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EcoServ-GIS

Ecosystem Services Mapping:

A Wildlife Trust GIS Toolkit to map ecosystem services at a county scale

Dr Jonathan Winn
Living Landscape Coordinator
Durham Wildlife Trust

EcoServ-GIS – A Sussex case study

Ecosystem Services Mapping:

A Wildlife Trust GIS Toolkit to map ecosystem services at a county scale

Henri Brocklebank

Strategy Lead – Sussex Biodiversity Record Centre

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Why EcoServ–GIS ?

EcoServ-GIS has been funded by RSWT Strategic Development Fund / Dame Mary Smieton Fund

- Mapping Ecosystem service to implement the Ecosystem approach
- Mapping takes time, but can be automated – cost savings
- Include non-designated sites / general countryside
- Local planning and Green Infrastructure context

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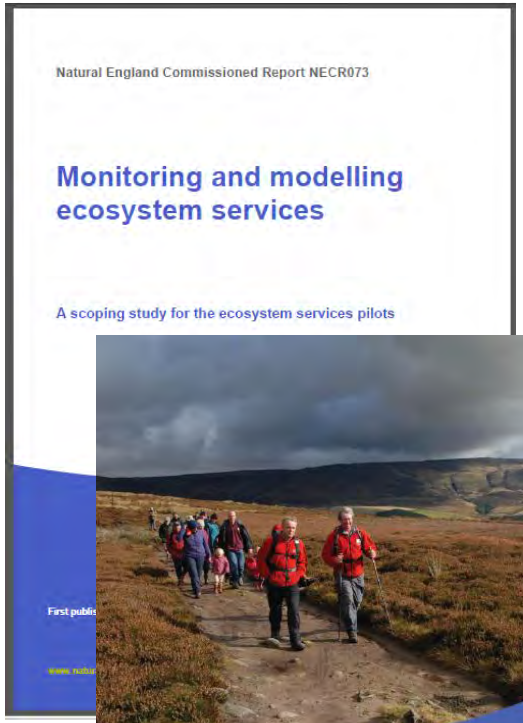
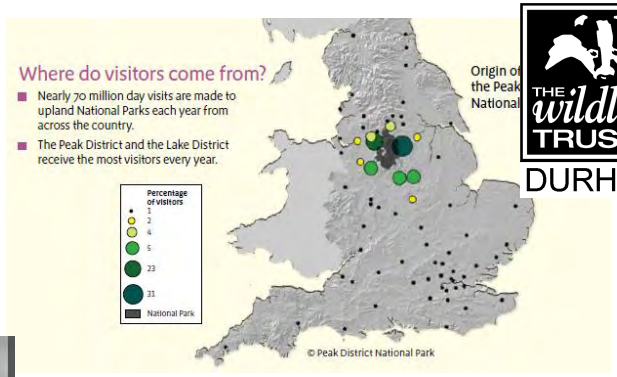
Many studies different scales





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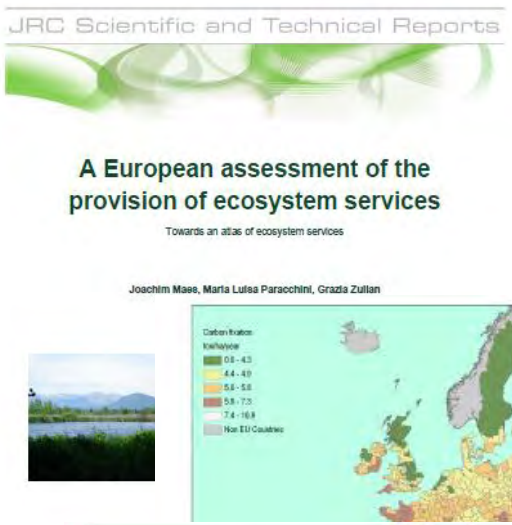
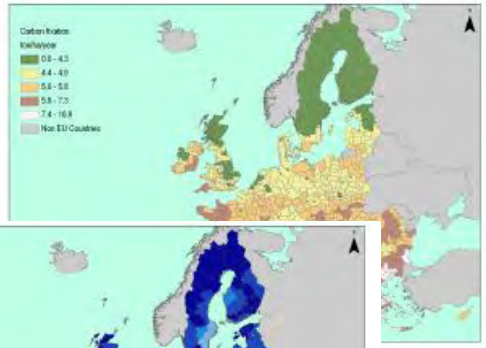
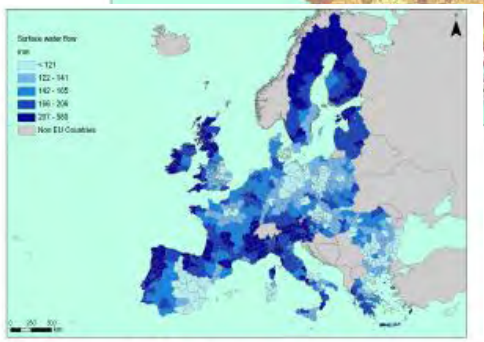
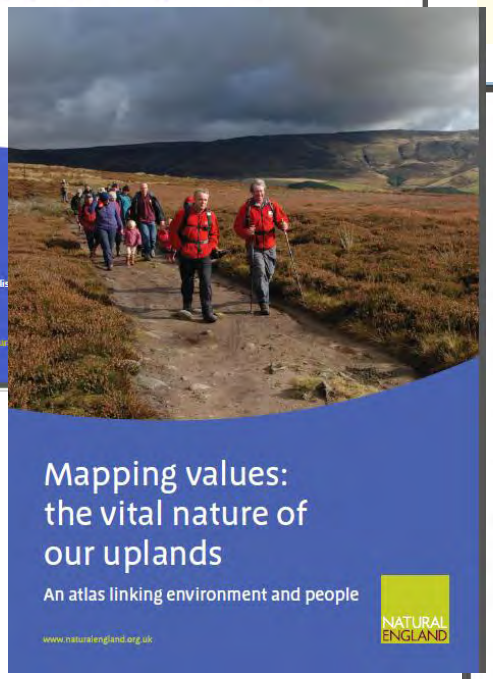
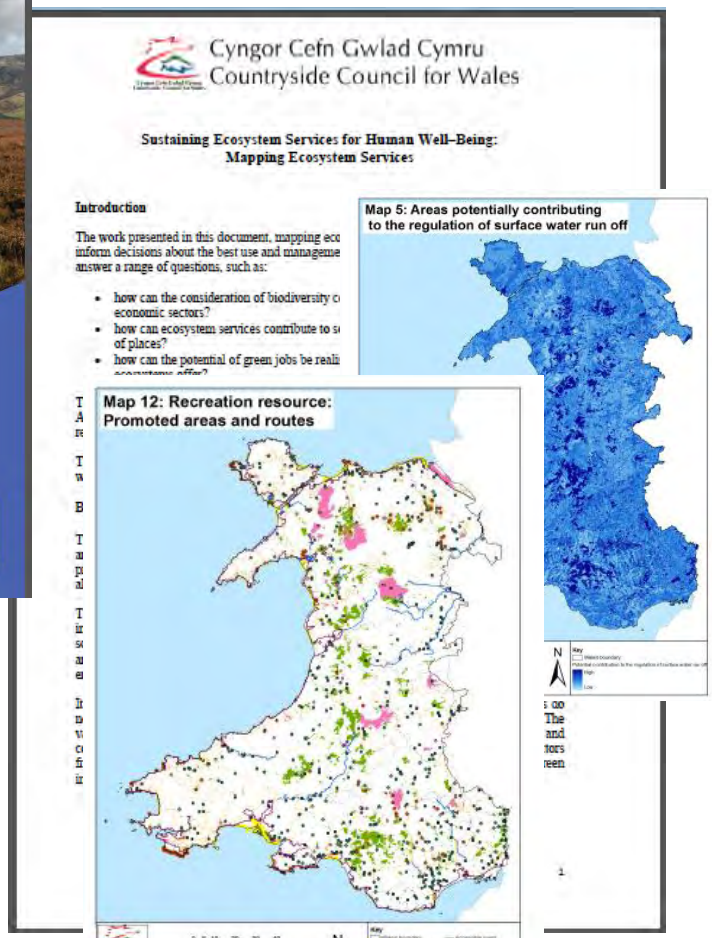








Policy focussed / broad scope



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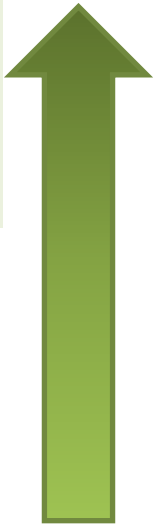
Much existing research, literature, reports and methods .....but

Local authority and conservation staff need a toolkit to help them implement the ecosystem approach; **mapping is a good way to do this**

How the toolkit works

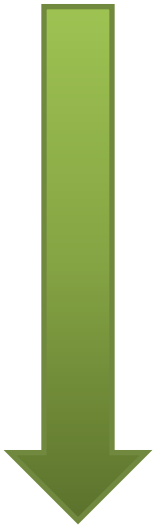
- Many mapping methods have been tried and tested:

