Developing indicators for the resilience of Wales' Natural Resources based on current monitoring programmes

Prof Bridget Emmett

NERC's Centre for Ecology and Hydrology
Bangor

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

What do we want our natural resources to do?

"Bend not break"

i.e. be able to recover their function (so we receive the benefits) when exposed to:

Chronic pressures

- Warming
- Air pollution
- Land Management

Acute pulses

- Pests and disease
- Droughts and Storms

i.e. be resilient & sustainable

And the pressures are many and have moved us beyond the ‘safe operating system’ globally

1. Climate change
2. Ocean acidification
3. Stratospheric ozone depletion
4. Nitrogen cycle
5. Phosphorus cycle
6. Global freshwater use
7. Global land use
8. Biodiversity loss
9. Anthropogenic aerosol loading
10. Chemical pollution

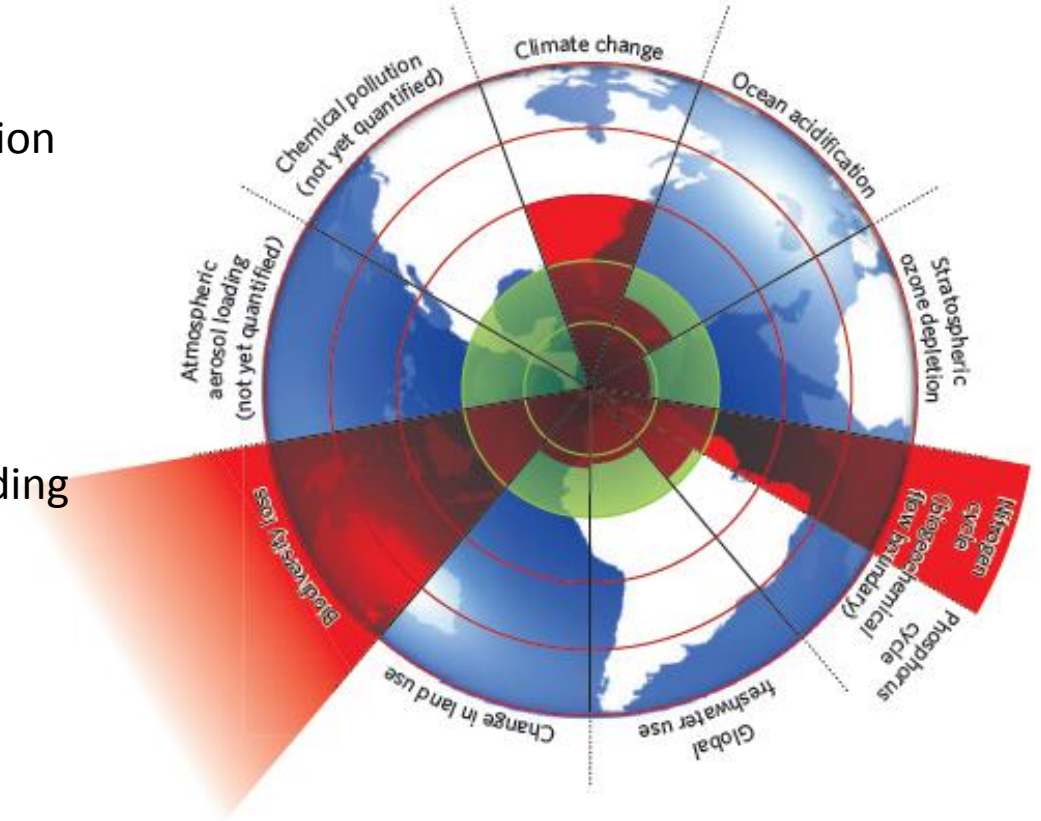


Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

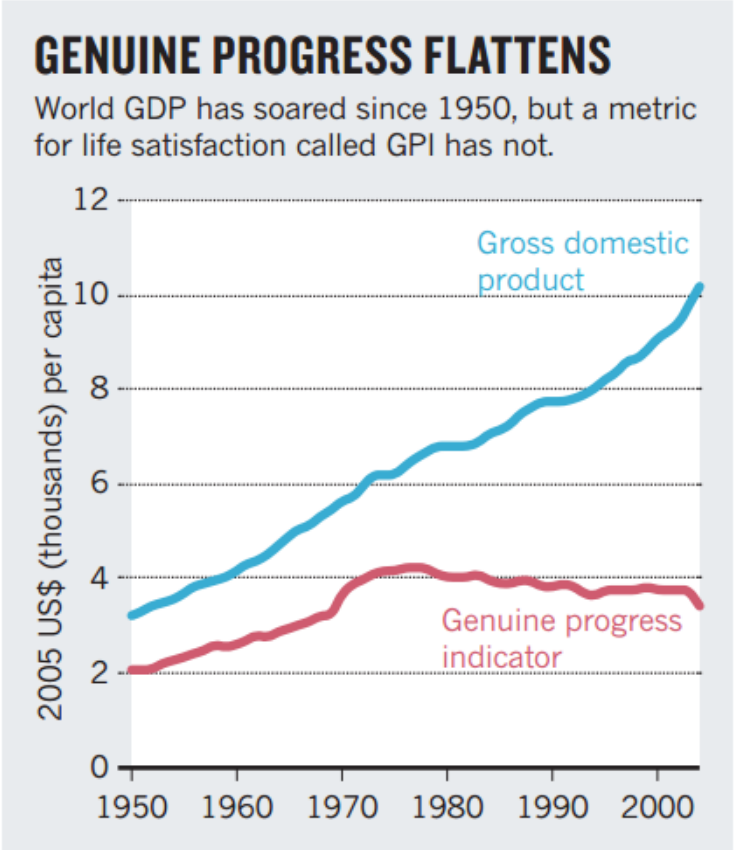
NATURAL ENVIRONMENT RESEARCH COUNCIL

Rockstrom et al. (2009) Nature 461 - 475

And it is easy to be misled – the economists were

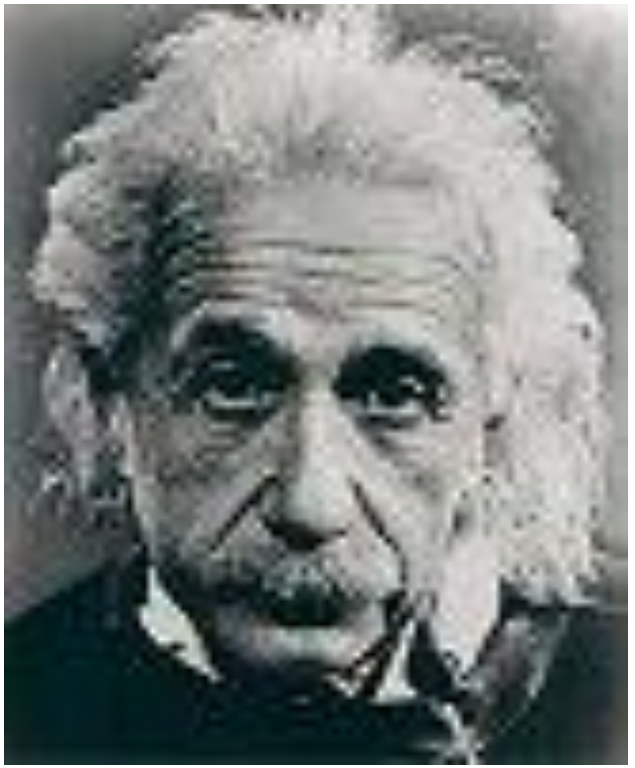
Ecosystem Services can be delivered at high rates but with the underlying Natural Capital being eroded i.e. we are not using them sustainably

Living off your savings to pay your bills
Similar analogy to the 'illusion' of GDP

