



UNIVERSITY OF
HOHENHEIM

200
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YEARS

Public Participation GIS for Ecosystem Services

Payment schemes for ecosystem services

Assessment of ecosystem services

PPGIS: Introduction

Recap: Where were we?



- Ecosystems are linked to human well-being in manifold ways, which is captured in the ecosystem services concept.
- ES are a vibrant field of research, have found their way into public debates and receive high policy interest – they are most central in current policy and management strategies.
- However, ES are only one of several approaches to conceptualizing human-nature-relationships and come with potentials and challenges.

??? QUESTIONS ???



Overview of today's session

- Ecosystem services in current land management: Payment schemes
- Assessment of ecosystem services: Requirements, challenges, ways forward
- (Overview of ecosystem services assessment tools)
- Introduction to Public Participation GIS



■ Payments for ecosystem services (PES)

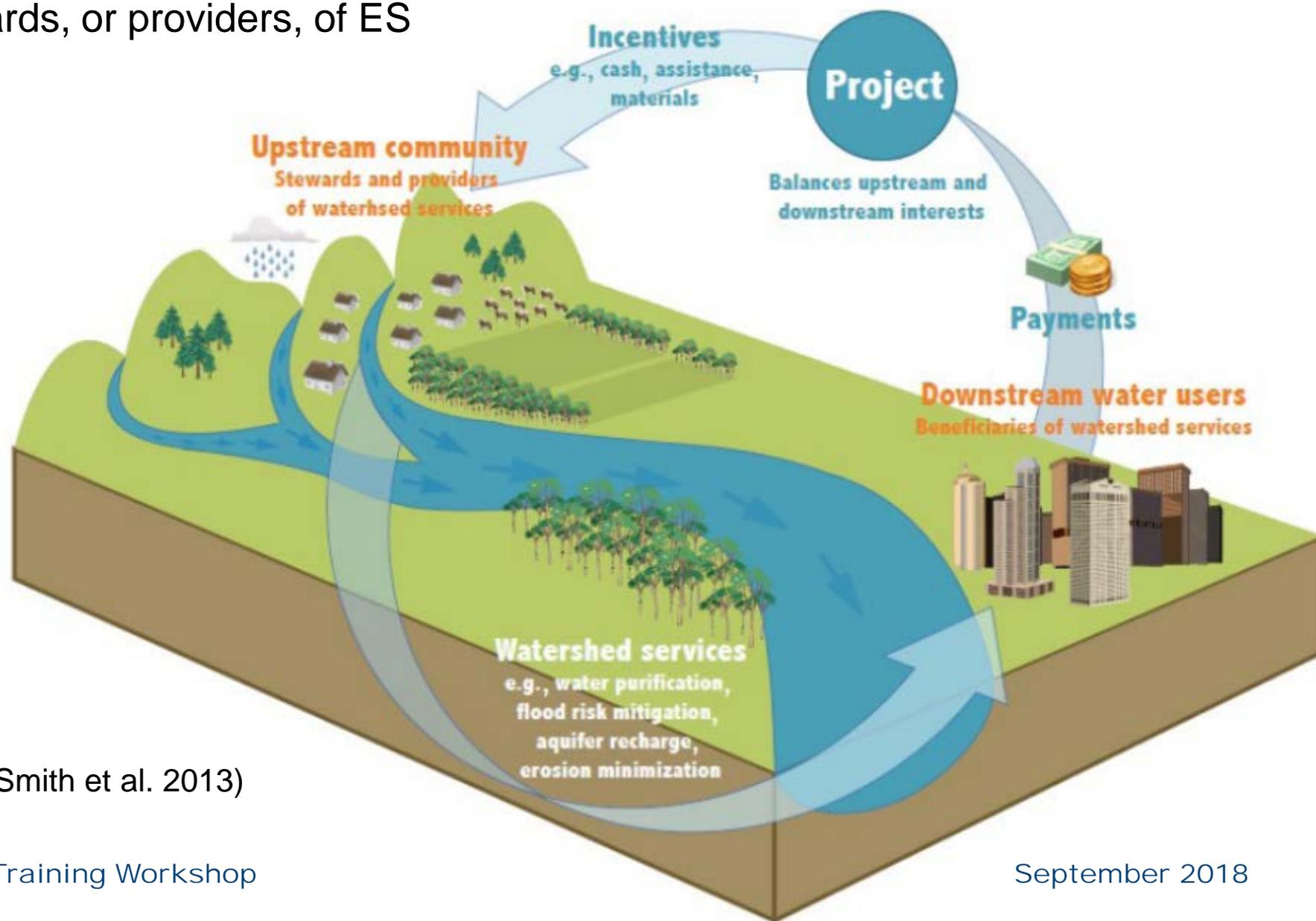
“Voluntary, conditional agreement between at least one ‘seller’ and one ‘buyer’ over a well defined environmental service – or a land use presumed to produce that service”

(Wunder 2007)



Payments for ES: The idea

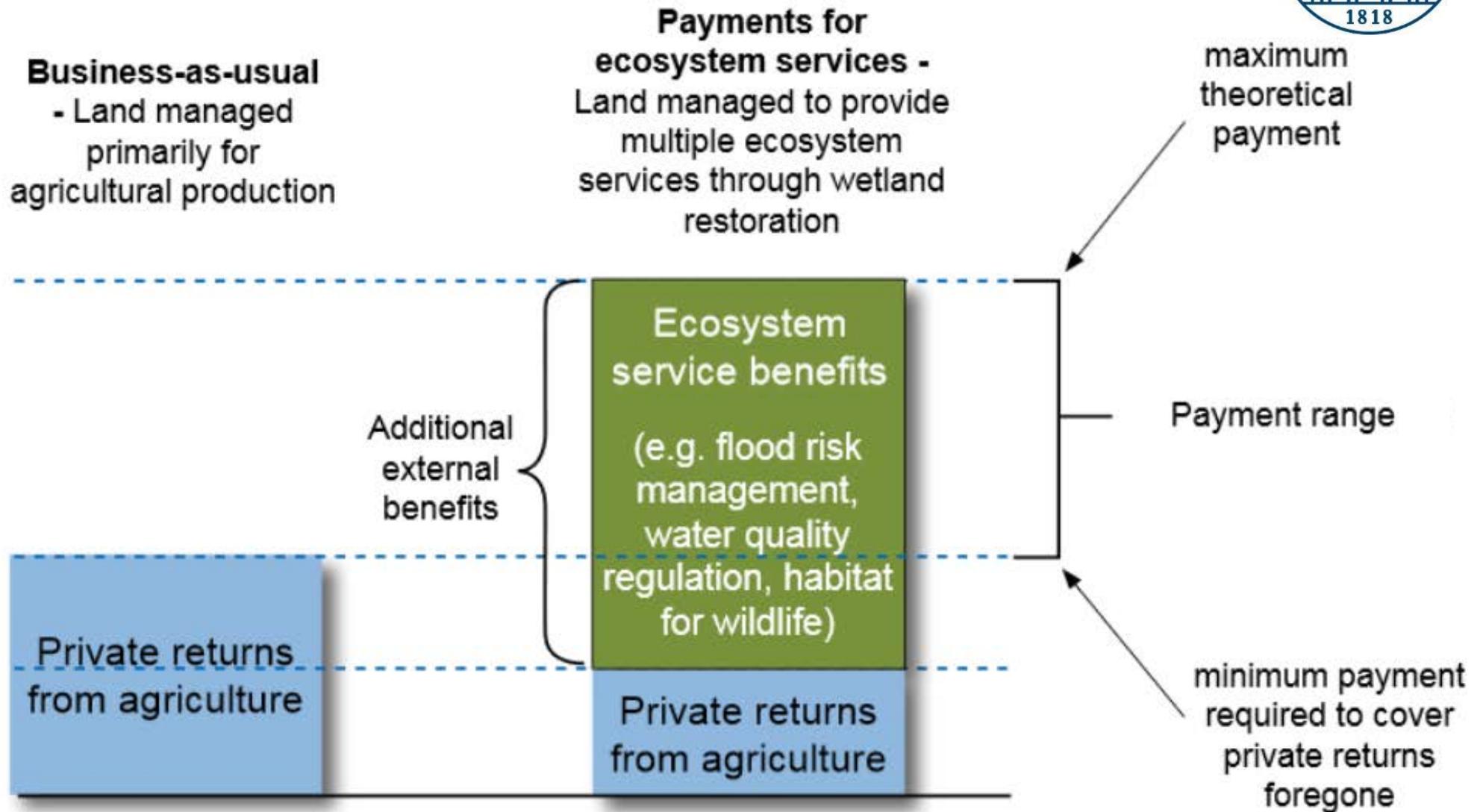
beneficiaries, or users, of ES provide payment to the stewards, or providers, of ES



