UNIVERSITY OF TWENTE.

USE AND USER REQUIREMENTS OF ECOSYSTEM SERVICE MAPS

ANALYZING DECISION MAKERS' NEEDS WITHIN THE CONTEXT OF TARGET 2 (ACTION 5) OF THE EU BIODIVERSITY STRATEGY FOR 2020 ON EU, NATIONAL AND SUB-NATIONAL LEVEL

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OVERVIEW

1) **Introduction and scientific background**

2) **Methodology**

3) **Research results**

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1) INTRODUCTION AND SCIENTIFIC BACKGROUND

RESEARCH CONTEXT

Action 5
Biodiversity Strategy 2020

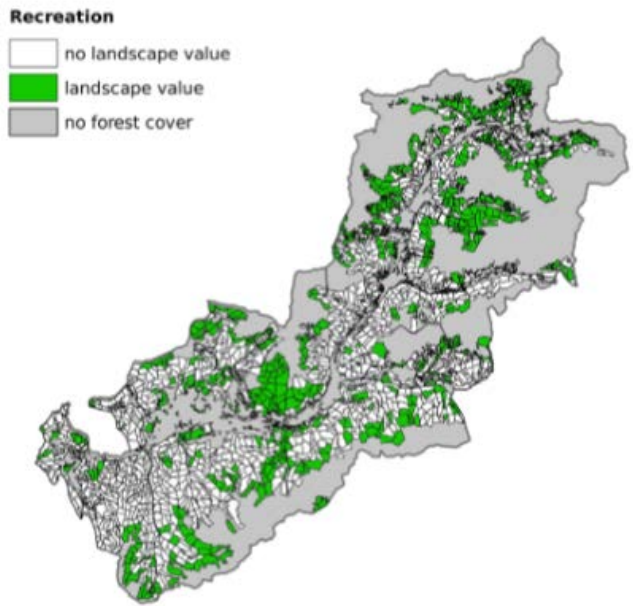
- **Ecosystem services (ES)**
  - *"the nature's contributions to people" [1]*
  - *Food provision | climate regulation | recreation potential*
  - *ES supply | flow | demand*
- **Ecosystem service maps (ESM)**
  - *Static | interactive*

ECOSYSTEM SERVICE MAPS

Recreation landscape value [2]

Supply

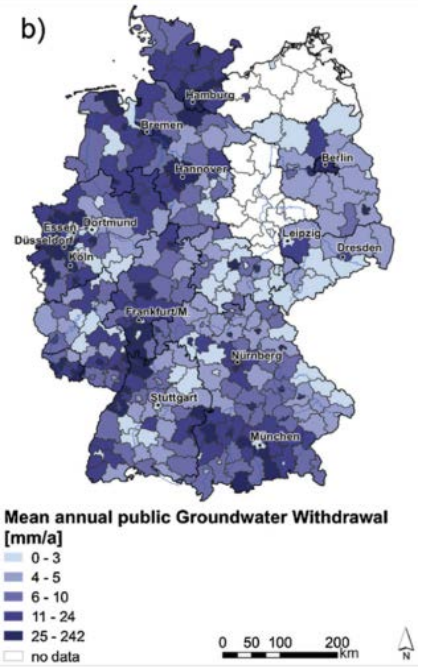
Dasymetric map



Groundwater withdrawal [3]

