

# Implementation of ecosystem services as indicators for landscape management in the Basque Country, Spain

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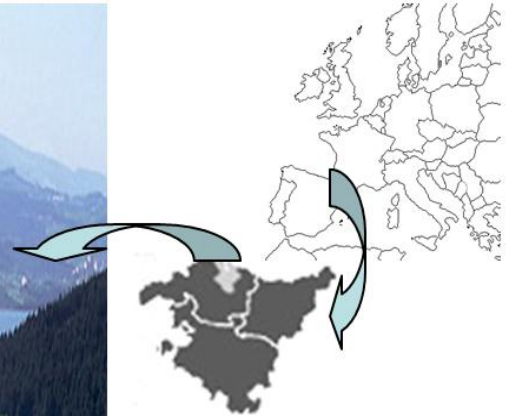


26<sup>th</sup>-28<sup>th</sup> October 2014, Dubai, United Arab Emirates

# *1- The Plan for Landscape Management of the Urdaibai Biosphere Reserve is updated including ecosystem services*

Declared by UNESCO as a Reserve in 1984  
Protected by law in 1989

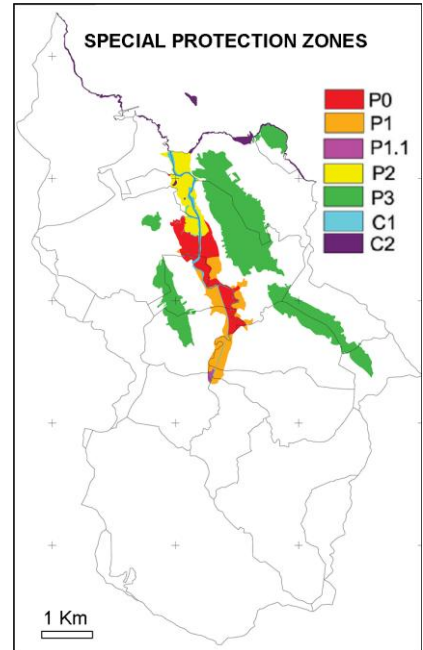
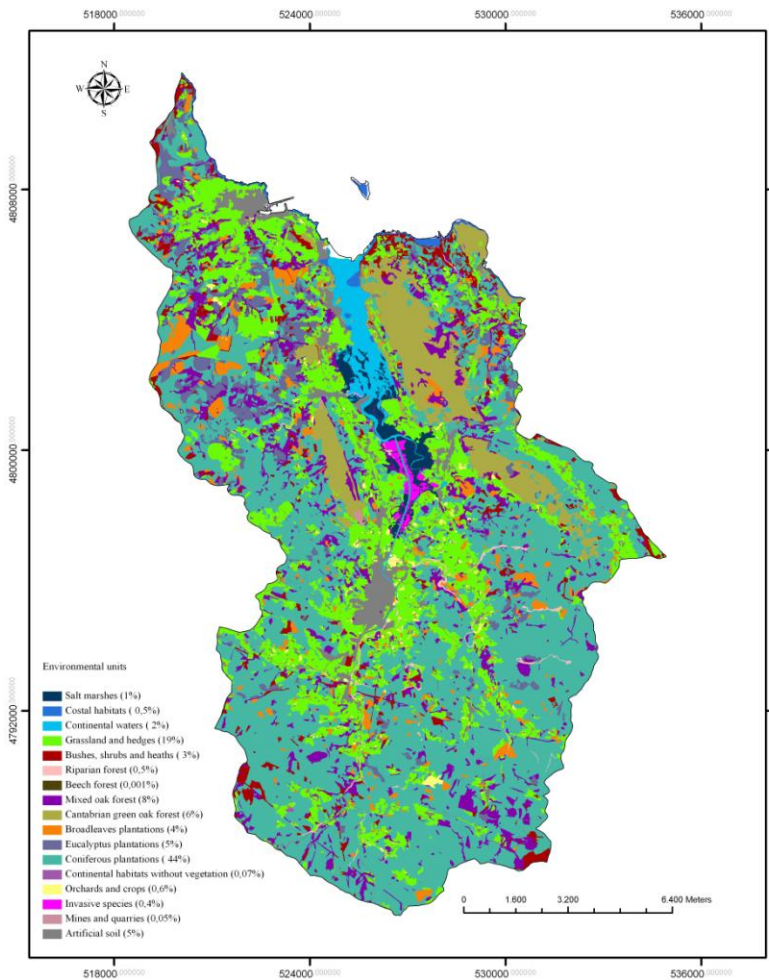
220km<sup>2</sup> ; 44,000 inh.  
Gernika