(Smith et al. 2013)



Payments for ES: Principle



(Smith et al. 2013)



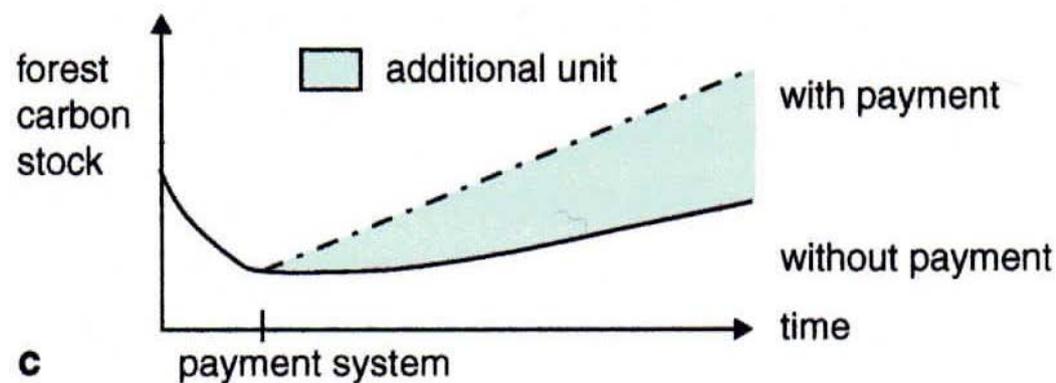
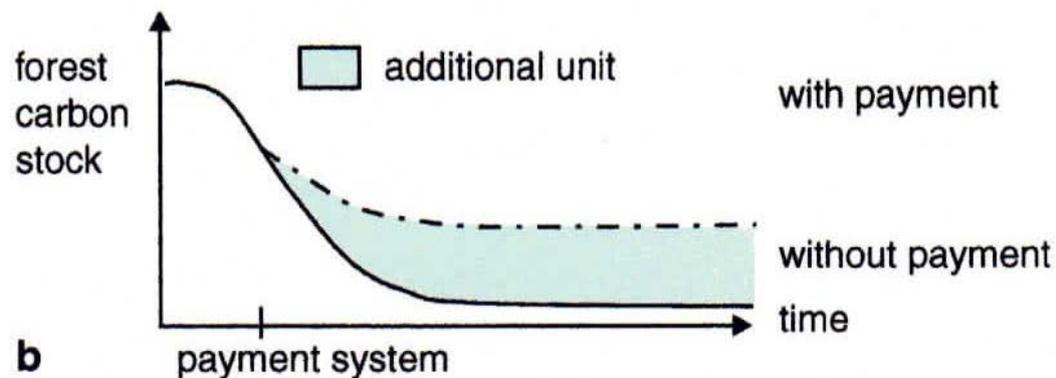
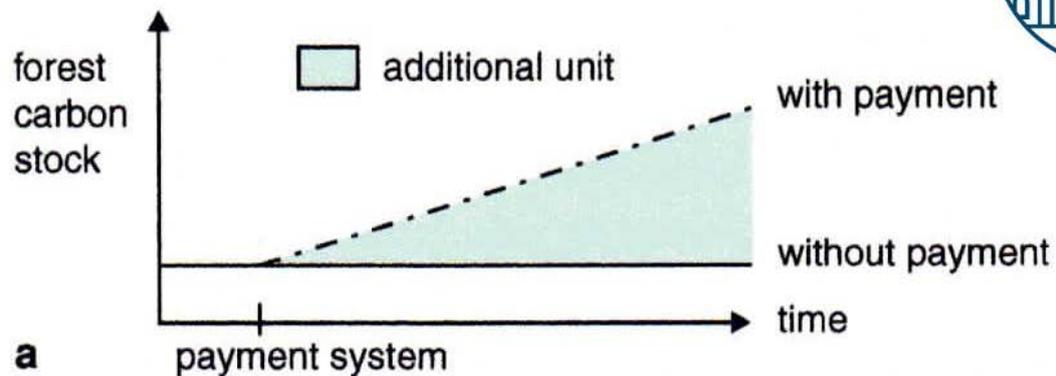
Payments for ES: Different scenarios

Ecosystem services
delivery baseline

a) static

b) deteriorating

c) improving



(Ring & Mewes 2015)



Payments for ES: Two classical examples

Vittel (bottled water company), France

Aim: reduction in groundwater pollution

ES: water purification

Vittel pays above-market prices to purchase land around its water springs and signs contracts with farmers to use more sustainable dairy farming techniques and to improve farm facilities.

Pico Bonito Forests, Honduras

Aim: plantation of native trees to capture carbon

ES: climate regulation

Mission-driven, for profit joint venture between investors and local communities. Carbon credits are sold through the World Bank's BioCarbon Fund to countries aiming to meet their carbon emissions reduction targets.





Payments for ES: Example from Romania

Danube PES project (lead by WWF) (2010-2014): Demonstration and promotion of PES and other sustainable financing schemes in the Lower Danube river basin (Romania, Bulgaria)

E.g. **Maramures project**

(Romania): Problem of unregulated tourism and lack of funding for protected areas

- Aim to support biodiversity conservation and cultural values of protected areas
- Key ES: landscape beauty / traditional land use
- Establishment of a fund (managed by local association) for allocating financial resources in equal proportion to nature conservation and to development needs associated with ecotourism



WWF / Pop Emil

■ Payments for ES: Examples



Smith, S., Rowcroft, P., Everard, M., Couldrick, L., Reed, M., Rogers, H., Quick, T., Eves, C. & White, C. (2013):

Payments for Ecosystem Services: A Best Practice Guide.

Defra, London. Available online at

<https://www.cbd.int/financial/pes/unitedkingdom-bestpractice.pdf>

Do you know any examples for payment schemes for ES in Armenia or the larger region (Caucasus...)?

Establishing payment schemes for ES: Questions which need to be clarified

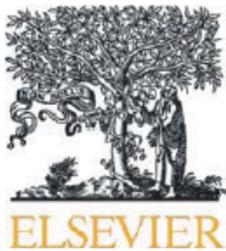


Necessary steps for establishing a payment scheme for ES:

- Defining, measuring and determining marketable value of the ES in a particular area (e.g. Boundaries? Possibilities for monetarization?)
 - Identifying prospective sellers and buyers (e.g. Demand? Willingness and capacity to sell?)
 - Assessing legal, policy, and land ownership context (e.g. Clear property rights? Administrational capacity)?
- Designing payment types and management and business plans
- Implementation
- Monitoring and evaluation



Ecological Economics 69 (2010) 1228–1236



Contents lists available at [ScienceDirect](#)

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon



Payments for ecosystem services as commodity fetishism[☆]

Nicolás Kosoy^{a,*}, Esteve Corbera^{b,c}

^a Ecosystem Service Economics Unit, Division of Environmental Policy Implementation, United Nations Environment Programme, 00100 Nairobi, Kenya

^b School of International Development, University of East Anglia, Norwich NR4 7TJ, United Kingdom

^c Tyndall Centre for Climate Change Research, Zuckerman Institute for Environmental Connective Research, University of East Anglia, Norwich NR4 7TJ, United Kingdom



Critique on payments for ecosystem services

N. Kosoy & E. Corbera (2010):

Payments for ecosystem services as commodity fetishism

Ecological Economics 69: 1228-1236

- Perspective from political economy, ecological economics
- Commodity fetishism: „masking the social relationships underlying the processes of production“ (going back to Karl Marx)
- Key characteristics of payment schemes for ecosystem services:
 - ecological function subject to trade
 - establishment of a standard unit of exchange
 - supply, demand and intermediation flows between sellers and buyers
- Generates three problems:



Critique on payments for ecosystem services

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Ecological Economics 69: 1228-1236

1. Invisible complexity

„itemisation of ES for the purpose of monetary valuation is obscuring ecosystems‘ complexity“ (establishment of boundaries to form discrete units of trade vs. interconnectedness and complexity in ecosystems)

2. Invisible values

„imposing a single unit of valuation makes human-nature-relationships invisible“ (ES are valued differently by multiple stakeholders, in different geographies, at different spatial scales; false feeling of control; neglect of other values)

3. Invisible institutional asymmetries

„masks the way in which prices for ES are established and the inequalities underlying the access to these services“ („the poor sell cheap“; property rights)



Critique on payments for ecosystem services

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Ecological Economics 69: 1228-1236

Two possible conclusions:

1. Radical approach:

concentrating on environmental ethics, re-claiming the public good character of ES, discarding any attempt to price and market them as a way to foster conservation

2. Constructive, reformist approach:

bundling ES, acknowledging plural values, addressing inequities in access to ES and market exchange



Group exercise / discussion

- Pick a concrete case where an ES is in decline/endangered.
 - Discuss what a radical and what a reformist approach would mean for your case:
 1. How could the two approaches be implemented, in concrete terms (up to three central measures each)?
 2. What are their potentials and challenges (up to three important ones each)?
 3. For what approach (radical vs. reformist) would you decide?
- Sum up on flipchart and present to your coursemates!