Demand

Choropleth map

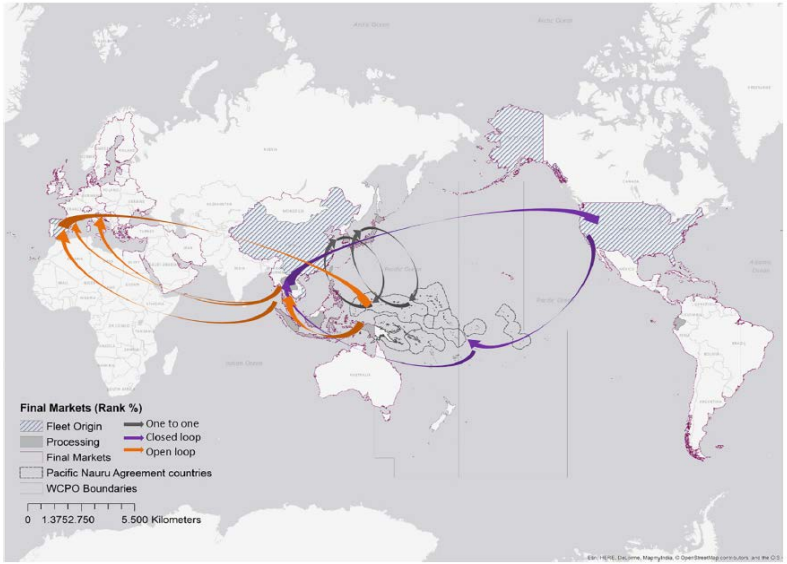


ECOSYSTEM SERVICE MAPS

Costs and benefits of tuna fishery [4]

Flow

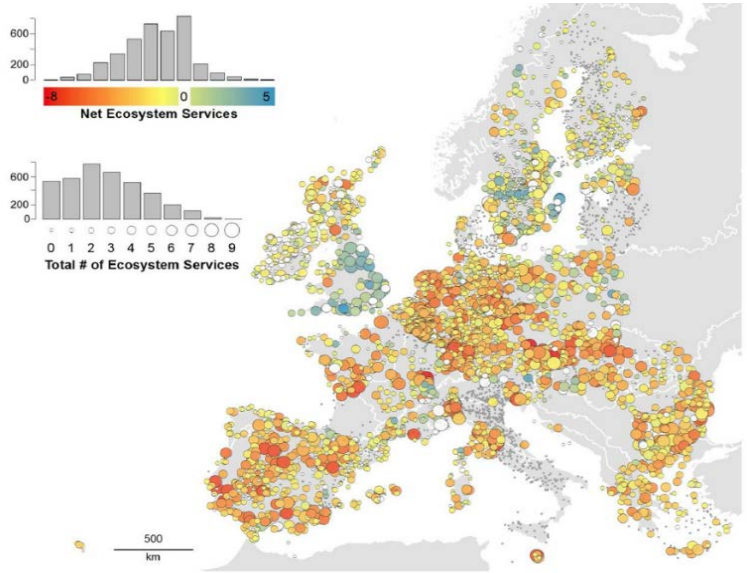
Flowline map



Supply by protected areas [5]

Supply

Proportional symbol map



RESEARCH CONTEXT

Action 5
Biodiversity Strategy 2020

- **Ecosystem services (ES)**
  - *"the nature's contributions to people"* [1]
  - *Food provision* | *climate regulation* | *recreation potential*
  - *ES supply* | *flow* | *demand*
- **Ecosystem service maps (ESM)**
  - *Static* | *interactive*

Aim: Informing decisions

Problem: Currently not used in decision-making processes

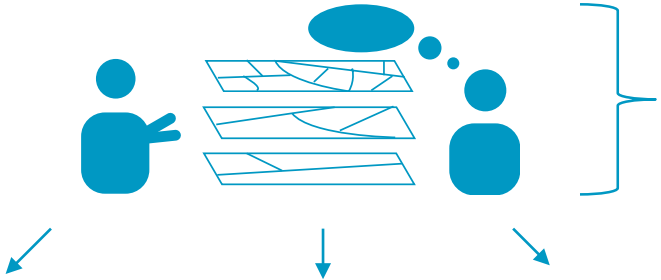
→ **Challenge: Lacking user requirement assessment**

RESEARCH CONTEXT

Hypothesis: Issue in cartographic communication process

Goal: Provide a detailed **description** of and **recommendations** for the **use and user requirements** of ESM

Novelty: Cartographic perspective + User-centred design + ES



EU-, national and sub-national level

Map makers‘ perspective → Existing maps → Users‘ perspective

RESEARCH OBJECTIVES

1. Create a profile of the decision makers who use ESM at EU, national and sub-national level.
2. Identify the intended map use purposes of the map maker at EU, national and sub-national level.
3. Identify usability issues with current ESM at EU, national and sub-national level.
4. Derive recommendations for future ESM design at EU, national and sub-national level.