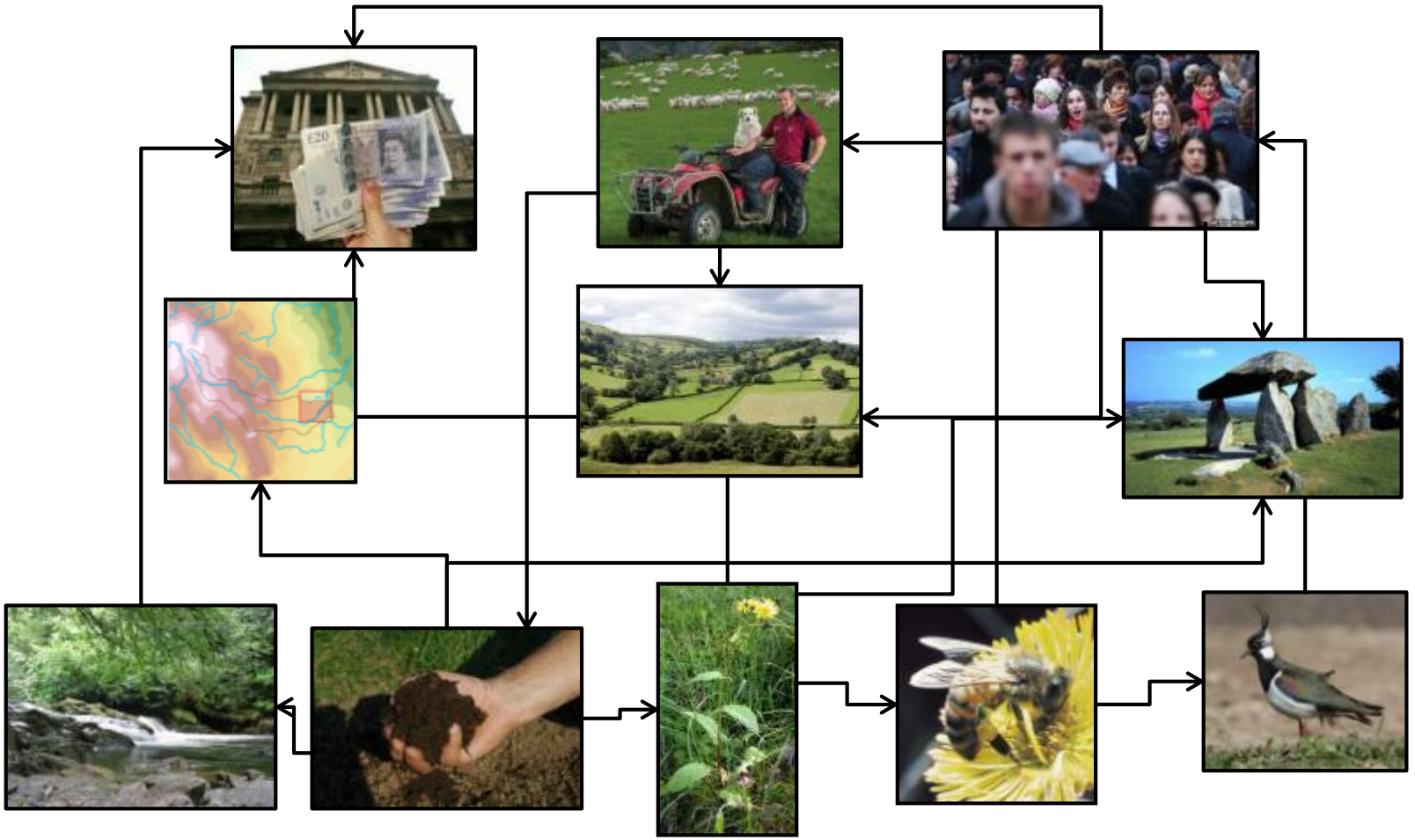


How to measure resilience

"Make everything as simple as possible but not simpler"



People and natural resources are highly inter-connected



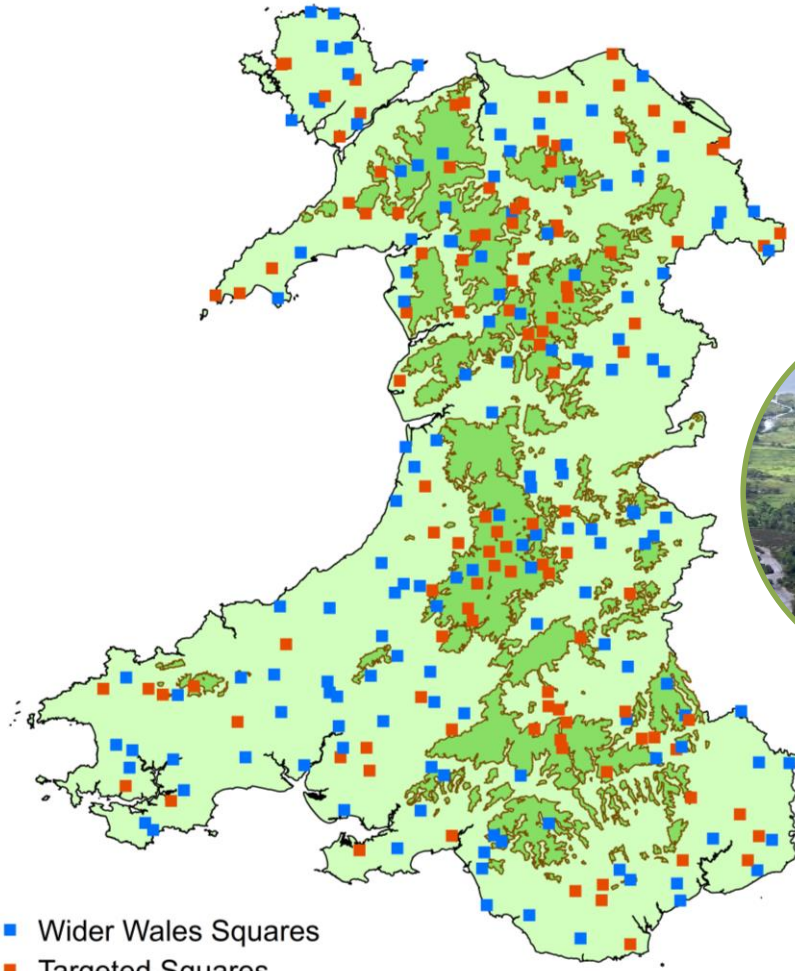
Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