Simple; quick & easy to implement & interpret



Habitat – service matrix

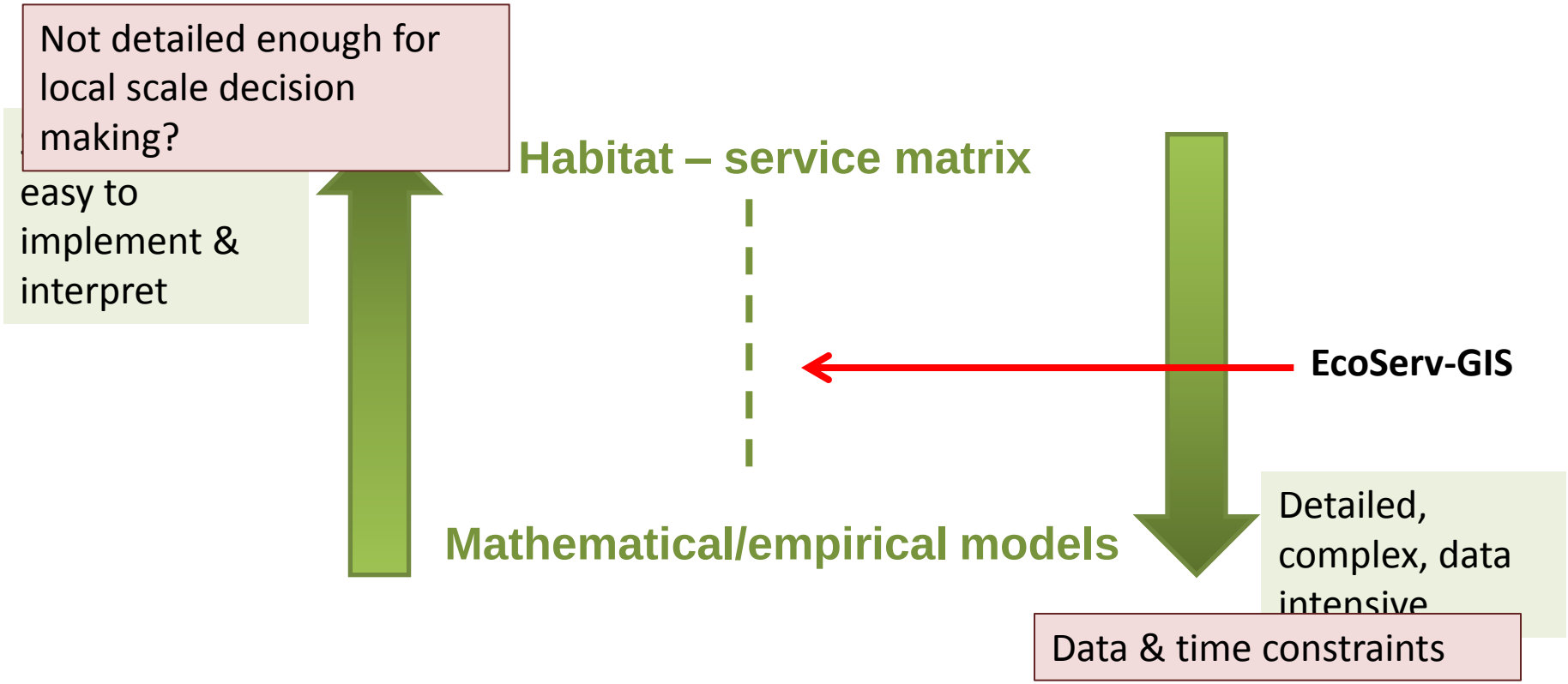
Mathematical/empirical models



Detailed, complex, data intensive

How the toolkit works

- Many mapping methods have been tried and tested:



Which services?

Categories	Ecosystem service (12)	Sub-category (24)
Provisioning	Nutrition	• **Food provision** • Water supply/availability
	Materials	• **Timber**
Regulating	Climate (biophysical) regulation	• **Carbon storage** • **Local climate regulation**
	Flows / hazard regulation	• **Noise regulation** • Wave attenuation • Water flow regulation • Erosion regulation
	Purification/waste regulation	• **Water purification** • Air purification
	Biotic environment regulation	• **Pollination** • Biological control
Cultural	Wild species diversity	• **Wildlife watching** • Wildlife corridors
	Inspiration/symbolic /spiritual	• Aesthetic quality • Spiritual places
	Culture and community	• Community cohesion/integration • Heritage and cultural identify
	Environmental settings and local places	• **Accessible nature experience** • Outdoor recreation spaces • Green travel corridors
	Information, knowledge, employment	• **Education / knowledge opportunities**

Which services?
Stage I

- Wildlife watching
- Accessible nature
- Education opportunities
- Carbon storage
- Local climate regulation
- Water purification
- Pollination
- Noise regulation
- Food
- Timber

Which services
Stage II
(TBC)

- Community cohesion
- Erosion regulation
- Water flow regulation (flood control)
- Aesthetic quality
- Heritage and cultural identity

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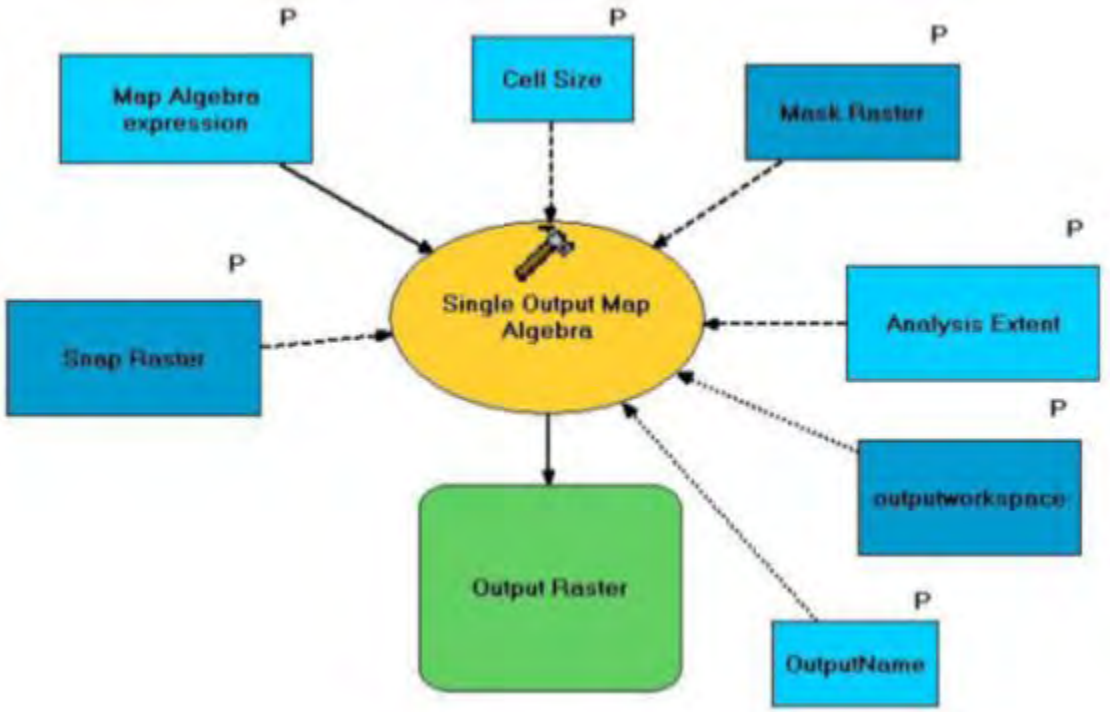
Automating ecosystem service mapping

- ArcGIS Modelbuilder
- Widely accessible data
- User guide produced



- Transparent
- Transferable
- Standardised
- Repeatable
- Accessible
- Easily updated & applied to further analysis

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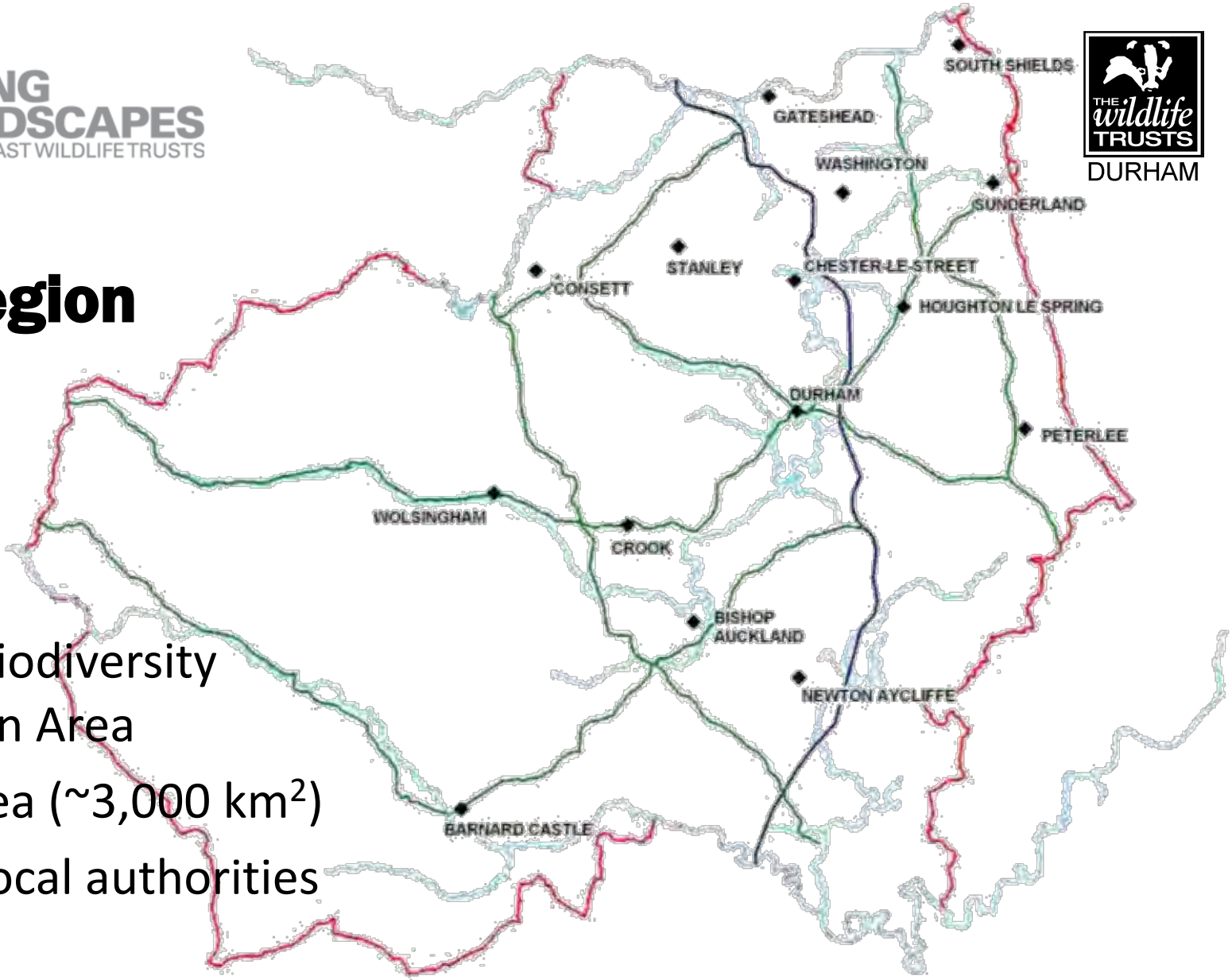
Pilot region



