Imperial College London

Valuing Natural Capital in Low Carbon Energy Pathways Programme (ValEn?):

Science Plan

Ideas Brokerage Workshop
21 July 2014

Jim Skea
Research Councils UK Energy Strategy Fellow

Imperial College London

Why valuing nature/energy?

- Only tangentially referred to in the National Ecosystem Assessment
- Profound changes taking place in the UK energy system
  - Depletion of North Sea oil and gas reserves
  - Exploitation of new renewable and non-renewable indigenous resources
  - Loss of self-sufficiency and increased reliance on imports
- Major implications for ecosystem services
  - In the UK and globally
  - Potential new conflicts….but also synergies

Imperial College London

The guiderails

- 2007-12 NERC Strategy *Next Generation Science of Planet Earth*
- *Sustainable Use of Natural Resources* (SUNR) Theme
- Theme Action Plan (TAP) 4
- Also relevant to new NERC Strategy *The Business of the Environment*
- *Benefitting from Natural Resources* Theme

Imperial College London

Theme Action Plan Research Challenges

1. to characterise the ***impact pathways of specific energy chains and energy infrastructure development*** in the ***UK's marine, aquatic, coastal margin and terrestrial environments*** under a range of energy scenarios;

2. to understand ***how different means of sourcing energy from outside the UK would impact ecosystem services*** from a global perspective and to identify options for managing these impacts;

3. to understand ***the cumulative and indirect effects of energy technologies/infrastructure*** over time on the full range of ecosystems services – underpinning, regulating, cultural and provisioning, addressing both economic and non-economic values; and

4. to understand better ***the nexus between energy, land and water*** and the trade-offs and synergies associated with different patterns of energy development.

