Mapping Ecosystem Services in the Urdaibai Biosphere Reserve
(Northern of the Iberian Peninsula)

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Objective:

The aim of this work is to develop a methodology for mapping ecosystem services based in biophysical conditions and to evaluate its application to the Urdaibai Biosphere Reserve.

Methods:

STUDY AREA: The Urdaibai Biosphere Reserve in located in the north of the Iberian Peninsula. It presents a diverse landscape with villages, traditional farmhouses and urban nuclei, where various natural systems of extraordinary importance are present. Outstanding areas include the estuarine or maritime system, the karstic system that supports extensive Cantabrian evergreen-oak forests (*Quercus ilex* subsp. *Ilex*), and a coastline with beaches and cliffs. In the rest of the area the potential vegetation consists of mixed-oak forests (*Quercus robur*) which, throughout the 20th century, were heavily fragmented being nowadays most of its potential area occupied by forest plantations (*Pinus radiata* and *Eucalyptus* sp.) together with grasslands and crops (Fig. 1).

METHODOLOGY: This methodology is based in the use of GIS data. For each service the different factors that affect the service were mapped and valuated in a 4 rank scale (4: very high contribution of that factor to the provision of the service; 3: high contribution; 2: medium contribution; and 1: low contribution). This valuation was based on expert knowledge and quantitative data. Once the factors were individually valuated, the map of the total value of the service was obtained by maps algebra.
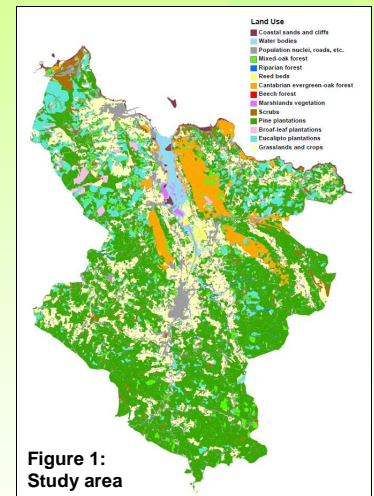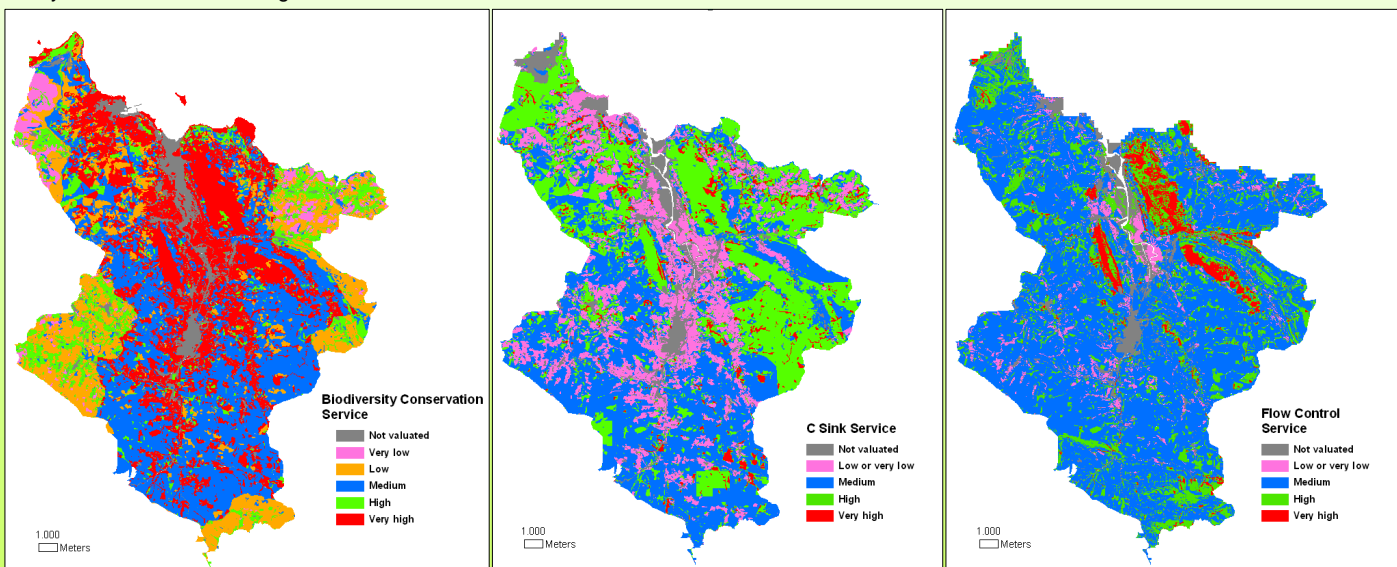

Figure 1:
Study area

Service	Biodiversity conservation	C sink	Water flow control
Valuated factor	Instead of the total richness of the ecosystems, their contribution to the conservation of important native species was considered	C content (soil + vegetation) (tC/ha)	Surface run-off control
Valuation system	Two factors were taken into account: the contribution of the different ecosystems due to their intrinsic characteristics; and, the protection status of the different areas. $$B= V+Z$$ where: **B=** Biodiversity conservation service value **V=** Value for the intrinsic characteristics of the ecosystem (based on expert knowledge). The naturalness of the different ecosystems was considered being more valuated the natural systems than the artificial ones. In the case of artificial systems the type of management was also taken into account. **Z=** Value for the protection status of the different areas. Z=1: If it had any protection status. Z=0: If it had no protection status.	The valuation was made in two steps: firstly, the content of C of the soil was valuated; and, secondly, the content of C of the vegetation. $$SC= CS+CV$$ where: **SC=** C sink service value **CS=** Value for the soil C content. The map of soil C content for the Basque Country (2004) was used. **CV=** Value for the vegetation C content. To obtain the content of C for the different forests, the data of the Forest Inventory was used. The final valuation was: 4 and 3 for the different forests; 2 for the shrub systems; and, 1 for the rest.	The evaluation was made in two steps: firstly, the contribution of the geophysic conditions (slope, soil permeability and precipitation) was valuated; and, secondly, the contribution of the biotic factor (land uses): $$F= (U+GF)/2$$ $$GF=(Sl+Pr+Pc)/3$$ where: **F=** Water flow control service value **U=** Value for the land use (based on expert knowledge) **GF=** Value for the geophysic conditions **Sl=** Value for the slope: 4: >50%; 3: 50-30%; 2: 30-15; and, 1: <10%. **Pr=** Value for the soil permeability: 4: High; 3: medium; 2: low; and, 1: very low or not permeable. **Pc=** Value for the precipitation. Max Pc 4 → Min PC 1

Results:

The maps obtained using this methodology reflect well the expected results for the area, thus, this methodology seems to be adequate to map the ecosystem services in this region.