- Durham Biodiversity Action Plan Area
- A large area (~3,000 km^2)
- Multiple local authorities

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Methods: selecting service indicators

1) **Ecosystem service capacity:** The performance and capability of an ecosystem or a landscape to deliver services

2) **Service demand areas:** Areas where there is societal demand for a service and/or the need for ecological regulation

3) **Service delivery areas:** Functioning ecosystems graded according to a combination of their capacity to deliver a service and the societal and ecological demand for the service

Select indices and spatial scales based on current scientific research, and data availability and transferability.

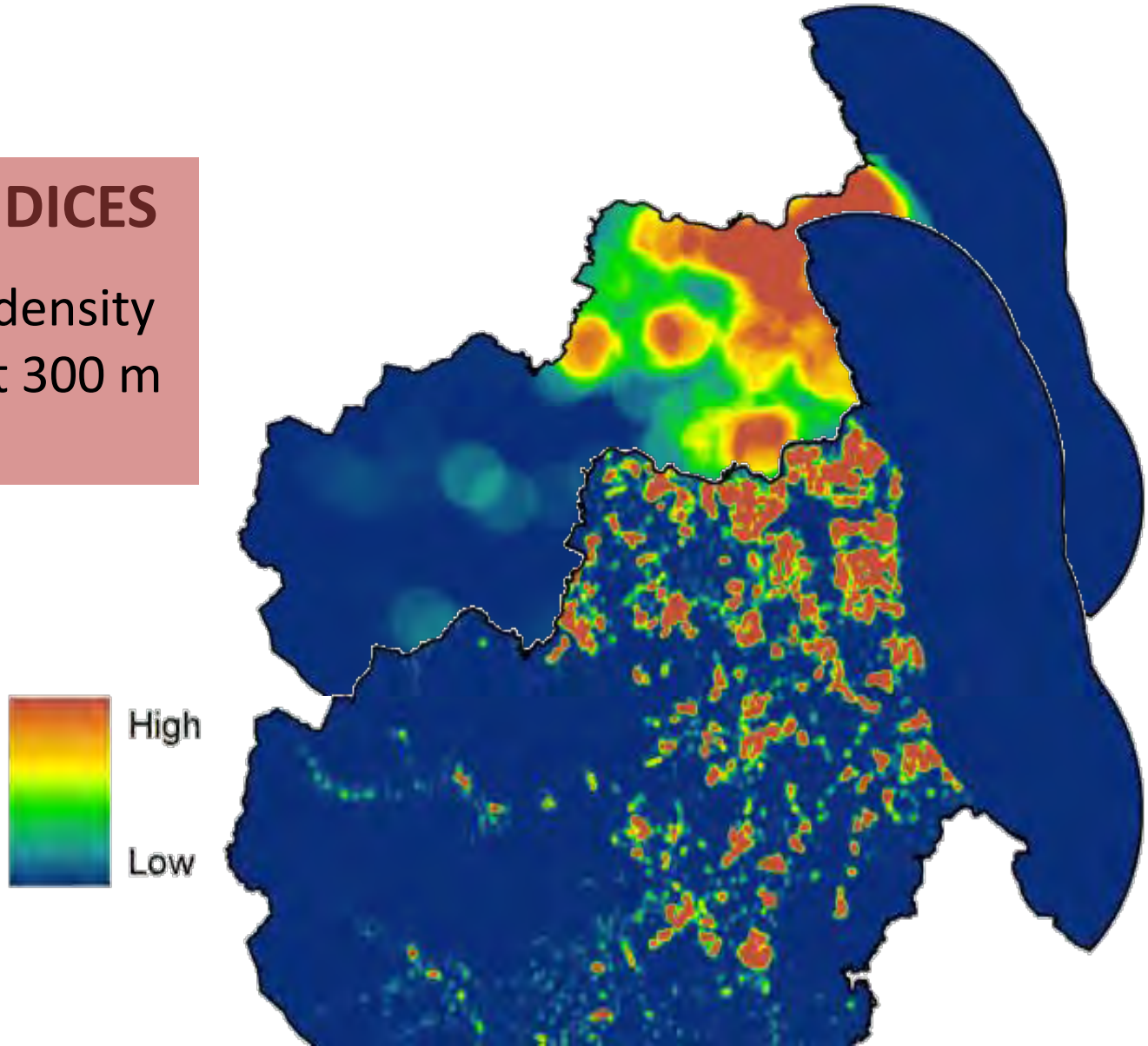
Presentation health warning

We do not yet have the documentation that explains the thinking behind each model, only the technical documentation.

Example: Accessible nature experience

DEMAND INDICES

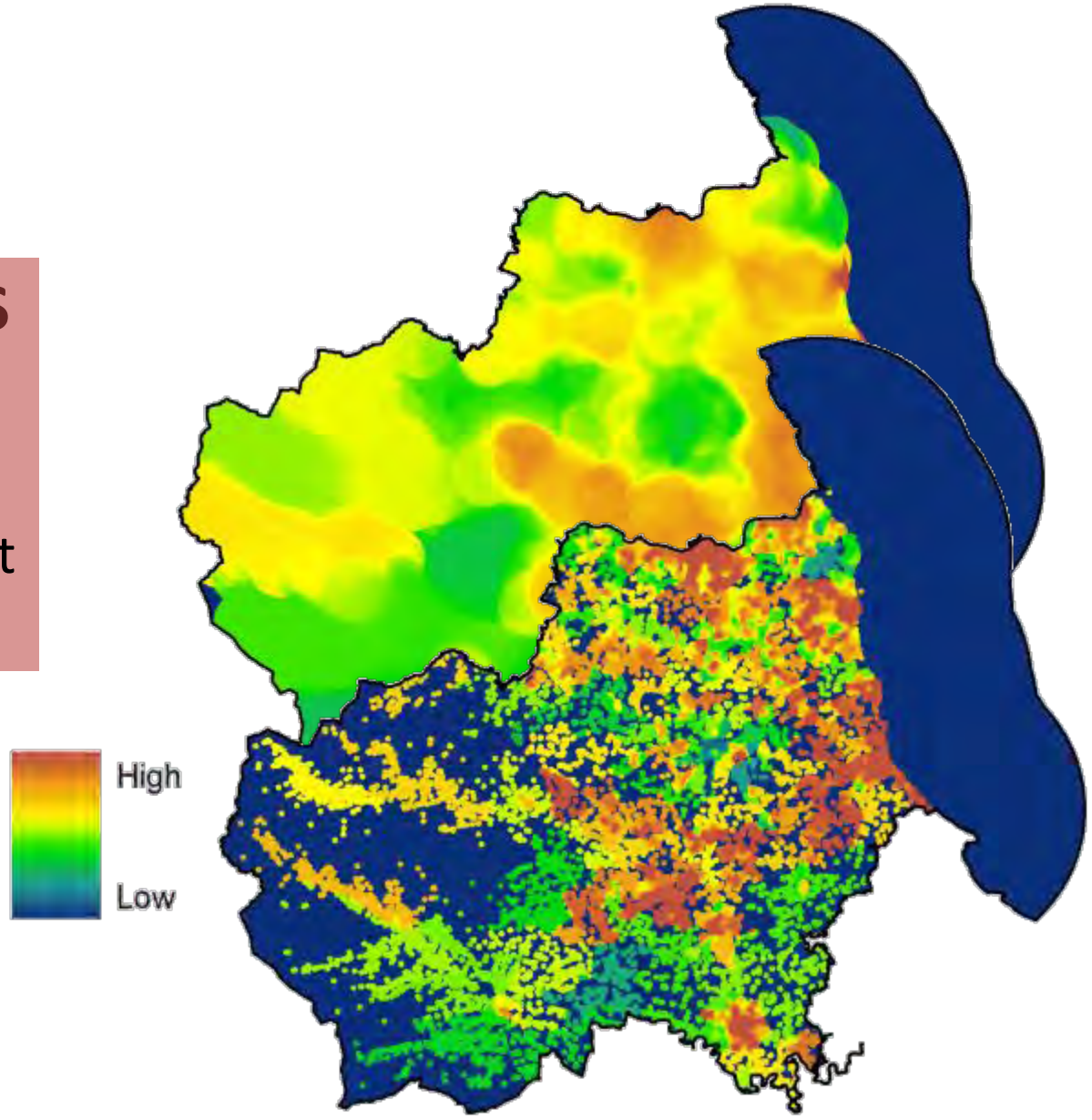
1) Population density measured at 300 m and 3.2 km



