

Climate change, tourism and landscape impacts: A regional analysis

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MANCHESTER
1824

The University of Manchester

Contents

- Background/context
- CCVE Project
- Landscape capacity analysis
 - Impacts of visitors on the landscape
 - Impacts of climate change on landscape
 - Socio-economic impacts on landscape
 - Preliminary conclusions
- Integration into policy response

Landscape – a tourism resource

- Landscape is a zone or area as perceived by local people or visitors, whose visual features and character are the result of the action of natural and/or cultural factors
- The landscape has an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation

(European Landscape Convention)



Impacts of tourism on landscape

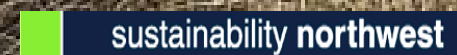
- The continual increase of the tourism industry has prompted discussion of adverse impacts on the natural environment
- Visitor impacts include air pollution and congestion, overburdened infrastructure, disturbance of wildfire, visitor crowding and erosion of footpaths
- Areas freely open to public access are particularly susceptible to pressure e.g. National Parks and open countryside



Impacts of climate change on landscape

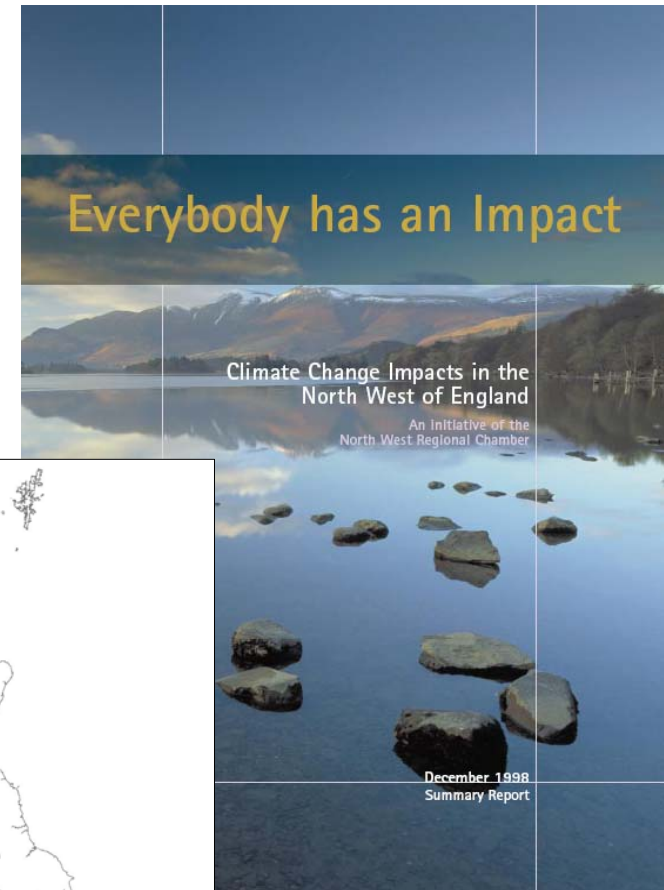
- Landscape is also vulnerable to direct impacts of climate change
- The extent that climate change will impact on landscape will vary depending on the degree of change and the response of natural components to change
- Socio-economic changes such as differing policies and development structures will impact on both the degree of climate change and the landscape directly

The Climate Change and the Visitor Economy Project



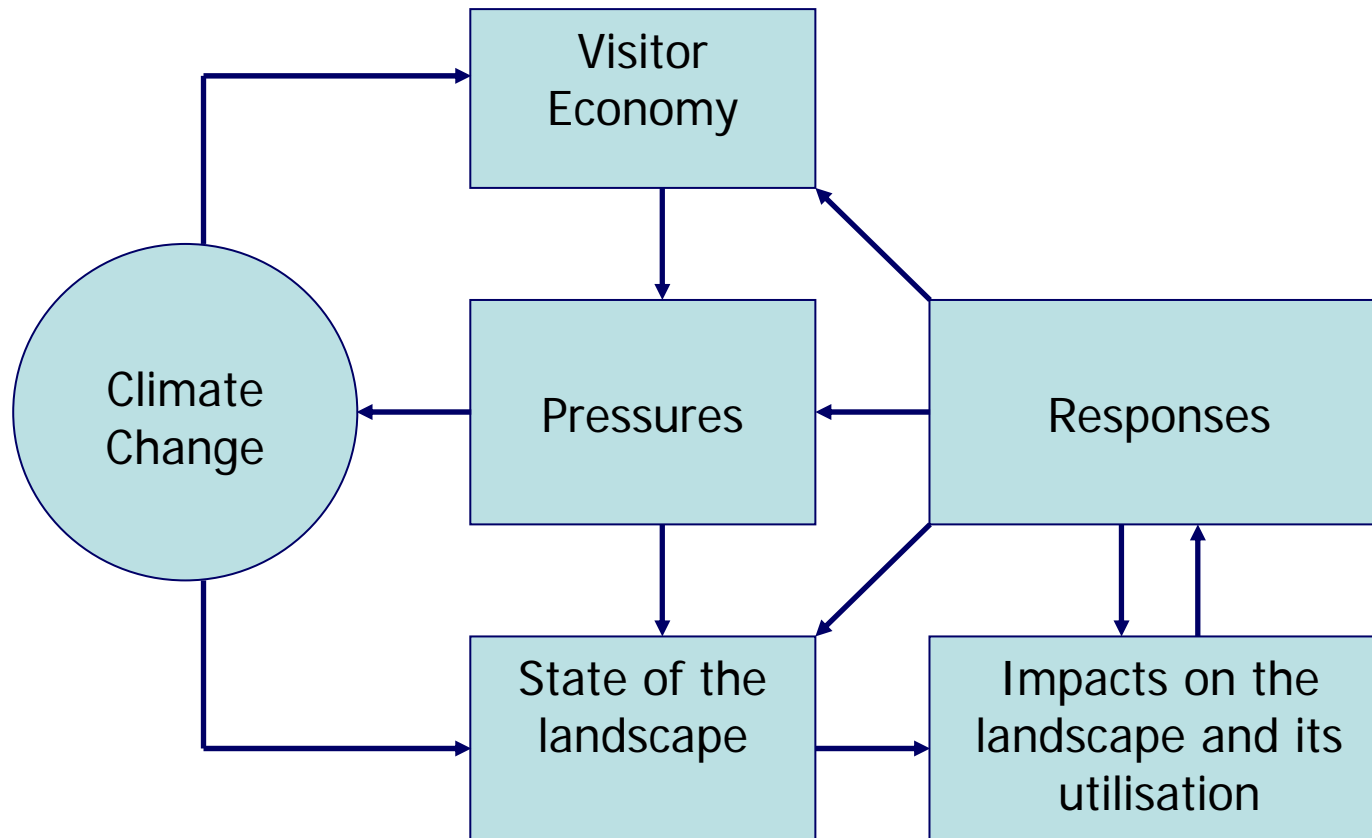
The Regional Climate Change Scoping Study

“there are potential benefits resulting from climate change in some economic sectors, especially tourism and recreation, but we can be less certain about the scale of such benefits and they are unlikely to be distributed evenly across the sector”

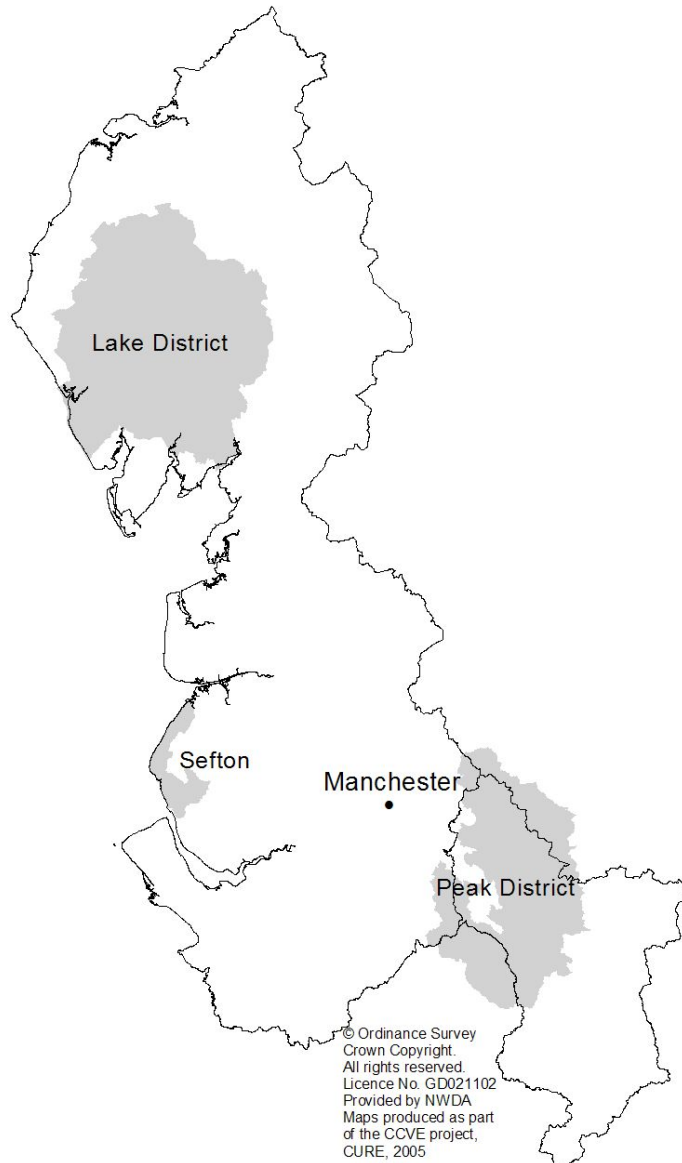


North West
NUTS 1
Area: 14,165km²

CCVE Research Framework



The case study landscapes



1. Integrity of the Sefton Dune System
2. Moorland wildfires in the Peak District
3. Footpath erosion in the Lake District
4. Public Spaces in Manchester city centre