2) METHODOLOGY

RESEARCH METHODOLOGY & ANALYSIS

Users‘ perspective (RQ1)	Map-makers‘ perspective (RQ2)	Usability evaluation of existing maps (RQ3)
Semi-structured interview	Semi-structured interview	Task execution exercise (think-aloud and observation)
Transcribed	Transcribed	Transcribed Coding scheme Efficiency + effectiveness

Recommendations (RQ4)

User profile and use case

CONDUCT OF RESEARCH AND ANALYSIS

- **23 Participants**

	Map-maker	User
EU	2	3
National (Greece)	5	3
Sub-national (Greece)	5	5 (+1 TAL)

- **Conduct**

Remotely	In person
Video observation via skype if possible	Video observation with camera
21 participants	2 participants

3) RESEARCH RESULTS

RESULTS – USERS‘ PERSPECTIVE

Category	EU	National	Sub-national
Profession	European Commission	Ministry	National park
ES concept experience	Very	A bit	Mixed
ESM use experience	Very	Mixed	Not used yet
Map medium	Static, paper, (rarely) dynamic	Static, paper	Not used yet

„*It can be a concrete argument for everybody*“ (TP4)

“*It would be definitely important to […] be trained on how this information can contribute to your more efficient work*” (TP18)

RESULTS – USERS' PERSPECTIVE

Category	EU	National	Sub-national
Use purposes	Policy Communication and raising awareness	Policy Management decisions Risk assessment Information	(Policy) Management decisions Monitoring purposes Public communication and raising awareness Educational purposes
Decision influence	No	No	Not used yet
Decision-making process	During, with other types of evidence		

"*Only data for example that can contribute to designated better policy is important*" (TP18)

"*I sometimes say to myself, ok, people made this map, what the hell is it going to be used for... in practise*" (TP3)

RESULTS – MAP-MAKERS‘ PERSPECTIVE

- **Use purposes** do not strongly differ
- **Tools**: Data processing and modelling
  - “*The representation of that it has not been kind of the focus […] we [are] using the simplest that we can to actually show spatially the results*” (TP22)
- **User involvement** only once, no feedback from final product
  - “*they help us make our job better*” (TP2)
- **Science-policy gap**
  - *“What is expected from the policy maker is not answered by the maps we produce”* (TP22)

USERS‘ AND MAP-MAKERS‘ PERSPECTIVE

- **Business context**
  - Users mostly willing to use ESM
  - Willingness to produce for user
    - EU: Maps explained to user
    - National & sub-national: Not clear how maps are brought to user
- **Use purpose**
  - Not strongly different
  - Vague

USABILITY ISSUES

- Colour scheme
- Title
- Description

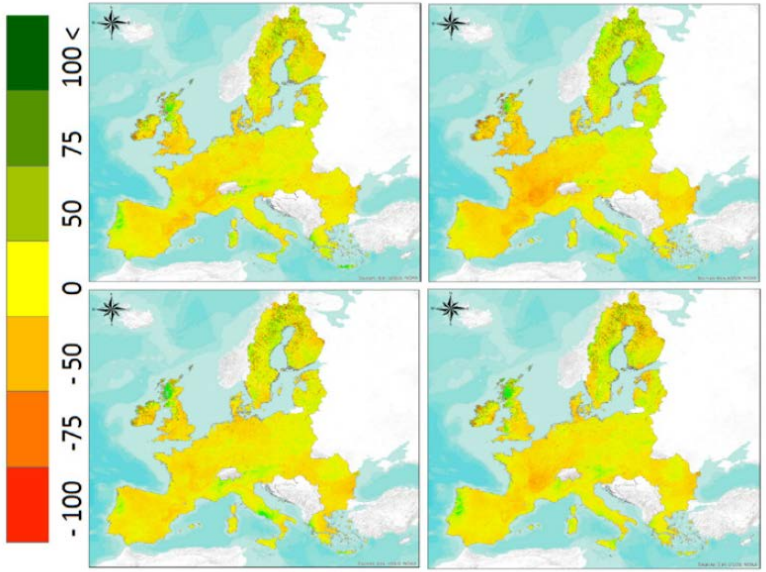
  "First row is MRI bla bla and I do not know what that really stands for" (TP3)