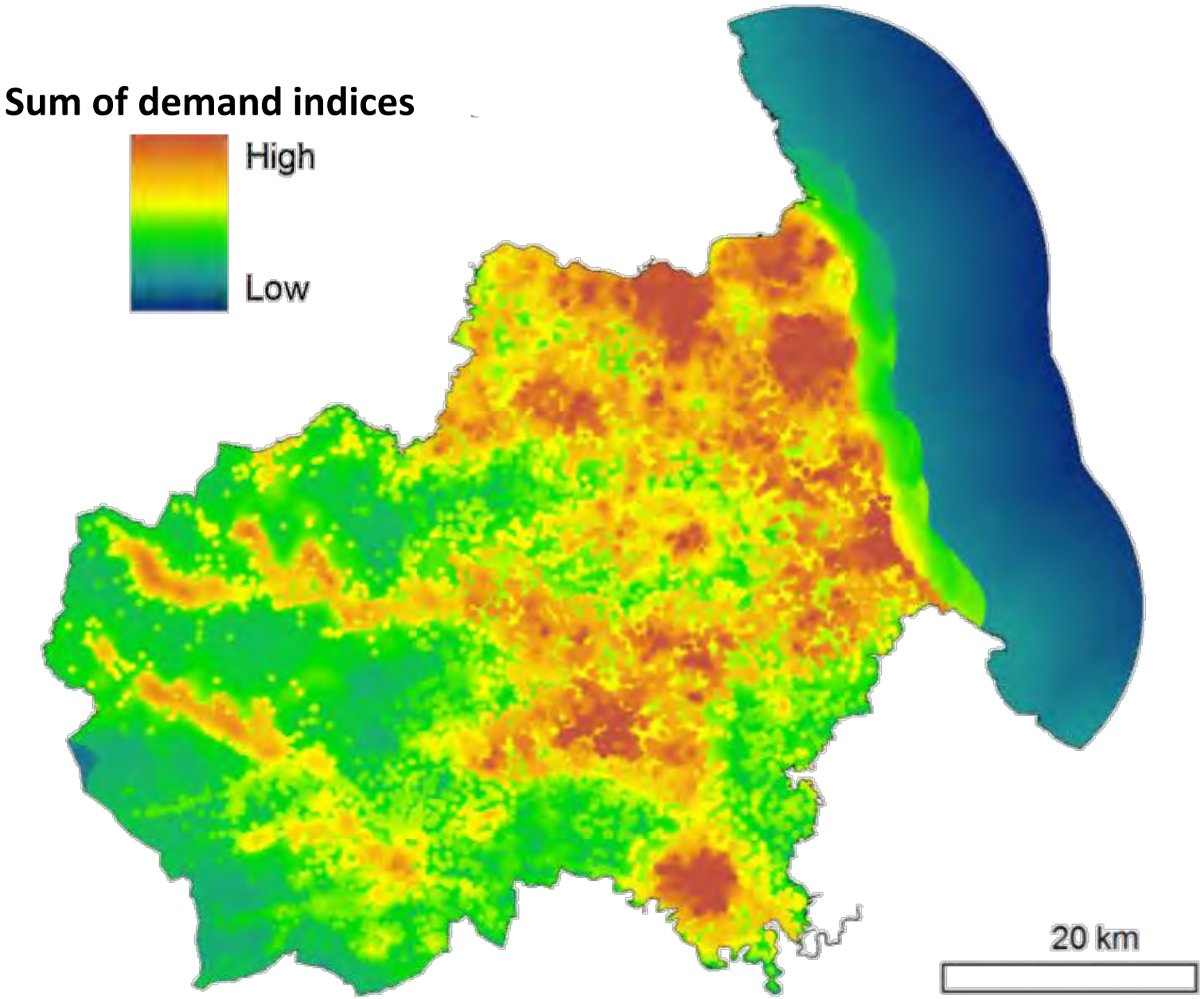
Example: Accessible nature experience

DEMAND INDICES

2) Index of Multiple Deprivation health scores measured at 300 m and 3.2 km



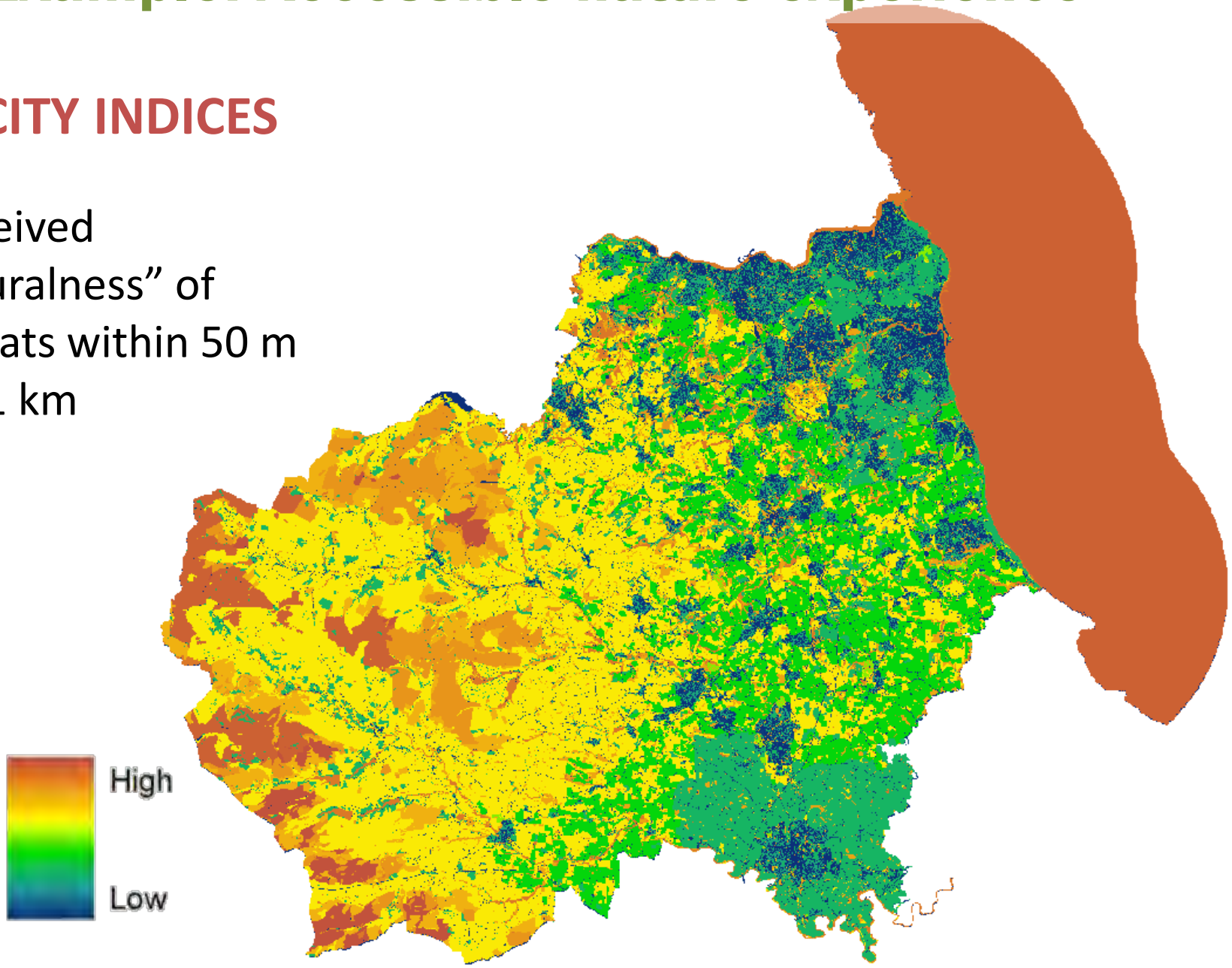
Example: Accessible nature experience



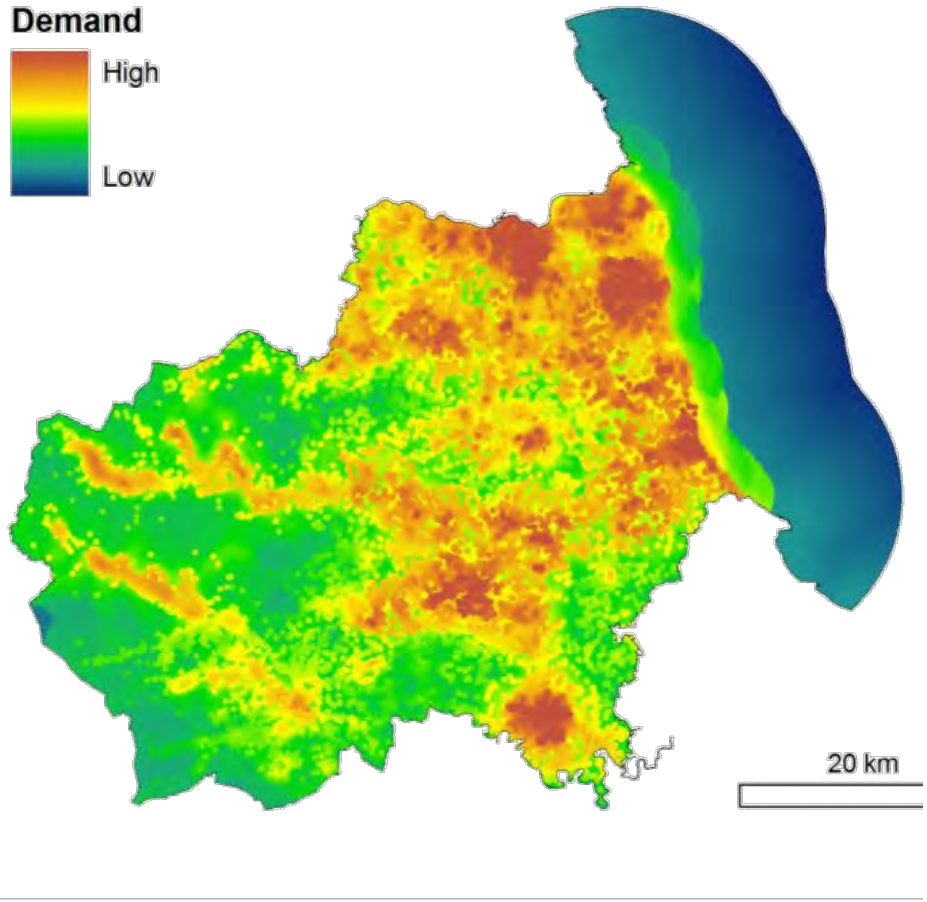
Example: Accessible nature experience

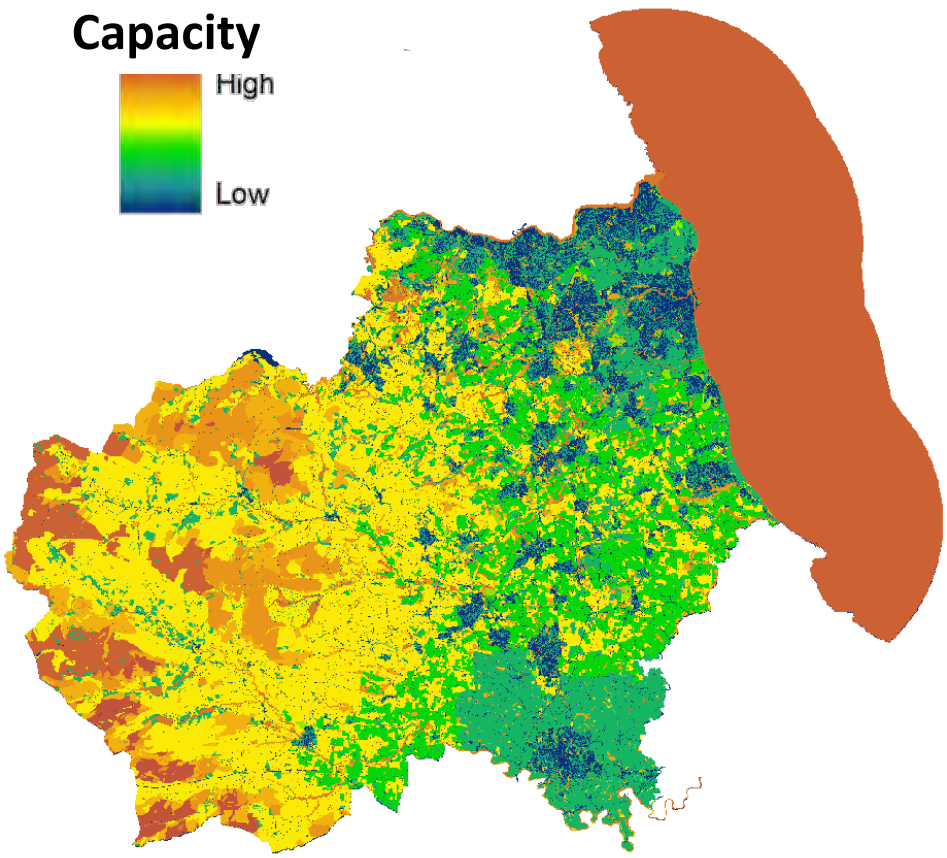
CAPACITY INDICES

