

Calculations and considerations behind ecosystem services

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Outline

- The concept of Ecosystem Services
- Valuing ecosystem services at a single site
- Valuing ecosystem services at larger scale
- Strengths and weaknesses

Ecosystem Services



Linking nature to human welfare

Ecosystem Services – A definition

The **Millennium Ecosystem Assessment** distinguishes four classes of ecosystem services:

1. *Provisioning services*

Products obtained from ecosystems (e.g. genetic resources, food, fiber, and fresh water).

2. *Regulating services*

Benefits obtained from the regulation of ecosystem processes (e.g. the regulation of climate, water, and some human diseases).

3. *Supporting services*

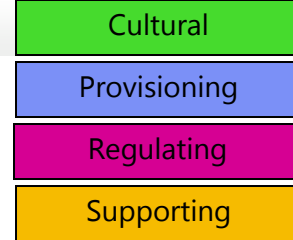
Necessary for the production of all other ecosystem services (e.g. biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat).

4. *Cultural services*

Non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience as well as knowledge systems, social relations, and aesthetic values.

From ecosystem services to their value

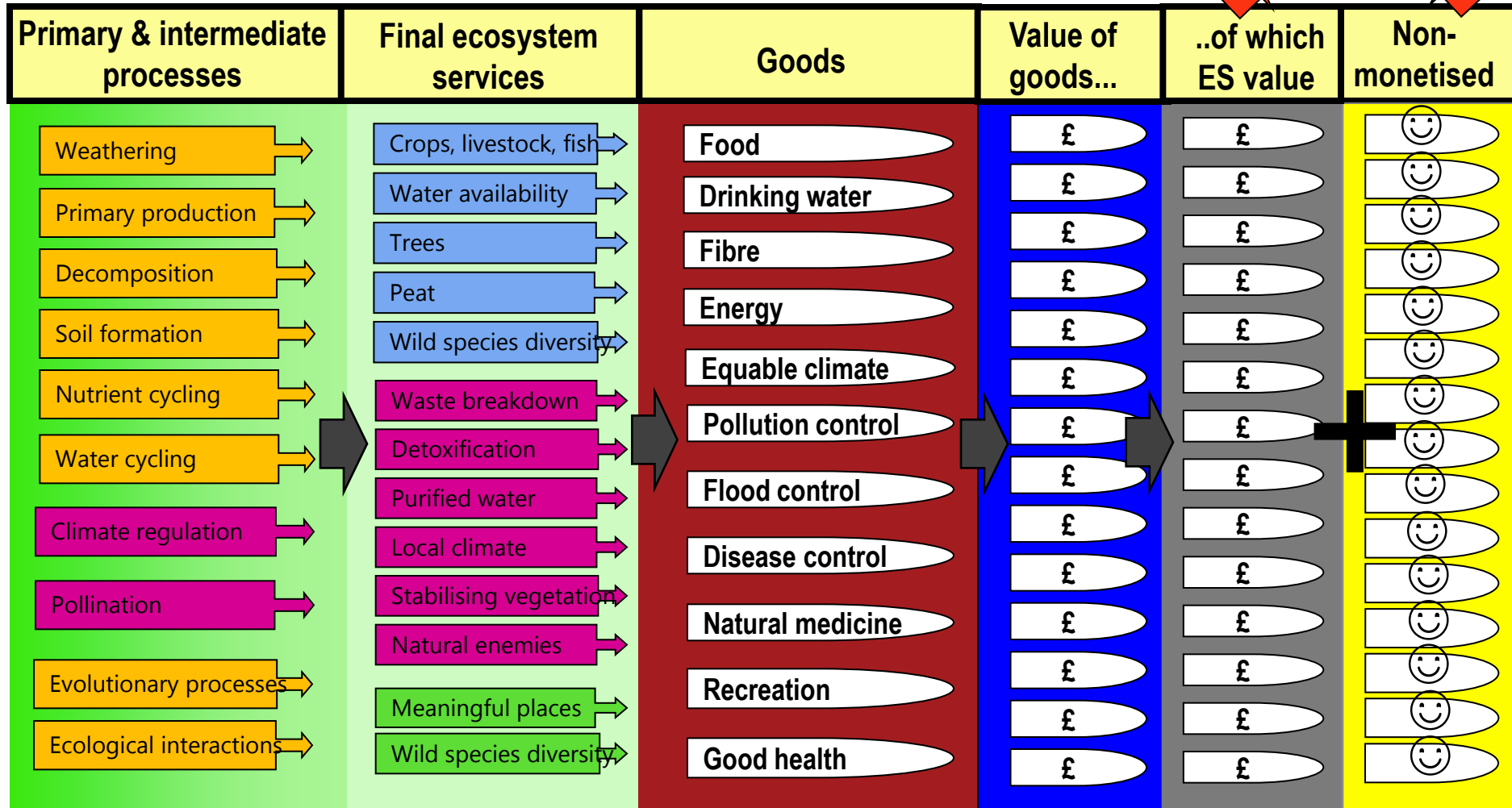
Millennium Assessment categories



Physical and chemical inputs

Other capital inputs

ES contribution to well-being



Biodiversity and ecosystem services

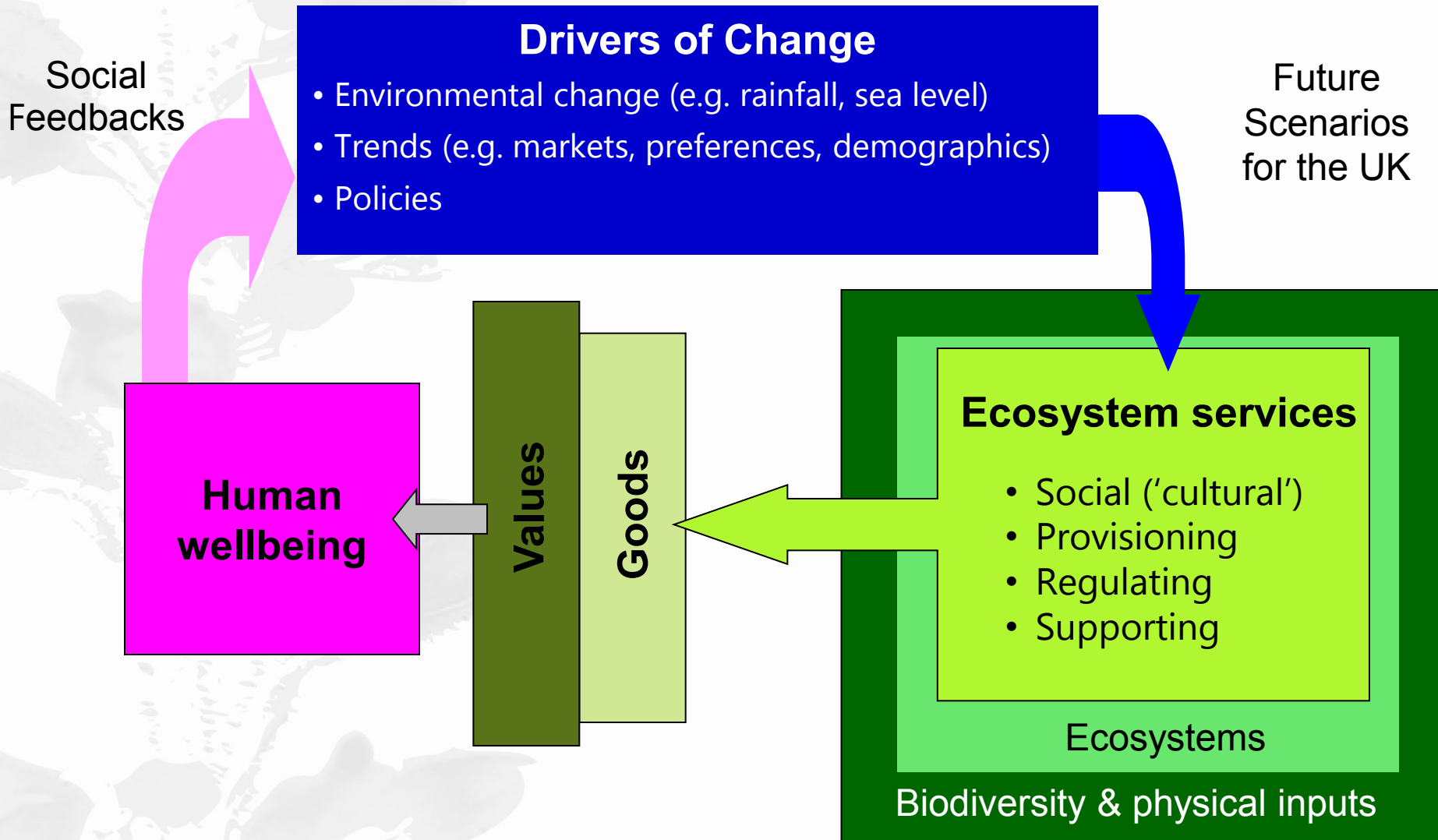
- “the factor underlying it all – does not enter the concept”
- “but we can do with less” – willingness to trade off
 - Part of
 - Provisioning services (e.g. wild pollination)
 - Regulating services (e.g. resilience)
 - Supporting services (e.g. decomposition)
 - Cultural services (e.g. existence value)

=> The scientific community is not in agreement of how to include it – as a separate service or not

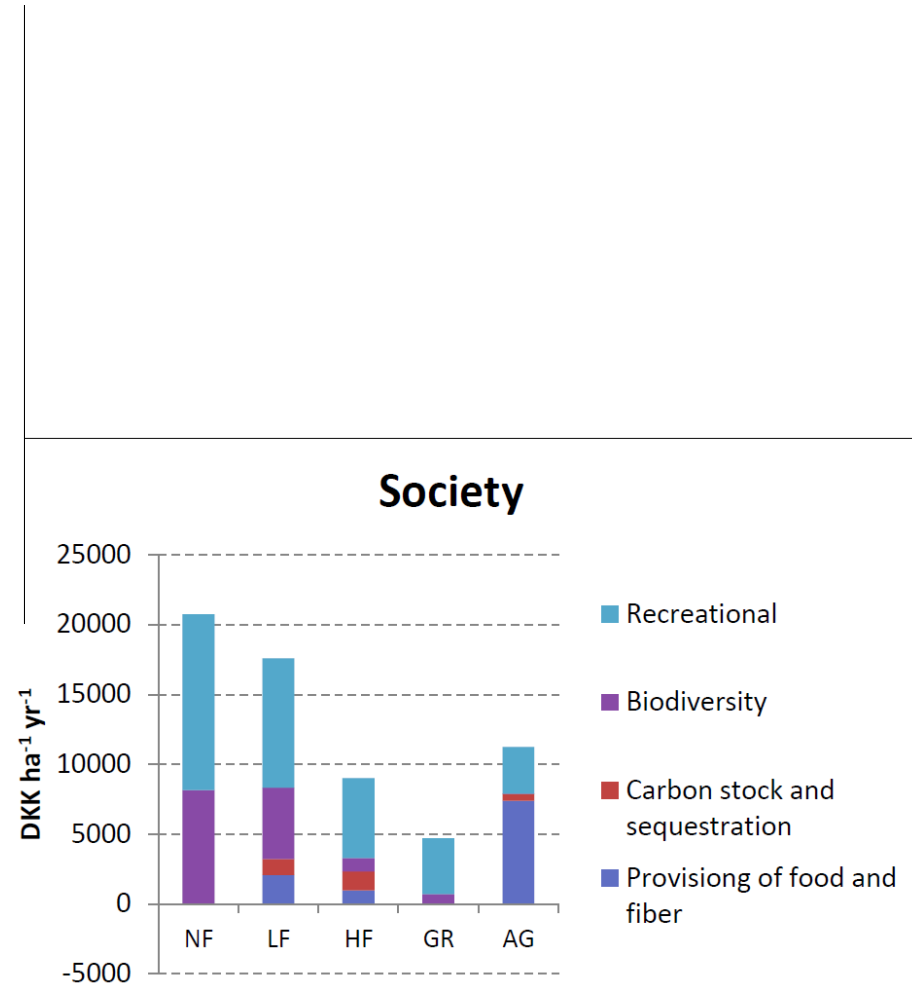
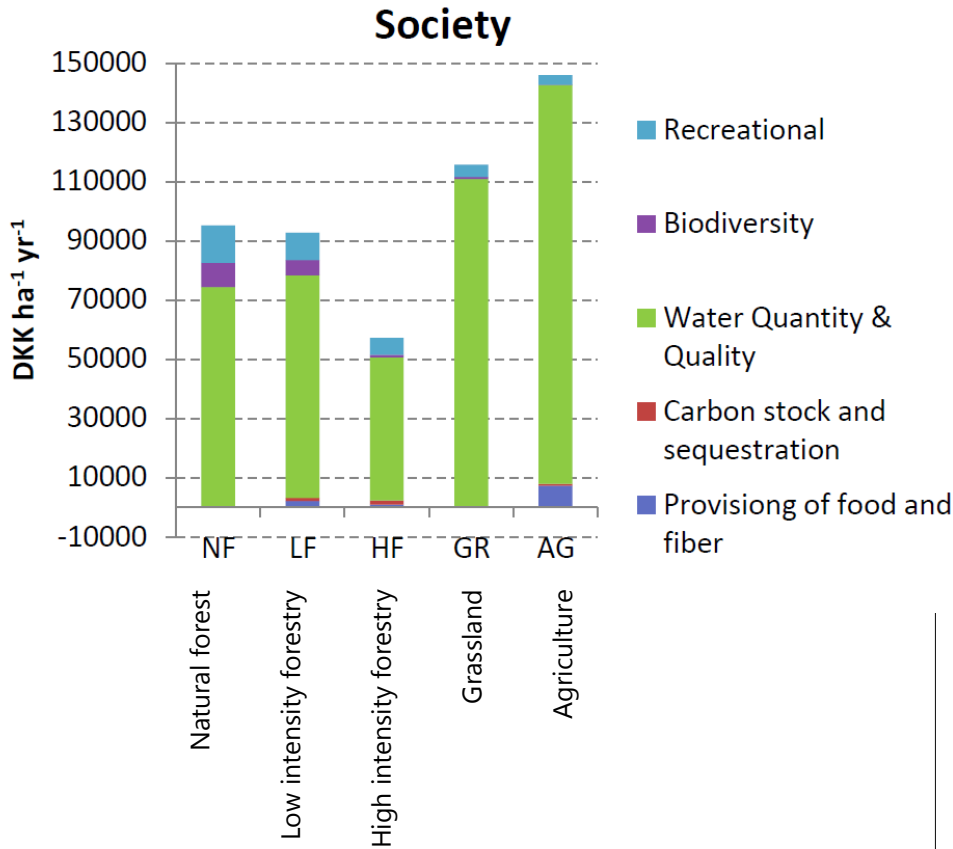
Why value ecosystem services?

- To see what we gain or loses when we ***change*** the provision of ecosystem services
- Distinction of the four categories can help us be explicit about it
- A value has an anthropocentric perspective
- Be careful of double counting

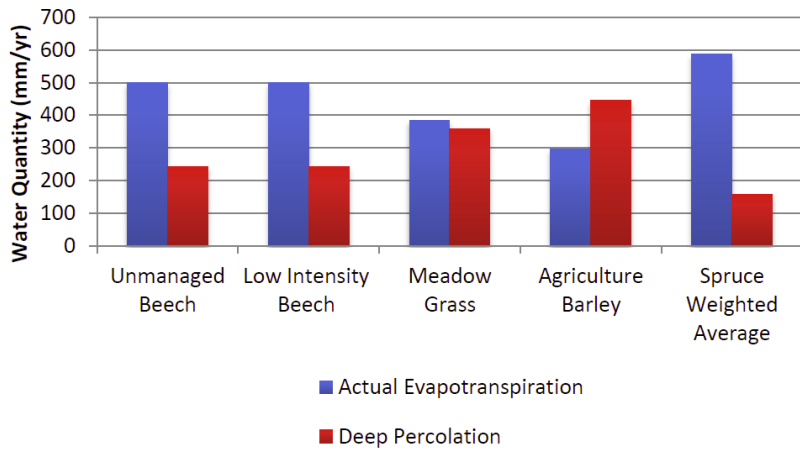
UK National Ecosystem Assessment (NEA): Overall Conceptual Framework



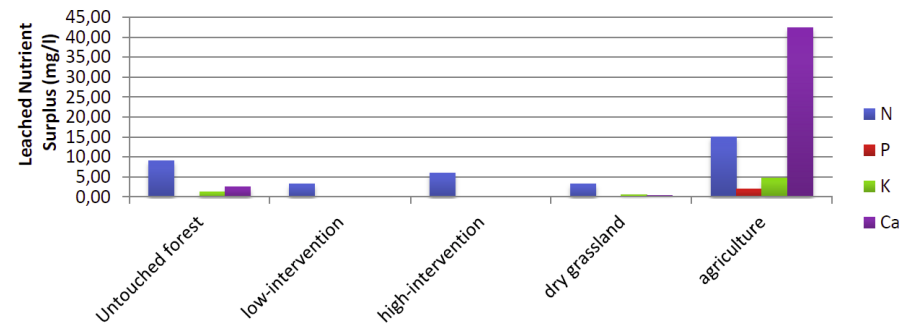
Comparing landuses on a single (very fertile) site



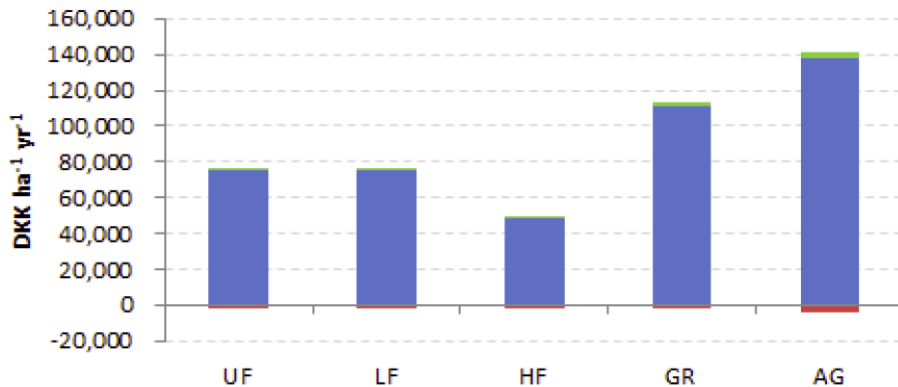
Water Quantity



Nutrient Leaching with Seepage Water



- Private value of providing water
- Social cost of the N-abatement
- Social value of providing drinking water



Deep percolation ~1/2 goes to groundwater
Shadow cost of N reduction by other means
Water price



Results

- Used a very high water value
- What determines that? Demand... and surroundings
- In some contexts it may be so

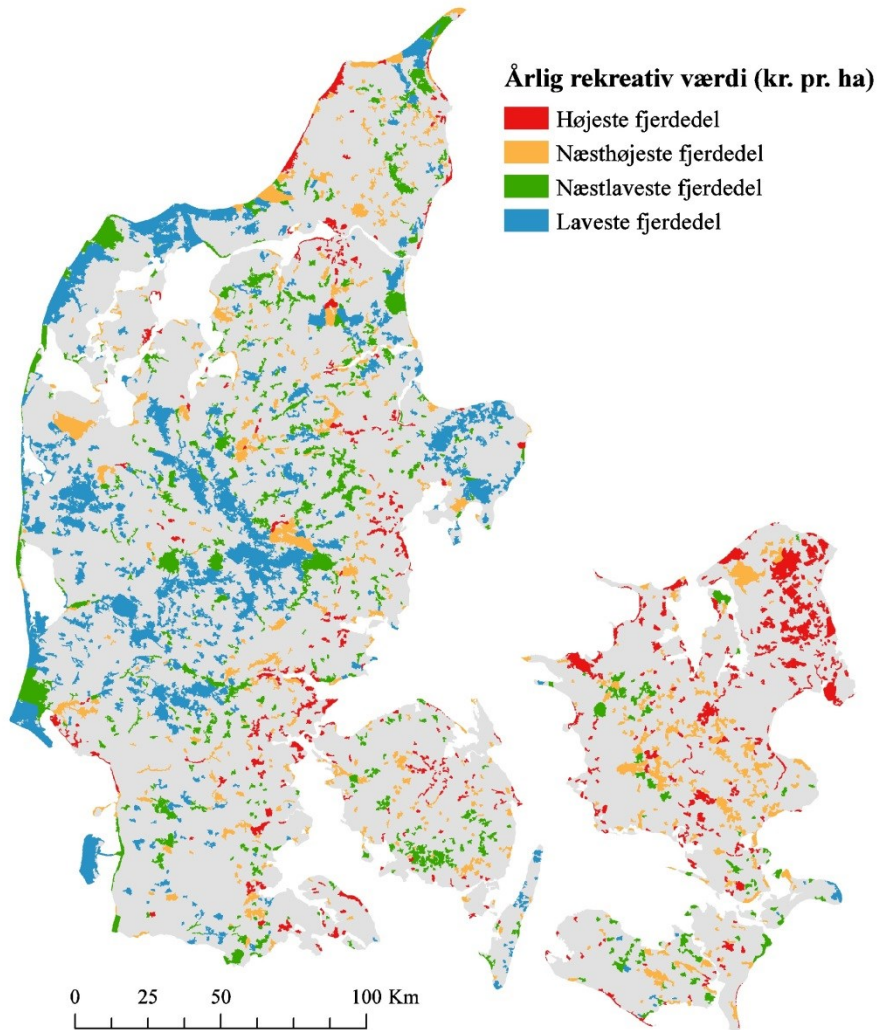
- Measuring:

A mix of very rough average numbers and very precise numbers

Typically the next is to look at it at a landscape level

A single service at a large scale

Recreational values and demand, DØRS



Some of the averagering and simplifications made:

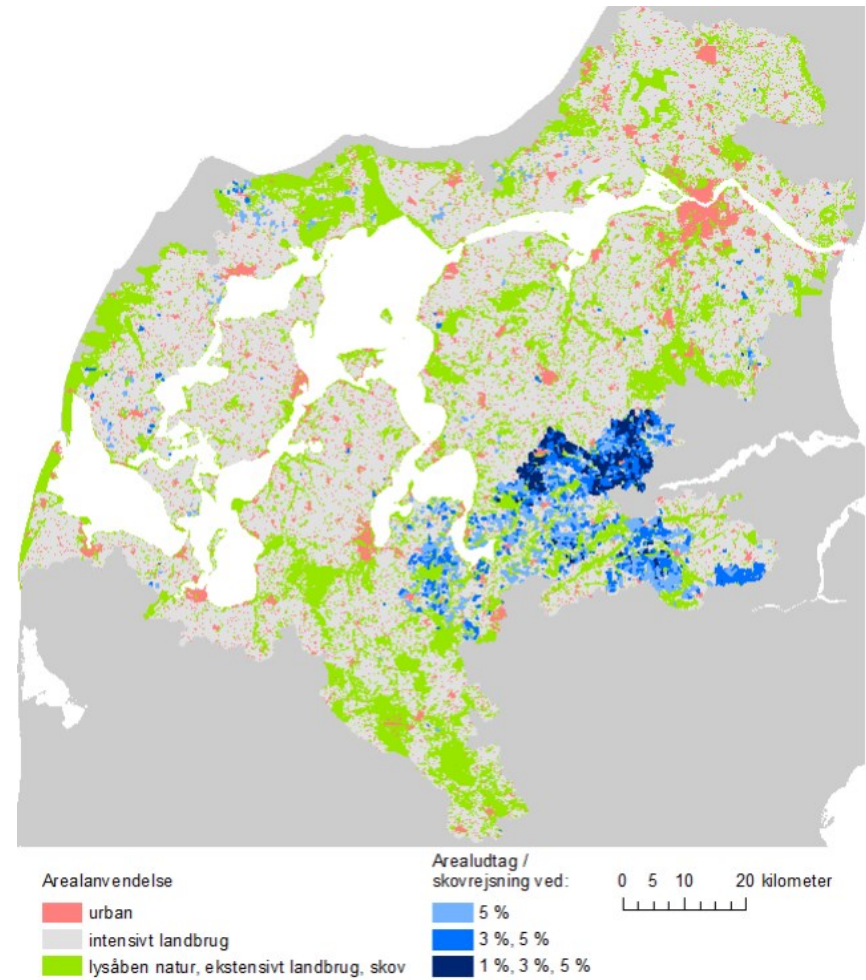
1. Only consider areas (outside cities) larger than 50 ha
2. Consider only visited areas as alternatives

Taye, Panduro, Lundhede, Jacobsen, 2018:

1. Results in another dataset are not sensitive to whether small areas are included or not – people go to the larger areas
2. Some potential bias in alternative selections with choices of less than 50 alternatives
2. Make another simplification: people only visit areas 30 km away...

Working with ecosystem services

- Spatially explicit data
- Focus on neighbouring effects



Figur 10 Arealudpegning der optimerer den totale økonomiske værdi af ændringen i fire økosystemtjenester (vandkvalitet, klimaregulering, fødevarereproduktionen, træproduktion) ved udtag af 1 % (a), 3 % (b) og 5 % (c) af omdriftsarealet. Klimaeffekterne er værdisat ved kvoteprisen.

The use of spatial data

- Easy to communicate
- Looks more precise than it is...
 - The quality of the underlying data
 - The spatial resolution of the underlying data
 - Which averaging is used... probably a mix
- No tracking of changes over time
We update the map layers continuously
=> difficult to follow changes over time
⇒ Especially for long term effects this is limiting
- Link to green GDP

Conclusion

- Working with ecosystem services is valuable tool to illustrate and systematically analyse effects of management changes
 - At single site level
 - And more so at a larger scale
- Mapping and trade-off analyses:
 - Accumulation of best possible knowledge... at an aggregate level
 - Details are not precise – consider whether it matters
 - Valuation depends on surroundings... single site values is only a stepping stone
 - Be aware of the assumptions
 - Be aware of temporal aspects