CCVE Conclusions

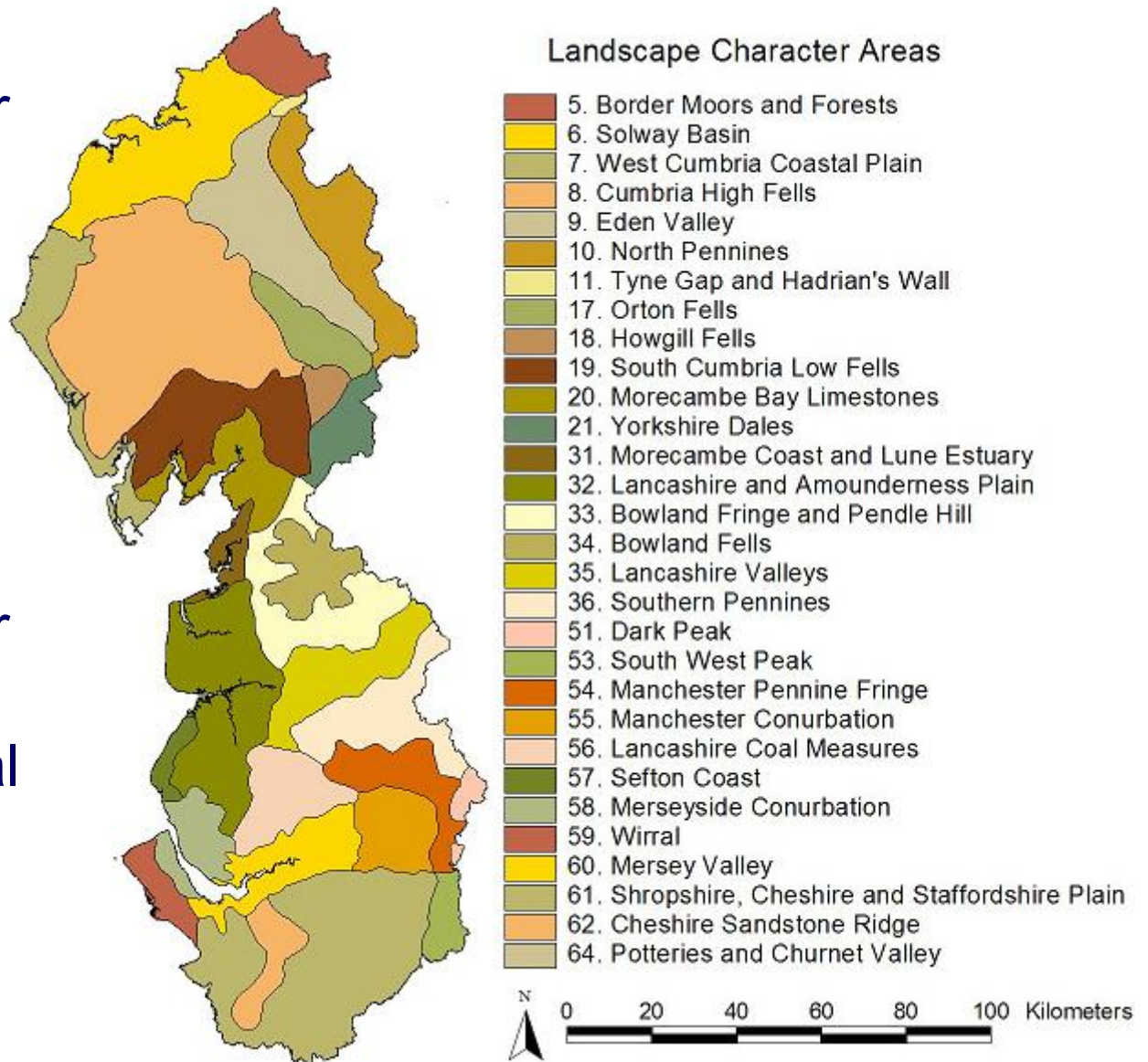
- Climate change will not automatically boost the visitor economy of the UK through stimulating a growth in visitors
- Development of adaptation strategies important to sustain the quality of landscapes
- Key recommendation was to use landscape character areas as a basis for assessing sensitivity at the regional and landscape scales, in order to scope out climate change impacts



Landscape character areas

Landscape character is a distinct and recognisable pattern of elements that occur consistently in a landscape

Landscape character areas are the discrete geographical areas of a particular landscape type



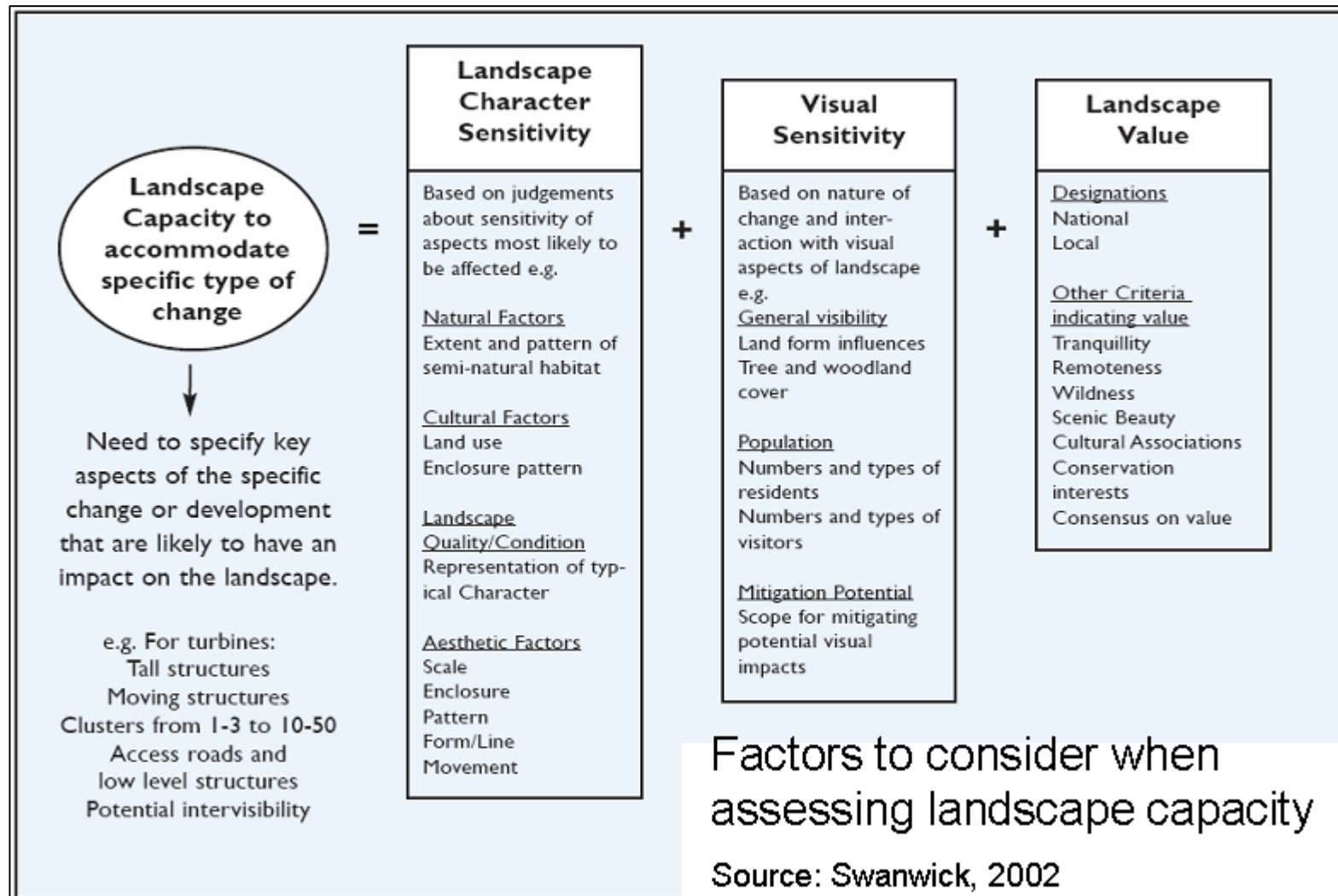
Follow-on Aims

- 1. To explore current visitor capacity through the framework of landscape capacity analysis*
- 2. To explore future impacts of climate change and socio-economic scenarios on visitor capacity (ongoing research)*

Methodological Approach

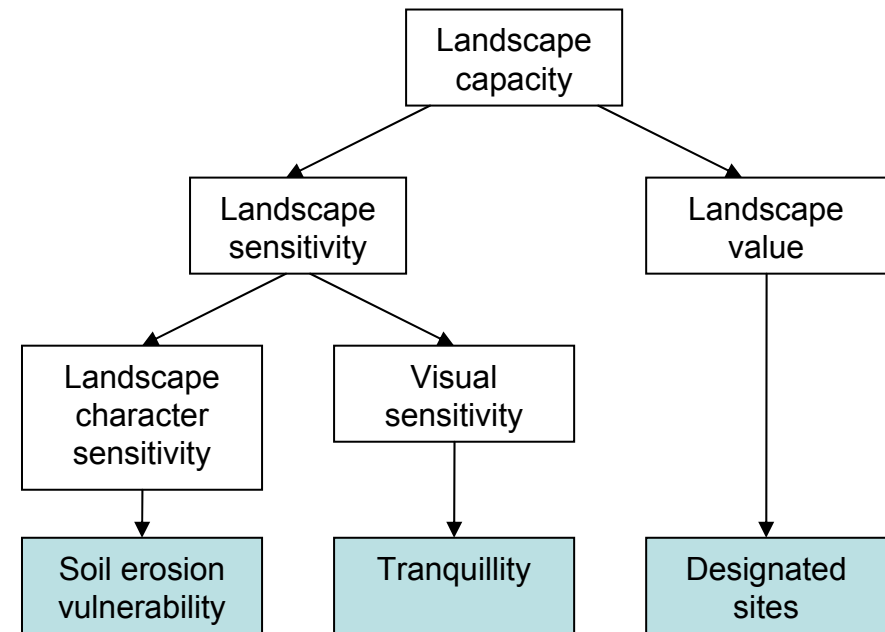
- Landscape capacity analysis is used as a framework for assessing visitor capacity
- Landscape capacity is the ability of a landscape to accommodate different amounts of change or development of a specific type which reflects:
 - The inherent sensitivity of the landscape (both the sensitivity of the landscape resource and its visual sensitivity)
 - The value attached to the landscape
- Thus it is the ability of a landscape to accommodate visitors that is of interest