Payments for ES: Potential and challenges

Great promise for fostering conservation of ecosystem services:

„I see a future where credits for clean water, greenhouse gases, or wetlands can be traded as easily as corn or soybeans“

(Mike Johanns 2005, Secretary U.S. Department of Agriculture)

... and great challenges:

- Putting a price on nature creates **exchangeable commodities** and puts conservation policies at the core of neoliberal economic thinking
- **Many ES can't be assessed in economic terms**, especially cultural ES
- Payment schemes **drive attention to a single service and may blind out other services and trade-offs**
- Difficulty of a **just acknowledgement of different stakeholder perspectives**, particularly regarding contested values and property rights (e.g. land owners as ES 'providers' – owner of rain, water flows, beautiful landscapes, species?)





■ Ways forward? An agenda for ES assessments

- Power-sensitive approach e.g. regarding access and control over ES
 - Acknowledging the role of labor in ES co-production (Who contributes to ES delivery?)
 - Acknowledging the varying relevance of ES for different user groups
 - Minding the socio-cultural, historical and geographical context of ES
 - Taking into account a diversity of services instead of focusing on a single one (synergies, trade-offs)
 - Acknowledging the more hidden and less tangible services, most notably cultural ecosystem services
- Complementing biophysical and market-based valuation of ecosystem services with context-specific socio-cultural valuation techniques

(see Bérbes-Blázquez et al. 2016, Daniel et al. 2012, Martín-López et al. 2012)

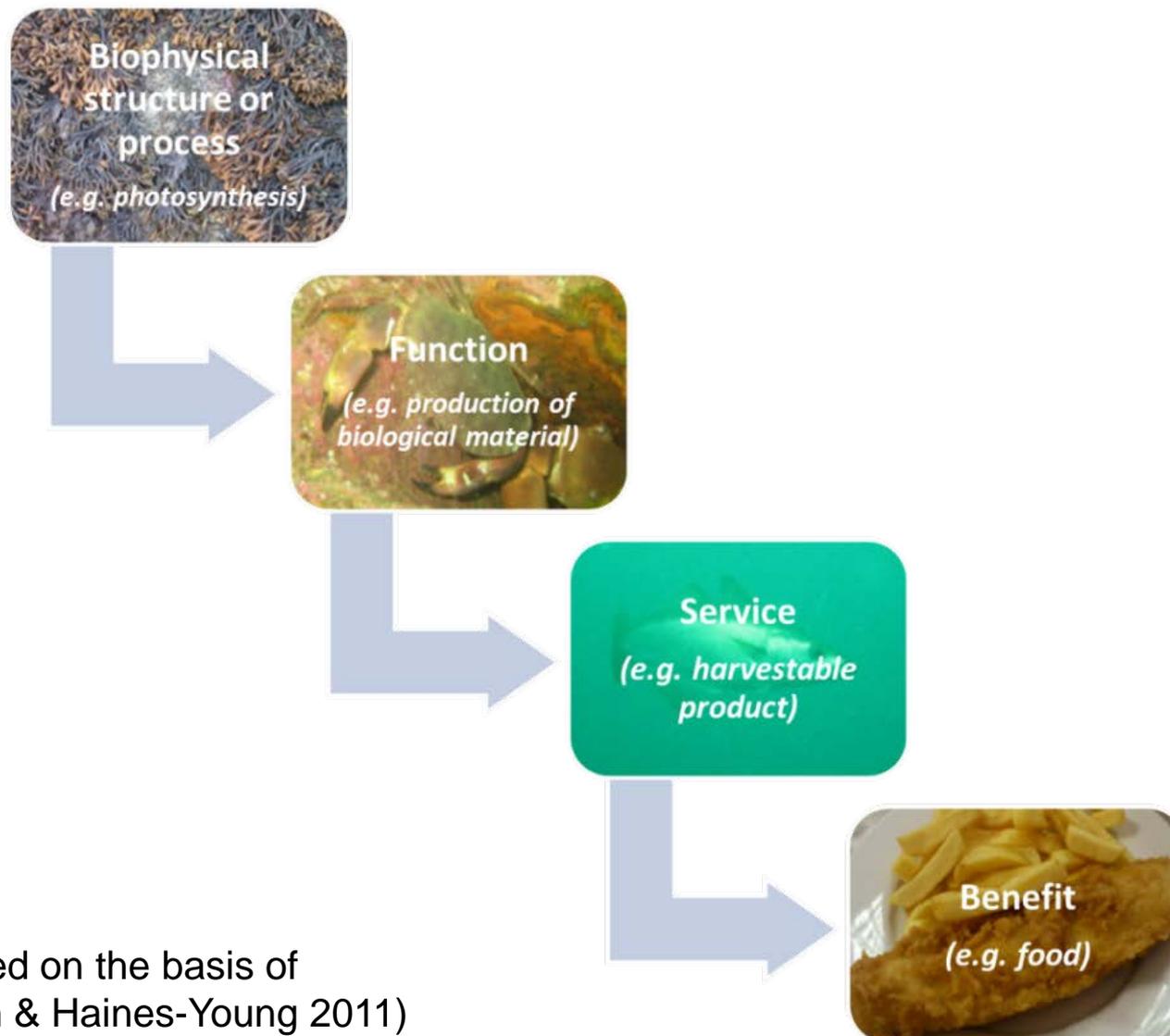


■ Assessment and valuation of ecosystem services

Key question:

How to describe, locate and define the value of ecosystem services?

What exactly are ecosystem services? Advancement of the concept used in the Millennium Assessment



(simplified on the basis of
Potschin & Haines-Young 2011)

Advancement of the ES concept: Common International Classification of Ecosystem Services (CICES)



Aim: Integration with statistical accounting, modelling etc.

five-level hierarchical structure:

- Section (e.g. provisioning)
- Division (e.g. nutrition)
- Group (e.g. terrestrial plants and animals for food)
- Class (e.g. crops)
- Type (e.g. wheat)

(see <http://cices.eu/>)



Challenges/requirements: Assessing trade-offs

Trade-offs between ES need to be considered:

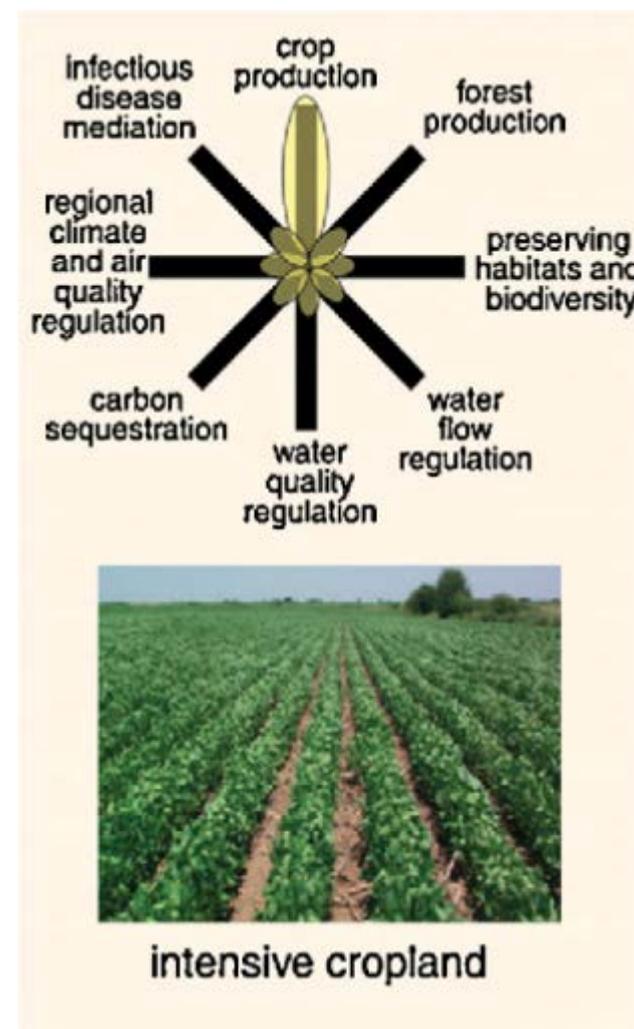
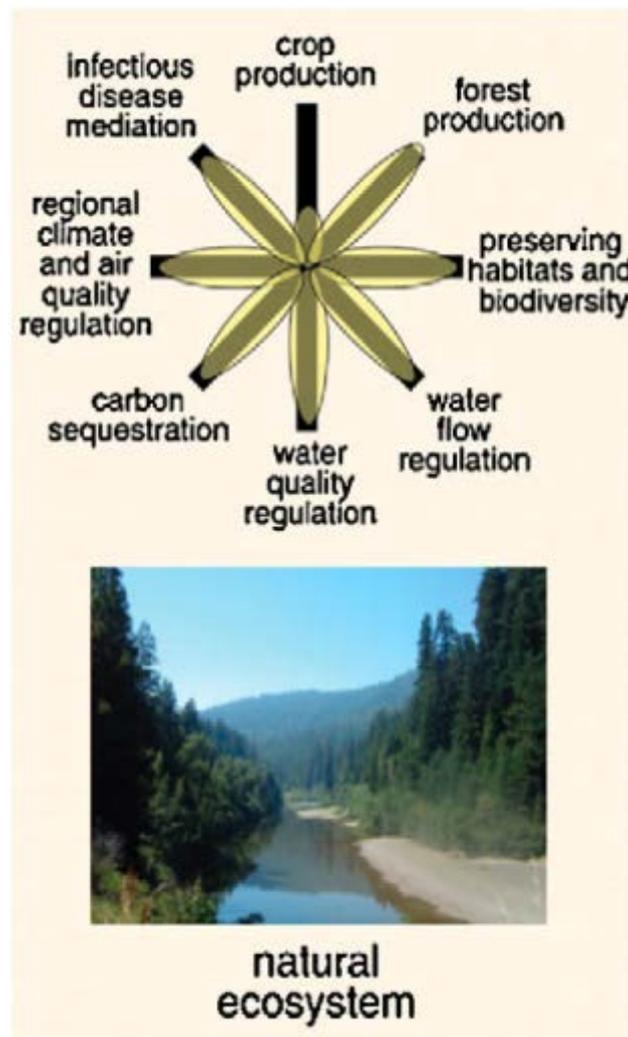
...challenge of measuring the whole bundle

