Valuing Coastal Ecosystem Stocks and Flows

VALUING NATURE NETWORK

Project leader: Professor Kerry Turner CBE, University of East Anglia
r.k.turner@uea.ac.uk

Aim

- To support and enhance coastal zone management principles and practice in the UK and Europe.
- Using an interdisciplinary and systems based approach, to investigate the stock and flow of ecosystem services provided in coastal zones.
- To investigate the associated management and governance problems that are posed in this especially dynamic environment.
- To apply the UK National Ecosystem Assessment (NEA) conceptual framework to the coastal zone context.
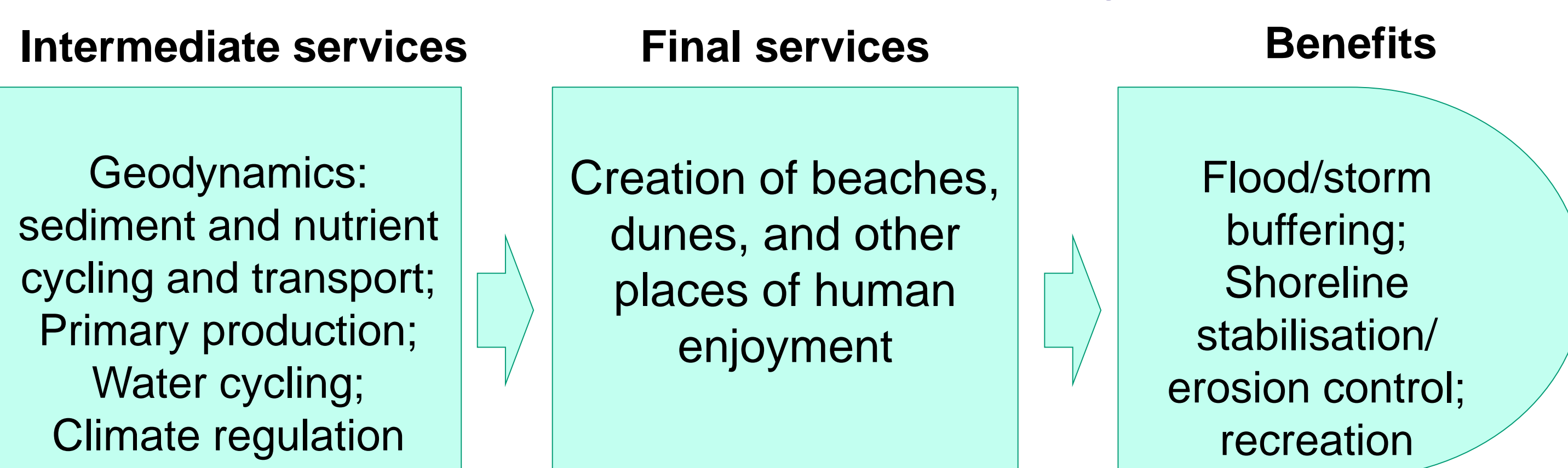
Research

The research quantified and evaluated a set of significant ecosystem services (carbon storage, fish nursery provision and recreation and amenity) for some large North Sea estuaries. There were four components of investigation to the research:
- The conceptual framework
- UK governance case studies
- Decision support tools
- Valuation

Conceptual framework

- The coastal zone provides the dynamic transition (across time and space) between terrestrial and marine domains and encompasses highly diverse natural systems.
- Coastal ecosystem stocks (natural capital - the ecosystem structure and processes and links to the abiotic environment) provide a diverse set of habitats and species with a consequent flow of ecosystem services of significant value (welfare benefit) to human society and economy, for example, geodynamics:

Intermediate services	Final services	Benefits
Geodynamics: sediment and nutrient cycling and transport; Primary production; Water cycling; Climate regulation	Creation of beaches, dunes, and other places of human enjoyment	Flood/storm buffering; Shoreline stabilisation/ erosion control; recreation