Methodology for Landscape capacity analysis



Analytical Process

- Spatial analysis using GIS
- Concerned with ability to accommodate use by walkers
- Indices used to represent factors in landscape capacity that relate to use by walkers
- Indices combined using matrices and classified into 5 classes of vulnerability from very low to very high



Soil erosion vulnerability

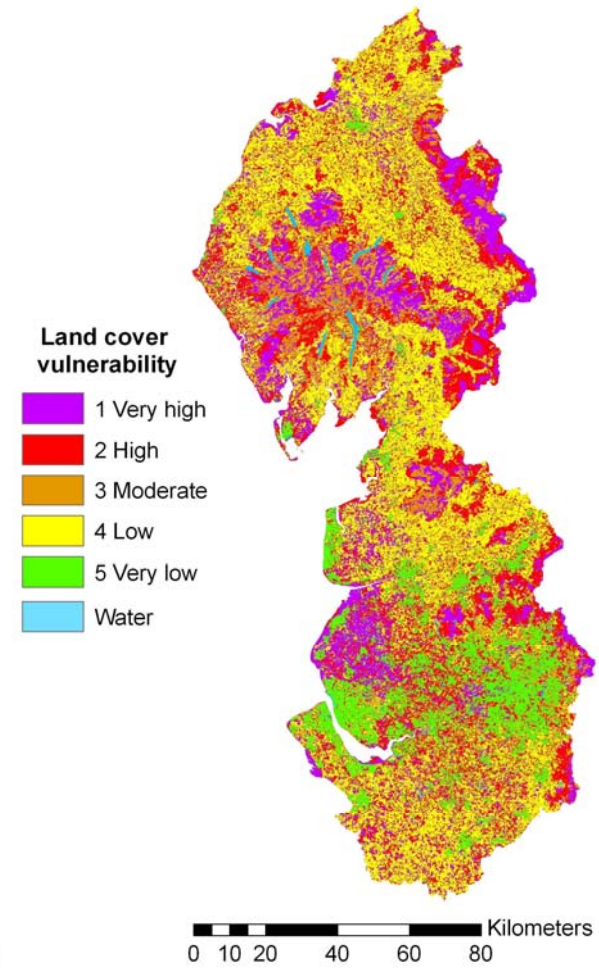
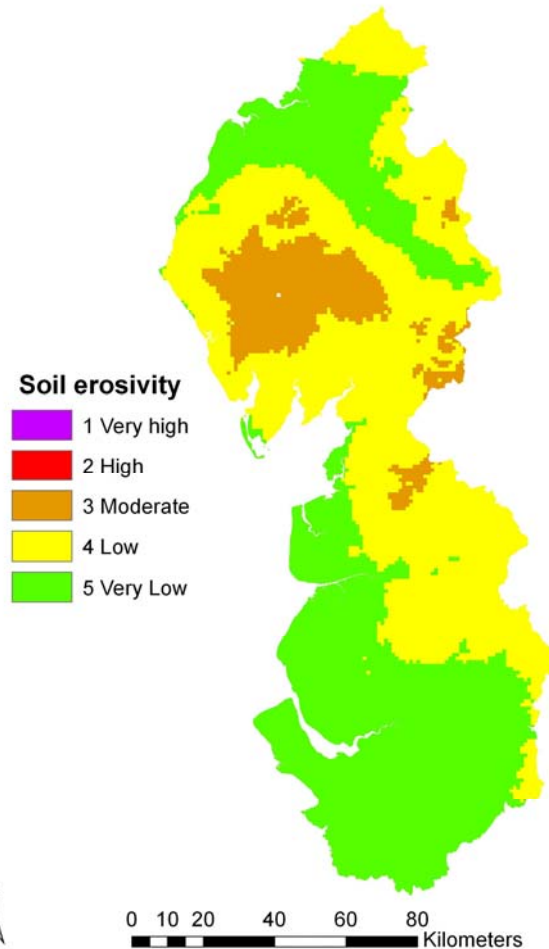
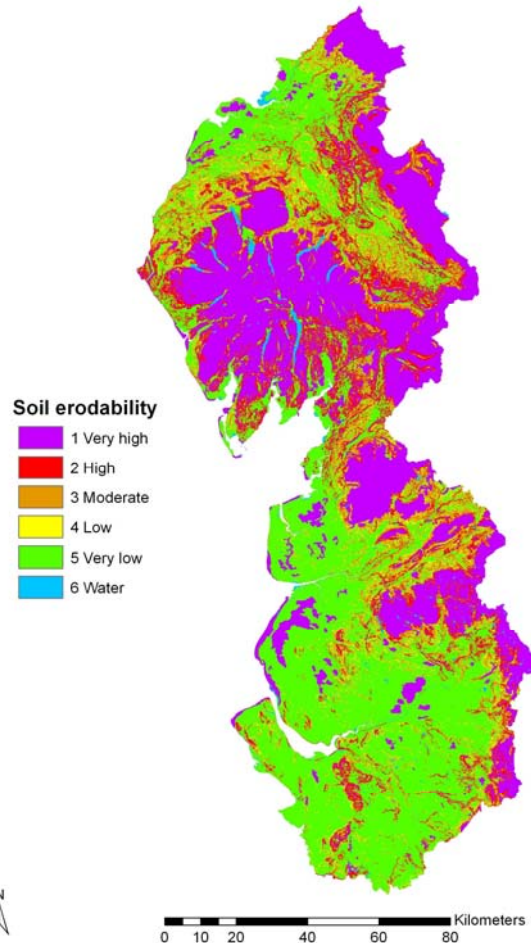
Soil erodability
(slope + soil texture)



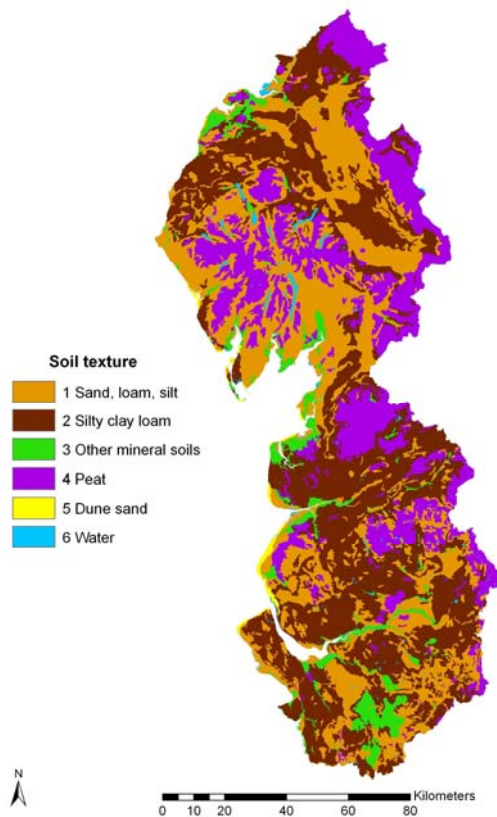
Soil erosivity
(Fournier +
Bagnouls-Gaussen)



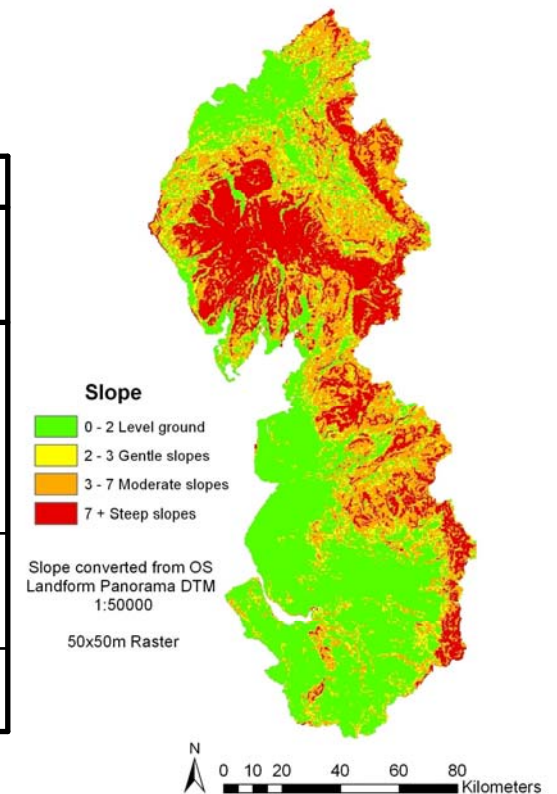
Land cover
vulnerability



Soil erodability



Slope class Soil Texture class		4	3	2	1
		Steep slopes >7°	Moderate slopes 3-7°	Gentle slopes 2-3°	Level ground <2°
1	Sand Loamy sand Sandy loam Sandy silt loam Silt loam	Very High (High)*	High (Moderate)*	Moderate (Low)*	Very low
2	Silty clay loam	High (Moderate)*	Moderate	Low	Very low
3	Other mineral soils	Low	Very low	Very low	Very low



Soil erosivity

$$MFI = \frac{1}{P} \sum_{i=1}^{12} P_i^2$$

$$\sum_{i=1}^{12} P_i^2 / P$$

$$i = 1 \text{ (Arnoldus, 1980: 130)}$$

Where:

MFI = Modified Fournier Index

P_i = monthly rainfall

P = annual rainfall

$$BGI = \frac{1}{12} \sum_{i=1}^{12} (2t_i - P_i) \cdot k_i$$

$$\sum_{i=1}^{12} (2t_i - P_i) \cdot k_i$$

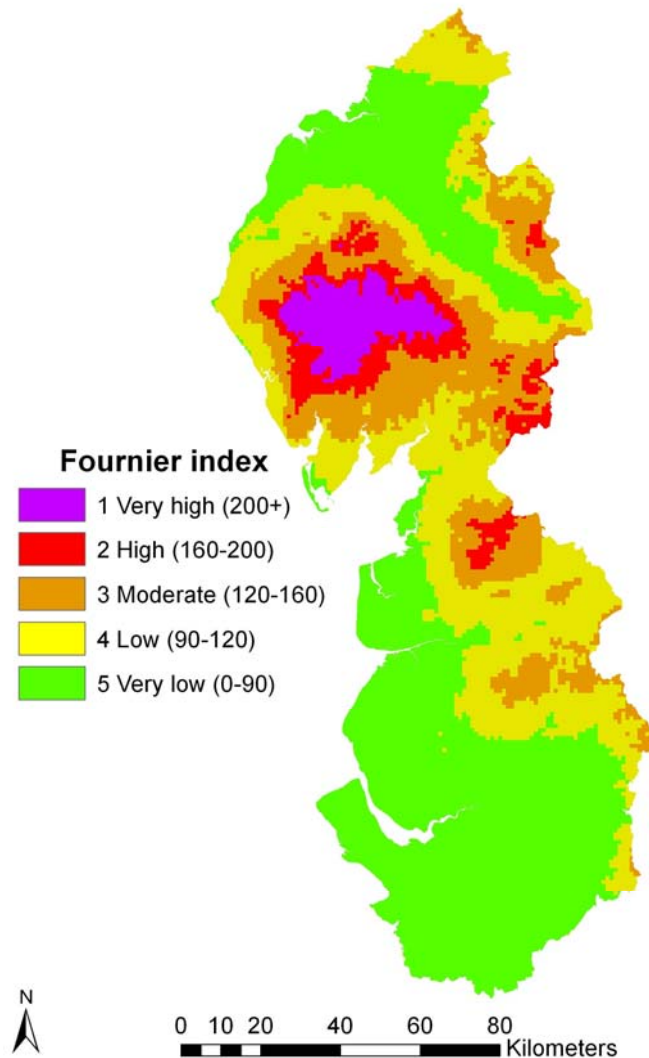
$$i = 1$$

Where:

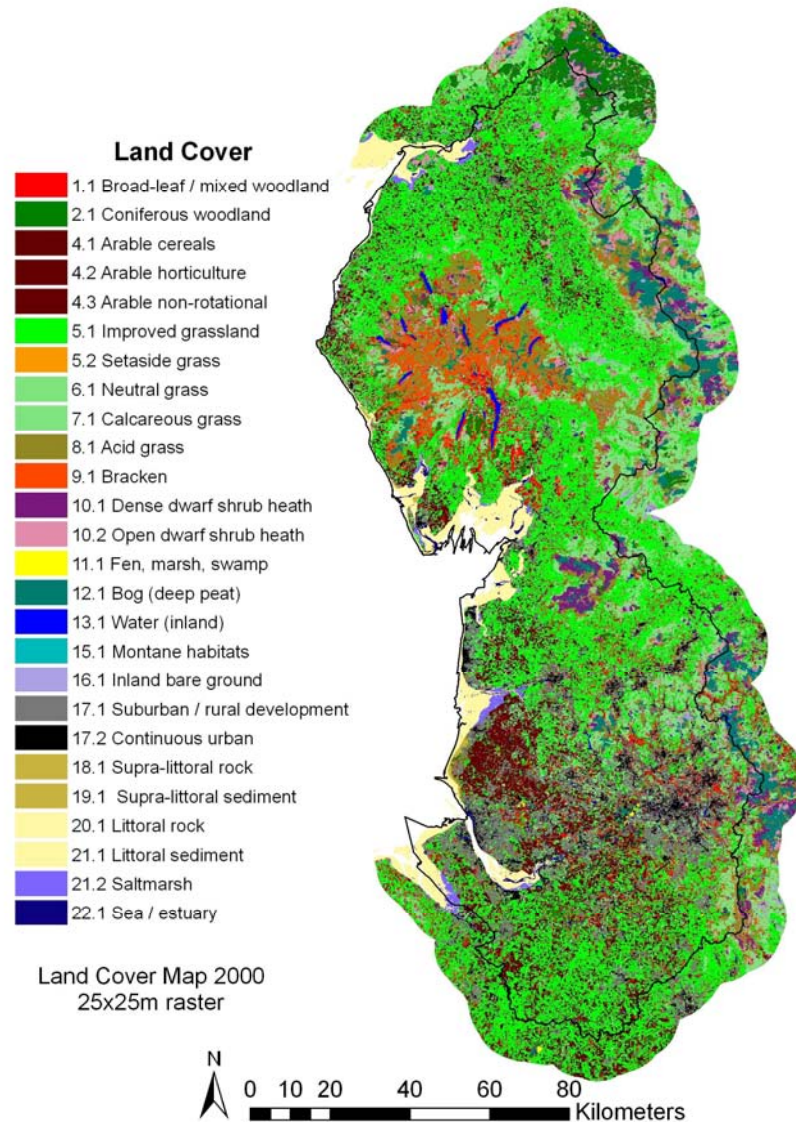
t_i = the mean temperature for month i

P_i = the total precipitation for month i

k_i = the proportion of the month during which $2t_i - P_i > 0$



Land cover vulnerability



Vulnerability class	Land cover types
1 Very high	Arable horticulture; acid grass; fen, marsh, swamp; bog (deep peat); montane habitats; inland bare ground; supra-littoral sediment; saltmarsh
2 High	Arable cereals; arable non-rotational; neutral grass; calcareous grass; open dwarf shrub heath; littoral sediment
3 Moderate	Broad-leaf / mixed woodland; bracken; dense dwarf shrub heath; supra-littoral rock; littoral rock
4 Low	Coniferous woodland; improved grassland; setaside grass
5 Very low	Suburban / rural development; continuous urban

Landscape capacity

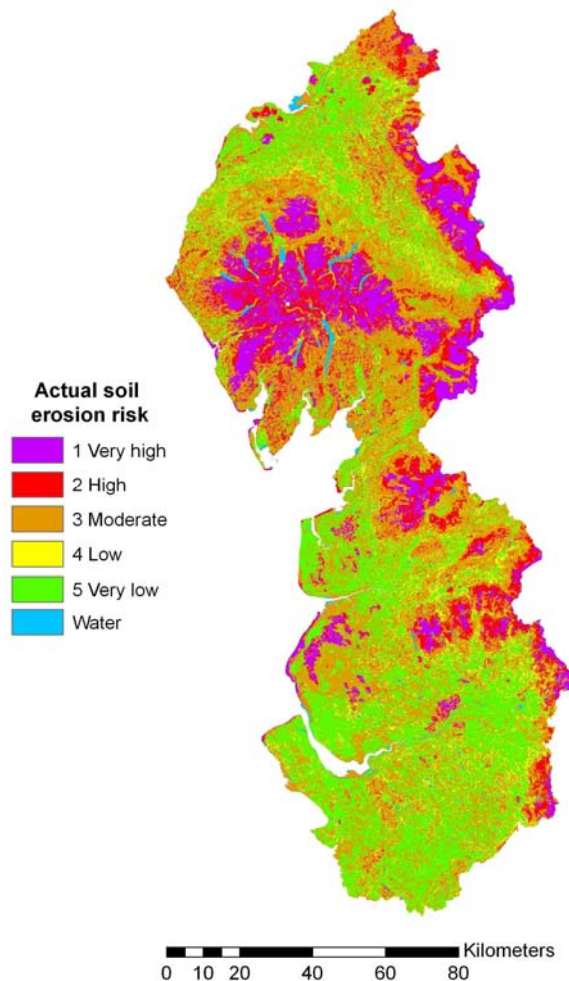
Landscape
character sensitivity



Visual sensitivity

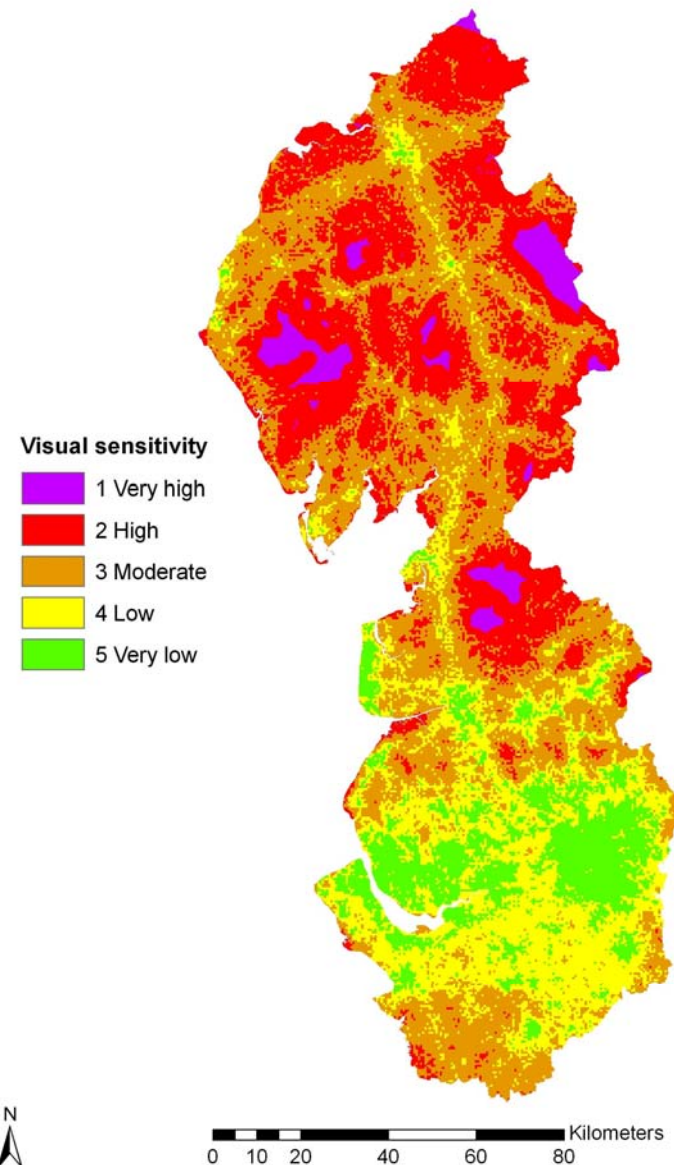


Landscape value



Visual sensitivity

- Visual sensitivity is the general visibility, or presence and size of populations
- Landform, land cover and tree cover/pattern are important elements of visual sensitivity
- CPRE tranquil areas capture the experience of visitors to the countryside