1) Perceived "naturalness" of habitats within 50 m and 1 km

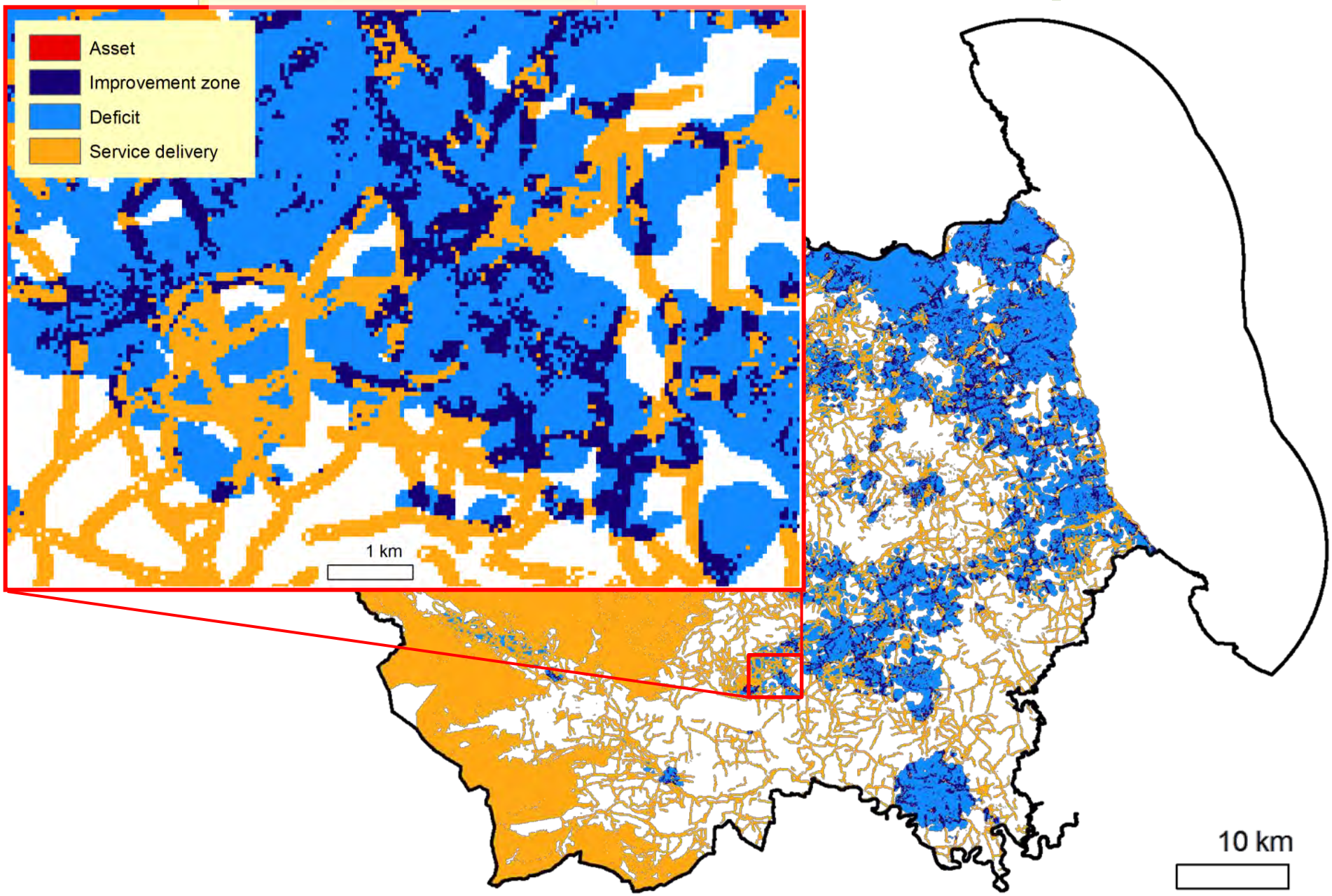


Combine Demand with Capacity to show service flow

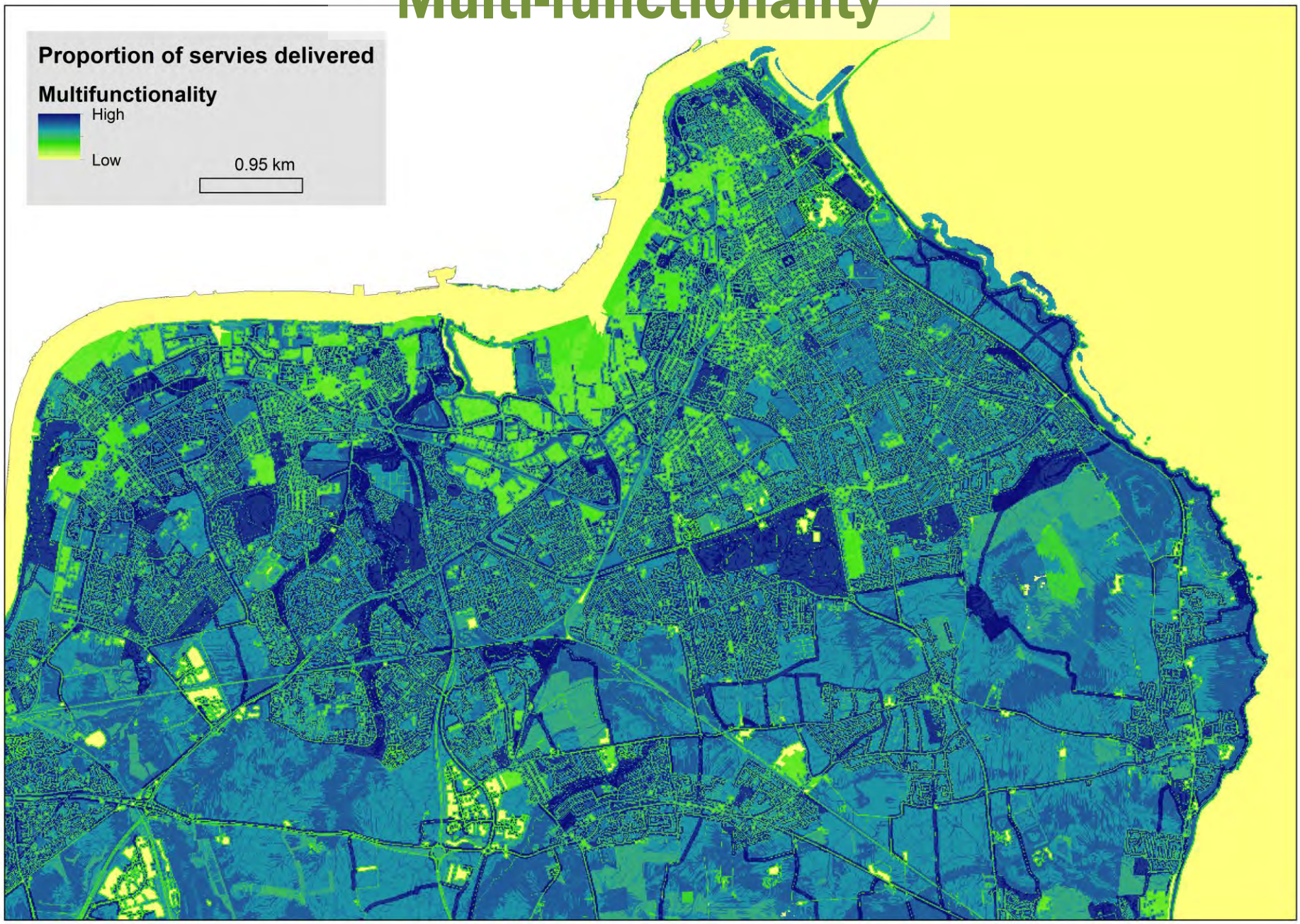




Accessible nature - Derived output



Multi-functionality



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What will EcoServ-GIS be used for, and by who?

Landscape-scale Conservation:

- LNPs
- BAP
- HLF