...and at different scales!

...and for different stakeholders!

→ Integrated assessment of ES

→ Consideration of interconnections between ES



Foley et al. (2005)

Challenges/requirements: Assessing cultural ES

Example Millennium Ecosystem Assessment



Service	Human Use	Enhanced or Degraded
Cultural diversity	NA	NA
Spiritual and religious values	▲	▼
Knowledge systems	NA	NA
Educational values	NA	NA
Inspiration	NA	NA
Aesthetic values	▲	▼
Social relations	NA	NA
Sense of place	NA	NA
Cultural heritage values	NA	NA
Recreation and ecotourism	▲	+/-

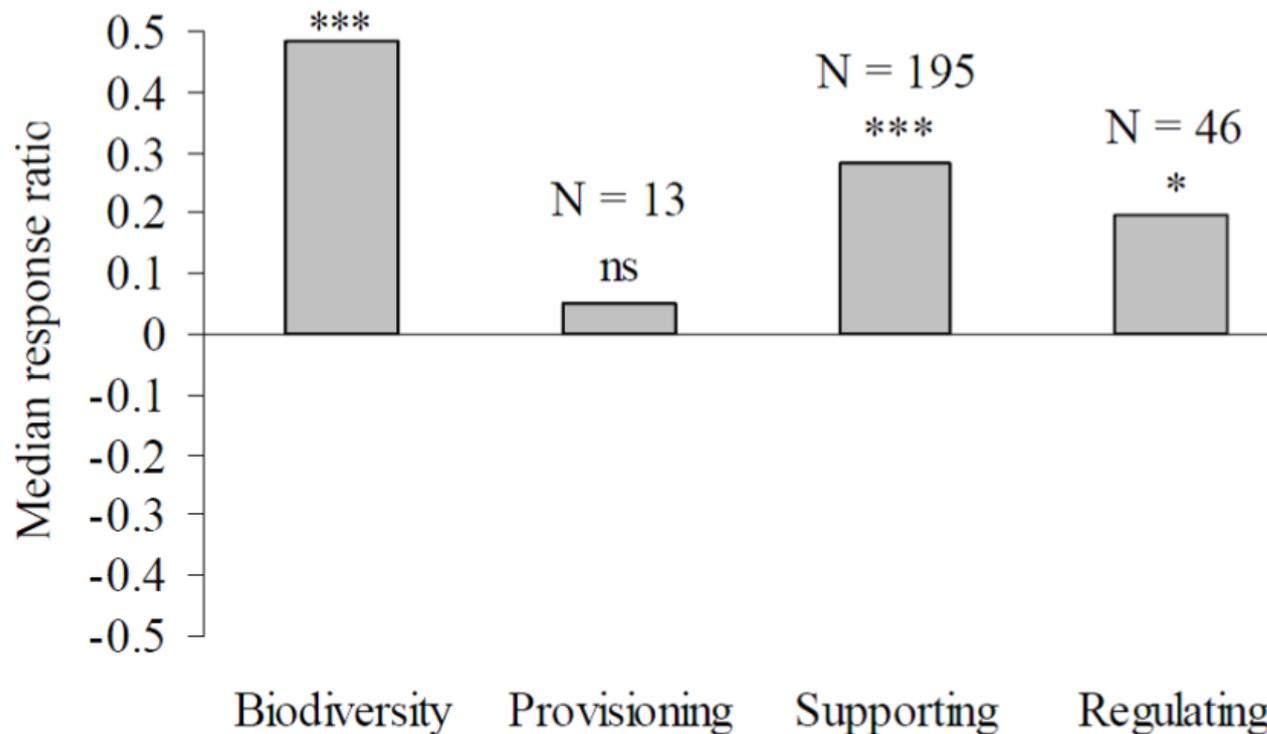
(Millennium Ecosystem Assessment 2005)

Challenges/requirements:: Assessing cultural ES

Example review of restoration projects



A Restored vs Degraded
N = 270



Restoration of biodiversity
and ecosystem services:
A meta-analysis

(Rey Benayas et al. 2009)

„Clearly, the assessment of trends in human use and of the status of cultural services is one of the most difficult and least accomplished tasks in ecosystem services research.“

(Schaich et al. 2010)

