

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

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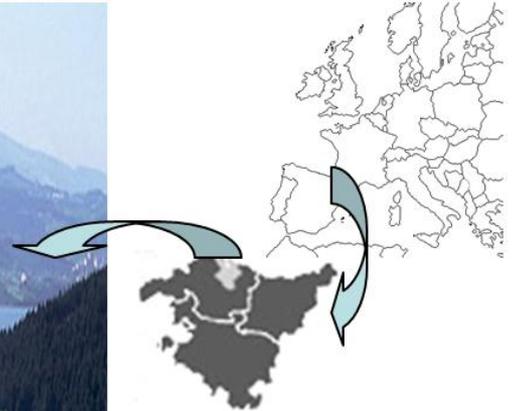


26th-28th October 2014, Dubai, United Arab Emirates

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

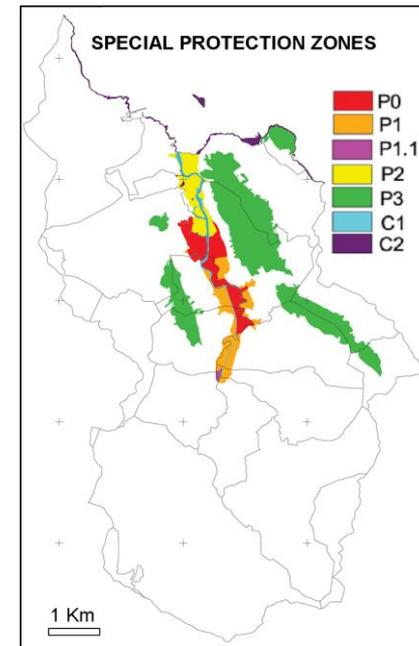
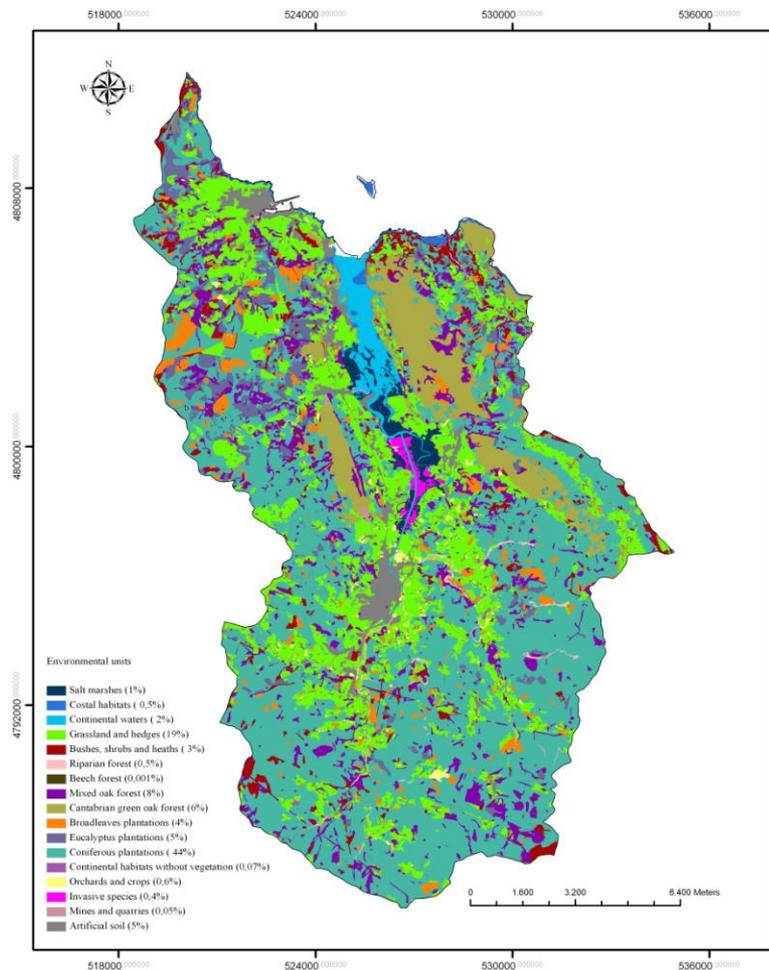
220km² ; 44,000 inh.
Gernika