# Master Plan for Use and Management

1993, revision in 2003, updated in 2014

Outlines the uses and actions that are allowed in each area



Core areas: coastal ecosystems, salt marshes and Cantaurian evergreen oak forests



Nature,  
basis  
of well-being

Ecosystem Services of the **Basque Country**

# *Participatory process*

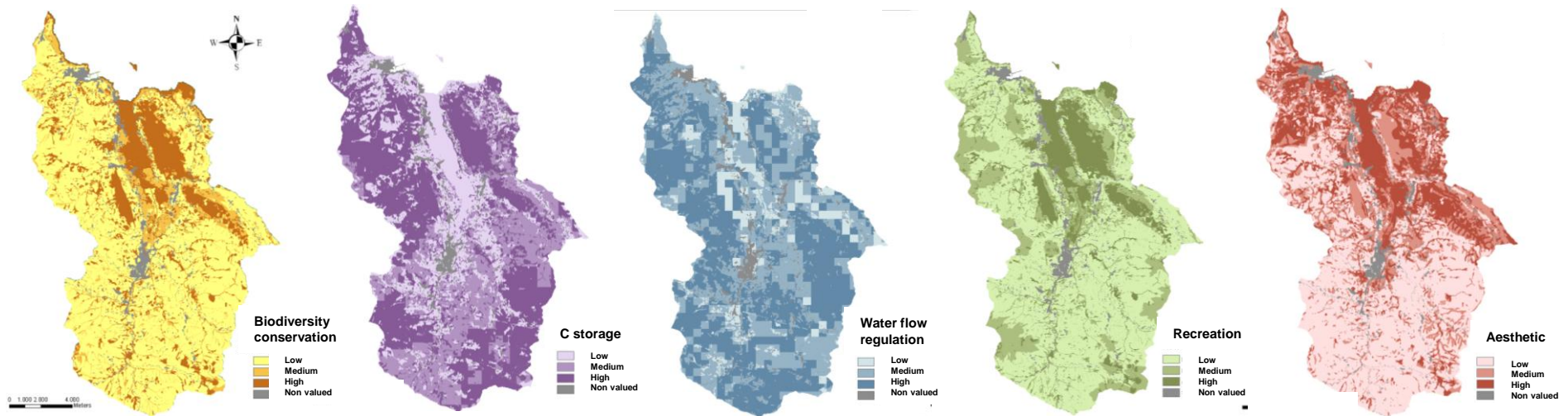
Proposed: the introduction of criteria  
to include ecosystem services