Challenges/requirements:: Assessing cultural ES

Review of indicators for CES

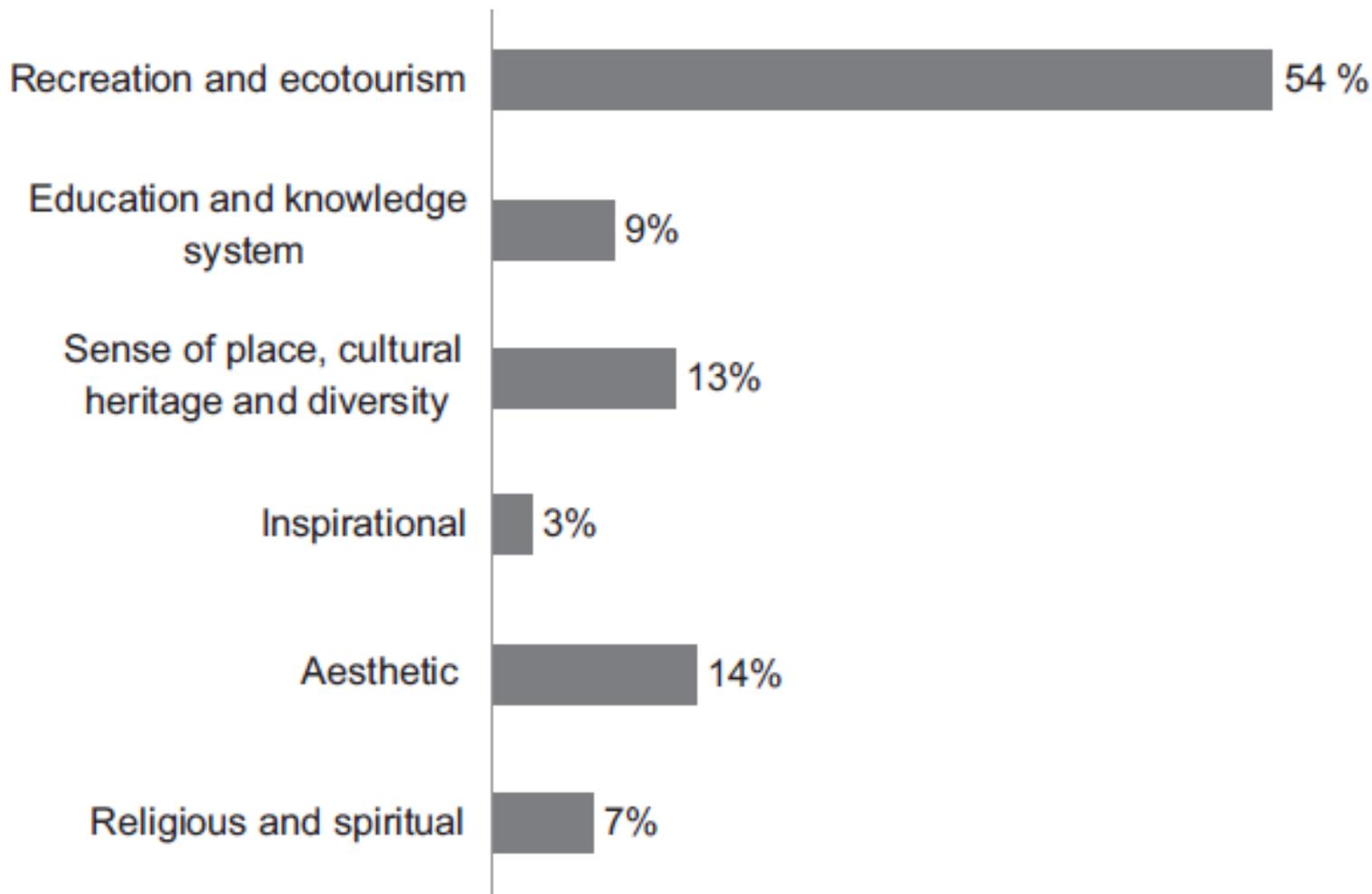
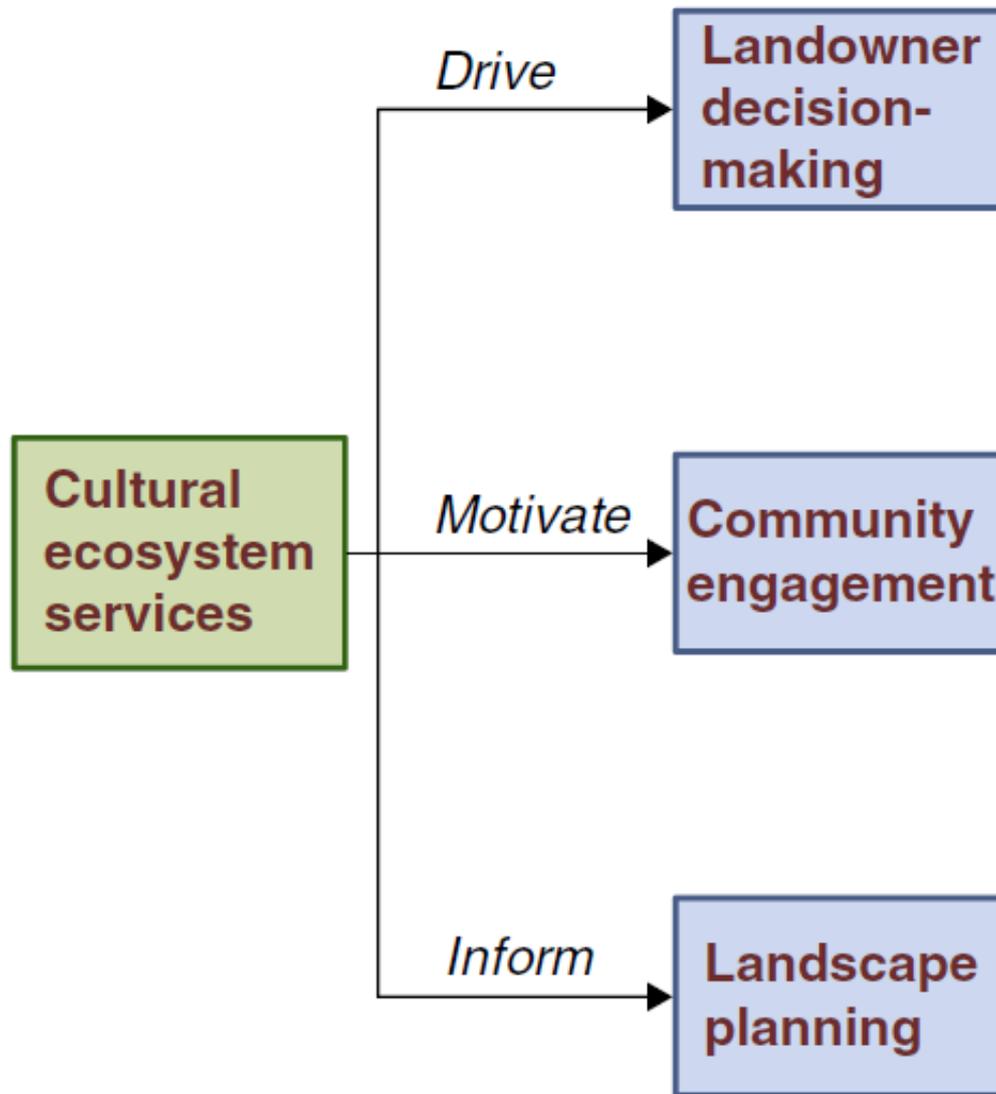


Fig. 2. Percentage of cultural service indicator categories.

(Hernández-Morcillo et al. 2013)

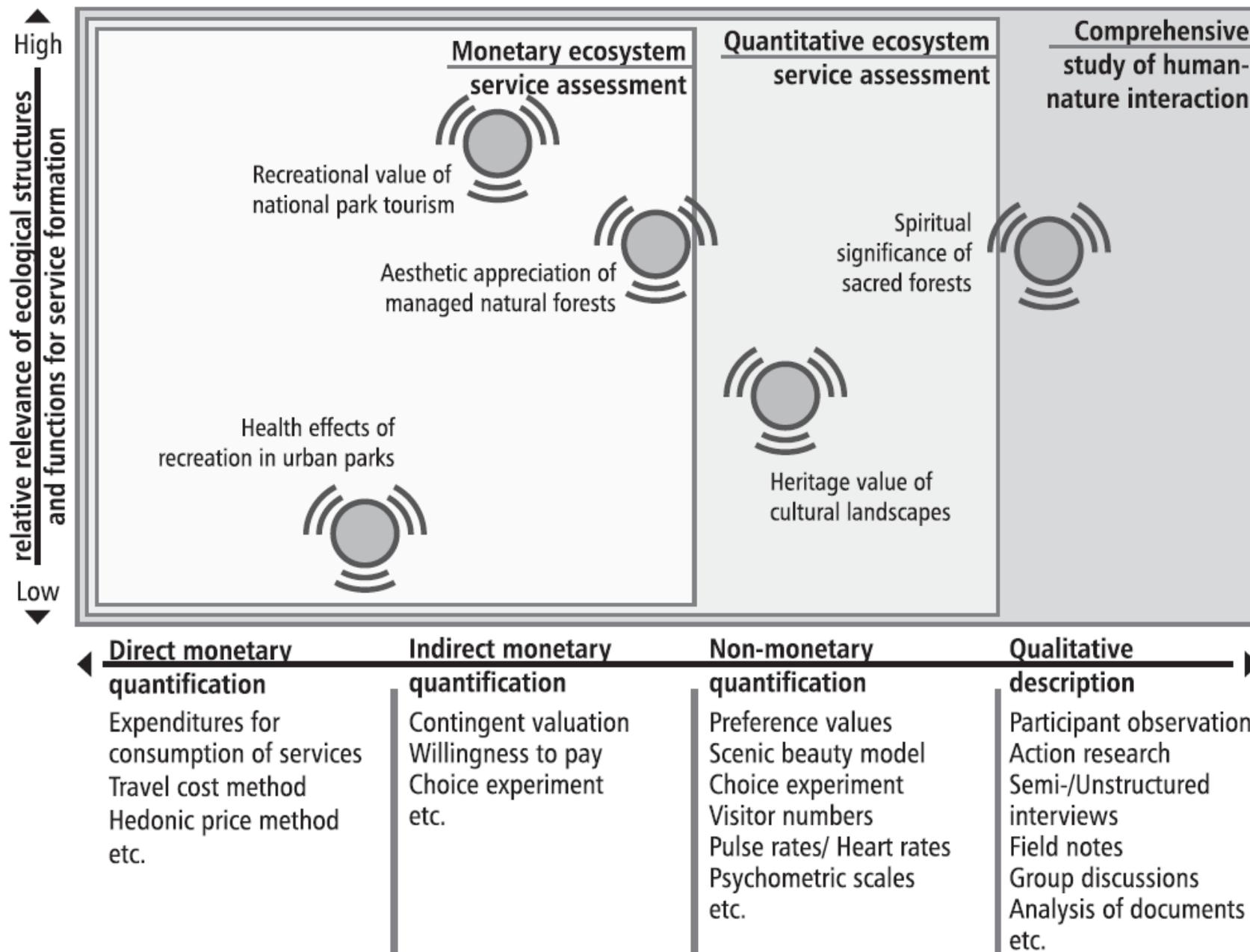
Relevance of including cultural ecosystem services



(Plieninger et al. 2015)



CES assessment and valuation approaches



(Daniel et al. 2012)



Assessment and valuation of ecosystem services

Key question:

How to describe, locate and define the value of ES?