- Image resolution
- Spatial/Thematic resolution

  "It is not easy, it is far to small to recognize" (TP5)

- Legend

  "From -100 to +100. I don´t know what is the units there" (TP23)

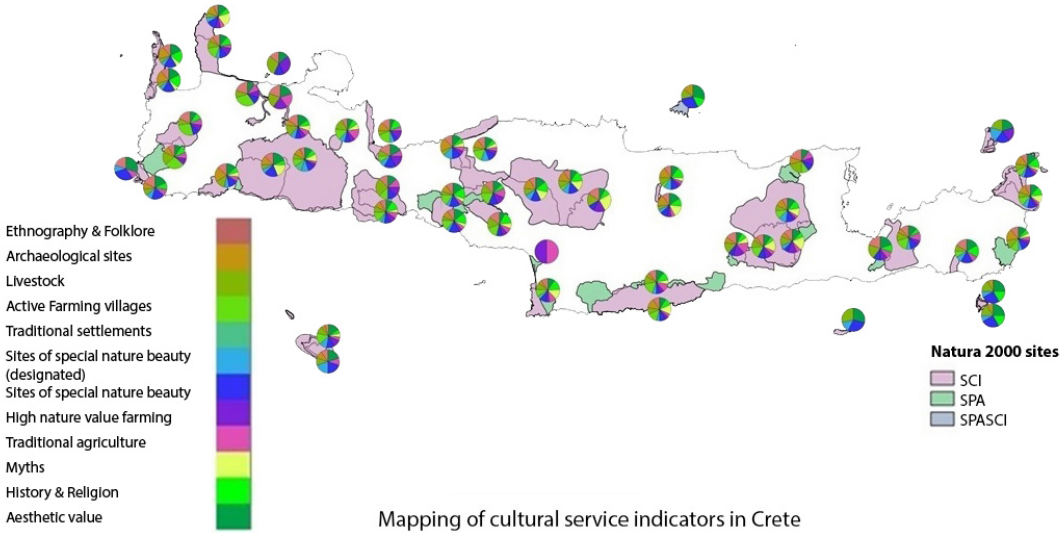


Changes in soil organic carbon stocks by 2050 by Climate Scenarios and Representative Concentration Pathways (RCPs). 1st row: MRI-CGCM3 (RCP 2.6, 4.5). 2nd row: MRI-CGCM3 (RCP 6.0 and 8.5). Red areas represent decrease and green areas represent increase in SOC stocks (tonnes·ha−1) compared to present conditions (background map: ESRI, USGS, NOAA)

Changes in soil organic carbon stocks by 2050 [7]

USABILITY ISSUES

- Colour scheme
- Thematic resolution
- Element size *„the pies are a bit small"* (TP16)
- Legend