Landscape value

Landscape designations



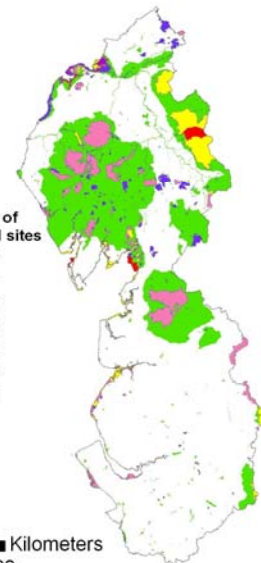
World Heritage Sites



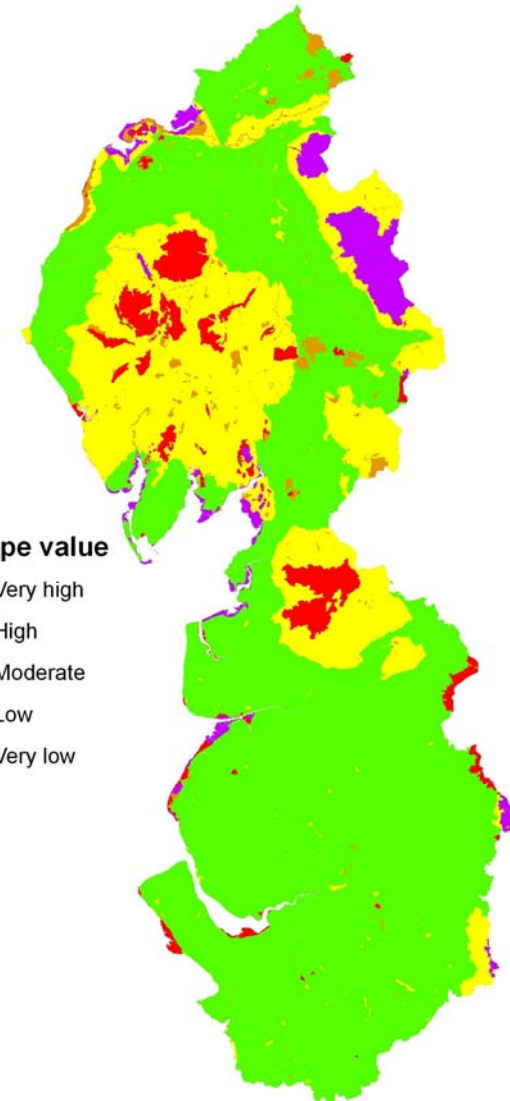
Wildlife designations



Number of designated sites



Landscape value



Landscape capacity

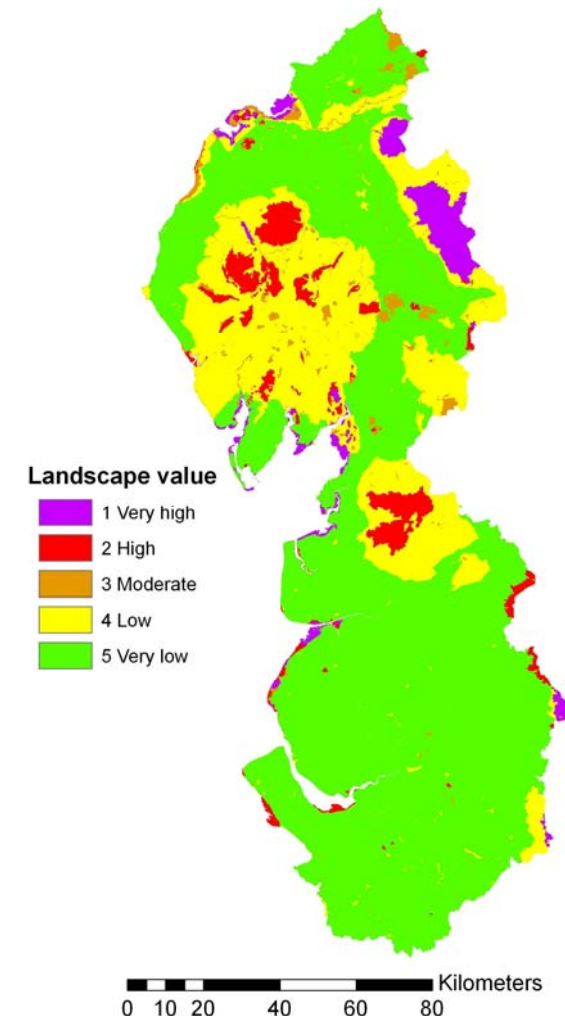
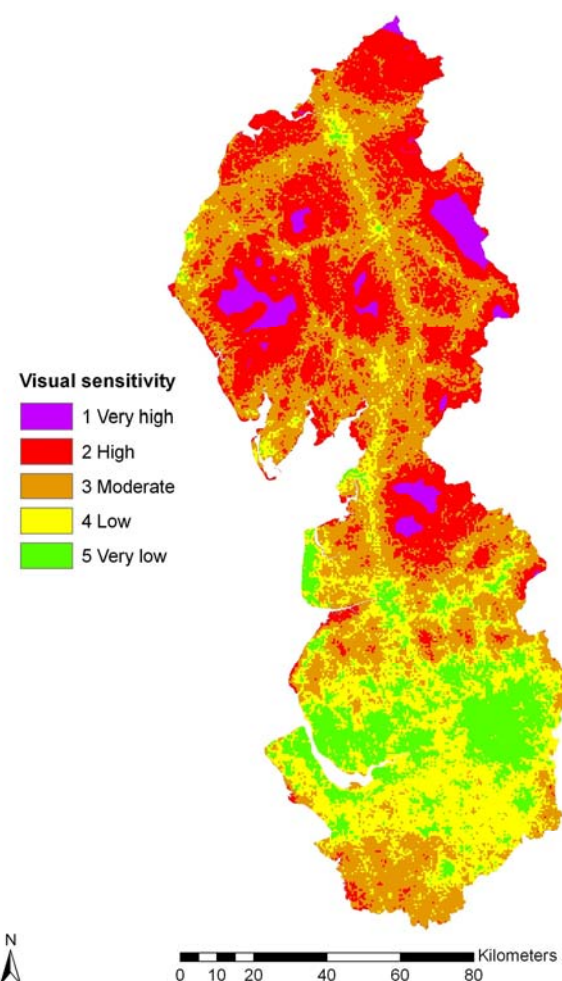
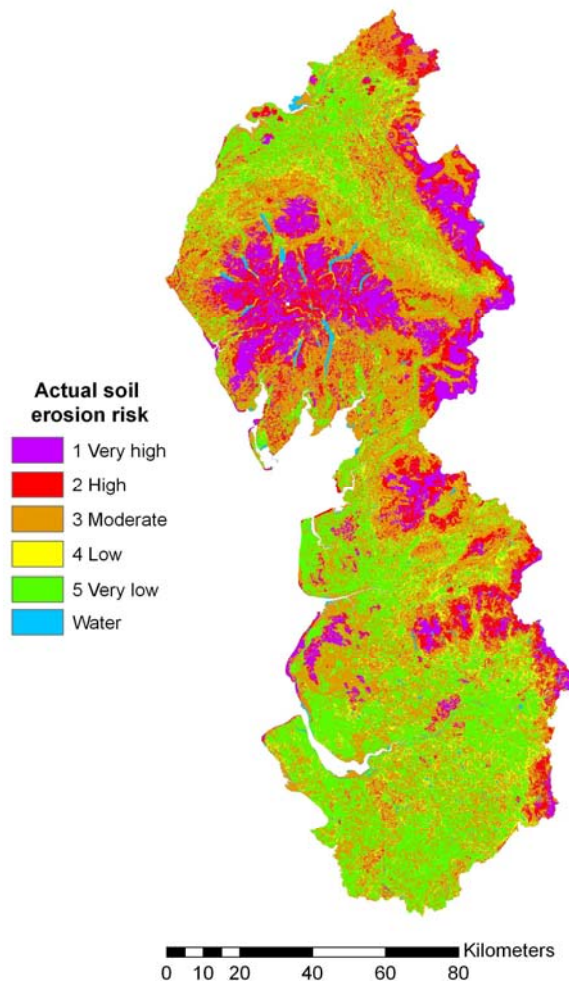
Landscape
character sensitivity



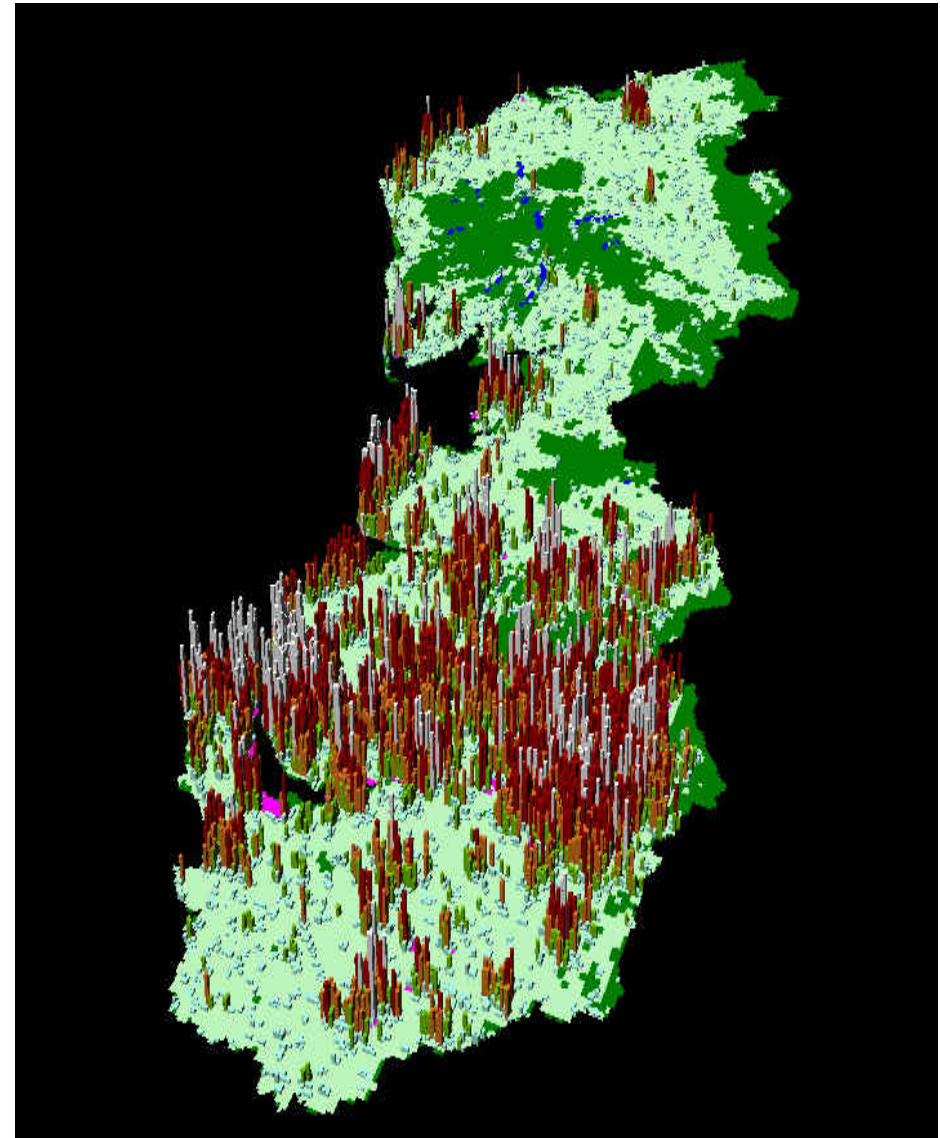
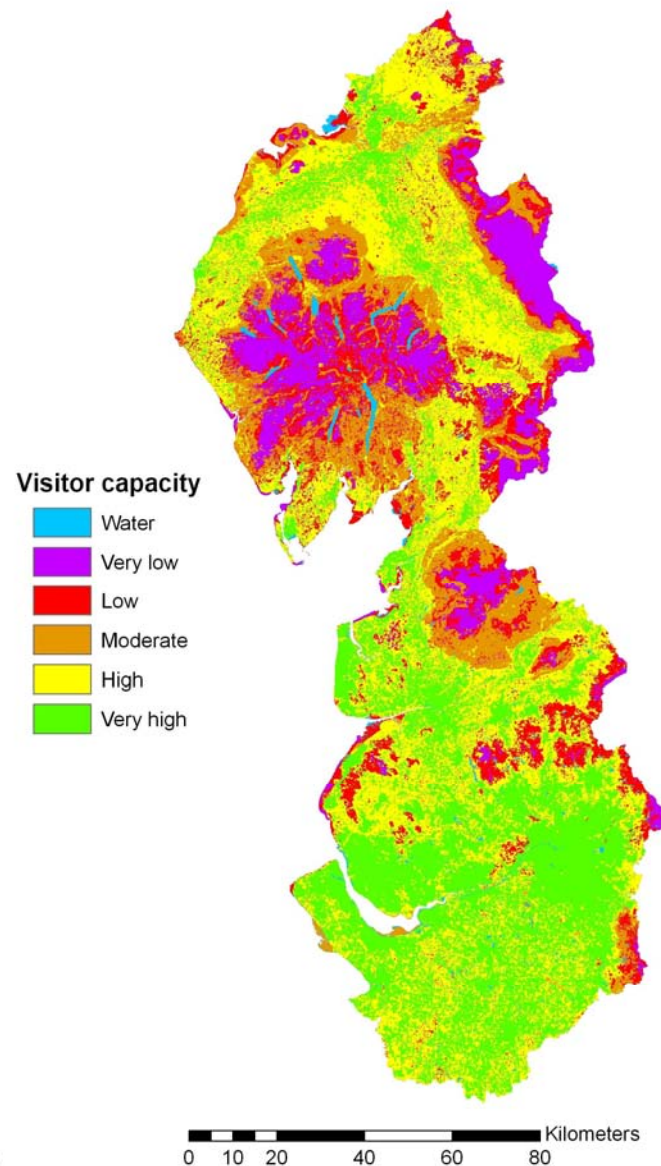
Visual sensitivity



Landscape value



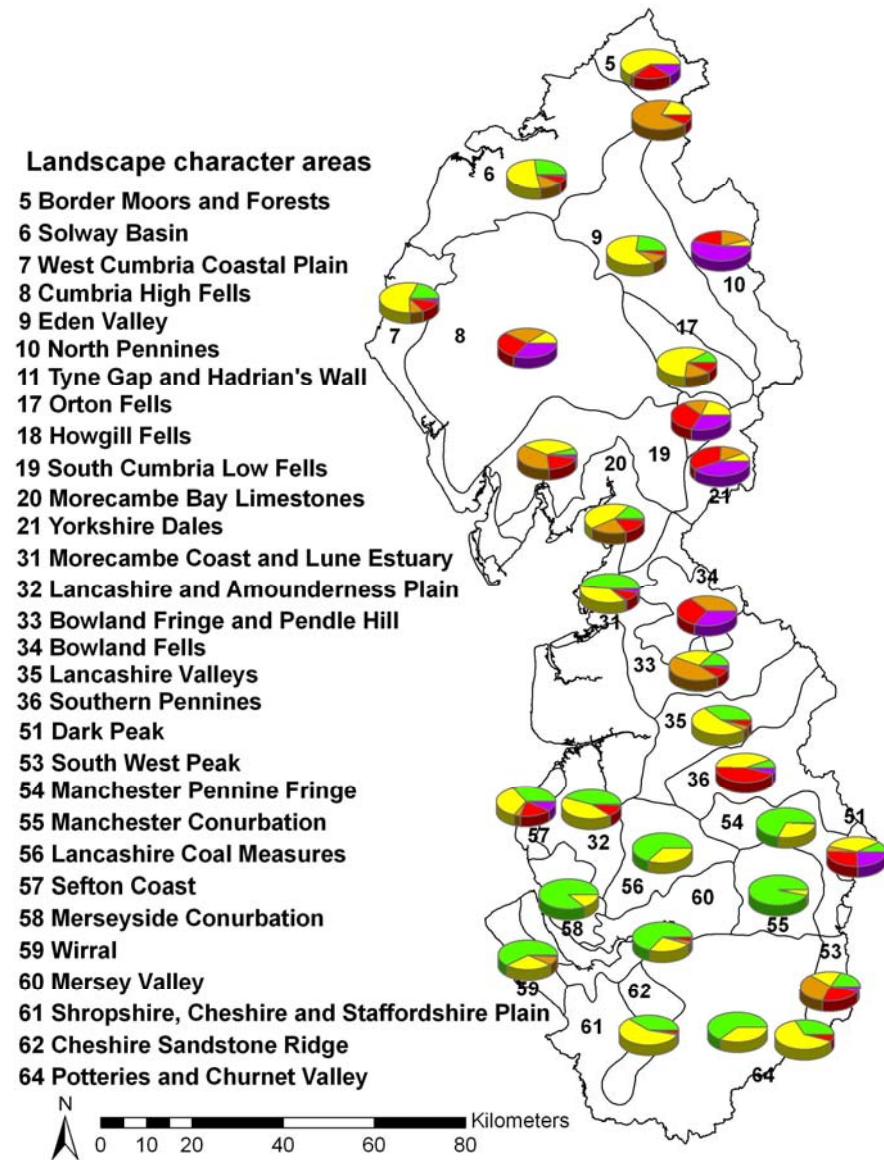
Landscape capacity



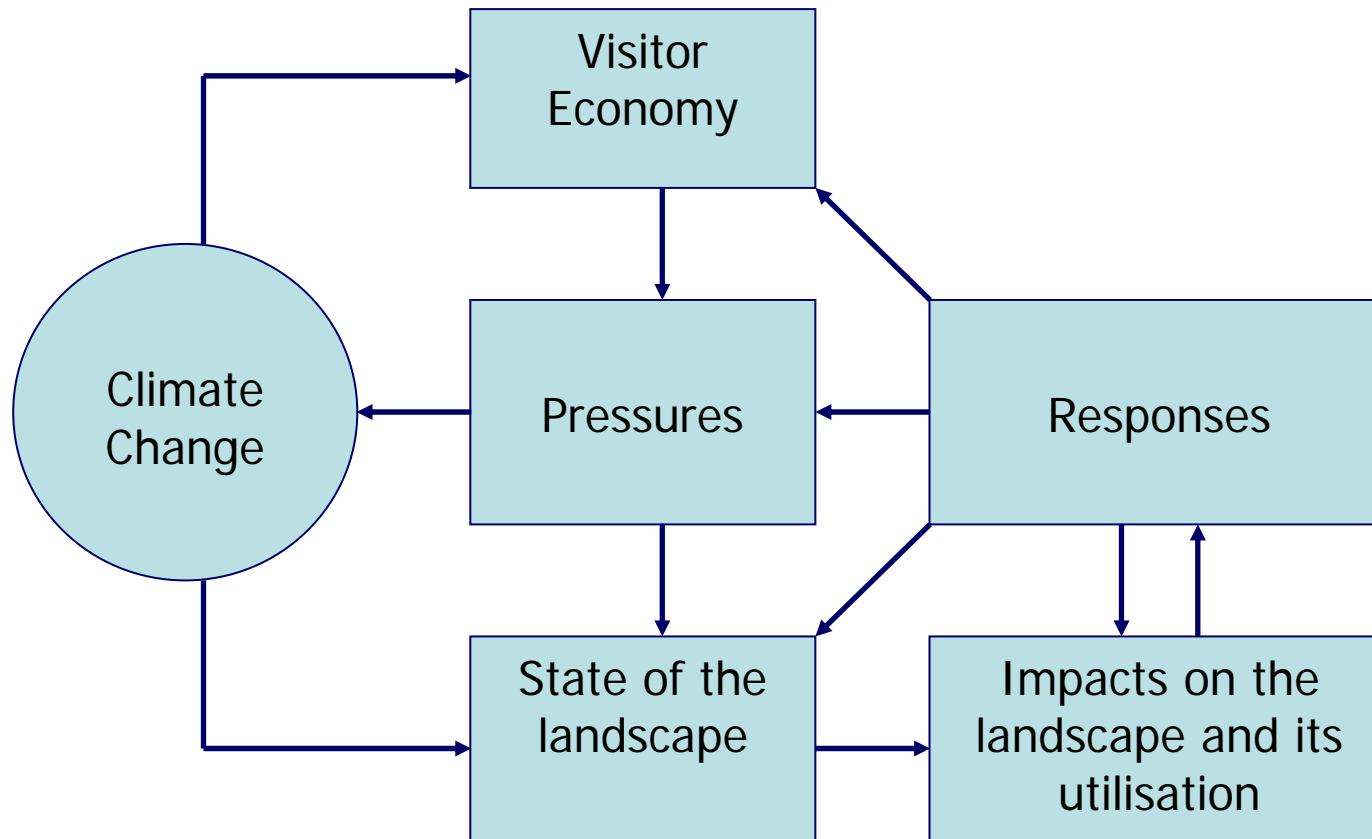
Capacity of landscape character areas

- Some landscape character areas are particularly sensitive to visitor use

e.g. North Pennines (10), which has high landscape sensitivity, high visual sensitivity and is a high value landscape



Impacts of climate change on landscape



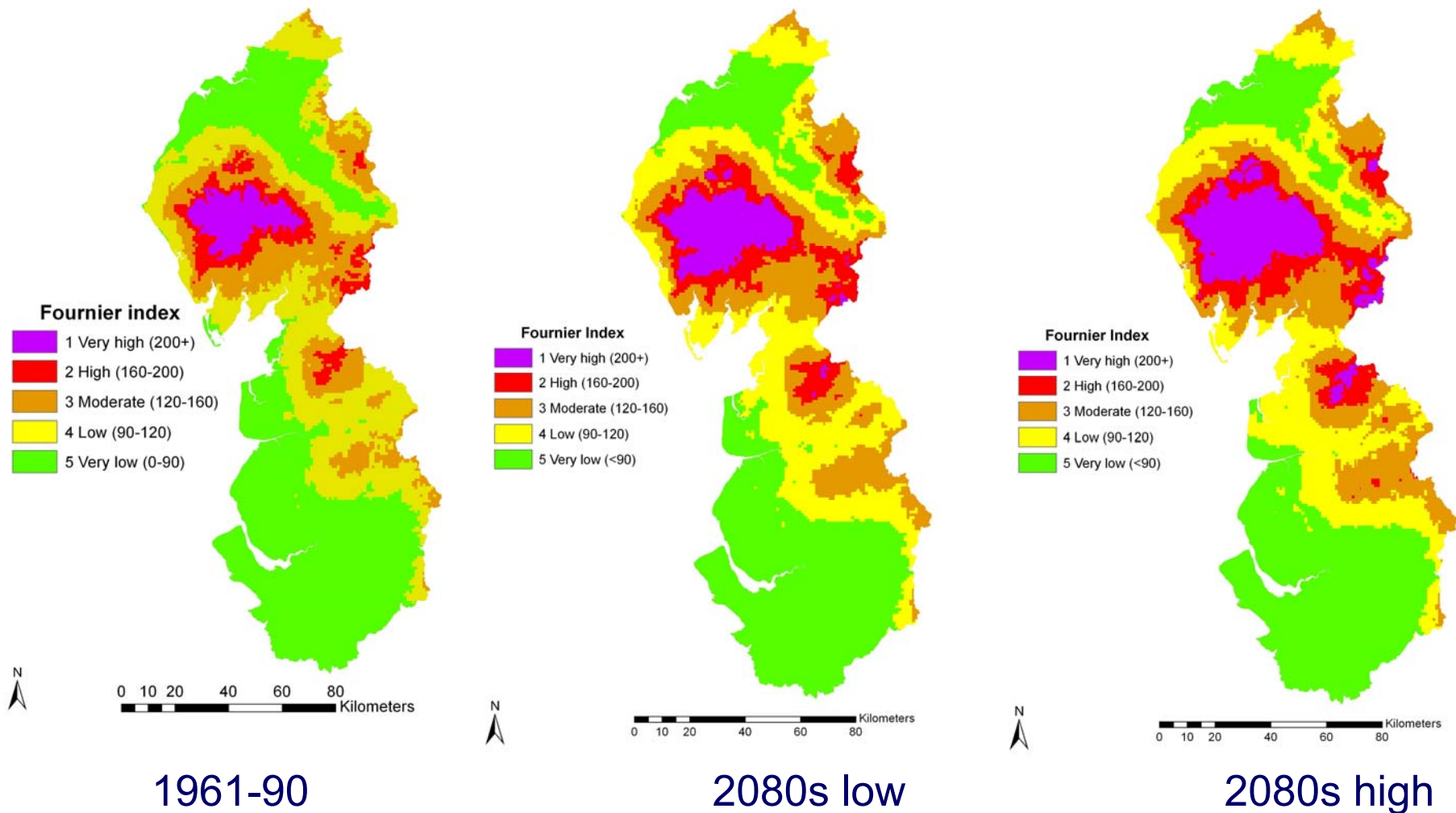
Impacts of climate change on landscape

Climate change is likely to affect components of the landscape, for example:

- Natural environment
 - Sea level rise will displace ecosystems, alter sediment dynamics and increase the vulnerability of social infrastructure
 - Changes in temperature and rainfall will affect habitat and species composition by changing the available climate space for species
 - Higher temperatures and lower rainfall in summer will increase wildfire risk
- Land use
 - Warmer average temperatures and a longer growing season is likely to change crop patterns and land cover, affecting land cover vulnerability and therefore, soil erosion risk
- Cultural heritage
 - Old buildings, archaeological sites, and historic parks and gardens will be at increased risk due to flooding, coastal erosion, subsidence and increased storminess