Different types of ES need to be assessed through different approaches, various disciplines involved (e.g. ecology, economics, cultural studies)

Types of approaches:

- Qualitative – quantitative assessment
- Economic valuation – non-economic valuation
- Spatially not explicit – spatially explicit assessment (mapping)

→ More and more methods and tools developed – guidance and overview?



<https://portals.iucn.org/library/node/47778>

Tools for measuring, modelling, and valuing ecosystem services

Guidance for Key Biodiversity Areas, natural World Heritage sites, and protected areas

Rachel A. Neugarten, Penny F. Langhammer, Elena Osipova, Kenneth J. Bagstad, Nirmal Bhagabati, Stuart H. M. Butchart, Nigel Dudley, Vittoria Elliott, Leah R. Gerber, Claudia Gutierrez Arrellano, Kasandra-Zoica Ivanić, Marianne Kettunen, Lisa Mandle, Jennifer C. Merriman, Mark Mulligan, Kelvin S.-H. Peh, Ciara Raudsepp-Hearne, Darius J. Semmens, Sue Stolton and Simon Willcock



Ways forward? An agenda for ES assessments

- Power-sensitive approach e.g. regarding access and control over ES
- Acknowledging the role of labor in ES co-production (Who contributes to ES delivery?)

- Acknowledging varying contributions of different user groups
- Mindful of the multiple dimensions of ES
- → Public Participation GIS
- Acknowledging the role of culture, most notably cultural ecosystem services

→ Complementing biophysical and market-based valuation of ecosystem services with context-specific socio-cultural valuation techniques

(see Bérbes-Blázquez et al. 2016, Daniel et al. 2012, Martín-López et al. 2012)

INTRODUCTION TO PPGIS

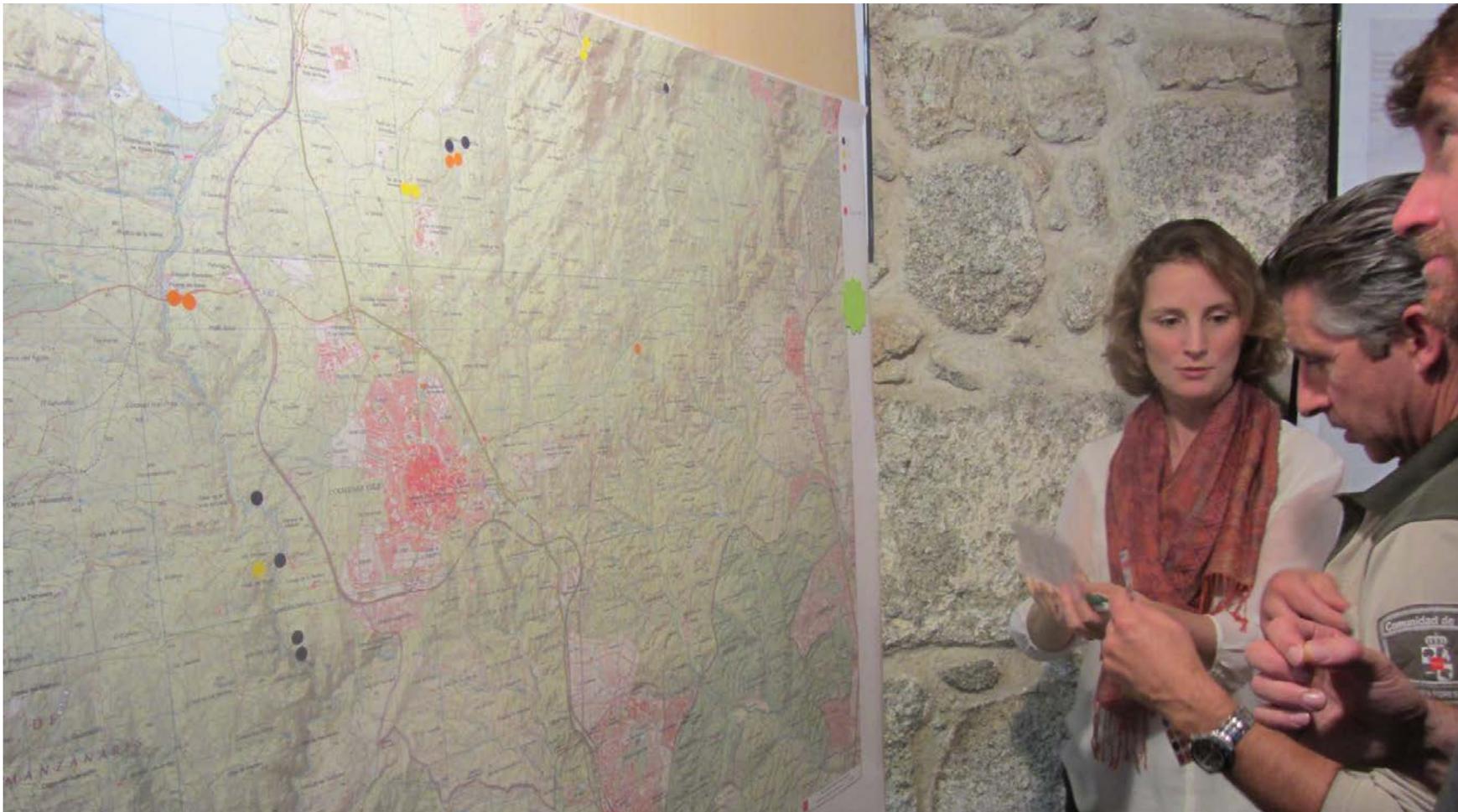
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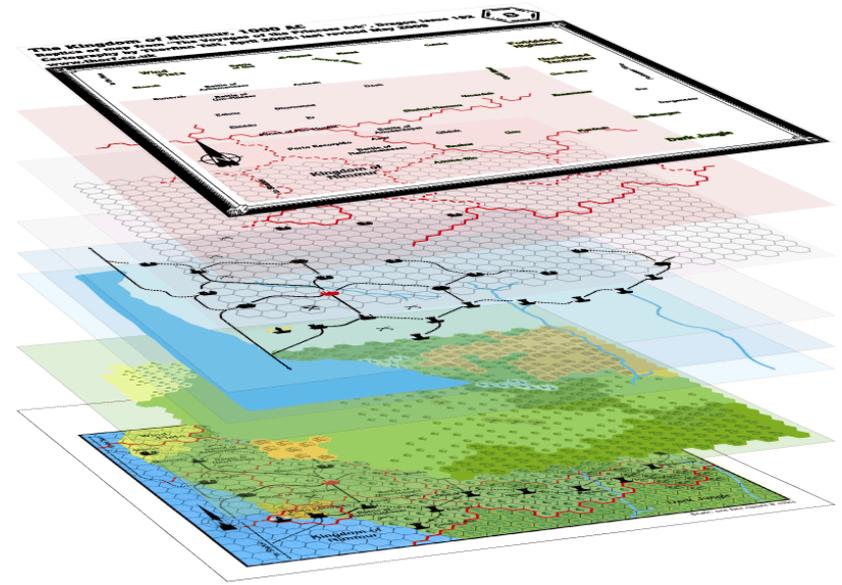
What is PPGIS ?



Where do you perceive / have you seen / would you like ... ?



What is PPGIS ?

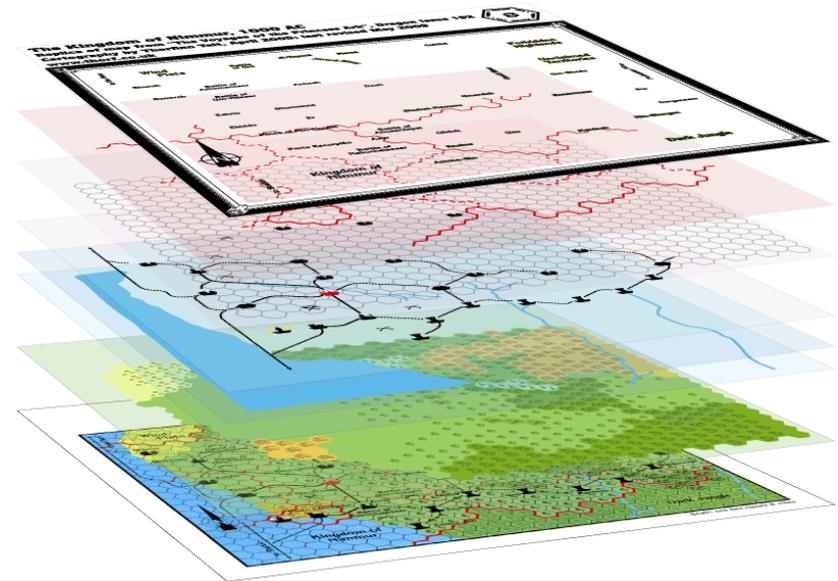


spatial decision-making



What is the origin and development of PPGIS ?