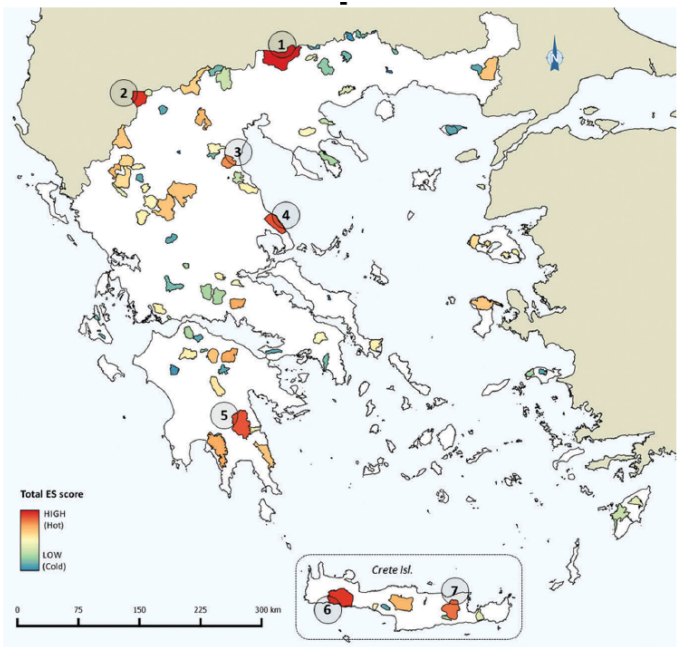
Cultural ecosystem services in Crete [8]

USABILITY ISSUES

- Map content
- Personal knowledge

  "*It is very high. Of course if is very high it got a mountain*" (TP8)

  "*I would answer low, because there is desertification in that area, that I know*" (TP12)



Total scoring of the provided ecosystem services & hot spots at 91 mountainous Natura 2000 sites (SACs) in Greece. The island of Crete (box at the bottom of the map) is identified as an ES hot spot area. Numbers 1 to 7 indicate the sites with top total ES scores (1: Mt Belles & Lake Kerkini, 2: Prespes lakes area, 3: Mt Olympos, 4: Mt Pilio, 5: Mt Parnon, 6: Mt Lefka Ori, 7: Mt Dikti).

Total ES Score in Natura 2000 sites in Greece [9]

RECOMMENDATIONS: 1) CARTOGRAPHIC MAP DESIGN

Issue	Solution
Colour scheme	Colours for visually impaired people e.g. red & blue instead of red & green [10]
Title	Add title to map and place carefully [11]
Legend	Add units to legend
	Explain abbreviations
Description and map content	Add explanatory description explaining the map content
	Adjust to the background knowledge of user [10, 12]
Image resolution	High enough to allow zooming in
Spatial/Thematic resolution	Ensure the spatial resolution matches the map scale (aggregate & generalize) [10]

RECOMMENDATIONS: 2) USER PROFILE AND USE CASE

Sub-national user profile	
Age group	31 - 60 years
Ethnicity	Greek
Highest education	Bachelor's degree or higher
Education	Ecology, biology
Profession	Employee of management authority of national park
Map use experience	Very experienced
Knowledge on ESM	< 1 year, did not use such maps yet
Sample use case	Conduction of environmental impact assessment by comparing the impacts of alternative future management actions. Sample geographic questions: ▪ What important patterns are there? ▪ Will the spatial patterns change over time?

RECOMMENDATIONS: 3) GENERAL

- **Training** on cartographic map design principles
- **Application of User-centred design** and **inclusion of the users** in the mapping by actively consulting them e.g. by asking about specific geographic questions they need to answer [13] or participatory approaches [14]
- **Iterative, repeated communication** between the **map-maker and user** throughout all stages of the map creation [15,16]
- **Training on map use** and development of **guidelines** for ESM and the ES concept for prospective users
- **Capacity building** between researchers and stakeholders

LIMITATIONS AND FURTHER OPTIONS

Limitation	Future research option
Sample size and selection	Quantitative approach
Static maps	Interactive maps
Focus on choropleth or dasymetric maps	Exploration of other thematic mapping techniques to avoid shortcommings of choropleth mapping
Generic user requirement analysis	One case study with more in depth analysis e.g. geographic questions Apply other stages of User-centred design
Chosen research methods	Application of other research methods (e.g. focus goup, eye tracking)

OUTLOOK

Presentation of thesis research findings at Ecosystem Service Partnership (ESP) conference 2018

Session: Less is more or the more the better. Dealing with simplification and uncertainties in ES mapping

See you in San Sebastián

Thank you for your attention!

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