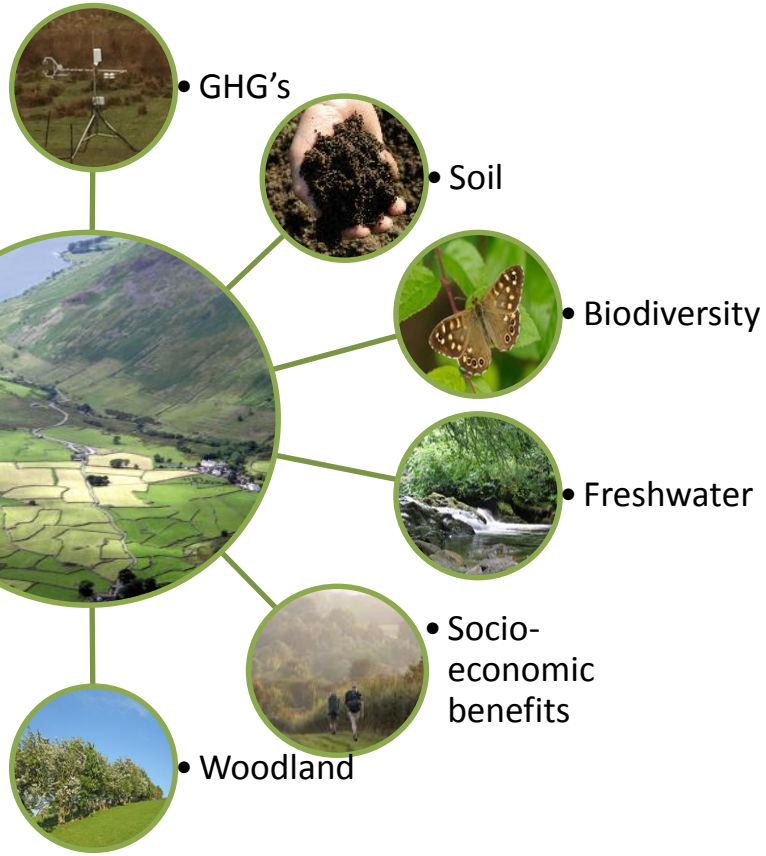
NATURAL ENVIRONMENT RESEARCH COUNCIL

How can we monitor Wales to reflect this complexity and inter-dependence?

The Glastir Monitoring and Evaluation Programme

Glastir Monitoring and Evaluation Programme



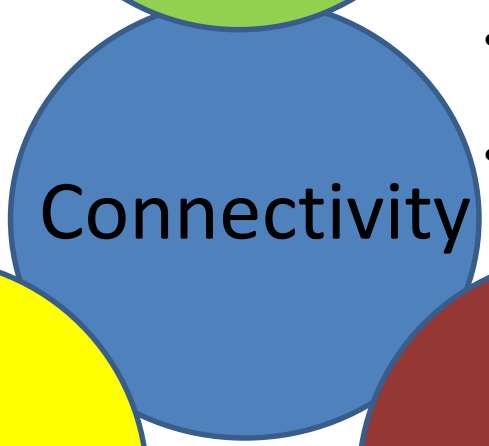


CEH
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

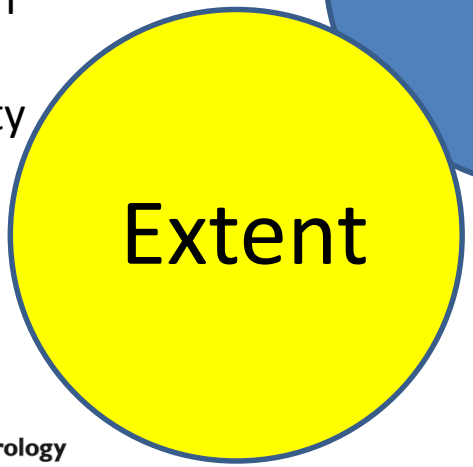
GMEP data and modelling work have the potential to deliver resilience metrics around 4 key issues