GIS as an elitist technology



But a key support tool in landscape management



What is the origin and development of PPGIS ?

1990s



1996 meeting at the U.S.
National Center for Geographic
Information and Analysis

**PPGIS! GIS technology to
support public participation**



What is the origin and development of PPGIS ?

Main goals

Integrating local qualitative and experiential knowledge in spatial planning

Empowering local people to participate in decision making

Supporting communication and minimising conflict in land planning

- Articulation of different stakeholders' views
- Awareness of the spatial implications of a decision / problem
- Transparency

Legitimacy and quality of land management decisions

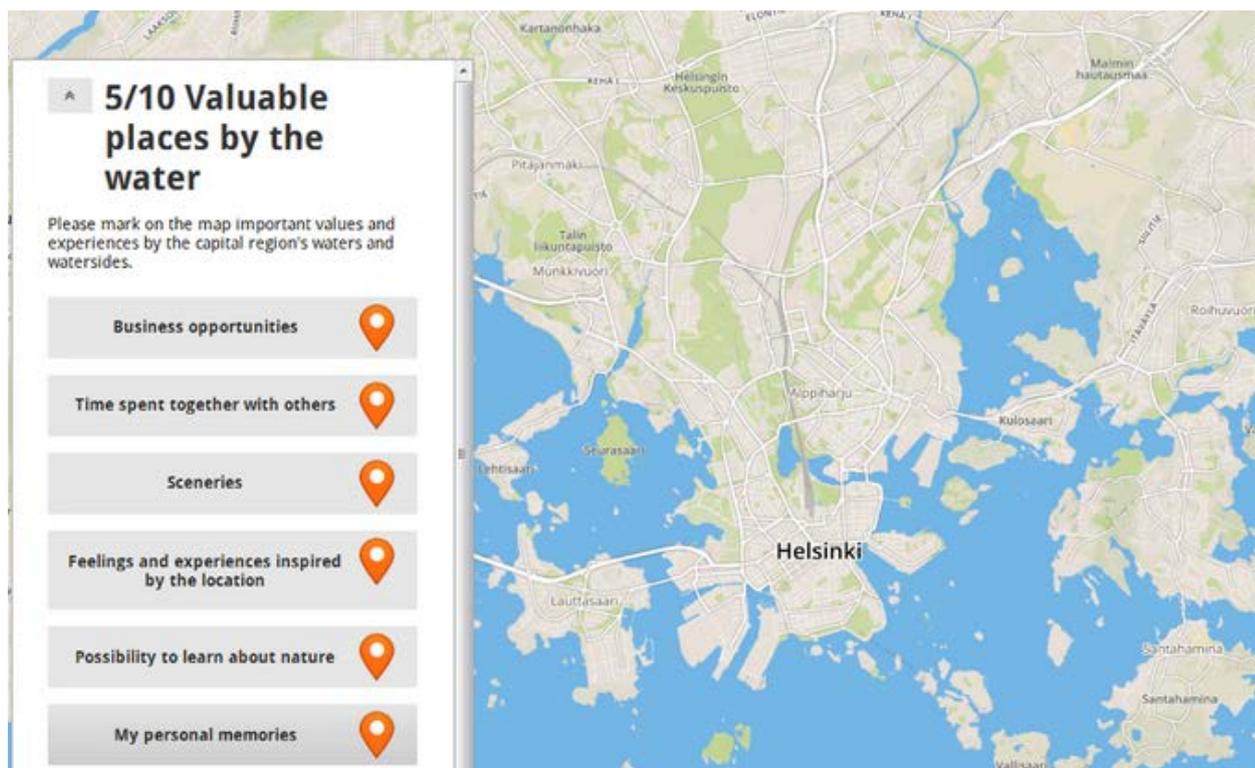


What is the origin and development of PPGIS ?

Related concepts

Public Participation GIS (PPGIS)

- urban-centered populations in “developed” countries
- emphasis on the generated maps and how the spatial data can inform planning



<http://geoawesomeness.com/new-ways-listening-citizens-helping-helsinki-become-livable-lovable/maptionnaire-4-geoawesomeness/>

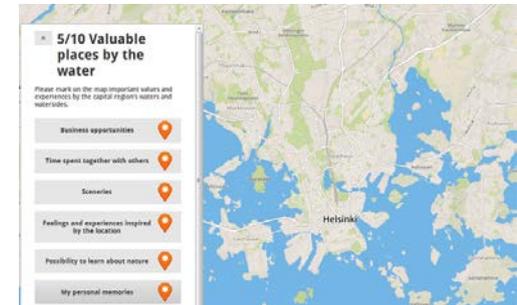


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Participatory GIS (PGIS)

- rural areas of “developing” countries
- focus on social learning and community engagement and empowerment



<http://pgis.cta.int/en/index.html>

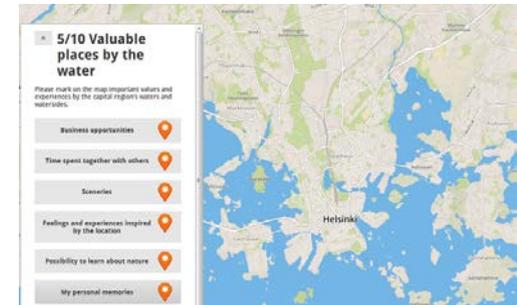


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Participatory GIS (PGIS)

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Volunteered Geographic Information (VGI)

- Voluntary participation on geoweb platforms
- No specific focus

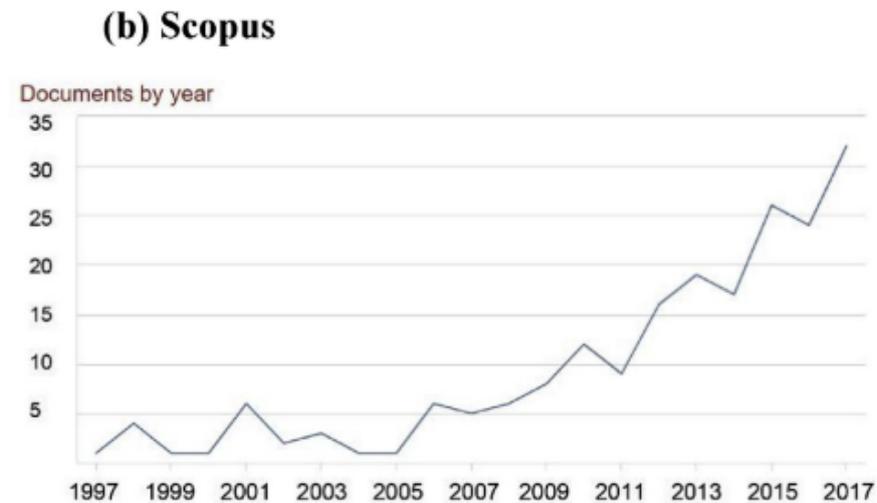
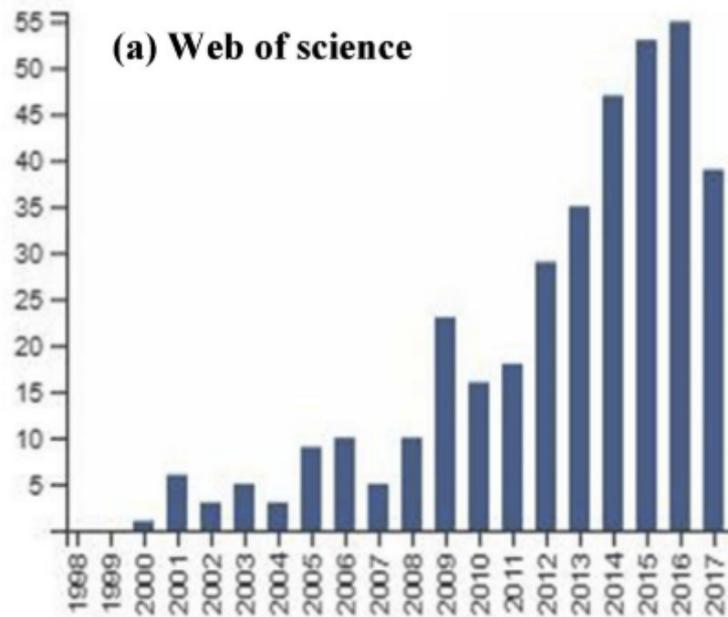


<https://www.vgiscience.org/>



What is the origin and development of PPGIS ?

Bibliographic search results by terminology and number of publications by year (as of November 1, 2017). Graphs show the increase in: (a) Web of Science publications by year (1998–2017) and (b) Scopus publications, using the combined search terms of PGIS or PPGIS.



^a Search for articles, books, book chapters, and published proceedings in “topic” which includes title, abstract, and keywords.

^b Search for articles or conference papers in title, abstract, keywords.

Brown and Kytä 2018



What is PPGIS used for ?

Several applications

- Community and neighborhood planning

The screenshot shows a mobile application interface for a Participatory GIS (PPGIS) project titled "Mobility in UTU campus". The interface is divided into three main sections:

- Introduction Panel:** Contains the title "Mobility in UTU campus", a welcome message, a survey description, a note about the survey duration, a "Happy mapping!" message, and a reference to the course "GIS and Society". A large black arrow button is at the bottom right.
- Opportunities and hindrances at the campus:** A central panel with a title and instructions: "Please choose the point or line markers below to map places and routes, You may map as many as you like." It lists two categories:
 - Opportunities:** Includes "Good parking place" (with a blue location pin icon) and "Good route between campus buildings" (with a blue line icon).
 - Hindrancies:** Includes "More parking places needed" (with a red location pin icon), "Route that needs development" (with a red line icon), "More signboards needed to find way" (with a red location pin icon), and "High traffic accident risk" (with a red location pin icon).
- Map:** A map of the UTU campus area showing buildings, streets, and green spaces. The map is overlaid with the application's interface elements.

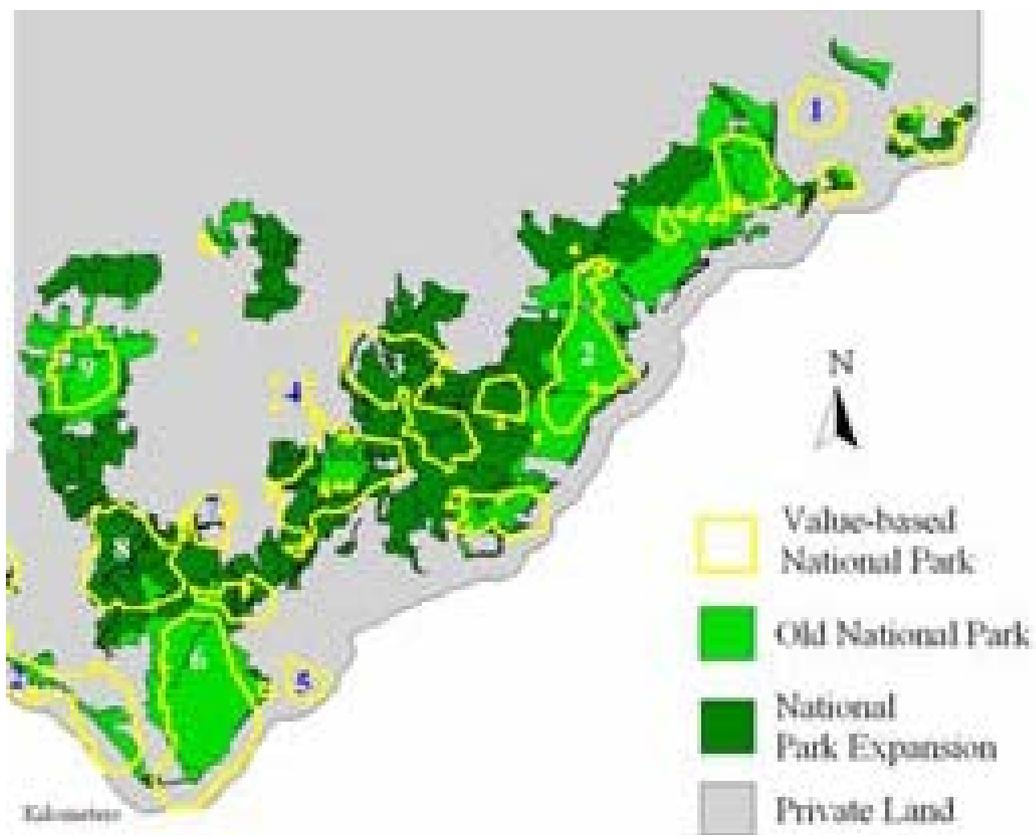
Nora Fagerholm, 2015



What is PPGIS used for ?

Several applications

- Community and neighborhood planning
- **Environmental and natural resource management**



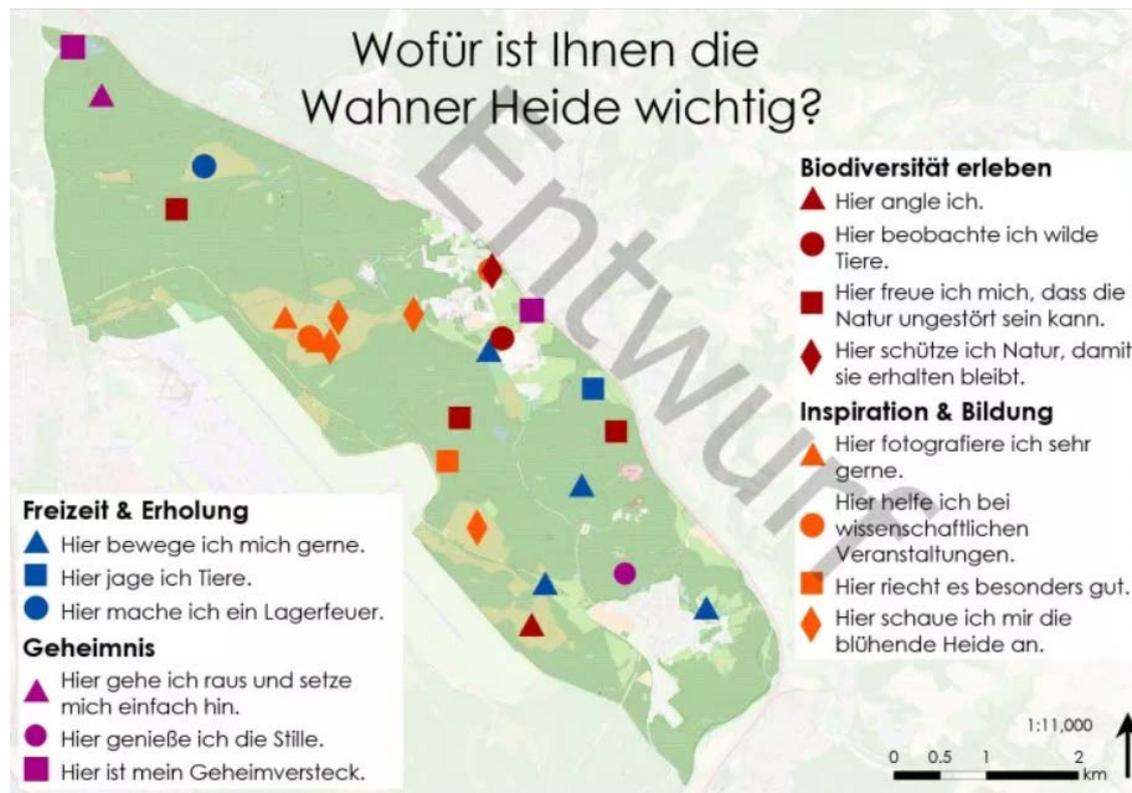
<https://www.landscapevalues.org/applicationsv1.html>



What is PPGIS used for ?

Several applications

- Community and neighborhood planning
- Environmental and natural resource management
- **Values and preferences of local actors identification**



<https://naturerbe-leben.de/en/projects/part-3/>



What is PPGIS used for ?

Several applications

- Community and neighborhood planning
- Environmental and natural resource management
- Values and preferences of local actors identification
- Ecosystem services mapping
- Traditional ecological and local knowledge preservation
- Intangible cultural heritage preservation
- Future scenario planning



Today's session in a nutshell

- Payment schemes for ecosystem services (PES) are more and more applied and hold promises, but also big challenges – many of these are inherent to ES assessments in general.
- Steps forward in making good use of the ES concept include considering the socio-cultural context and the diversity of stakeholder views and interests as well as taking into account the whole suite of ES, particularly cultural ES.
- A variety of toolboxes are offered for ES assessments, with different requirements, outcomes, applications...
- In the following, we will focus on Public Participation GIS (PPGIS) as a particularly powerful method which can be used as part of /integrated with several of these toolboxes.
- PPGIS combines perceptions-based social data (survey) with spatially explicit data (maps).

Homework



- Have a look at the IUCN overview report on ES assessment toolkits (Neugarten et al. 2018) and familiarize yourself with the different options and applications:

<https://portals.iucn.org/library/node/47778>

- Bring a syllabus from the courses you are involved in – tomorrow we will explore possibilities for injecting the topic of ecosystem services!

Thank you!





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