- The scope of delivered coastal final ecosystem services is very wide, ranging from food to carbon storage, coastal protection and defence and recreational and amenity:
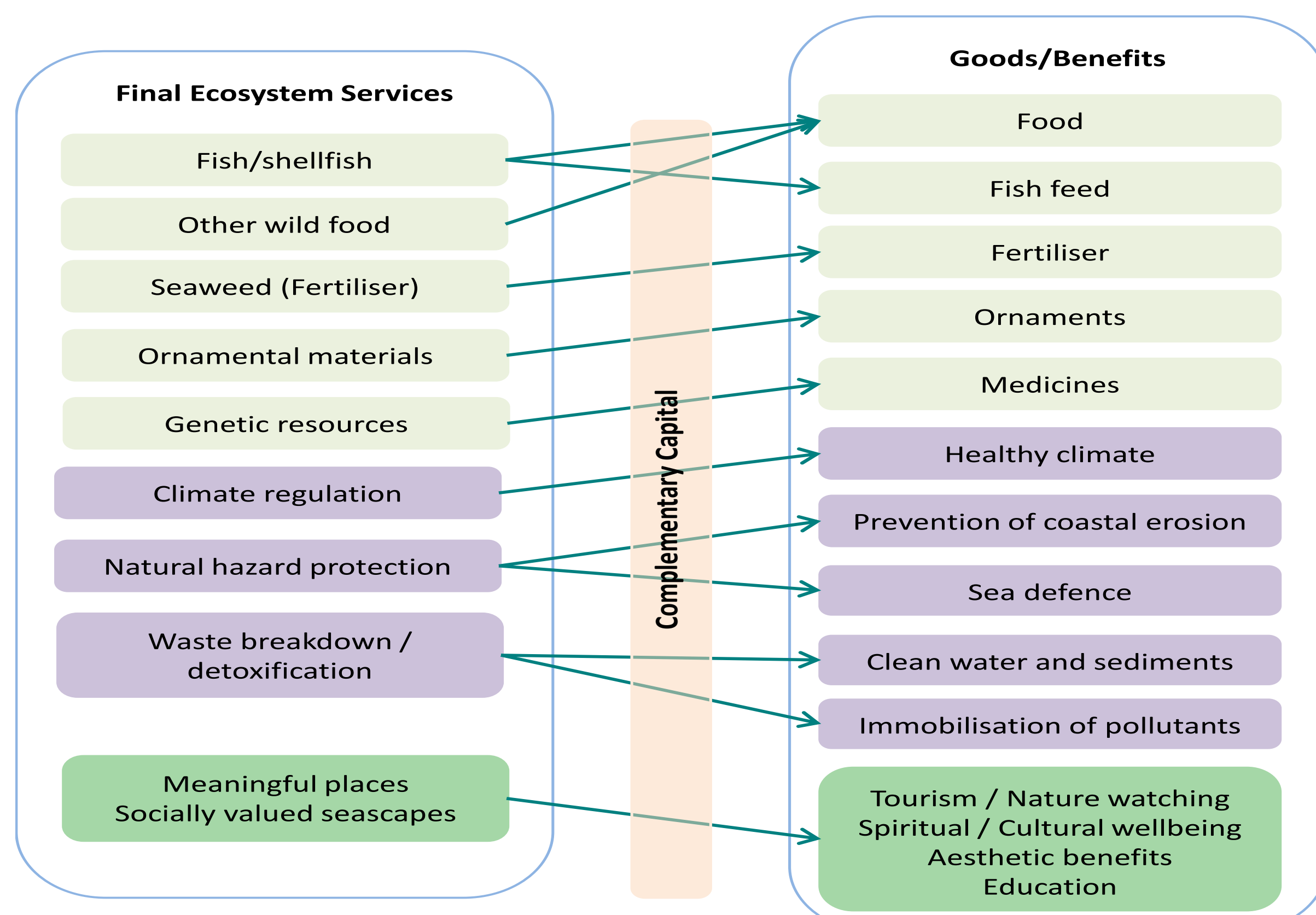
Governance

- In the context of **marine spatial planning**, a number of marine protected areas (MPA) have been proposed. UK case studies include: Moray Firth, Studland Bay, Lyme Bay, Lundy and Skomer.
- This research has identified the ecosystem services most likely to be conserved/provided.

Tools

A **decision-support system** was developed, based on the principles of adaptive management, including the following:
- Indicators related to ecosystem function.
- Futures marine-based scenarios.
- 'Balance sheets' appraisal method.
- Meta-data inventory.
- MPA-related matrices linking conservation characteristics to ecosystem services provision.

Valuation

- The assessment and valuation of ecosystem stock and services flow is not a straightforward task.
- The monetary valuation of stocks and flows has to rely on a variety of accounting price and economic valuation methods.
- Some services (e.g. a number of cultural services) cannot be meaningfully 'valued' in monetary terms.
- **Stock values** can be expressed as monetary accounting measures of the quantity of ecosystem services holding prices constant.
- **Flow values** are the gains and losses in stocks and consequent service flow changes over time and can be assigned marginal economic value.
- Valuation example: **European Coastal 'Blue Carbon'**: Existing saltmarsh and sea grass beds have an accounting stock price of approximately US $180m. If habitat loss trends continue US $15m worth of ecosystem service benefits will be lost by 2060.

Conclusion

A more adaptive and integrated management approach using decision-support systems and evaluation techniques is required for future coastal management.