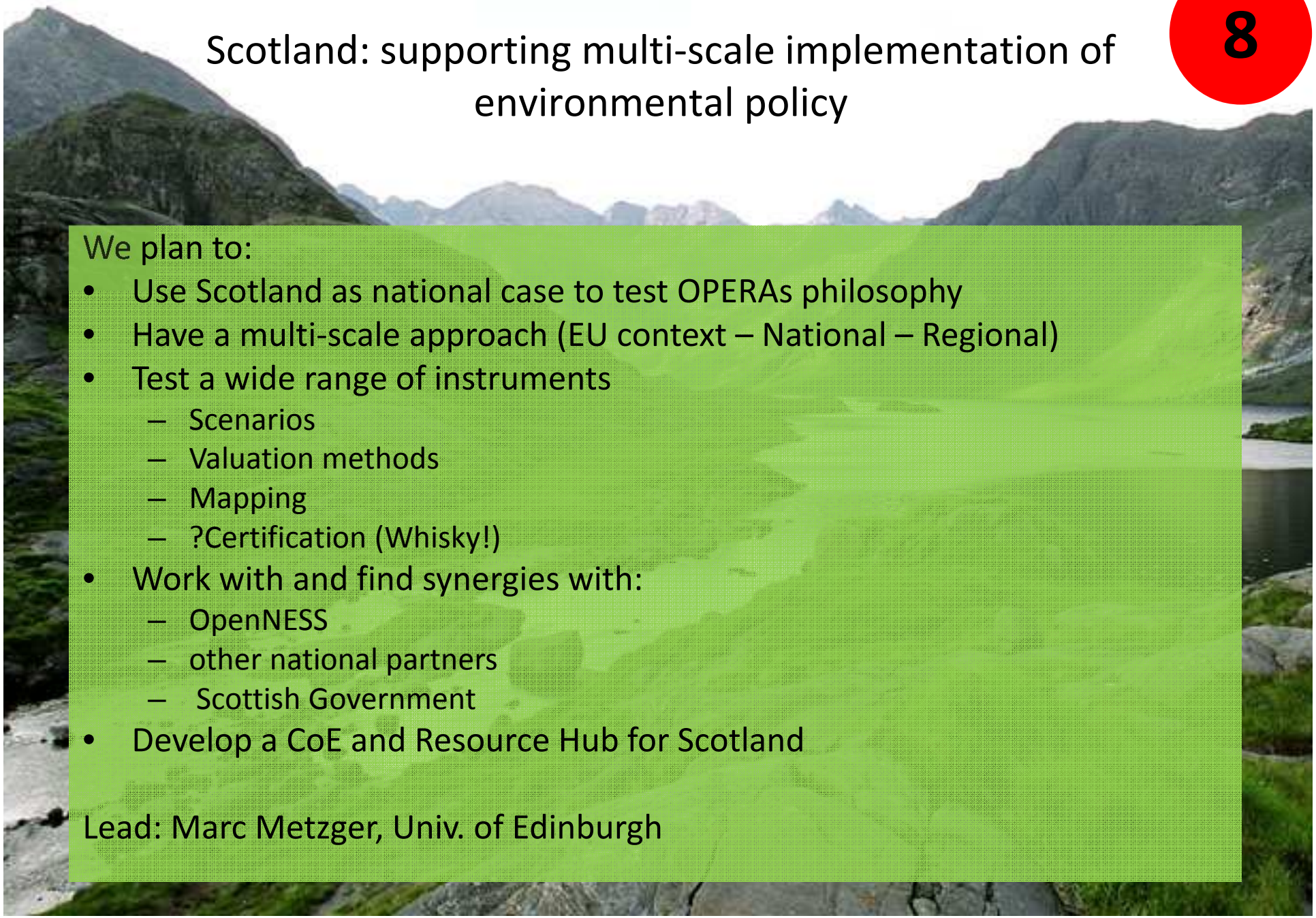
Major recent policies have an ES/NC focus:

- Climate
- Land
- Biodiversity
- Marine

There great policy interest and ongoing research:

- UK National Ecosystem Assessment
- National ES/NC research
  - James Hutton Institute
  - Forest Research
  - CEH (OpenNESS case-studies)
- Emerging Community of Practice

Scotland: supporting multi-scale implementation of environmental policy



We plan to:

- Use Scotland as national case to test OPERAs philosophy
- Have a multi-scale approach (EU context – National – Regional)
- Test a wide range of instruments
  - Scenarios
  - Valuation methods
  - Mapping
  - ?Certification (Whisky!)
- Work with and find synergies with:
  - OpenNESS
  - other national partners
  - Scottish Government
- Develop a CoE and Resource Hub for Scotland

Lead: Marc Metzger, Univ. of Edinburgh

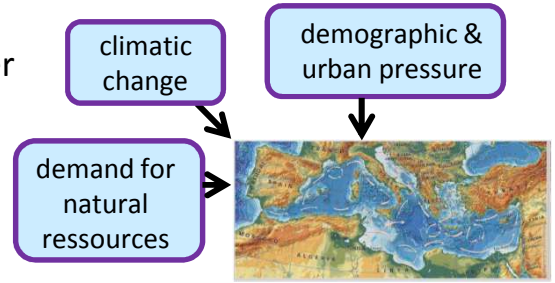
Mediterranean Agrobiodiversity & Ecosystem Services

Wolfgang Cramer, Alberte Bondeau, Simon Decock,
IMBE, Aix-en-Provence, France

9

Questions / object

1) Ecosystem services from Mediterranean (agro-)ecosystems under multiple pressures (global change) - role of land management and ES assessment for sustainable agriculture



degraded agroecosystem

production ↓
biodiversity ↓
C sequestration ↓
esthetic value ↓
water holding capacity ↓

2) Role of biodiversity in Mediterranean agroecosystem functioning

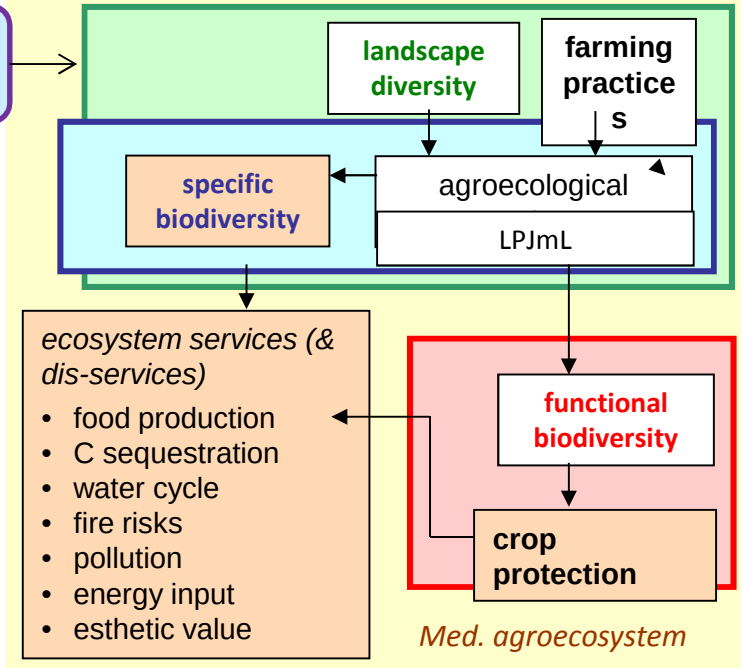
Landscape diversity, diversity of crops and woodlands, agroforestry, mixed farming, traditional practices & innovative systems

Does the higher diversity of agro-ecological systems provide social and economic benefits in a more sustainable way?

3) Research objectives for the Mediterranean OPERAs exemplar:

- better quantification of the interactions between agriculture and biodiversity
- estimation of ES trade-offs between different agricultural systems
- evaluation of the capacity of Mediterranean biodiverse agroecosystems to provide viable, sustainable, and resilient ecosystem services in a global change context
- test the applicability of a process-based ecosystem model (LPJmL) in this context

?



Mediterranean Agrobiodiversity & Ecosystem Services

Wolfgang Cramer, Alberte Bondeau, Simon Decock,
IMBE, Aix-en-Provence, France

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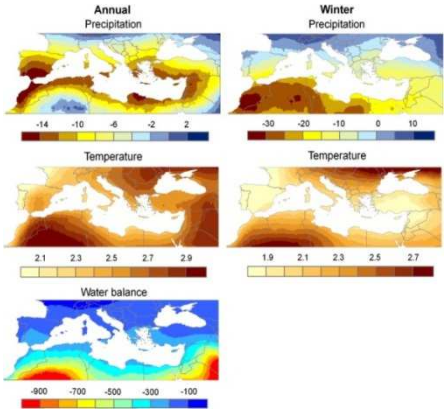
Data 1:

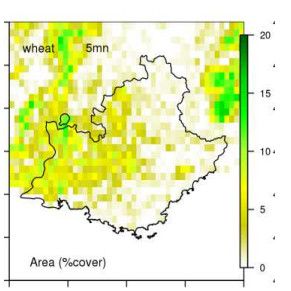
1) Input data for ecosystem p… odelling:
climate, soil properties, atmospheric composition ([CO_2], [O_3], N deposition), etc (historical, present, projections)

Several data sets already in-house, available freely, or through collaborations (GHG Europe, Carbo-Extreme, FUME, OT-Med etc)

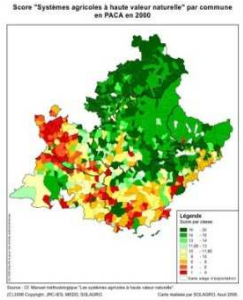


Projected Climate Change *(Gracia-Ruiz et al., 2011)*

2) Data on management / farming practices / landscape diversity:
land use, rotation, fertilizer use, irrigation, associated crops, multiple cropping, organic farming, mixed farming, crops-livestock, agroforestry, agrosystem typology, agro-ecological infrastructures, corridors, hedges, farm typology, etc
(historical, present, scenarios)



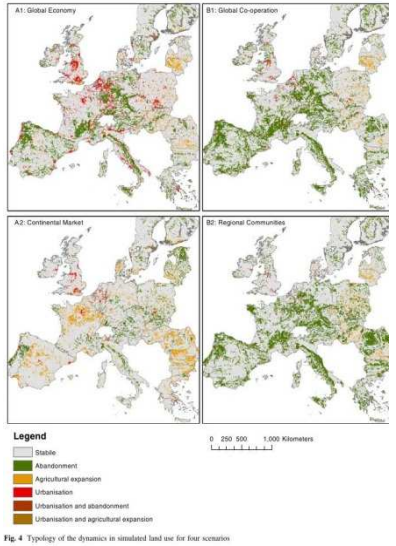
Wheat area
(Monfreda et al., 2008)



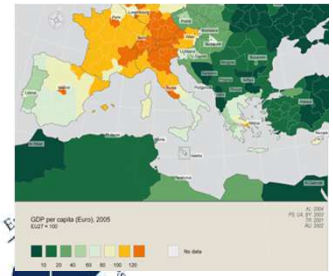
High Natural Value farmlands
(SOLAGRO., 2010)

Typology of exploitation
(SOLAGRO., 2010)

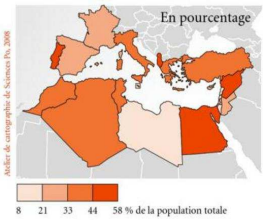
Arable weeds richness
(CBNBP-MNHMP 2000)



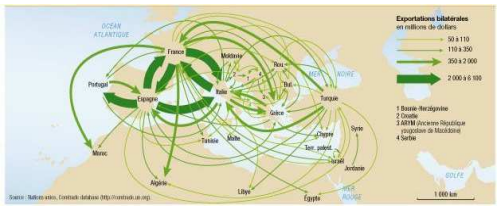
Land use change scenarios
(Verburg et al., 2010)



GDP per capita



Rural vs. urban population



Trade of agricultural products
(CIHEAM, Atlas Mediterra 2010)

3) Socio-economic data:
(historical, present, scenarios)

Work to do: complete, gap filling, homogenization, etc

Data 2:

Meta-analysis of studies (experiments, surveys, modelling) for comparison of different agricultural systems to provide indicators of ES trade-offs in the Mediterranean region

(examples for studies to evaluate)

Summary of ecosystem quality per farm type in the EU *(Reidsma et al. 2006)*

Ecosystem quality (%)	Farm types	Production systems
100	No production	Primary vegetation
40	Extensive grassland management	Medium/ high cattle density on natural grassland
35	Extensive organic farming	Low-External-Input and Sustainable Agriculture, permaculture
25	Extensive farming	Traditional farming; extensive farming; Low-External-Input Agriculture
20	Intensive organic farming	Rainfed organic farming
20	Intensive grassland management	Grassland production based on ploughing, reseeding and fertilization
15	Highly intensive organic farming	Organic farming in developed countries
10	Intensive production systems	Intensive agriculture; integrated agriculture; High-External-Input Agriculture, conv. agriculture
5	Highly intensive prod. systems	Irrigation based agriculture; integrated agriculture; drainage based agriculture; additional soil levelling practices; regional specialization