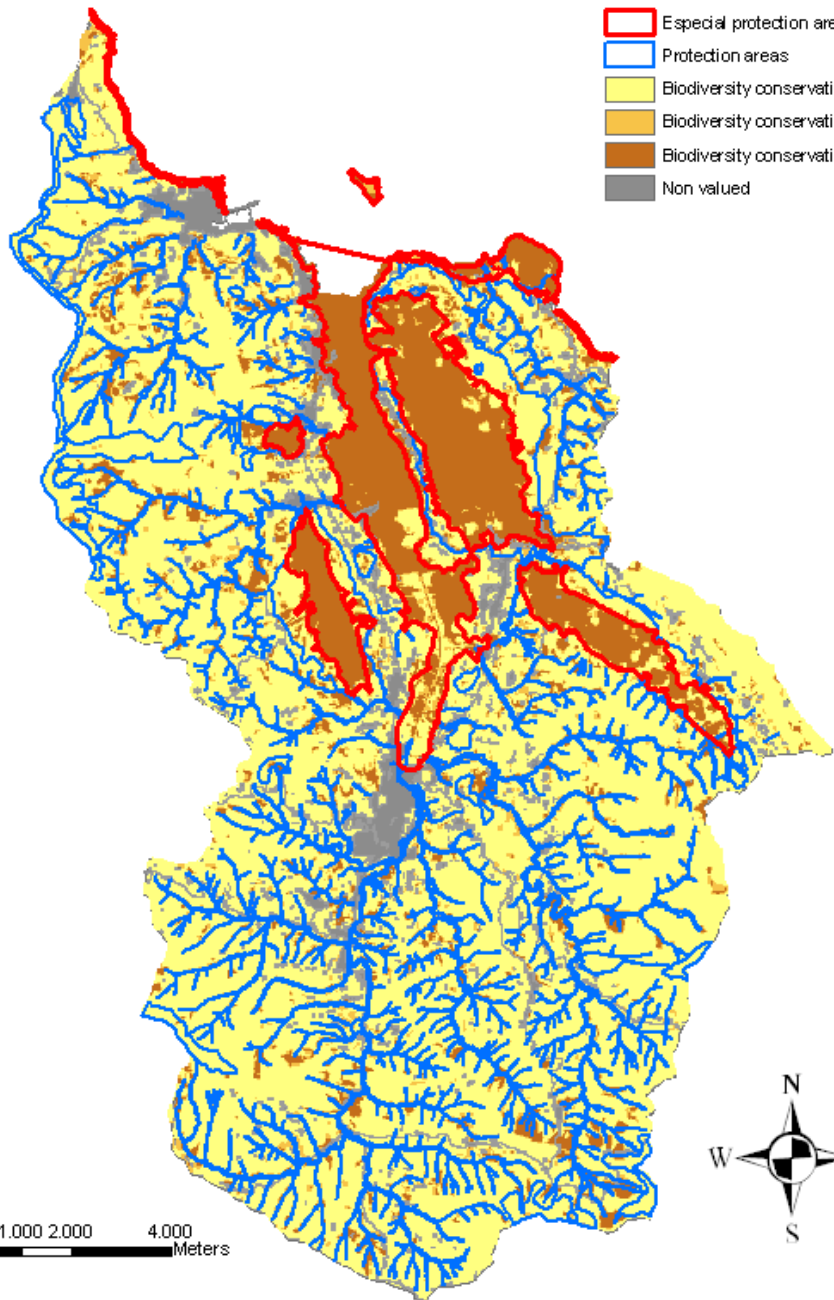


## **Question:**

- which ecosystems are the most important producers of biodiversity and ecosystem services?

# Maps of biodiversity and ecosystem services supply were used: carbon storage, water flow regulation, aesthetic value and recreation services





- Especial protection areas
- Protection areas
- Biodiversity conservation: medium-low
- Biodiversity conservation: high and less than two services
- Biodiversity conservation: high and more than two services
- Non valued

**Areas with high value for biodiversity conservation and at less two services**

<b>Especial protection zones</b>	53%
<b>Protection zones</b>	12%
<b>Without protection</b>	35% (mixed oak forest)



0 1.000 2.000 4.000  
Meters

# Results for management

- **Natural forests are the ecosystems that most contribute to biodiversity and ecosystem services**
  - Mixed oak forest will be include as a *core* area in the new Plan
  - The conservation of these forests will contribute to an increase of nearly 33% of the biodiversity hotspot, more than 40% of the carbon storage and almost 13% of the water flow regulation

Onaindia et al. 2013. Environmental science and policy 33: 283-294

Onaindia et al., 2013. *Forest Ecology and Mangement* 289:1-9.

## *2-Socio-economic compensation for the provision of ecosystem services at municipality level*

The contribution of the municipalities to the provision of ecosystem services is not considered, even though they are fundamental for human well-being

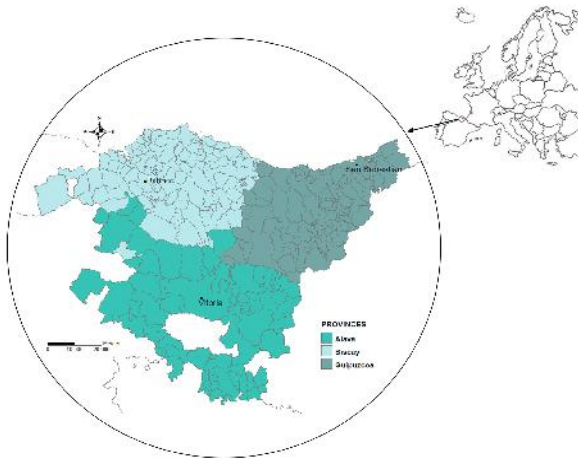


Fig. 1. Study area.

- Municipalities receive incentives and financial support from the regional government based on: inhabitants, GDP

Aim:

Define an index of landscape multifunctionality based on ES

1,200 km<sup>2</sup>, 250 municipalities, 2,200,000 inhabitants



# Selected indicators of Ecosystem Services: 15 indicators for 11 ES

**Table 1**

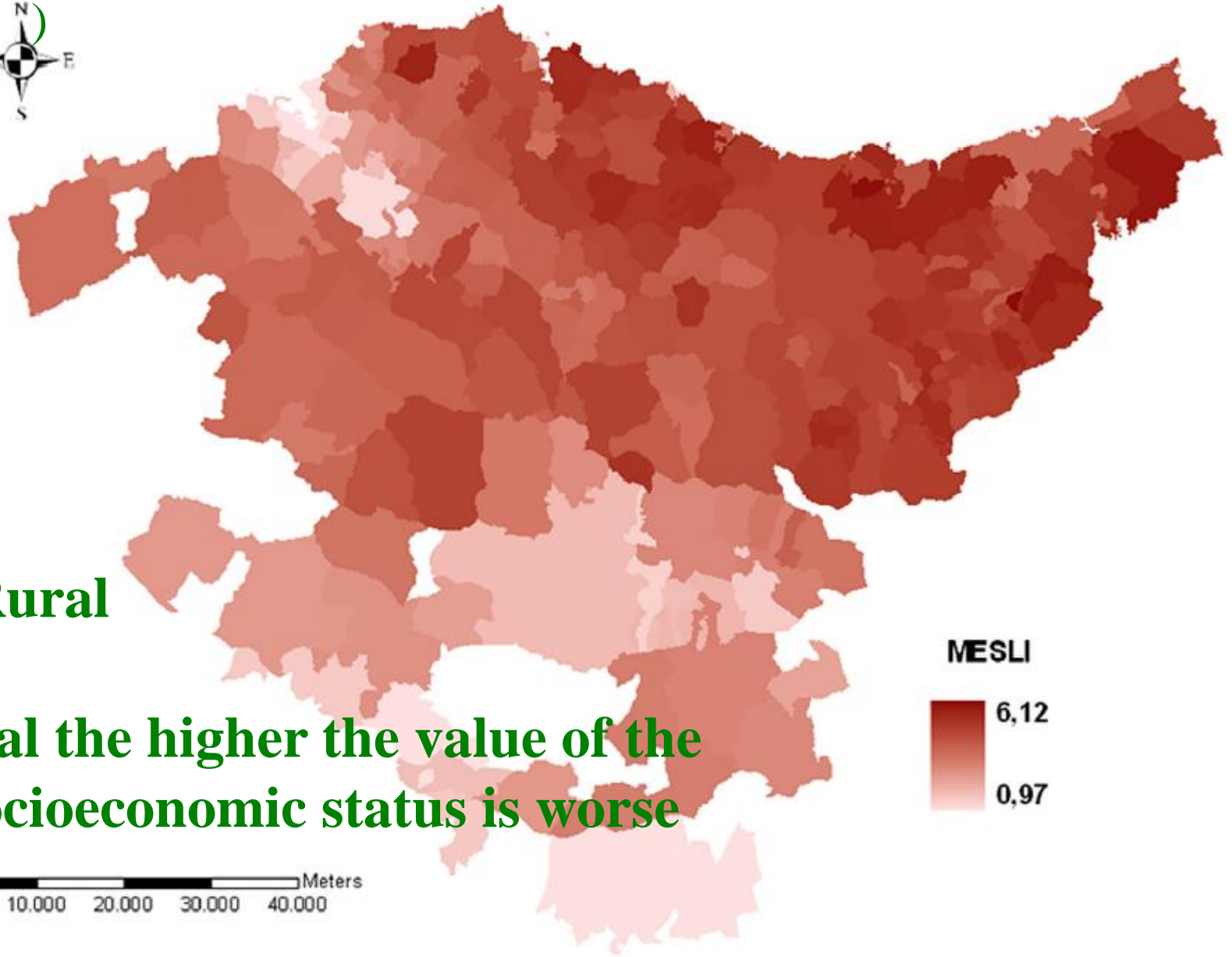
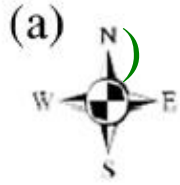
List of selected ecosystem services and biodiversity values with their potential indicators and low and high performance benchmarks (Min. t. s., Max. t. s.: minimum and maximum value in entire time series data). References that use the indicator, or a similar indicator, are noted.

Services	Indicators	Low performance benchmarks	Target	References
<b>Provisioning</b>				
Food	DC: Density of head of cattle (N°/100 ha)	0	Max. t. s.	Burkhard et al., 2012; Kandziora et al., 2012
	AP: Agricultural production (Ton/ha)	0	Max. t. s.	Maes et al., 2012; European Commission, 2014
Raw materials	Timb: Timber in forest plantations (m <sup>3</sup> /ha)	0	Max. t. s.	Burkhard et al., 2012; Maes et al., 2012
Freshwater	RO: Runoff = renewable water supply (mm)	Min. t. s.	Max. t. s.	MEA, 2005
<b>Regulating</b>				
Global climate regulation	SCSB: Stored C in soil and biomass (Ton C/ha)	0	Max. t. s.	Maes et al., 2012; Kandziora et al., 2012; van Oudenhoven et al., 2012; Layke et al., 2012
Maintenance of soil fertility	OCS: Organic C in soil (Ton C/ha)	0	Max. t. s.	Maes et al., 2012
Local climate regulation	Et: Evapotranspiration (mm)	Min. t. s.	Max. t. s.	Burkhard et al., 2012; Kandziora et al., 2012; Layke et al., 2012
Water flow regulation	SWS: Soil water storage capacity (mm)	0	Max. t. s.	van Oudenhoven et al., 2012; Layke et al., 2012
	SWI: Soil water infiltration capacity (cm/h)	0	Max. t. s.	Maes et al., 2012; Layke et al., 2012; Gomez-Baggethun and Barton, 2012
Water purification	RF: Cover of riparian forest in river margins (% in 25 m buffer)	0%	100%	Plieninger et al., 2012; European Commission, 2014
	NF: Cover of natural forest (% of municipality's surface)	0%	Max. t. s.	European Commission, 2014
Erosion prevention	Eros: Areas without erosion problems (% of municipality's surface)	0%	100%	Kandziora et al., 2012
<b>Cultural</b>				
Tourism	RTS: Density of rural tourism establishments (N°/km <sup>2</sup> )	0	Max. t. s.	Burkhard et al., 2012; Kandziora et al., 2012
<b>Biodiversity</b>				
	SP: Special protection area (% of municipality's surface)	0	Max. t. s.	Maes et al., 2012
	HCI: Habitat of community interest (% of municipality's surface)	0	Max. t. s.	Burkhard et al., 2012; Kandziora et al., 2012

$$\text{MESLI} = \sum_{i=1}^{11} \frac{\text{Observed value}_i - \text{Low performance benchmark}_i}{\text{Target}_i - \text{Low performance benchmark}_i}$$

- All the indicators were transformed in a 0 to 1 scale
- When clear performance benchmarks do not exist we used the entire time series data to set both, the maximum and the minimum observed (years 2000-2010)
- These standardised indices were summed to obtain the Multiple Ecosystem Services Landscape Index (MESLI)

# Results: Multifunctionality index value for each municipality



**Urban/Rural**

**In general the higher the value of the index, socioeconomic status is worse**

# Multifunctionality index trend value: 2000-2010

(b)

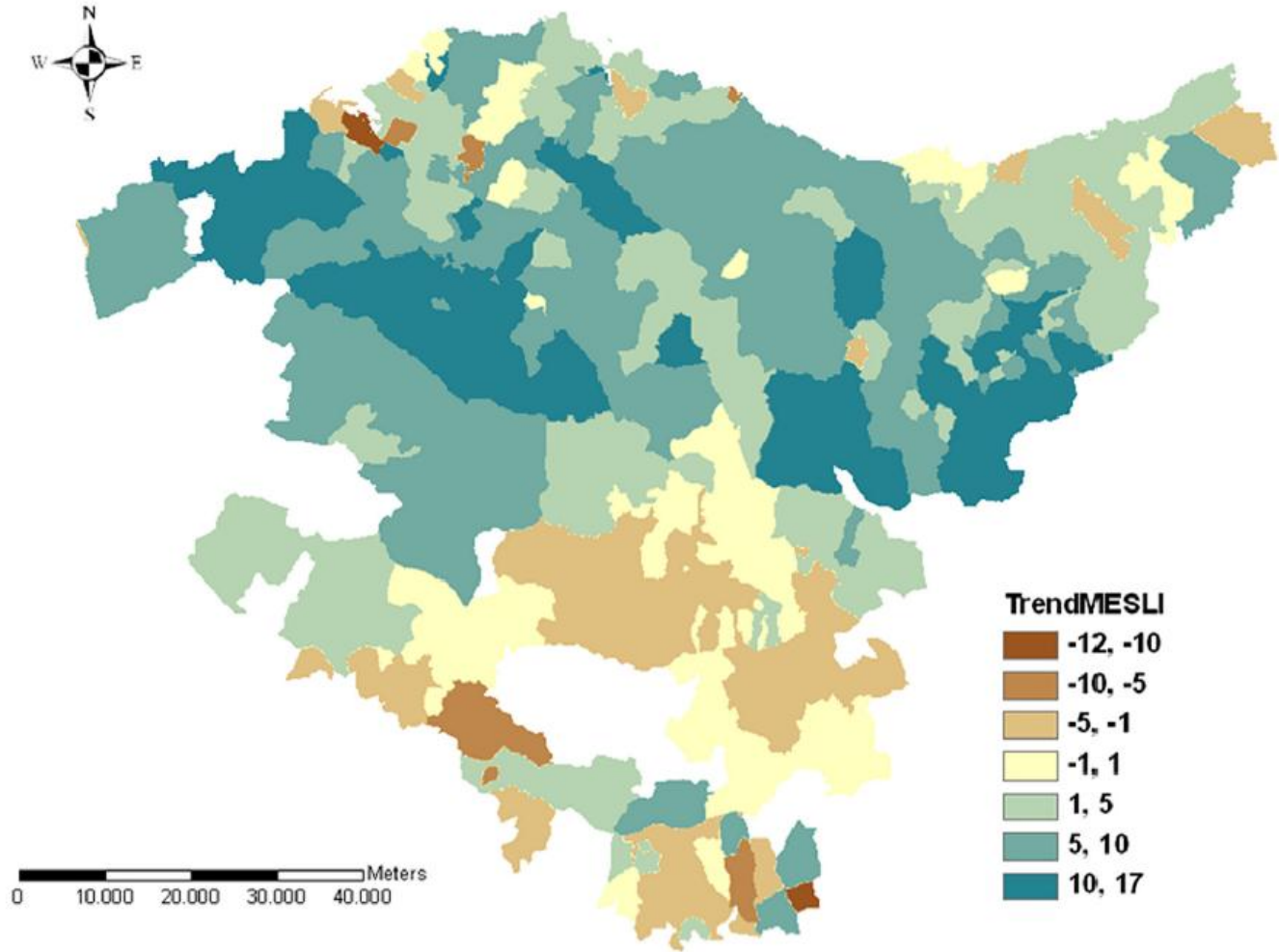


Fig. 2. Maps of the multiple ecosystem services landscape index (MESLI) (a) and TrendMESLI (b) by municipality.

# Results for management

- The indicator is a tool for measuring the multifunctionality, and to develop a system of socio-economic compensation for the provision of ecosystem services at municipality level
- Recognising the contribution of the municipalities to human well-being has the potential to improve the socioeconomic situation and reduce the differences between them



# 3- CONCLUSIONS

- The perspective of ecosystem services contributes to develop sound land-use policies and planning actions
  - Conservation Plans based on ecosystem services and biodiversity
  - Socio-economic compensation for landscape multifunctionality
- **Important issues:**
  - Stakeholders ‘ participation and collaboration between researchers, technicians and politicians
  - Development of technical tools: mapping, indicators, others (spatially explicit accurate information).
  - Engagement in Networks

# Thank you

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