Mapping Ecosystem Services: Current Trends

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Overview

1. Introduction:
   a) Framework & Components of an Ecosystem Service (ES)
   b) Increase in the number of publications related to ES

2. Objective
   a) Analyse the current state of the cartography of ES

3. Methods

4. Results
   a) What is being mapped? General results
   b) Location of the studies
   c) Valuation results

5. Conclusions, research needs and suggestions
Ecosystem Functions: the capacity of ecological processes and structure to provide services that satisfy human well-being (de Groot, 1992)

Ecosystem Services (ES): Benefits provided by ecosystems to humans, that contribute to making human life both possible and worth living (Díaz et al., 2006)
Introduction

Our framework...

ECOSYSTEMS

Natural Capital

Functioning → Ecological integrity → Structure

Connectivity with other ecosystems

Ecosystem functions

Ecosystem services

Genetic resources maintenance

Food
Introduction

Our framework...

ECOSYSTEMS
- Functioning
- Ecological integrity
- Structure

Connectivity with other ecosystems

Ecosystem functions

Ecosystem services

Natural Capital

Carbon sequestration

Suitable climate conditions
Introduction

Our framework...

ECOSYSTEMS

Natural Capital

Functioning → Ecological integrity ← Structure

Connectivity with other ecosystems

Ecosystem functions

Ecosystem services

Aesthetic information → Recreation: Nature tourism

SOCIAL-ECOLOGICAL SYSTEMS

LABORATORY
Introduction

Components of an ES...

SUPPLY

INSTITUTIONS

USE
Introduction

Mismatching scales...

SUPPLY
USE

SUPPLY
USE

Climate regulation
Hypothesis

- These tendency is the same in ES mapmaking
- Are we mapping all the components of the ES?
Objectives

Main objective:

• Analyse the Cartography of ES in the light of our framework

Specific objectives:

• Find out the gaps concerning cartography of ES

• Analyse the main variables of the cartography of ES

• Make some suggestions to improve the cartography of ES
Methods

**REVIEW**

Identified most commonly used words for Ecosystem Services and Cartography

**ANALYSIS**

- Number of publications
- What’s being mapped
- ES variables
- Map limits
- Location variables
- Monetary variables
- Management variables
- Gaps of information

**ISI Web of Knowledge**

More than 400 publications

All including a map of *Ecosystem Services* (39)
Results

**Nr. of Publications...**

**Total number of publications**

- 12
- (November)

**Year**
- 1997
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008

**Number of publications per year**
- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
Results

What is being mapped?

- Changes in ESV: 3%
- % ESV: 10%
- Other: 38%

Ecosystem Service Value (ESV)
- 50%

- Benefit functions
- Potential Impact for ES
- Other
- Flow of ES
- Area being serviced
- ESV + Biodiversity
- ESD

- ESV-ESD
- ESV + Economic Parameters
- Vulnerability of ES
- Nr. of ES
- ES provision, use & disturbance Coupling
- Economic benefit > opportunity costs
Results

What is being mapped?

Supply and use of the ES were measured for only 11% of ES

Distribution of beneficiaries mapped 6%

Distribution of beneficiaries not mapped 94%

Values the use of the ES
1: Yes
0: No

p-value < 0.0001
90% of the publications are written by a multidisciplinary team
Results

Number of ES mapped per publication

Is it enough to map just one ES?

Due to benefit transfer from Costanza 1997
Results

Types of ES mapped

- Provisoning: 58% (27%)
- Regulating: 33% (15% Cultural, 17%)

- Biodiversity conservation: 3%
- Biological control: 3%
- Carbon Storage: 3%
- Climate regulation: 3%
- Disturbance regulation: 3%
- Nutrient cycling: 2%
- Pollination: 1%
- Sediment regulation: 1%
- Seed dispersal: 1%
- Soil conservation and formation: 3%
- Soil fertility: 3%
- Waste assimilation: 4%
- Water regulation: 3%
Results

Types of ES mapped

- Regulating: 58%
- Provisioning: 26%
- Cultural: 15%

- Bioproducting: 1%
- Food: 10%
- Forest products: 2%
- Oxygen supply: 3%
- Raw materials: 5%
- Water supply: 6%
Results

Types of ES mapped

- Regulating: 58%
- Provisioning: 27%
- Cultural: 15%

- Aesthetic: 11%
- Non-use value: 2%
- Recreation: 2%
Results

Internal limits like states or countries might transmit the wrong idea of homogeneity in ES values in the territory.

Konarska et al., 2002
Results: Location

Distribution of publications

- Provisioning: 55 publications
- Regulating: 117 publications
- Cultural: 29 publications

- Europe: 14 publications
- USA: 11 publications
- Asia: 4 publications
- Africa: 3 publications
- South America: 1 publication

p-value: 0.054
Results: Location

Nr. ES mapped per publication

<table>
<thead>
<tr>
<th>Location</th>
<th>GROUP A</th>
<th>GROUP B</th>
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<tbody>
<tr>
<td>WORLD</td>
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<td>AFRICA</td>
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</tbody>
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p-value: 0.005
Results: Location

Type of ES mapped & habitat

p-value 0.047
Results:
Valuation

Estimated $ values...

ln Value $/Ha

Global studies
Mountain
Inland water
Temperate Forest
Tropical forest
Cultivated

p-value < 0.0001
Results: valuation

ES valuation for mapping

Is not easy to map many services in biophysic terms

Is benefit transfer the solution for ES mapping?
Results: Management

Also forgetting... different management regimes

Scientific & Methodologic Purpose: 20%
Scientific, Methodologic & Management Purpose: 80%

Analysis of different management regimes:
- Yes: 39%
- No: 61%

Map of different management regimes:
- Yes: 17%
- No: 83%

Vulnerability of ES has only been cited in 9% of the publications.
INSTITUTIONS RESPONSIBLE OF ES ARE CITED ONLY IN 15% OF PUBLICATIONS AND THEY HAVEN´T BEEN MAPPED YET
Results

Lack of Information & Future research

Complain about the lack of info to map ES

- Yes: 83%
- No: 17%

Remark the need of further research in the field of ES cartography

- Yes: 62%
- No: 38%
Conclusions

1. Most of the publications are not mapping all components of an ES (origin, beneficiaries & institutions).

2. Differences between ES and EF should be better understood to improve ES mapmaking.

3. Such improvements might permit the use of cartography of ES in management practices.

4. Connections between ES and management practices, vulnerability and scenarios should be a main research objective.

5. One of the main difficulties of ES mapmaking is the lack of suitable info regarding ES for mapping. Benefit transfer has been used as a solution but it must be used with enough care.
THANKS FOR YOUR ATTENTION

ANY QUESTIONS?
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1. Photos from EF & ES: Berta Martín-López
2. Conserved ecosystem: Marc André Giasson
3. Deteriorated ecosystem: Greenrightnow.com
4. Central Park: visitingDC.com
5. Man in the forest: ehsank.spaces.live.com
6. Earth: Freeweb.com