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

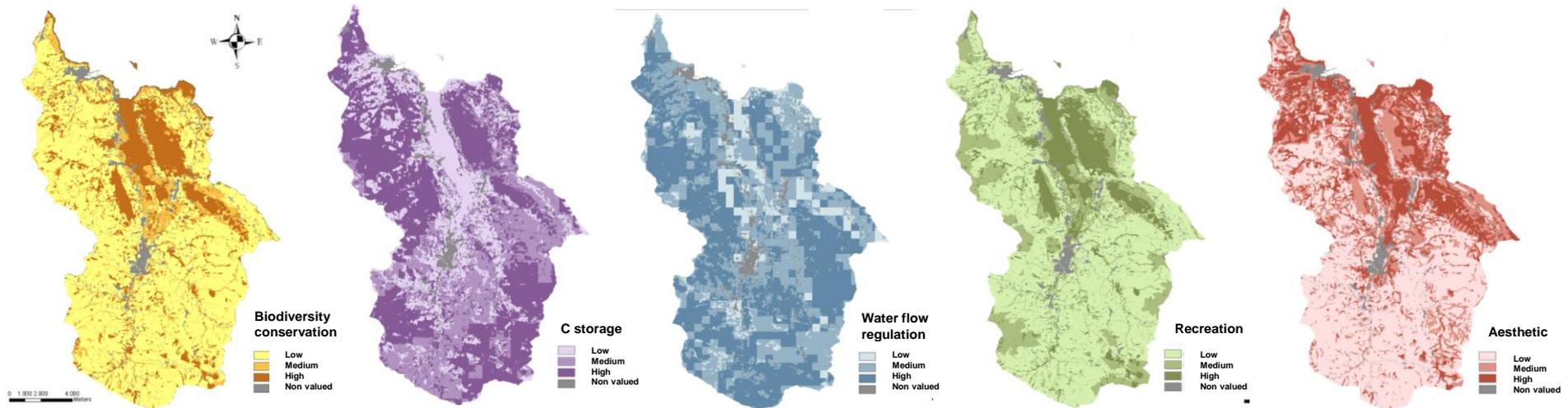
Proposed: the introduction of criteria
to include ecosystem services

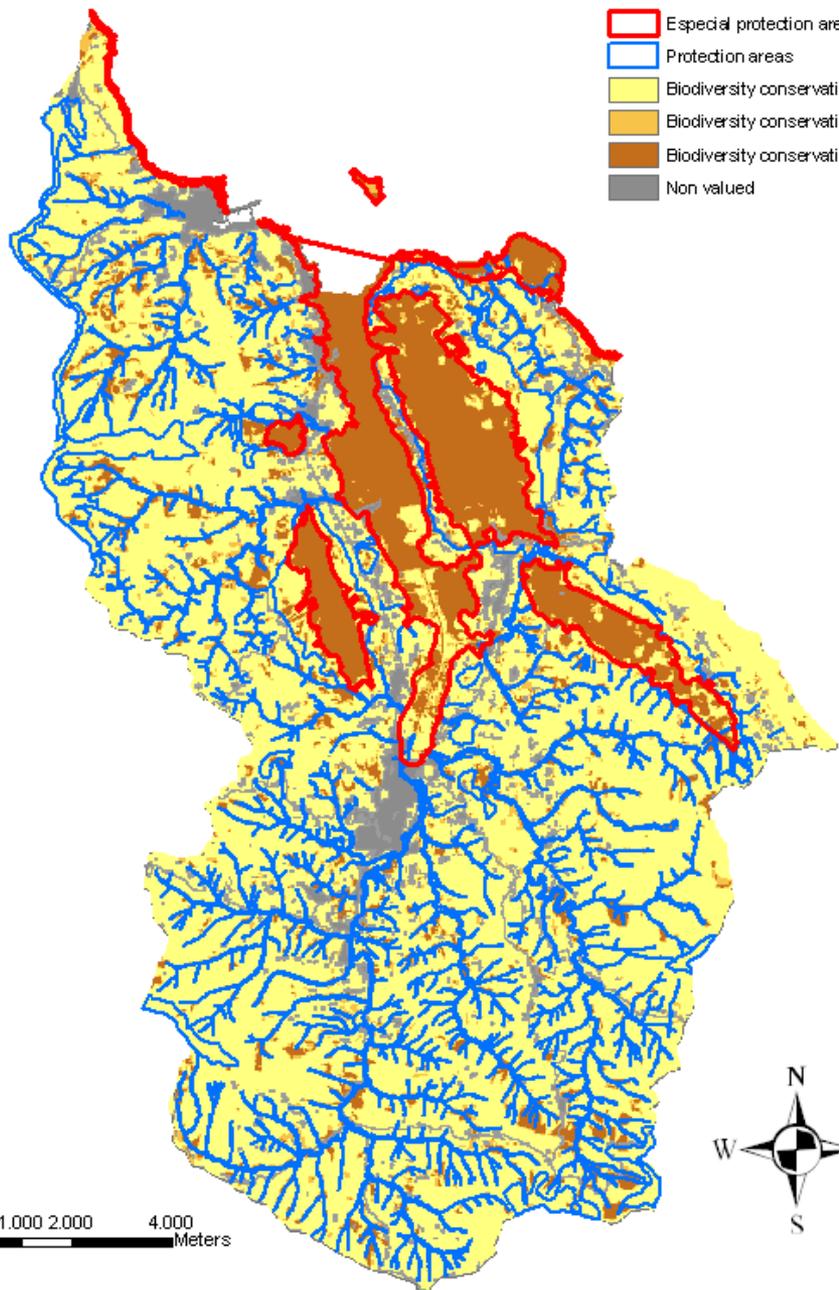


Question:

- 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

Especial protection zones	53%
Protection zones	12%
Without protection	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

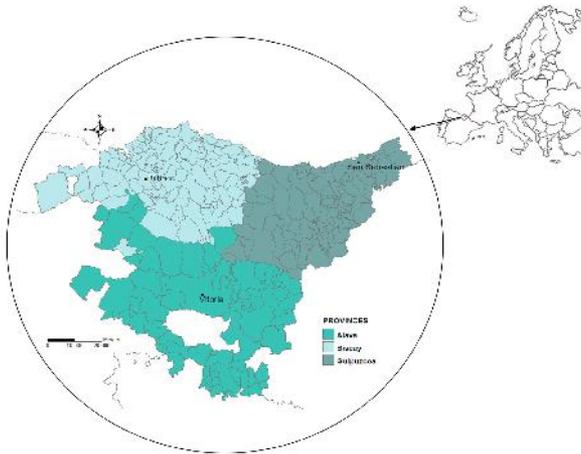


Fig. 1. Study area.

- 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 km², 250 municipalities, 2,200,000 inhabitants