Ex.: Reidsma, P. et al., 2006. Impacts of land-use change on biodiversity: An assessment of agricultural biodiversity in the European Union. *Agriculture, Ecosystems and Environment.*

Agroforest Syst (2011) 81:93–108
DOI 10.1007/s10457-010-9363-2

Farm-SAFE: the process of developing a plot- and farm-scale model of arable, forestry, and silvoarable economics

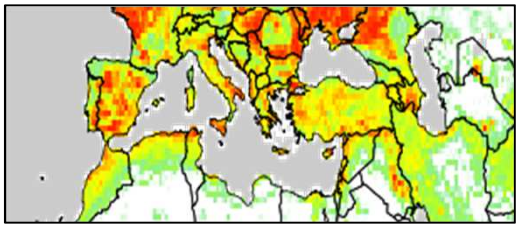
A. R. G
J.-P. T
J. Palm

Agroforestry Systems **43**: 71–80, 1999.

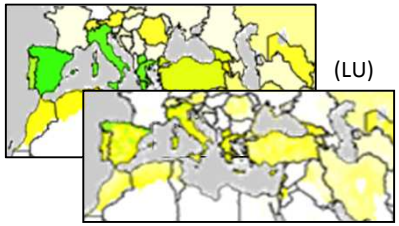
Growth and nitrogen status of young walnuts as affected by intercropped legumes in a Mediterranean climate

C. DUPRAZ[1,*], V. SIMORTE[2], M. DAUZAT[1], G. BERTONI[2], A. BERNADAC[2] and P. MASSON[2]
*[1]INRA-Lepse, 2, Place Viala, 34060 Montpellier, France; [2]ENSAT, Laboratoire d'ingénierie agronomique, 145, avenue de Muret, 31076 Toulouse, France (*Author for correspondence: E-mail: dupraz@ensam.inra.fr)*

ecosystem degradation (%)

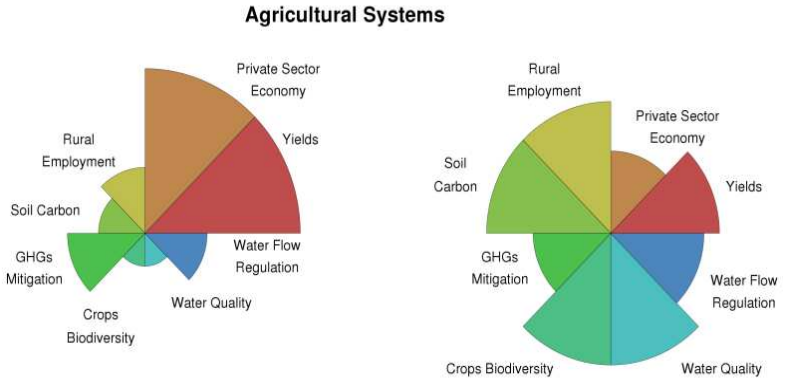


Endemism Richness of Vascular Plants (no LU)



(LU)

illustrative application:
from land use & management data
=> 1) ecosystem degradation due to LU
=> 2) change in the endemism richness of vascular plants



(hypothetical tradeoff analysis based on process model and ES indicators).

Mediterranean Agrobiodiversity & Ecosystem Services

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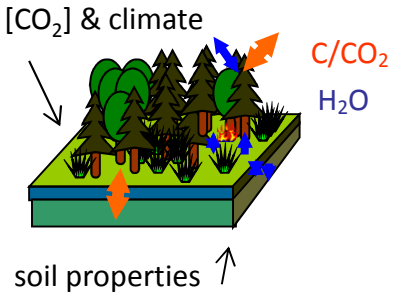
Instrument:

The LPJmL agroecosystem mo[illegible]ed for the Mediterranean region

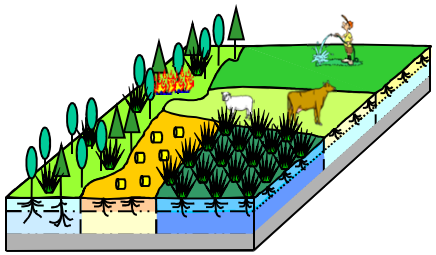
LPJ-DGVM
(Sitch et al. 2003, Gerten et al., 2004) :

Process-based dynamic global model for natural vegetation



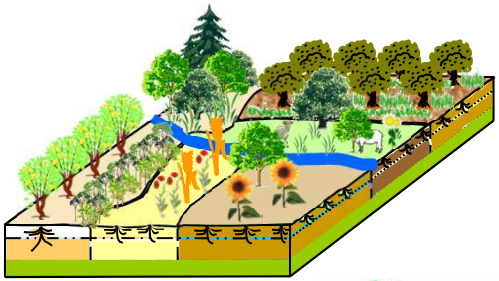
LPJmL
(Bondeau et al. 2007, Rost et al., 2008, Waha et al, 2011) :

LPJ for managed Land (with crops, pastures, bioenergy, irrigation, etc)

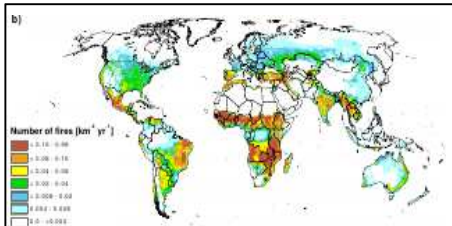


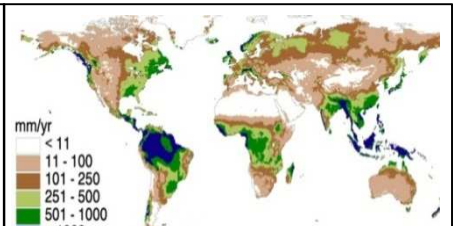
Mediterranean LPJmL
(PhD Simon Decock)

with perennial crops (olive, grapes) and different managements (e.g. mixed & low input farming, agroforestry), links with biodiversity

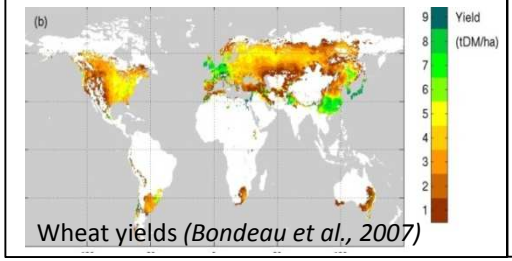


Example output from process-based LPJmL simulations

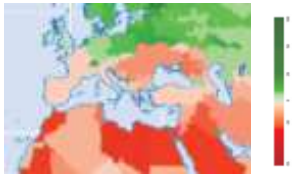

Fire ocurrence *(Thonicke et al., 2010)*



Runoff *(Gerten et al., 2006)*



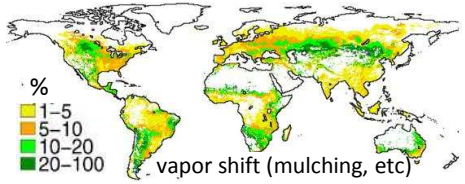
Wheat yields *(Bondeau et al., 2007)*


CC induced yield change *(Müller et al, 2009)*

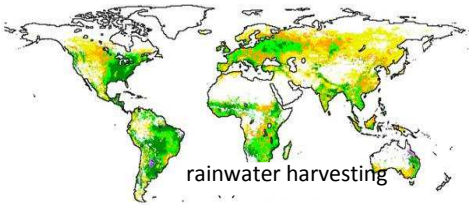
Accounting for agricultural management in a process-based model

Ability of adapted cropping practices and soft water management for increasing production in rainfed agriculture *(Rost et al., 2009)*