Toolkit run and used by partnerships of:

- Wildlife Trusts
- Local authorities
- Local record centres

PSMA – allows OS data to be sourced and shared between organisations (Local authorities, Environment Agency etc)

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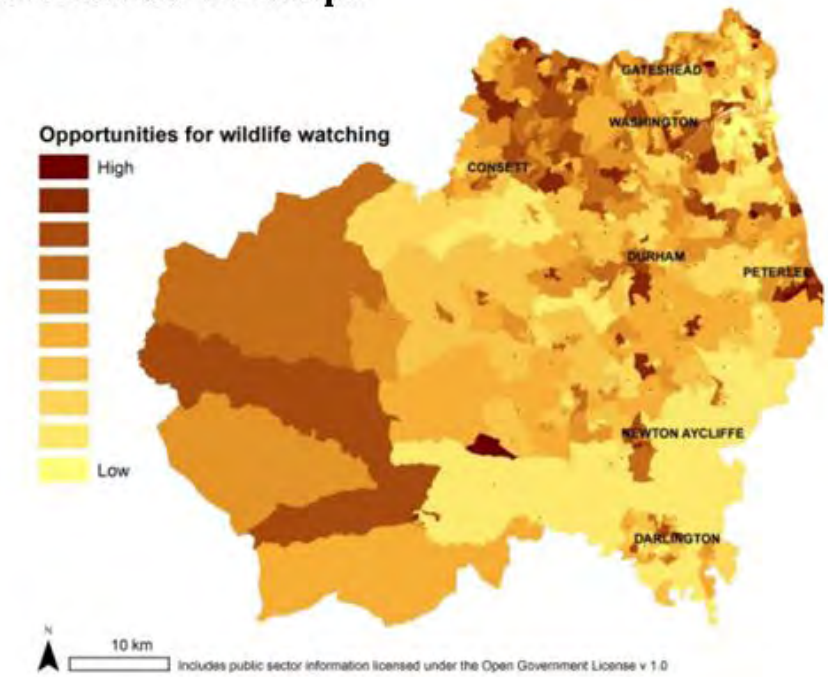
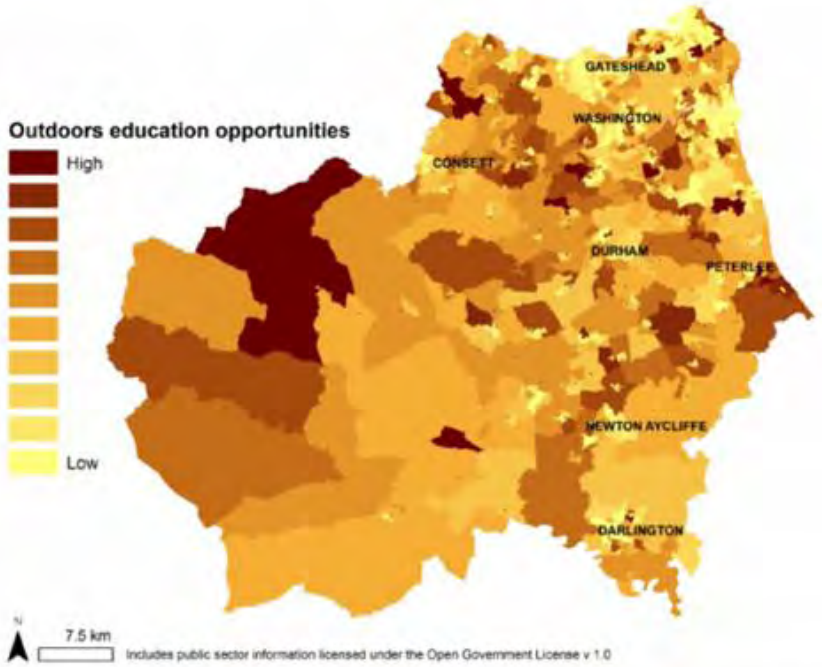
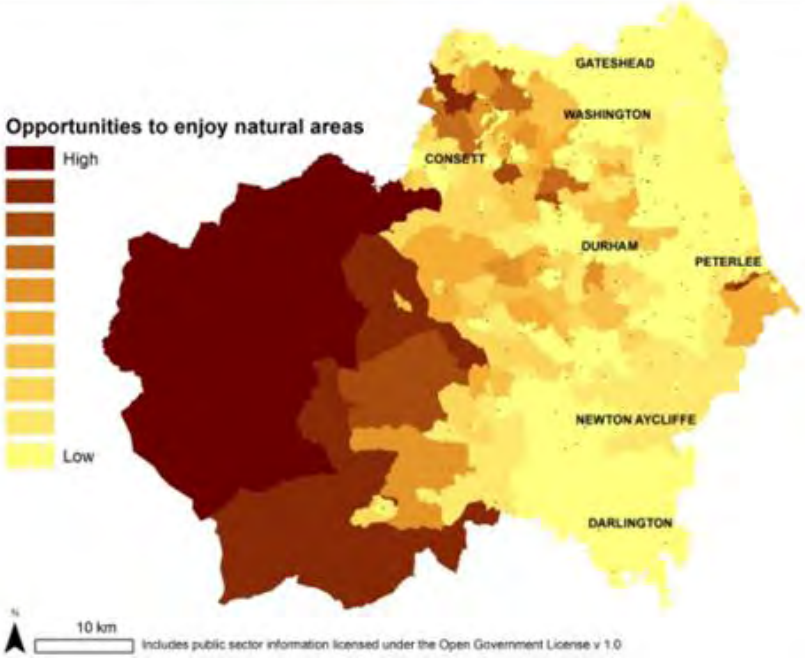
What will EcoServ-GIS be used for?