Selected indicators of Ecosystem Services: 15 indicators for 11 ES

Table 1

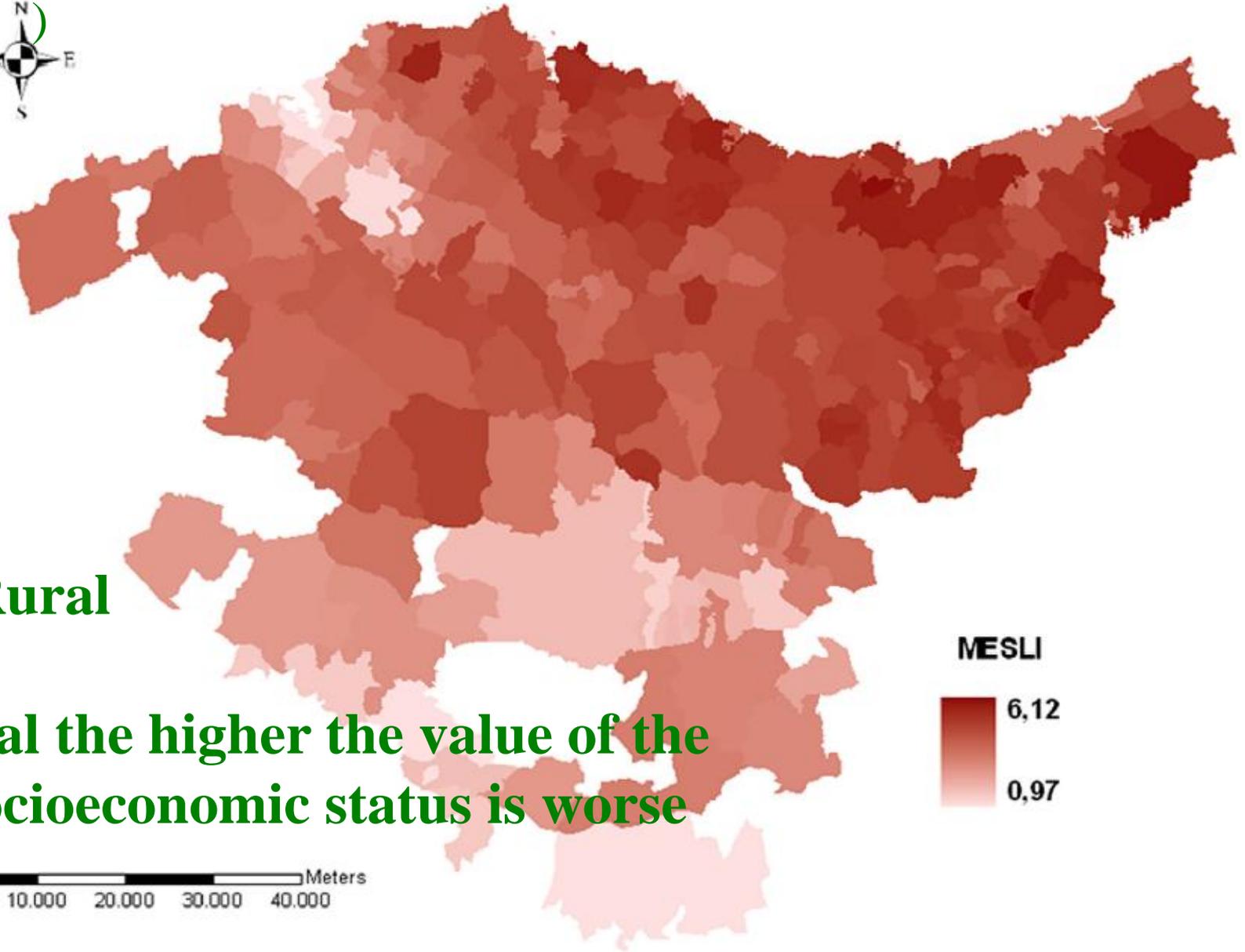
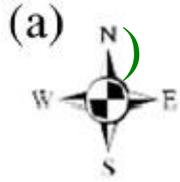
List of selected ecosystem services and biodiversity values with their potential indicators and low and high performance benchmarks (Min. t. s., Max. t. s.: minimum and maximum value in entire time series data). References that use the indicator, or a similar indicator, are noted.

Services	Indicators	Low performance benchmarks	Target	References
Provisioning				
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 ³ /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
Regulating				
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
Cultural				
Tourism	RTS: Density of rural tourism establishments (N°/km ²)	0	Max. t. s.	Burkhard et al., 2012; Kandziora et al., 2012
Biodiversity				
	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)

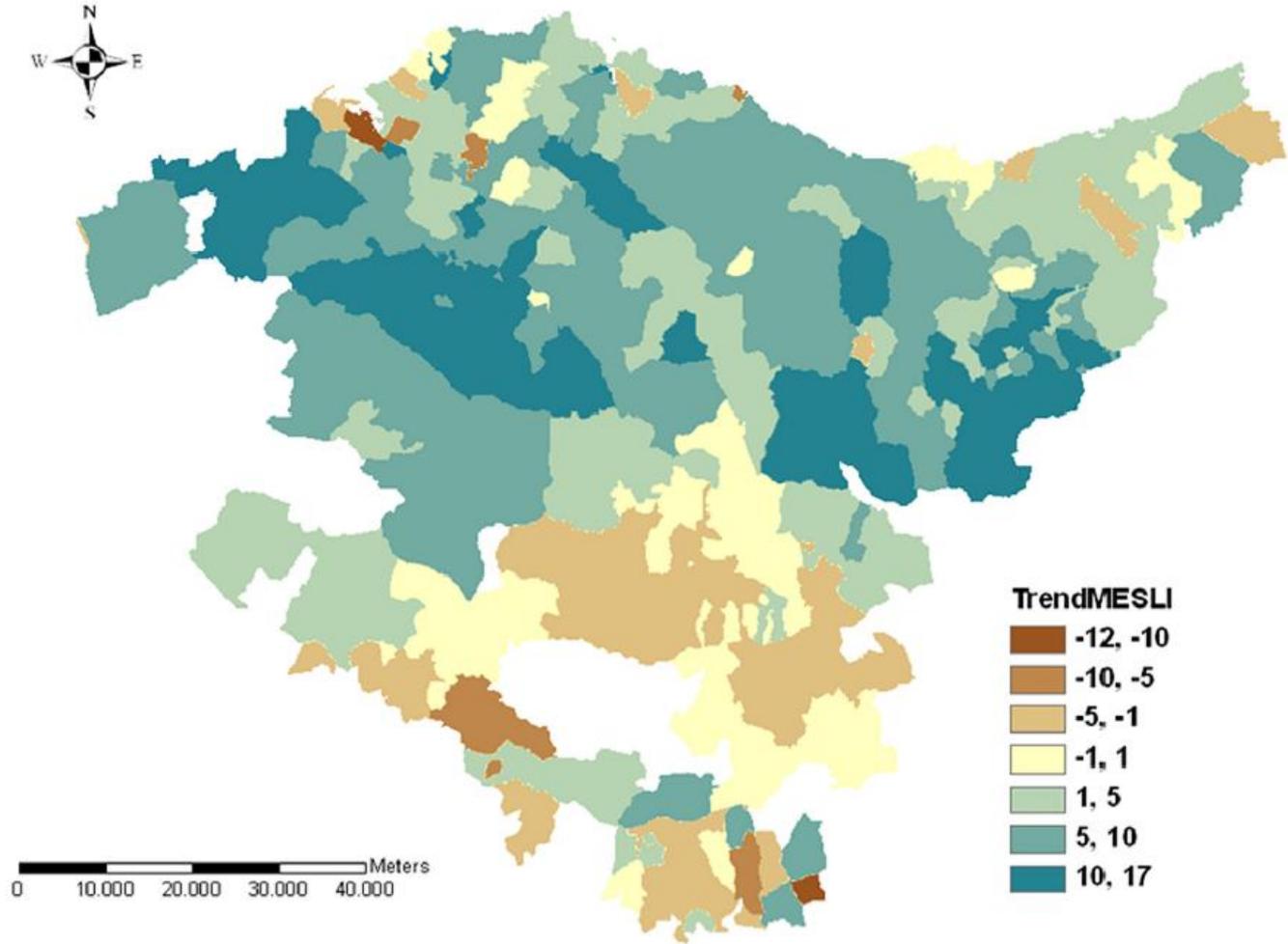


Fig. 2. Maps of the multiple ecosystem services landscape index (MESLI) (a) and TrendMESLI (b) by municipality.

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

Thank you

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