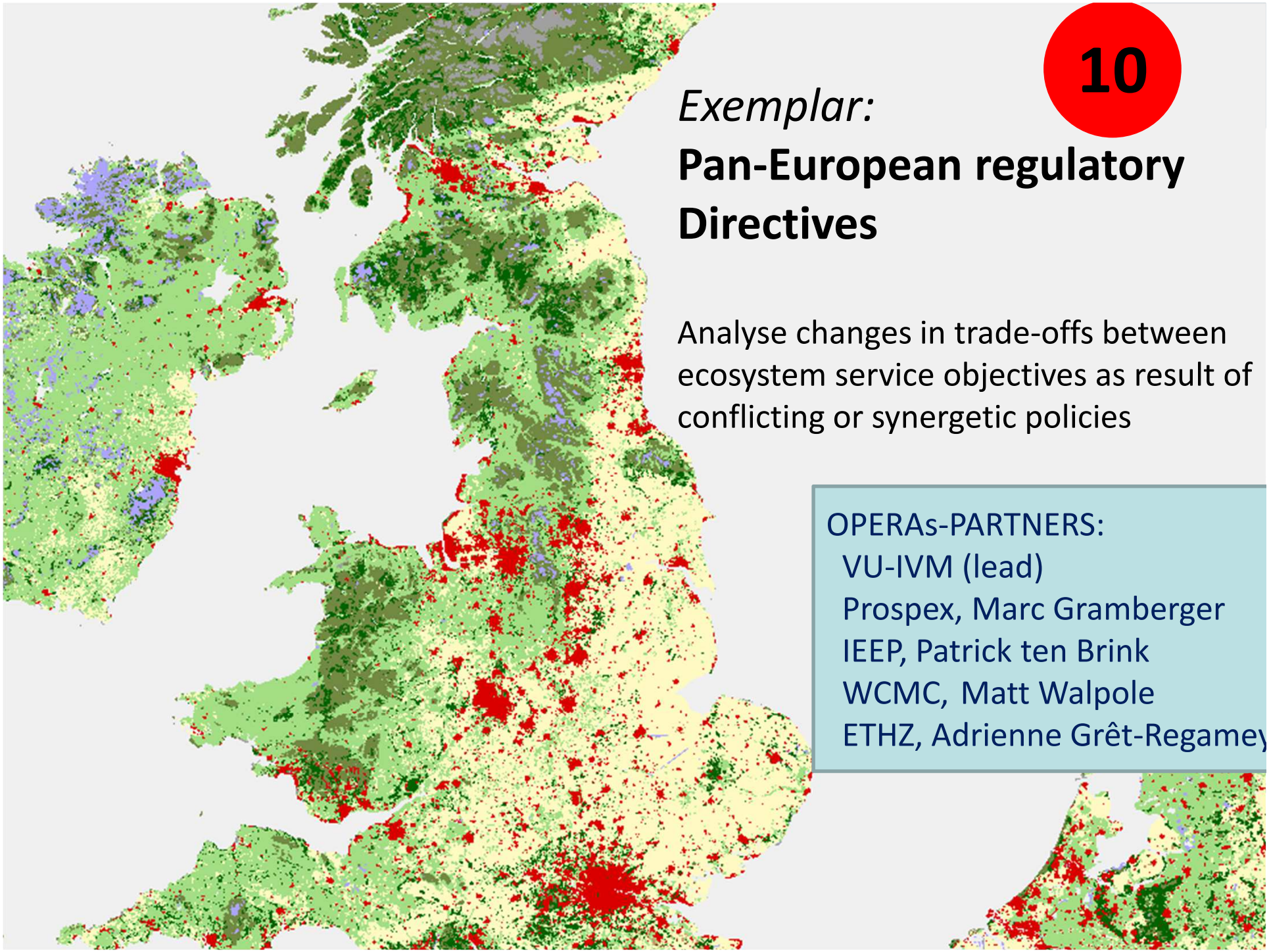
=> connection with socio-economic data to quantify trade-offs



vapor shift (mulching, etc)


rainwater harvesting

Subsequent estimation of tradeoffs between agricultural and non-agricultural ecosystem services, using adaptation of econometric models, e.g. InVest or ARIES (or with OPERAs partners?)



10

Exemplar:

Pan-European regulatory Directives

Analyse changes in trade-offs between ecosystem service objectives as result of conflicting or synergetic policies

OPERAs-PARTNERS:
- VU-IVM (lead)
- Prospex, Marc Gramberger
- IEEP, Patrick ten Brink
- WCMC, Matt Walpole
- ETHZ, Adrienne Grêt-Regamey

Pan-european exemplar: instruments

Stakeholder process on policy demand for instruments at EU level

Information tools:

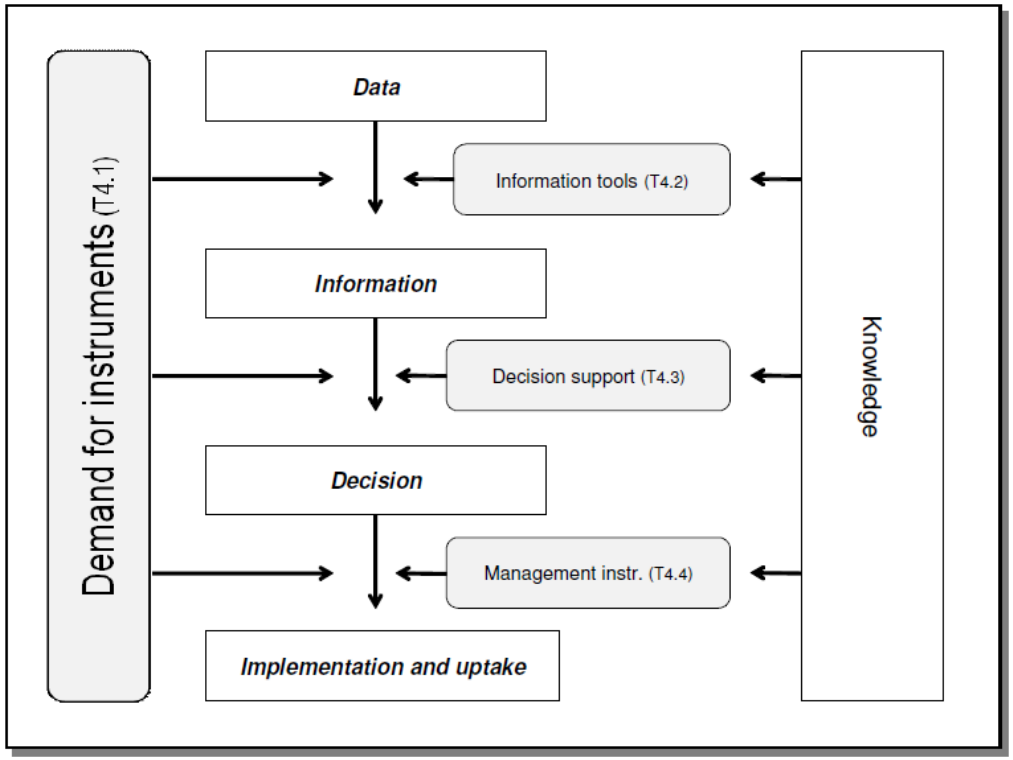
- Scenario analysis
- Impact assessment
- Trade-off analysis

Decision tools:

- Economic accounting??

Uptake:

- Stakeholder engagement (?)



Global mechanisms for climate protection and habitat conservation

11

CENTRAL RESEARCH QUESTION

What are impacts of global policy foci on climate, biodiversity or biodiv & ES protection on regional, national and global scale?
What are balanced solutions accounting for multi-dimentional interaction between climate change, habitat loss and ES?

THE PLAN:

Multi-scale investigation in 3-5 tropical countries to analyse the impacts of different policy foci, by

A. Large-scale modelling & economic valuation

B. Regional case studies including ecosystem modelling and varying PES

TOOLS:

Information tools for policy making

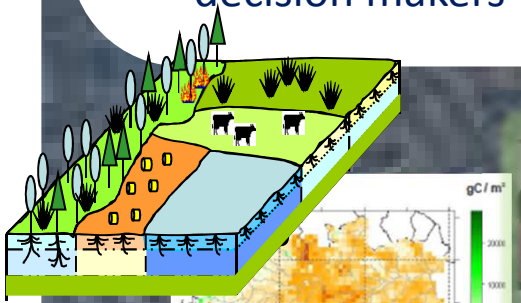
→ Simulation (land use, ecosystem responsed and post-processing quantification of ES)

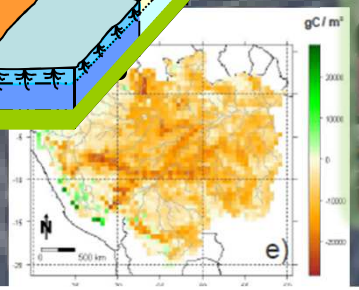
→ Economic valuation

→ Regional ES modelling

→ Regional PES schemes

→ Dialogue with multi-level decision makers





REDD+

$$

OPERAs PARTNERS: Ariane Walz, Almut Arneth, Peter Verburg, Roy Brower, Genevieve Patenaude, Bruno Locatelli, Emilia Pramova