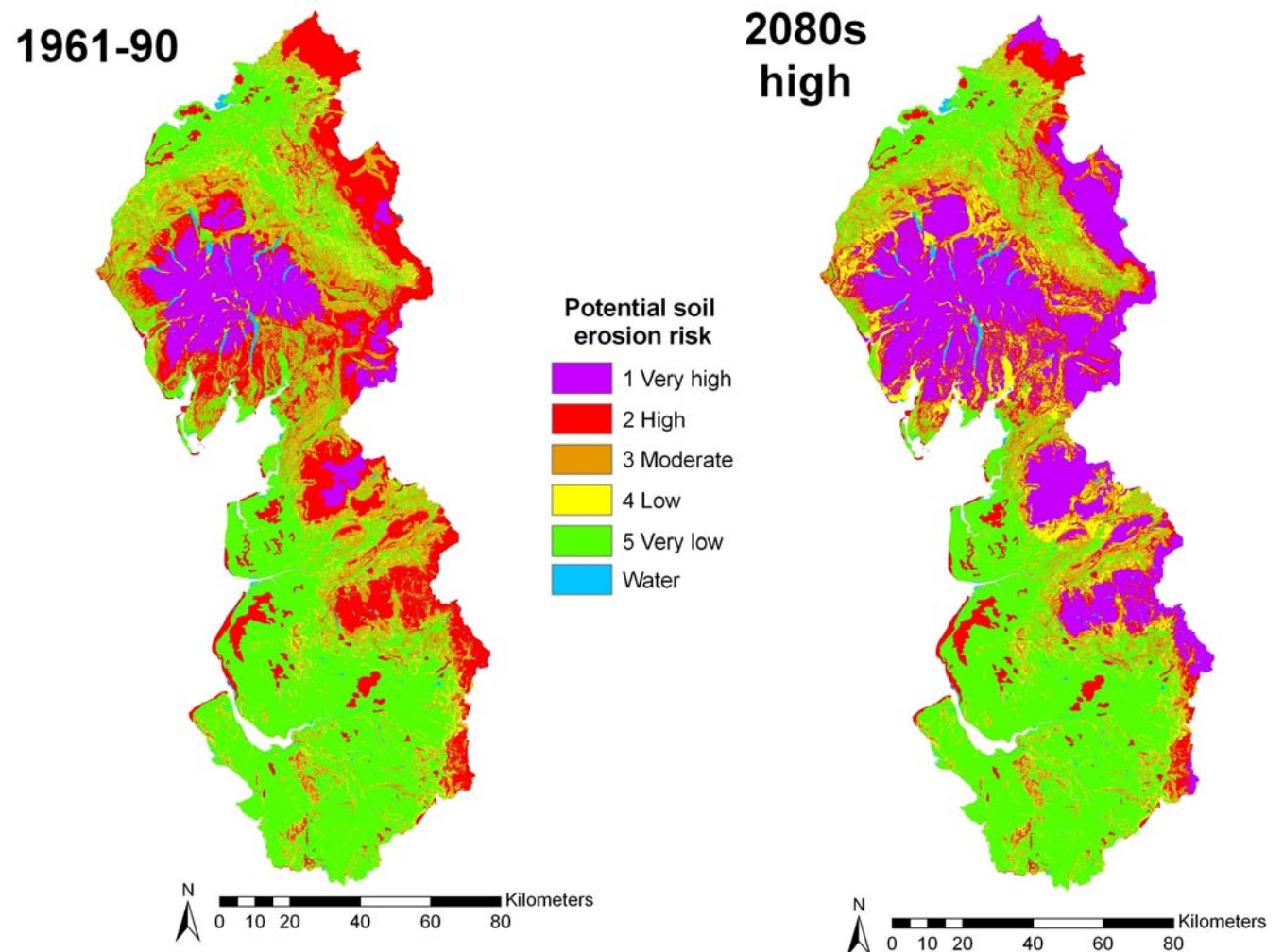
Impacts of climate change on landscape

e.g. Impacts of changing rainfall on erosivity



Impacts of climate change on landscape

Changes in rainfall impacts on the potential soil erosion risk



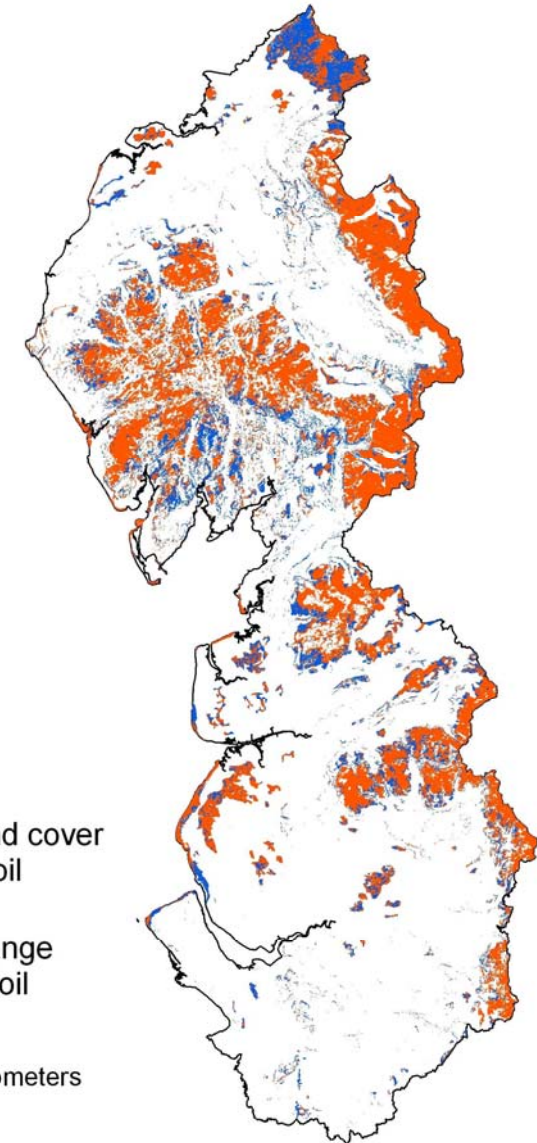
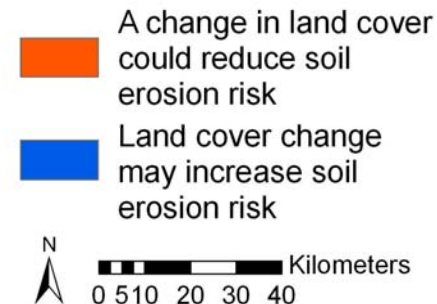
Socio-economic impacts on landscape

- Assuming climate change will occur in the same society and economy as today would undermine efforts to assess climate change impacts effectively (UKCIP, 2001)
- Very difficult to generate socio-economic projections due to limited understanding of the structure and causal factors operating in socio-economic systems and how they evolve over time
- Visitor response analysed through scenarios of future socio-economic characteristics of society
- e.g. land use change is crucial to understanding future erosion risk

Land cover change

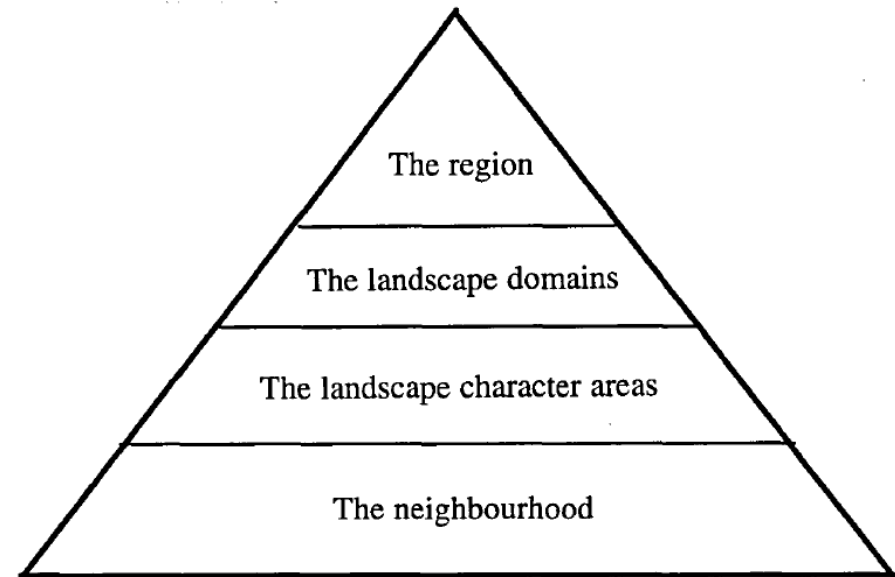
- Land cover change has significant implications on soil erosion risk

Potential soil erosion risk	Very high	Moderate	Moderate	High	Very high	Very high
	High	Moderate	Moderate	Moderate	High	Very high
	Moderate	Low	Moderate	Moderate	Moderate	High
	Low	Very low	Low	Low	Moderate	Moderate
	Very low	Very low	Very low	Low	Moderate	Moderate
Actual soil erosion risk		Very low	Low	Moderate	High	Very high
		Land cover vulnerability				



Integration into Policy Response

- Through landscape domains
 - Coast
 - Urban core / urban fringe
 - Rural lowland
 - Rural upland
- The response should be integrated and at an appropriate scale – a particular challenge for the conurbations



Components of a regional landscape strategy (Handley *et al.*, 1998)



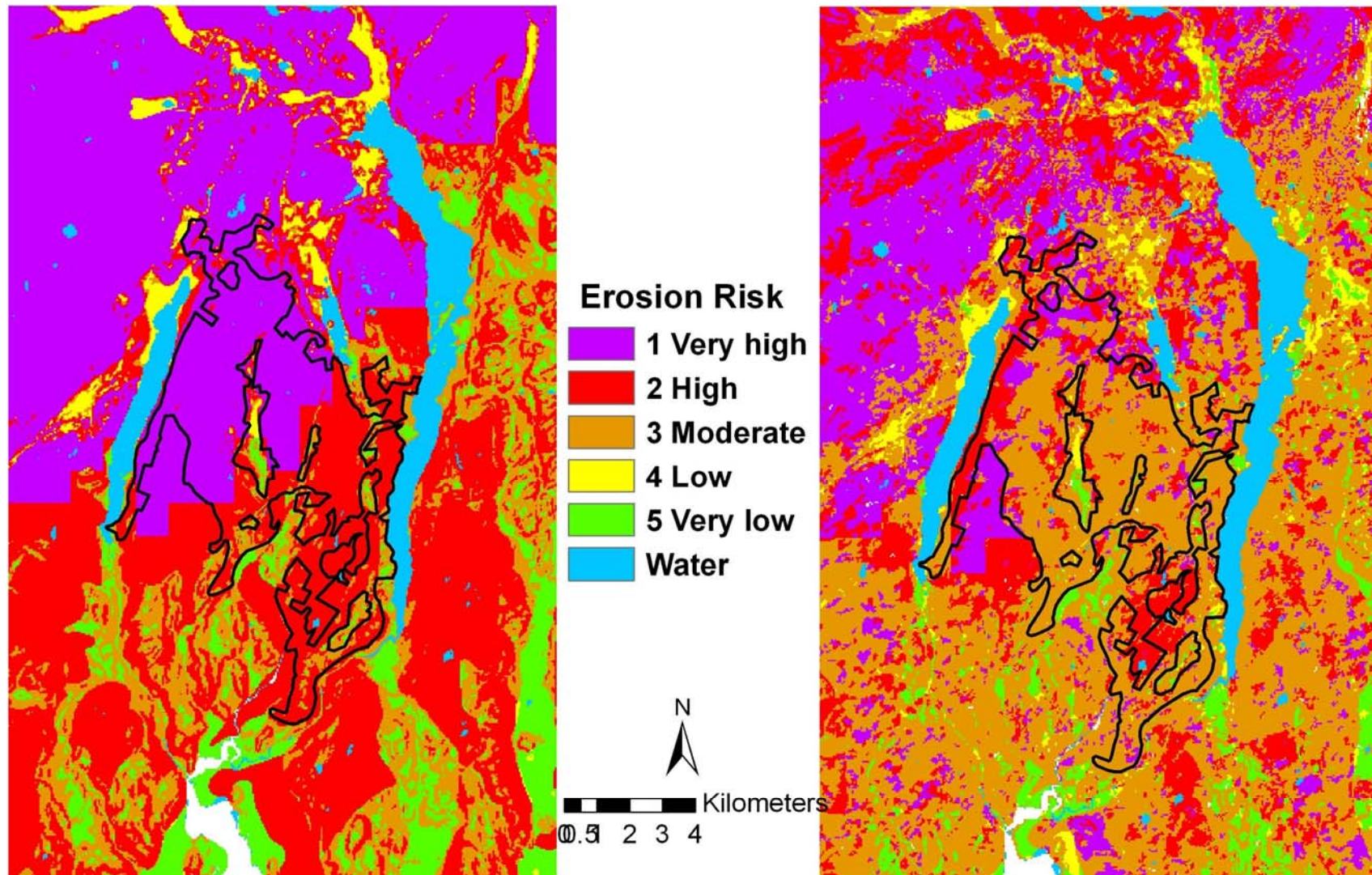
Grizedale Forest



- High capacity landscapes are an important tourism resource
- Forests allow a high capacity of visitors in compact locations (perceptual capacity)
- Trees and forestry also increase visitor capacity through reducing sensitivity of the landscape to erosion



Grizedale Forest – Erosion risk



Conclusions

- Socio-economic drivers of the demand for outdoor recreation indicate that greater participation is likely, meaning increased use of the landscape
- Climate change will impact on landscape condition and further enhance the pressure from visitors
- This will affect the landscape's ability to accommodate visitors
- Some landscapes will be at increased vulnerability in the future
- Land cover is very important in policy response
- Proactive management is needed within the regional landscape strategy

Many thanks

Further information:

CCVE: www.snw.org.uk/tourism

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