Imperial College London

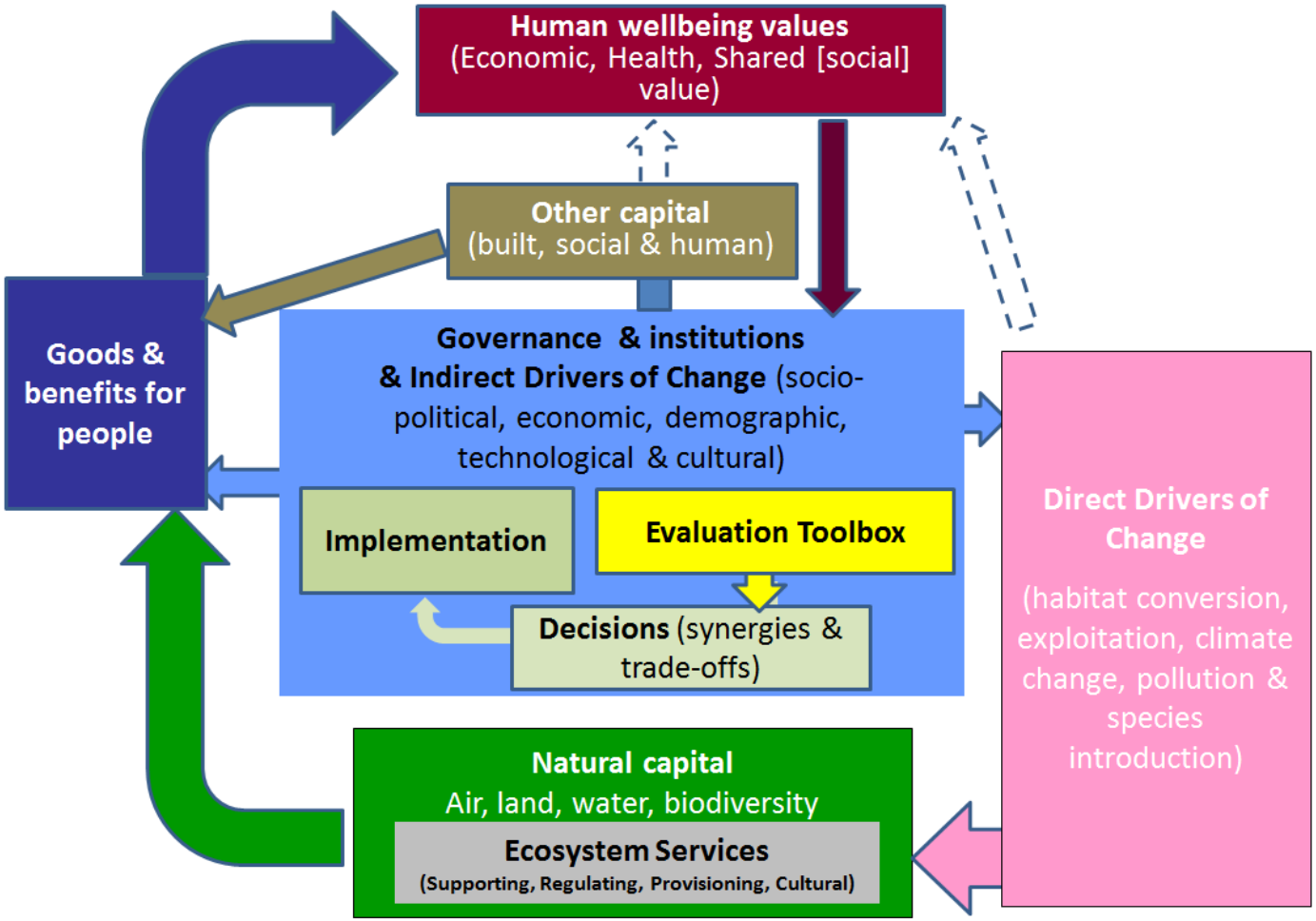
Advisory Group

Name	Organisation
Rosie Albinson	BP
Simon Butler	University of East Anglia
Rosie Hails	Centre for Ecology and Hydrology
Geoff Hammond	University of Bath
Davinder Lail	Defra
Jim Skea (Chair)	RCUK Energy Programme Strategy Fellow
Jim Wharfe	Environment Agency
Chris Franklin	NERC
Simon Kerley	NERC
Chris Noyce	ESRC
Sally Reid	NERC
Jacqui Williams	EPSRC

Two one-day meetings January and February - plus many offline iterations

Imperial College London

Decision-making framework for natural capital



Source: NEA Follow-up Phase 2014

Services – one word, several meanings

Ecosystem services - the benefits that humans derive from natural ecosystems

- provisioning services such as food, energy and water
- cultural services, i.e. non-material benefits
- regulating services, e.g. climate, that facilitate ecosystem function
- supporting services, e.g. the provision of habitats
- Is energy a provisioning service?

Energy services

- People do not value energy per se. They value the services that energy provides, e.g. light, heat, mobility etc.
- So is energy itself a service or not?

Imperial College London

Building on UKERC Phase II

Energy and Environment Theme

- Applying ecosystems service/natural capital concepts in the terrestrial and marine/coastal margin environments

Research Fund 2009 Call

- Spatial aspects of bio-energy development in the UK

Research Fund 2011 Call

- Integrated approaches to ecosystem services, environmental risk and energy

Imperial College London

The overall approach

- Advance a framework for integrating the analysis of energy systems and technologies with natural capital considerations and exemplify this with specific case studies.

- New but complementary (based around existing concepts but filling important gaps) - draw communities together whilst respecting existing concepts.

Imperial College London

Possible elements of the challenge

- Assessing the consequences for natural capital of adopting different patterns of energy development, exploring trade-offs and synergies
- Enhancing and integrating existing models
- Ensuring full scope of energy system impacts on natural capital (spatial and temporal) are considered
- Developing the concept of ecosystem services embedded in the trade of goods and services
- Examining the scope and benefits of spatial and temporal targeting of the energy system to make use of heterogeneity in natural capital stocks

Imperial College London

Impact pathways of energy chains and infrastructure in the UK's marine, aquatic, and terrestrial environments

- The energy and ecosystem assessment communities come together to develop scenarios that integrate energy with ecosystems and their services.
- Scenarios developed under the National Ecosystem Assessment Follow-On (NEAFO) phase were both plausible and relevant to the concerns of different groups of stakeholders
- Analytical tools available for developing scenarios in the UK energy domain: including the DECC 2050 pathways calculator, the ETI ESME model and the MARKAL/TIMES modelling system.
- The development of energy systems at different temporal and spatial scales and location specific trade-offs and co- benefits need to be considered to inform decision making.

Imperial College London

How energy sources from outside the UK would impact ecosystem services from a global perspective

- Out of scope: the ecosystem service impacts of consumption in general - energy only.
- Bioenergy could be a fruitful area of inquiry but the research undertaken *should not focus exclusively on that topic*.
- Realistic outcomes: build on the early work conducted under UKERC Phase 2 to establish a framework and methodologies for assessing global impacts and demonstrating this with selected case studies.
- Build on existing methods: emissions data, material and energy flow accounts, water footprints, ecological (and related) footprints and human appropriation of net primary production (HANPP).
- Multi-regional input-output (MRIO) modelling could be extended beyond GHG emissions?

Imperial College London

The cumulative and indirect effects of energy technologies/infrastructure

- Cumulative and interactive effects will depend on the energy mix and the spatial scale at which the different associated infrastructures are developed
- Cumulative effects relate to a wider range of social and economic, as well as environmental effects, and may be positive as well as negative
- Marine - build on UKERC Phase 2, the NERC Marine Renewable Energy (MRE) programme, and the SUPERGEN Marine Challenge
- GIS-based work on bioenergy, shale gas and wind?

Imperial College London

The nexus between energy, land and water

- Context: the UK economy is now more exposed to price fluctuations in global energy markets - local and global pressures also influence the market value of other goods (e.g. the food price spikes of 2008)
- Develop scientific understanding to inform spatial choices for locating energy generation and distribution and supporting long term decision-making, from both a UK and global perspective
- Relationship between energy and water: different energy sources use greatly varying amounts of water, yet water scarcity is often absent from debates around which energy sources will be most sustainable.
- Development of the UK's shale gas reserves could have consequences for the quality and quantity of water supplied at the regional level

Imperial College London

Personal observations

- This is an important (but huge!) agenda which resonates in both the energy and valuing nature communities
- Because it's huge, the onion needs peeled one layer at a time
- A sharing of concepts and ideas between two communities needed…..a *merger* not a *takeover* (in either direction)
- Spatial/temporal thinking will be needed in the energy domain….but beware of making this sound prescriptive and centrally planned. How does spatial targeting work in a competitive energy market?

Thank you!

http://www3.imperial.ac.uk/rcukenergystrategy