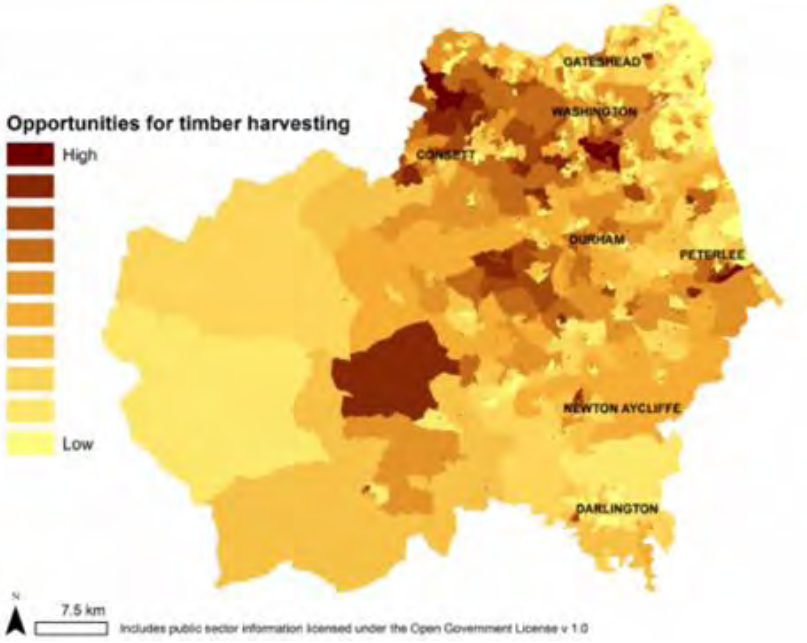
- Shows where there is particular need for certain services
  - E.g. water purification – shows where extra wetlands, reedbeds, woodland would help
  - Accessible nature - shows where is need for more greenspace
- Shows where areas are already performing services well

Example EcoServ-GIS maps









What nature does for you

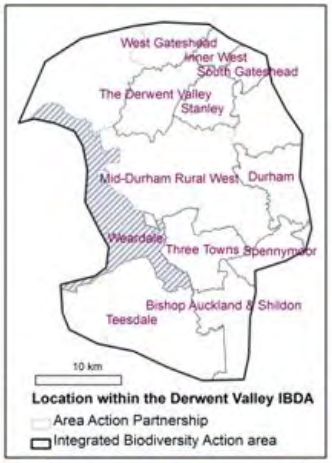
Protecting and enhancing ecosystem services

Weardale's top three:

- ★ Habitats here store a large amount of **carbon**.
- ★ The moorland provides a great opportunity for people to **enjoy natural landscapes**.
- • Woodlands help to **reduce road noise**.

Things to improve:

- ★ More habitats to capture sediment and pollutants in the surface water running off farmland are required to help improve **water quality**.
- • More publically accessible **wildlife watching** areas.
- • More woodland could be planted in areas that are suitable for **timber harvesting**.



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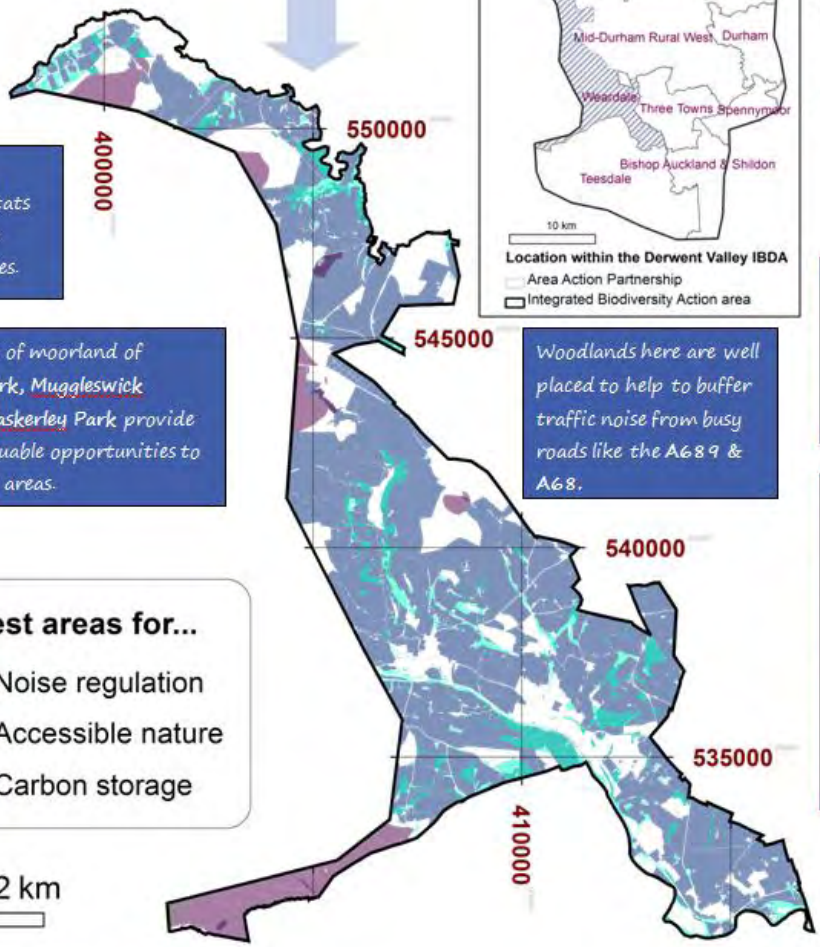


Woodland and moorland habitats are rich carbon storage resources.

The large areas of moorland of **Wolsingham Park, Muggleswick Common, & Waskerley Park** provide people with valuable opportunities to explore natural areas.

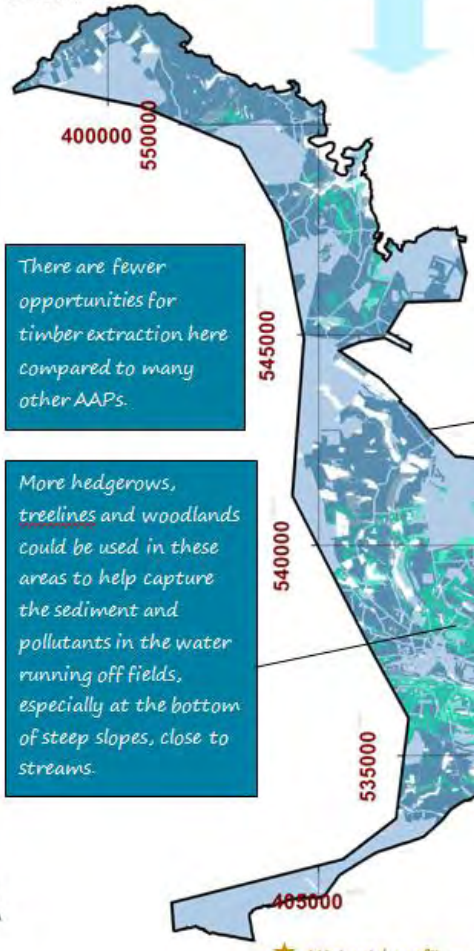
Woodlands here are well placed to help to buffer traffic noise from busy roads like the **A689 & A68**.

The best areas for...

- Noise regulation
- Accessible nature
- Carbon storage

N

2 km



Provide habitats for...

- Purifying runoff water
- Wildlife watching
- Timber provision

N

2 km

There are fewer opportunities for timber extraction here compared to many other AAPs.

More hedgerows, treelines and woodlands could be used in these areas to help capture the sediment and pollutants in the water running off fields, especially at the bottom of steep slopes, close to streams.

These areas would provide good opportunities for members of the public to see wildlife, if public access was improved.

★ Highest benefit or "need to improve" score of all AAPs & NPS

Project ideas for protecting and enhancing nature's benefits

	What can you do?	Ecosystem service								
		Carbon storage	Local climate regulation	Noise regulation	Pollinator habitats	Water purification	Accessible nature	Education & knowledge	Wildlife watching	Timber
Habitat creation	Plant a woodland	✓ Broadleaved woodlands are especially good	✓ Helps to cool dense areas of concrete and buildings	✓ Plant along noisy roads and railways. Coniferous trees provide cover year round.	✓ Plant close to arable land, gardens and allotments to improve habitat for pollinators like bees	✓	✓ Within areas accessible to the public and close to residential areas. People generally perceive areas of ancient and semi-natural woodland to be the most "natural"	✓ In publically accessible areas, close to education facilities	✓ In publically accessible areas,	✓ Areas that extraction machinery can access easily from the road network; outside of protected sites
Habitat creation	Unimproved grasslands	✓	✓		✓	✓	✓	✓ In publically accessible areas	✓ In publically accessible areas,	✗ Removal of woodlands reduces future timber opportunities
Habitat creation	Wetlands	✓ Peat bogs and marshes store a large amount of CO_2	✓			✓	✓ Within areas accessible to the public and close to residential areas.	✓ Within areas accessible to the public and close to residential areas.	✓ Within areas accessible to the public and close to residential areas.	✗ Removal of woodlands reduces future timber opportunities
Community projects in natural areas	Provide / improve access using footpaths or providing public accessibility	✗ Degradation of peatland can release CO_2					✓	✓	✓	✓
Community projects in natural areas	Create nature reserves, allotments or community gardens	✓ These can act as important carbon reserves in urban areas			✓		✓	✓	✓	
Community projects in natural areas	Provide opportunities for environmental volunteering						✓	✓	✓	

Project ideas for protecting and enhancing nature's benefits

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	Unimproved grasslands	✓	✓		✓	✓	✓	✓	✓	✗ noval of woodlands uces future timber portunities
	Wetlands	Peat mar larg CO_2								✗ noval of woodlands uces future timber portunities
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	Provide opportunities for environmental volunteering						✓	✓	✓	

These projects can improve multiple services and improve conditions for wildlife...

BUT...

There will be a trade-off between some services e.g. timber and accessible nature

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Current work

- User Guide to explain how to use the maps
- Working with Partner Wildlife Trusts across England (Somerset, Sussex, Northamptonshire)
- Adding in more mapped services
- Working on planning application scenarios

South Downs National Park Authority

Sussex Biodiversity Record Centre

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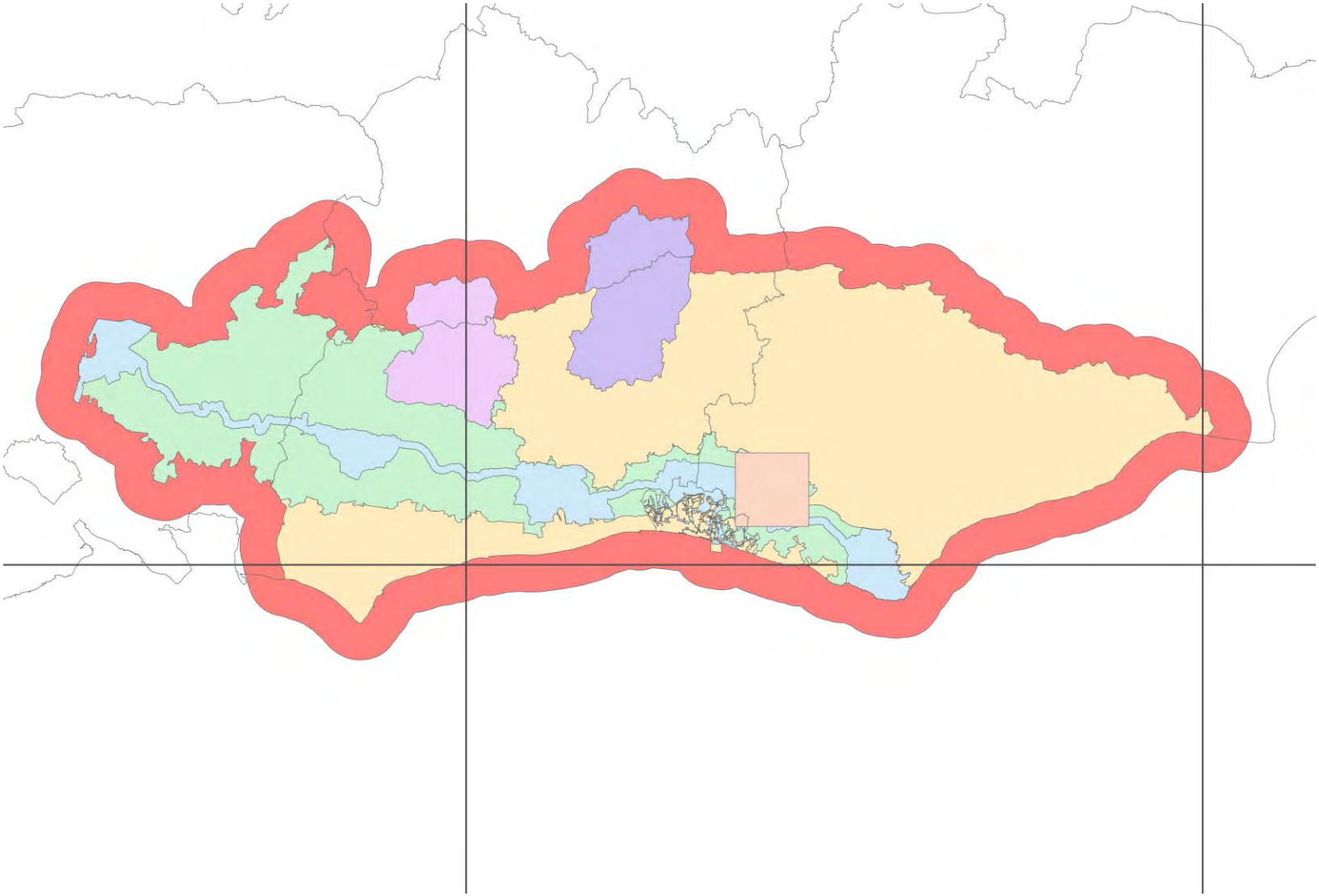
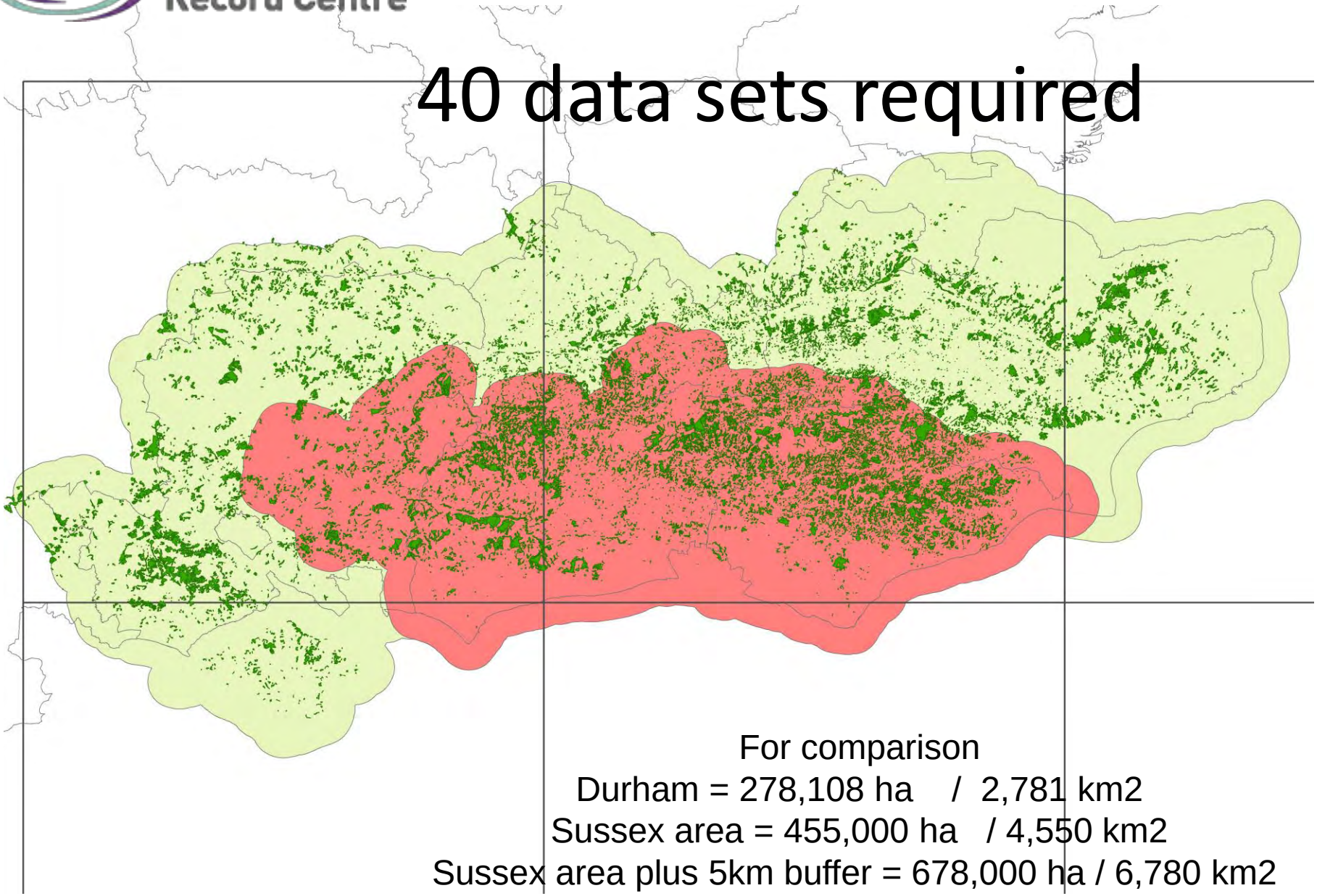
EcoServ-GIS – A Sussex case study

Sussex Biodiversity Record Centre



Sussex Biodiversity Record Centre

40 data sets required



For comparison

Durham = 278,108 ha / 2,781 km2

Sussex area = 455,000 ha / 4,550 km2

Sussex area plus 5km buffer = 678,000 ha / 6,780 km2

National Character Area profile:

125. South Downs

Supporting documents

Introduction & Summary | Description | Opportunities | Key facts and data | Landscape change | Analysis

www.naturalengland.org.uk

NATURAL ENGLAND

Which services? Stage I

- Wildlife watching
- Accessible nature
- Education opportunities
- Carbon storage
- Local climate regulation
- Water purification
- Pollination
- Noise regulation
- Food
- Timber

Which services Stage II (TBC)

- Community cohesion
- Erosion regulation
- Water flow regulation (flood control)
- Aesthetic quality
- Heritage and cultural identity

- Food provision
- Timber Provision
- Water availability
- Biomass energy
- Climate regulation
- Regulating water quality
- Regulating water flow
- Regulating coastal flooding and erosion
- Regulating soil quality
- Regulating soil erosion
- Pollination
- Pest regulation
- A sense of place/inspiration
- Sense of History
- Tranquillity
- Recreation
- Biodiversity
- Geodiversity