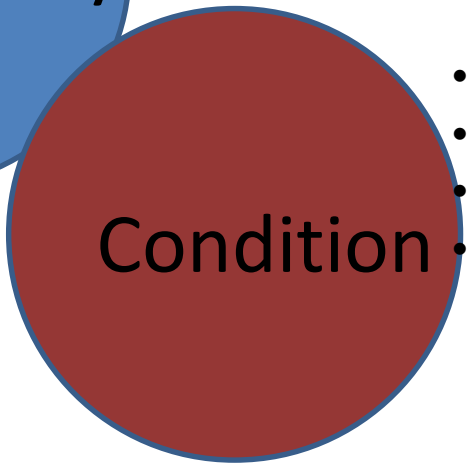
- Habitat diversity
- Plant species
- Bird indicators
- Pollinators
- HNV
- Farm business?



- Connectivity metrics for woodlands, wetlands etc
- Social connectivity

- Habitat area
- Fragmentation metric
- Area of priority habitats





- Soil condition
- Water quality
- GHG emissions
- Farm profitability

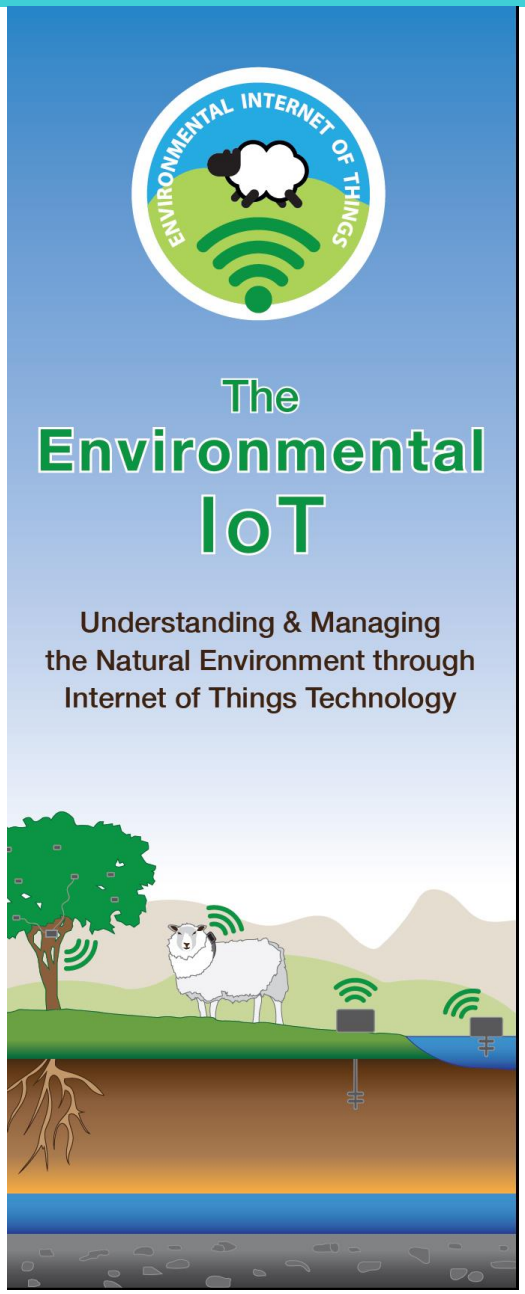
Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

GMEP: An example of collaborative working involving 17 organisations and > 100 scientists

Future challenges

- Little consensus in scientific world on resilience metrics
  - Connectivity can be undesirable during disease outbreaks
  - Extent and diversity can be mutually exclusive
- Targets will be challenging and potentially impossible
- In the meantime:
  - Actions to improve condition of our Natural Resources
  - Monitor Natural Resources to see if successful as we go along as evidence base is incomplete
  - Combine with new sensor technologies to develop early warnings (e.g the Environmental Internet of Things)



CEH Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Thank you & questions

bae@ceh.ac.uk

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL