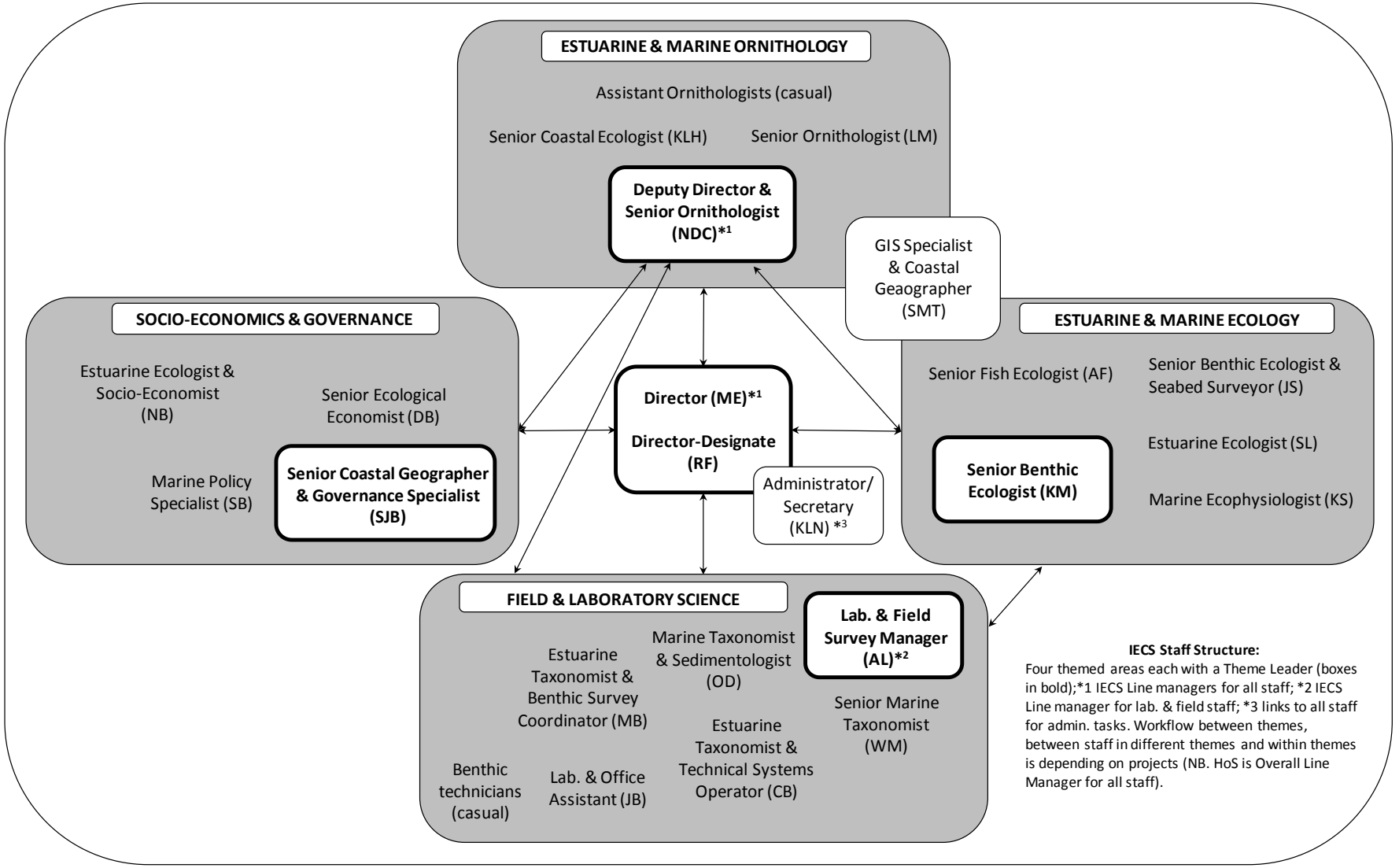
ECOSYSTEM SERVICES
What are they?
Why are they useful?
How have they been applied?

Daryl Burdon
Senior Ecological Economist,
Institute of Estuarine & Coastal Studies (IECS),
University of Hull

D.Burdon@hull.ac.uk

Institute of Estuarine & Coastal Studies

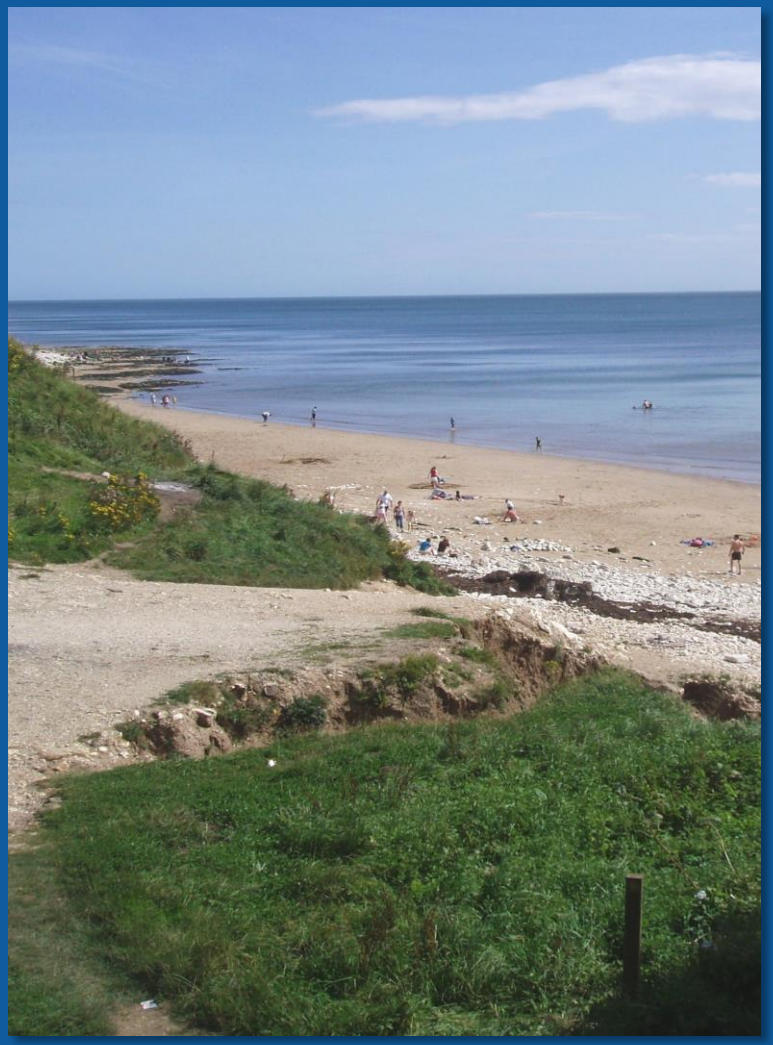
UNIVERSITY OF Hull



IECS Staff Structure:
Four themed areas each with a Theme Leader (boxes in bold);*1 IECS Line managers for all staff; *2 IECS Line manager for lab. & field staff; *3 links to all staff for admin. tasks. Workflow between themes, between staff in different themes and within themes is depending on projects (NB. HoS is Overall Line Manager for all staff).

Presentation Structure

- Ecosystem services…
  - What are they?
  - Why are they useful?
  - How have they been applied?
- Summary/Conclusions



What are they?

UNIVERSITY OF Hull

There are many definitions of Ecosystem Services within the literature but as yet there is no agreed definition…

'*Conditions and processes through which natural ecosystems, and the species they include, sustain and fulfil human life*' (Daily, 1997).

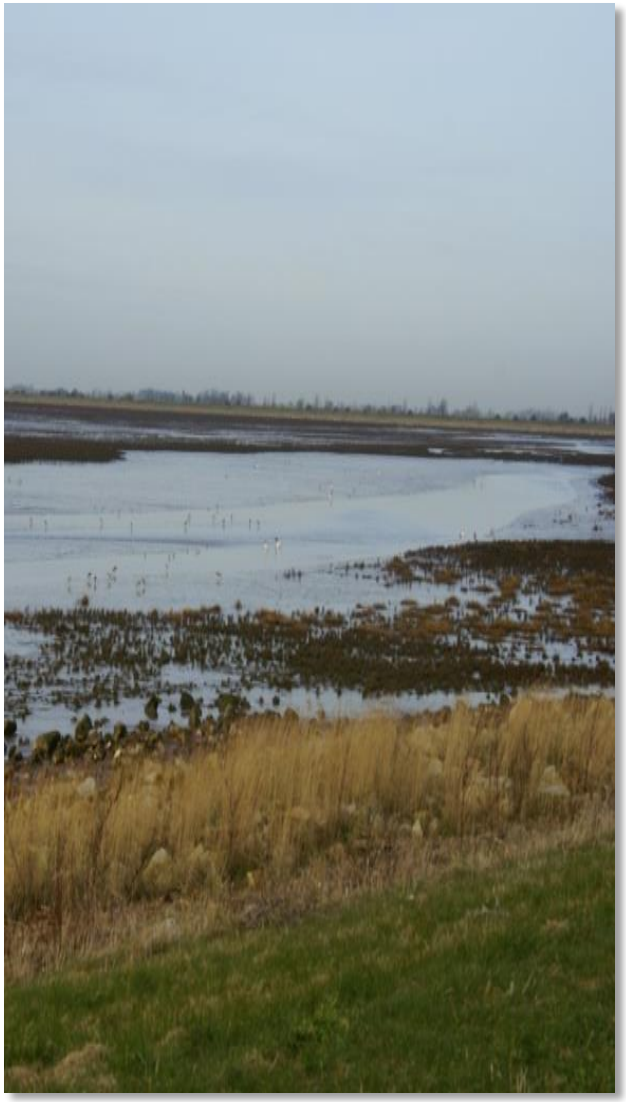
'*The outputs from ecosystems from which people and society derive benefits*' (MA, 2005).

'*The direct and indirect benefits people obtain from ecosystems*' (Beaumont *et al.*, 2007).

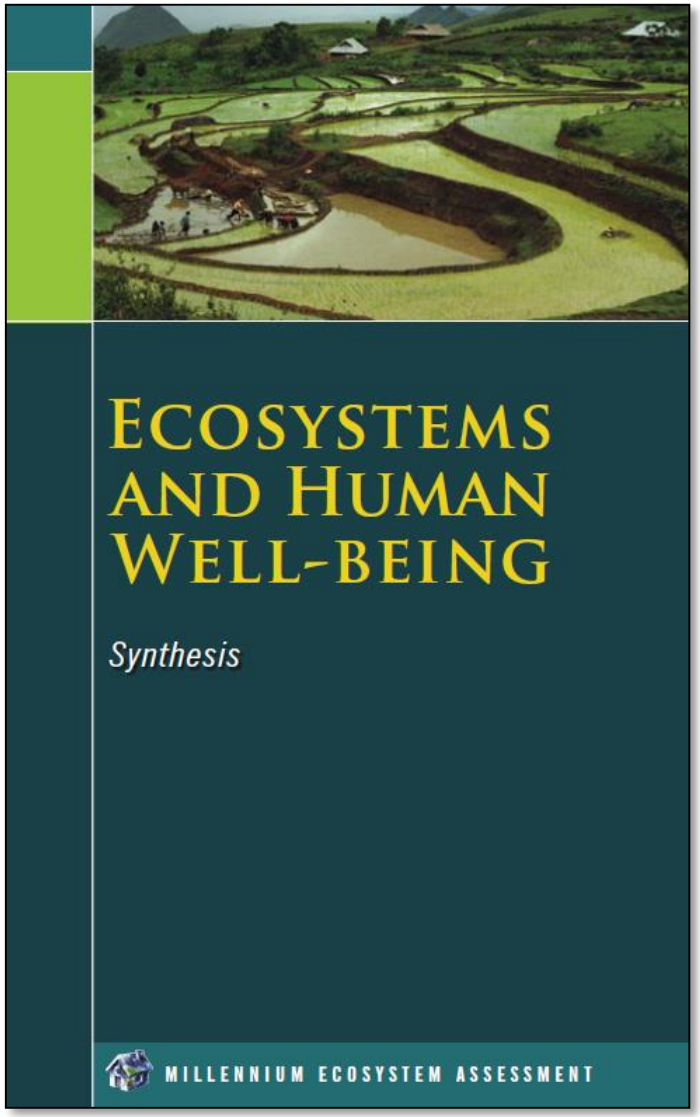
'*The aspects of ecosystems utilised (actively or passively) to produce human well-being*' (Fisher *et al.*, 2009).

'*The link between ecosystems and things that humans benefit from, not the benefits themselves*' (Luisetti *et al.*, 2011).

We take the view that Ecosystem services are the link between ecosystems and the benefits that they provide for society.



What are they?



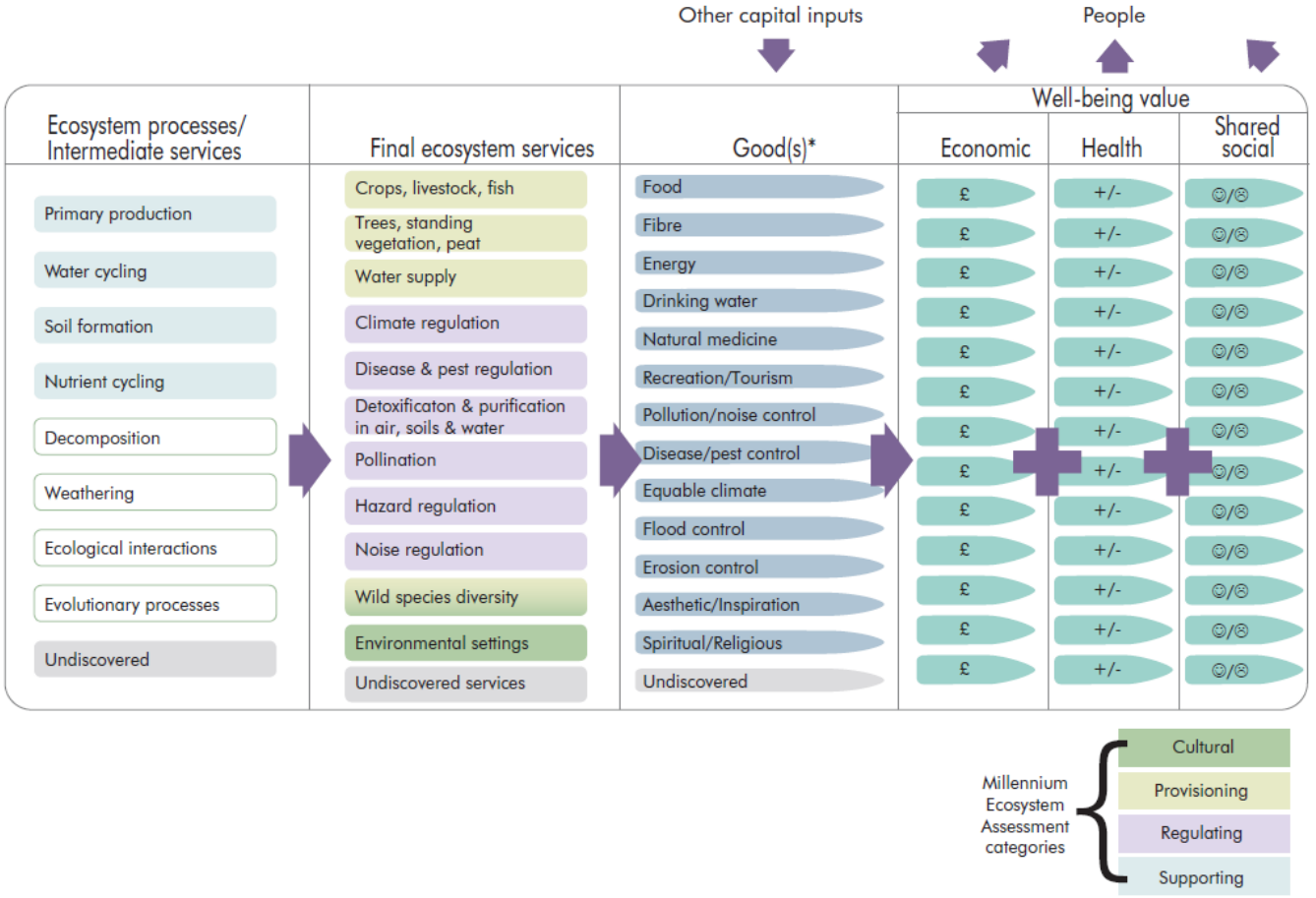
Millennium Ecosystem Assessment (2005)

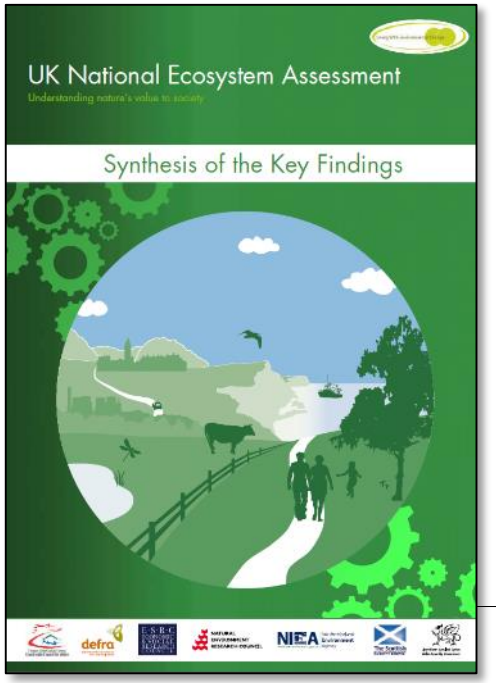
- **Provisioning services** are the products obtained from the ecosystem;
- **Regulating services** are the benefits obtained from the regulation of ecosystem processes;
- **Cultural services** are the nonmaterial benefits people obtain from ecosystems; and
- **Supporting services** are those that are necessary for the production of all other ecosystem services, but do not yield direct benefits to humans.

Note: the MEA did not attempt to value ecosystem services.

What are they?

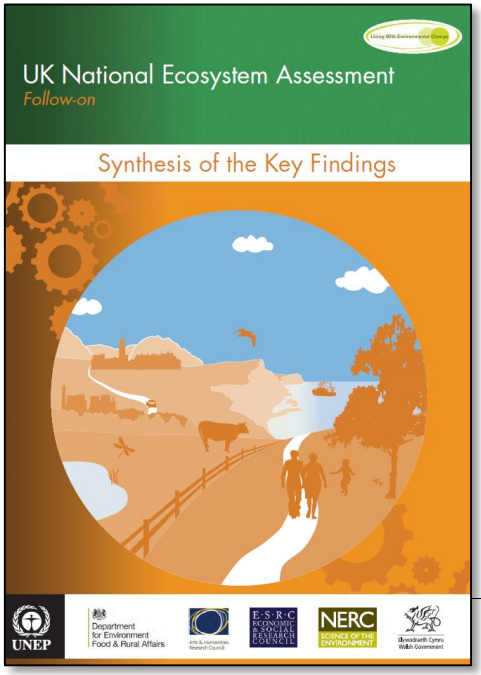
UNIVERSITY OF Hull

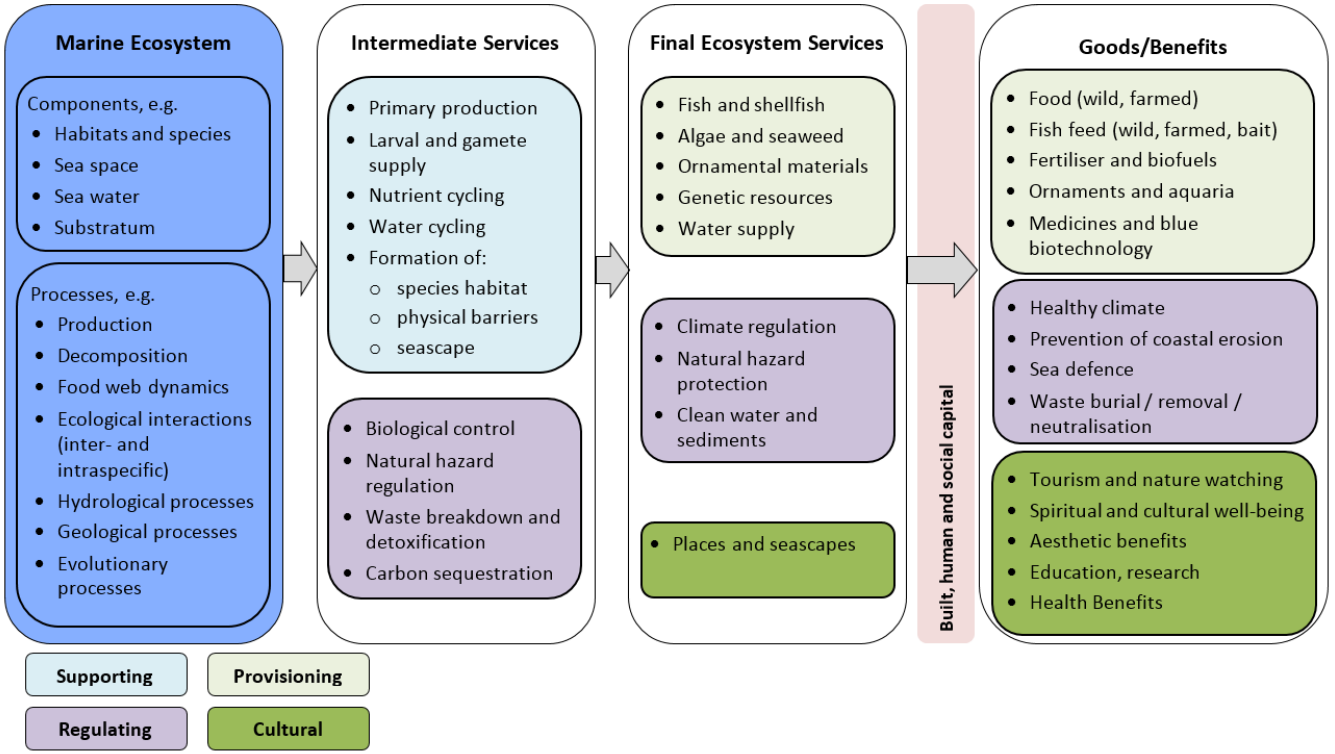




Distinguishing between intermediate services, final services and goods/benefits is important when it comes to an operational context e.g. for economic valuation.

What are they?





The framework is more refined in its focus on marine ecosystems and emphasises the need for complementary capital to gain benefits for society.

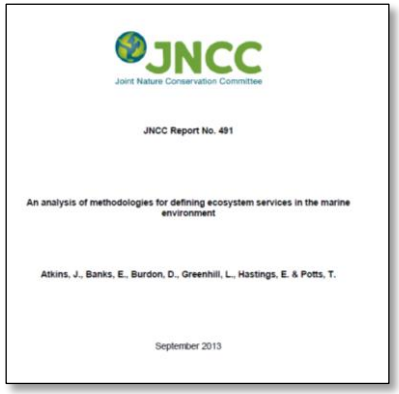
Why are they useful?

UNIVERSITY OF Hull

- Ecosystem services have potential to lead to goods/benefits.
- Appropriate to consider their value.
- Market prices may reflect their value but for others a market price either does not exist or is inadequate.
- A range of methods is available to assess the values that are placed on these goods/benefits.

Table 1
Economic valuation techniques and examples of their relevance to ecosystem services.

Economic valuation method	Description	Relevance to ecosystem services
Choice Experiment Method (CEM)	Discrete choice model which assumes the respondent has perfect discrimination capability. Uses experiments to reveal factors that influence choice	Applicable to all ecosystem services
Contingent Valuation Method (CVM)	Construction of a hypothetical market by direct surveying of a sample of individuals and aggregation to encompass the relevant population. Problems of potential bias	Applicable to all ecosystem services
Cost-of-Illness (COI)	The benefits of pollution reduction are measured by estimating the possible savings in direct out-of-pocket expenses resulting from illness and opportunity costs	Applicable to: clean water and sediments; and immobilisation of pollutants
Damage Avoidance Costs (DAC)	The costs that would be incurred if the ecosystem good or service were not present	Applicable to: healthy climate; prevention of coastal erosion; sea defence; clean water and sediments; and immobilisation of pollutants
Defensive Expenditure Costs (DEC)	Costs incurred in mitigating the effects of reduced environmental quality. Represents a minimum value for the environmental function	Applicable to: healthy climate; prevention of coastal erosion; and sea defence
Hedonic Pricing (HP)	Derive an implicit price for an environmental good from analysis of goods for which markets exist and which incorporate particular environmental characteristics	Applicable to: tourism/nature watching
Market Analysis (MA)	Where market prices of outputs (and inputs) are available. Marginal productivity net of human effort/cost. Could approximate with market price of close substitute. May require shadow pricing where prices do not reflect social valuations	Applicable to: food; fish feed; ornamentals; medicine; aggregates; healthy climate; prevention of coastal erosion; and sea defence
Net Factor Income (NFI)	Estimates changes in producer surplus by subtracting the costs of other inputs in production from total revenue and ascribes the remaining surplus as the value of the environmental input	Applicable to: food, fish feed, medicines, aggregates, clean water and sediments; and immobilisation of pollutants
Production Function Analysis (PFA)	An ecosystem good or service treated as one input into the production of other goods: based on ecological linkages and market analysis	Applicable to: food; fish feed; ornamentals; medicine; aggregates; healthy climate; prevention of coastal erosion; and sea defence
Productivity Gains and Losses (PGL)	Change in net return from marketed goods: a form of (dose–response) market analysis	Applicable to: healthy climate; prevention of coastal erosion; and sea defence
Replacement/Substitution Costs (R/SC)	Potential expenditures incurred in replacing the function that is lost; for instance by the use of substitute facilities or 'shadow projects'	Applicable to all provisioning and regulating services but with limited role for cultural services
Restoration Costs (RC)	Costs of returning the degraded ecosystem to its original state. A total value approach; important ecological, temporal and cultural dimensions	Applicable to: healthy climate; prevention of coastal erosion; sea defence; clean water and sediments; and immobilisation of pollutants
Shadow Price of Carbon (SPC)	A price that reflects the social cost of carbon consistent with the damage experienced under an emissions scenario such that e.g. a specific policy goal can be achieved (the precautionary principle might support a further adjustment to the price)	Applicable to: healthy climate
Social Cost of Carbon (SCC)	Damage costs of an incremental unit of carbon (or equivalent amount of other greenhouse gas emissions) imposed over the whole of its time in the atmosphere	Applicable to: healthy climate
Travel Cost Method (TCM)	Cost incurred in reaching a recreation site as a proxy for the value of recreation. Expenses differ between sites (or for the same site over time) with different environmental attributes	Applicable to: tourism/nature watching



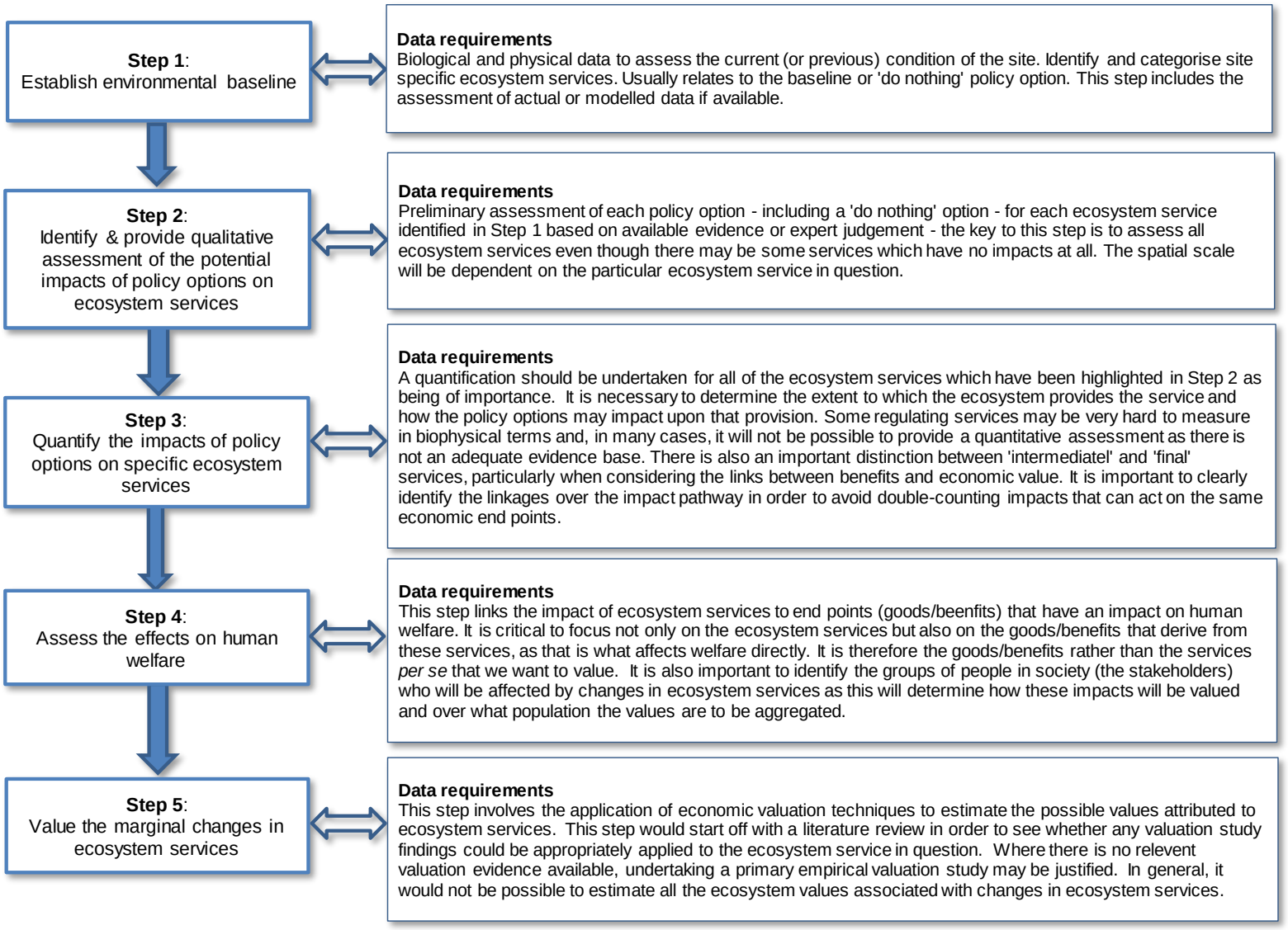
Why are they useful?

UNIVERSITY OF Hull

- Fundamental part of applying an ecosystem approach to management.
- Provides a means of integrating the natural and societal aspects.
- Make system complexity understandable to policymakers and stakeholders.
- Ecosystem service indicators can be used to identify behaviour, state and trajectory in coastal/marine systems.
- Therefore can be used for monitoring and management purposes.

Why are they useful?

UNIVERSITY OF Hull



Defra, 2007. An Introductory Guide to Valuing Ecosystem Services. Defra, London.

How have they been applied?

UNIVERSITY OF Hull

Case Study 1:

Estuarine Saltmarsh

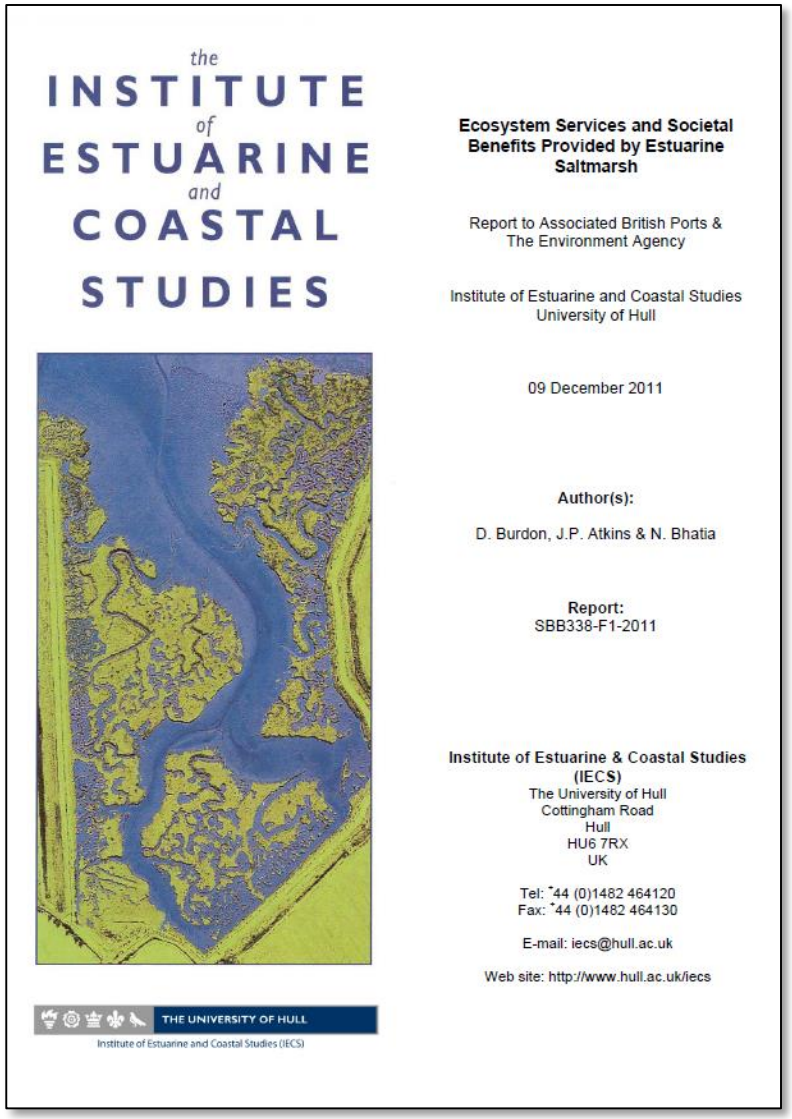
Case Study 2:

Marine Protected Areas

Case Study 3:

Biodiversity Valuation

Case Study 1: Estuarine Saltmarsh


the
INSTITUTE
of
ESTUARINE
and
COASTAL
STUDIES

Ecosystem Services and Societal Benefits Provided by Estuarine Saltmarsh

Report to Associated British Ports & The Environment Agency

Institute of Estuarine and Coastal Studies
University of Hull

09 December 2011

Author(s):

D. Burdon, J.P. Atkins & N. Bhatia

Report:
SBB338-F1-2011

Institute of Estuarine & Coastal Studies (IECS)
The University of Hull
Cottingham Road
Hull
HU6 7RX
UK

Tel: +44 (0)1482 464120
Fax: +44 (0)1482 464130

E-mail: iecs@hull.ac.uk

Web site: http://www.hull.ac.uk/iecs

THE UNIVERSITY OF HULL
Institute of Estuarine and Coastal Studies (IECS)

- Aim #1: to identify the ecosystem services provided by estuarine saltmarsh; and
- Identified five main groups of ecosystem services provided by saltmarsh:

  1) Coastal flood defence;

  2) Habitat for birds and invertebrates;

  3) Nutrient and carbon storage;

  4) Recreation and amenity; and

  5) Food and nursery grounds for fish.

Case Study 1: Estuarine Saltmarsh

UNIVERSITY OF Hull

e.g. Sea defence

Width of Salting (m)	Wall Height (m)	Cost of New Wall (£ m^{-1})	Maintenance Cost (£ m^{-1} yr^{-1})	Saving on building cost of a new wall (£ m^{-1} wall)*	Saving on cost of maintenance (£ m^{-1} wall)*
80	3	400	1	2,600-4,600	49
60	4	500	5	2,500-4,500	45
30	5	800	15	2,200-4,200	35
6	6	1,500	25-30	1,500-3,500	20-25
0	12	3,000-5,000	50	0	0

(Source: King & Lester, 1995)

Case Study 1: Estuarine Saltmarsh

UNIVERSITY OF Hull

e.g. Food and nursery ground for fish

- Fonseca (2009) investigated the contribution of managed realignment sites in the Blackwater Estuary to the local commercial sea bass fishery.
- Sampling was undertaken using a static-funnel net & a series of fixed block nets.
- Sea bass is an important commercial species and made up 19.3% of the total catch and 72.3% of total biomass within the MR sites.
- Production Function Analysis – economic valuation method based on ecological linkages and market analysis.

	Mean (per ha)	Tollesbury	Abbotts Hall	Orplands
Size (ha)	1	21	84	38
Mean price (£) @ £4.50 / kg	7.60	159.58	638.31	288.76
Mean price (£) @ £7.00 / kg	11.82	248.23	992.93	449.18
Total weight (kg)	1.69	35.46	141.85	64.17
Mean number of 5-group survivors	2.95	61.89	247.55	111.99

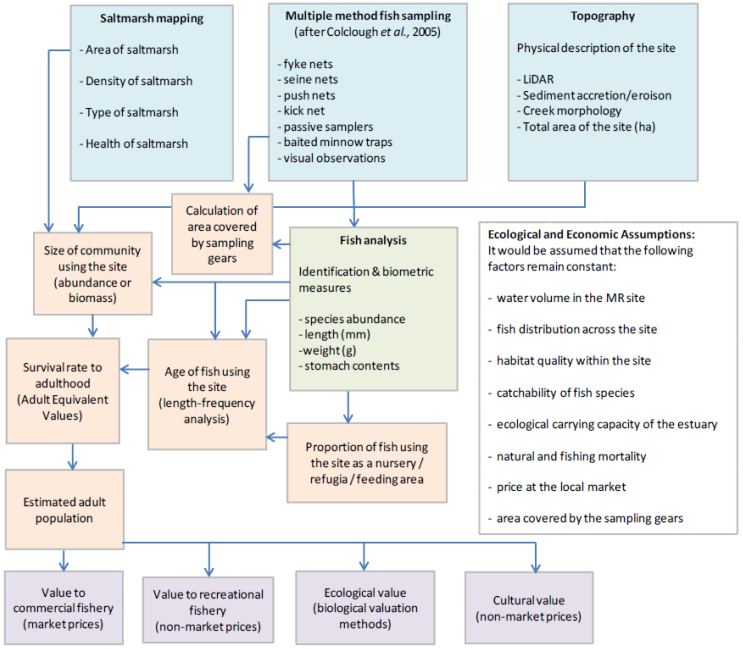
(Source: Fonseca, 2009)

Case Study 1: Estuarine Saltmarsh

UNIVERSITY OF Hull

Aim #2: to make an initial attempt to value the fish communities found within the Welwick MR site.

- Developed a four-stage approach:
  - fieldwork components (blue);
  - laboratory analysis (green);
  - data analysis (peach); and
  - economic valuation (purple).
- Insufficient data was to undertake a full analysis.
- Data gaps were identified:
  - Fish data to age the population;
  - Creek morphology data for up-scaling;
  - Commercial fish data in wider Humber and North Sea; and
  - Non-market survey data.



Case Study 1: Estuarine Saltmarsh

UNIVERSITY OF Hull

- Ph.D. thesis by Natasha Bhatia (IECS): "*Ecological and economic valuation of managed realignment sites, Humber estuary, UK: benefits for society*".
- Investigated ecological and socio-economic valuation of the societal benefits provided by four MR sites in the Humber Estuary.
- Aimed to identify how valuable the MR sites are in terms of societal benefits.
- A choice experiment and contingent valuation interview survey was used to gain the value of use and non-use values of residents within a 7 mile radius of one of the MR sites (19,346 households – 1,146 completed surveys – 6% of population).
- The main questions asked were:

"How much would you be willing to pay for maintenance of the site?"

– Which addressed their non-use value of their closest site.

"How much would you be willing to pay for access to the site?"

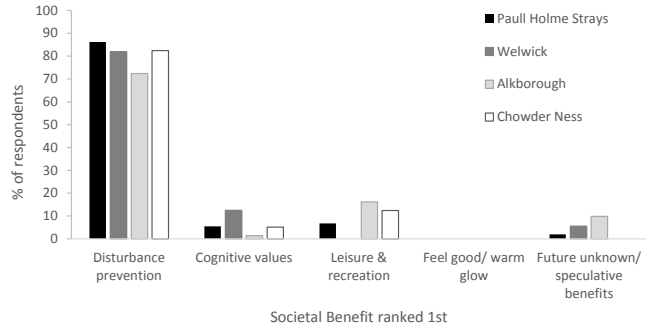
– Which determined their use value of their closest site.

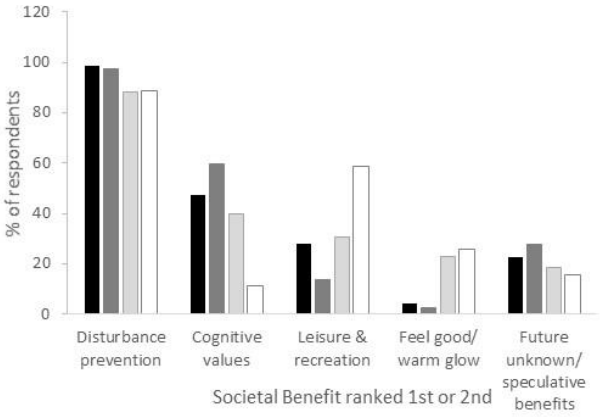
Case Study 1: Estuarine Saltmarsh

UNIVERSITY OF Hull

WTP Site values	Average annual WTP maintenance values	Average annual access
PHS	£7.32	£4.64
Welwick	£3.13	£0.28
Alkborough	£9.29	£6.20
Chowder Ness	£6.96	£4.43
Combined average value for MR sites on the Humber	£6.68	£3.89

For these particular sites, people are willing to pay more for non-use values, such as disturbance prevention, rather than just use values, such as leisure and recreation.



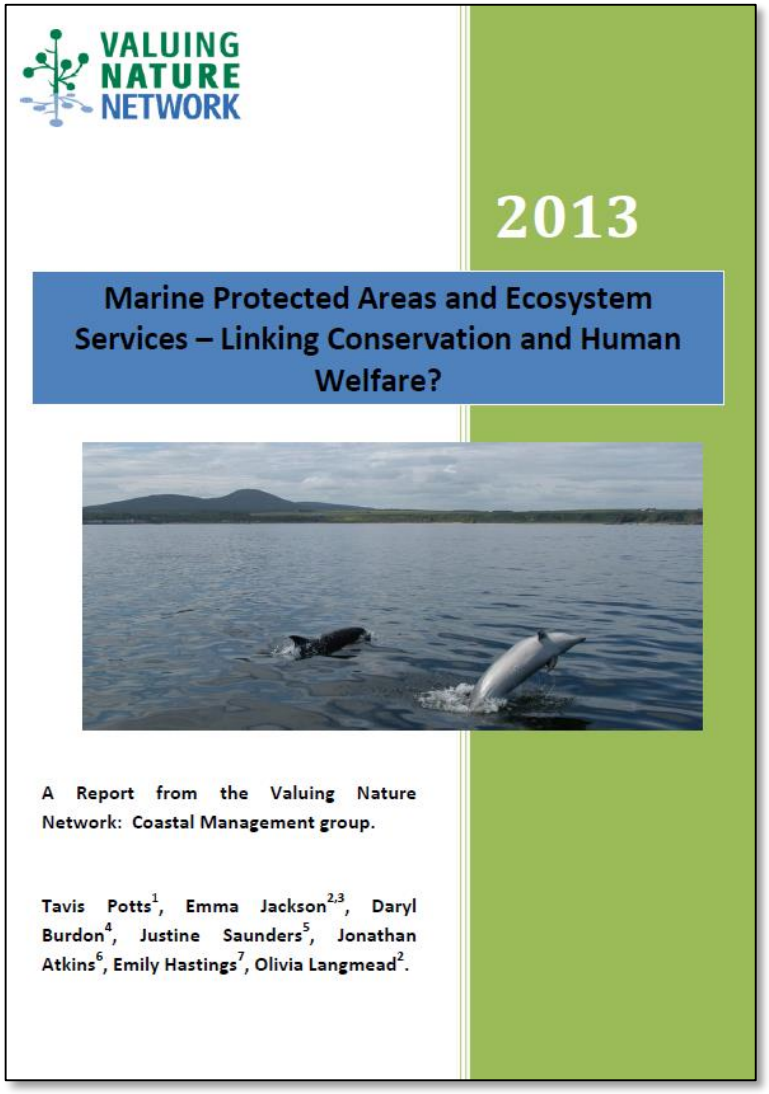


Disturbance prevention was seen as the most significant at all sites.

The other societal benefits varied in importance depending on the site.

Suggests differences in ecological development should be considered when considering future areas of habitat restoration/reclamation, especially if created with a specific purpose.

Case Study 2: Marine Protected Areas

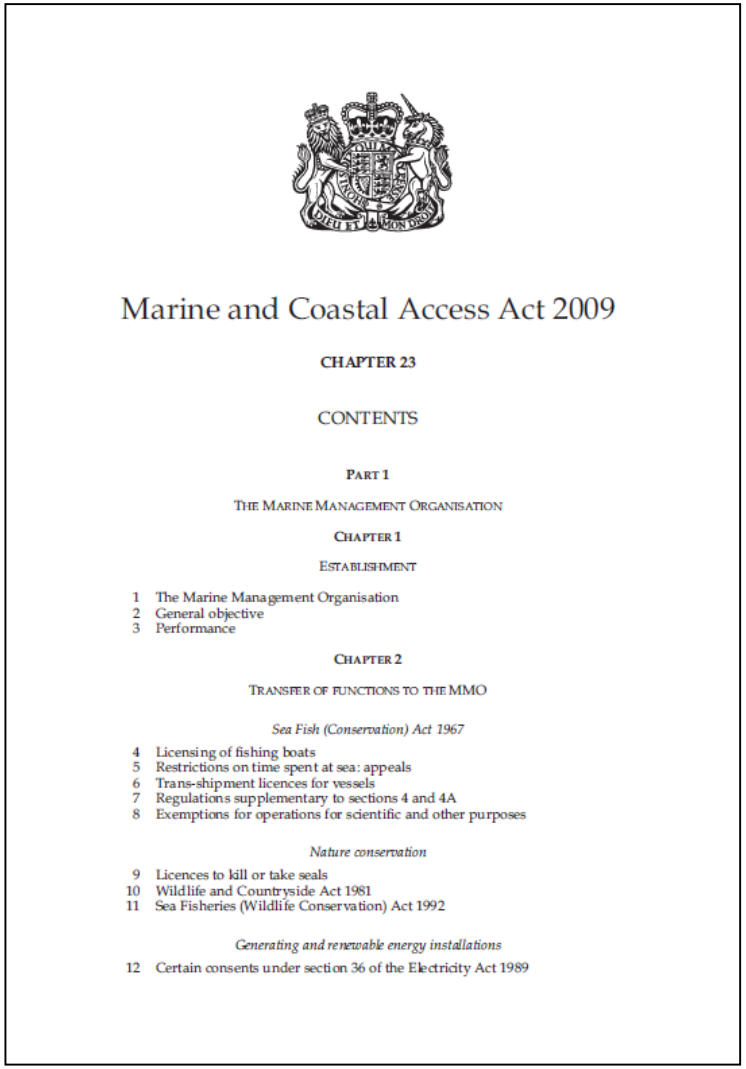


- Work undertaken as part of the NERC-funded VNN.
- Examines potential relationships between MPA designation and ecosystem service provision.
- Developed matrices for habitats and species.
- Applies matrices to a number of UK case studies.

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

- UK Marine Policy Statement (2011): '*creating a UK-wide ecologically coherent network of MPAs as a key element of its wider work to recover and conserve the richness of our marine environment and wildlife*'
- Made operational by the Marine and Coastal Access Act 2009.
- Part 5 of the Act allows the designation of Marine Conservation Zones (MCZs).



Marine and Coastal Access Act 2009

CHAPTER 23

CONTENTS

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

Features | Intermediate Services | Goods/Benefits

Feature Type†	EUNIS code Note: Eunis codes were identified using the JNCC EUNIS translation matrix. Some habitats do not have a direct relationship to the EUNIS code and this column should only be used as a guide.	Feature (Bold type repr… Broadscale habitats, normal type represents habitat FOCI)	Interm… …rvices										Go… …its													
			Supporting services							Regulating services				from Provisioning services					from Regulating services				from Cultural services			
			Primary production	Larval and gamete supply	Nutrient cycling	Water cycling	Formation of species habitat	Formation of physical barriers	Formation of seascape	Biological control	Natural hazard regulation	Waste breakdown and detoxification	Carbon sequestration	Food (wild, farmed)	Fish feed (wild, farmed, bait)	Fertiliser and biofuels	Ornaments and aquaria	Medicines and blue biotechnology	Healthy climate	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism and nature watching	Spiritual and cultural well-being	Aesthetic benefits	Education
Existing Habitats protected under EU legislation																										
E,EU,W	A1.1	**High energy intertidal rock**	3	2	3	1	2	1	1		1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,EU,W	A1.2	**Moderate energy intertidal rock**	3	2	3	1	2	1			1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,EU,W	A1.3	**Low energy intertidal rock**	3	2	3	1	2	1			1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,W	A2.2	**Intertidal sand and muddy sand**	3	3	3	1	3	1	3		3	1	2	1	2	1			2	3	3	1	1	1	3	1
E,W	A2.3	**Intertidal mud**	3	3	3	1	1		1		3	3	3	3	3	1			3	3	3	3	1	1	1	1

Assessment of Importance | Assessment of Confidence | Feature Type

Scale of ecosystem servi… …ied relative to other features

- # Significant contribution
- # Moderate contribution
- # Low contribution
- # No or negligible ESP
- Not assessed

Confidence in evide…

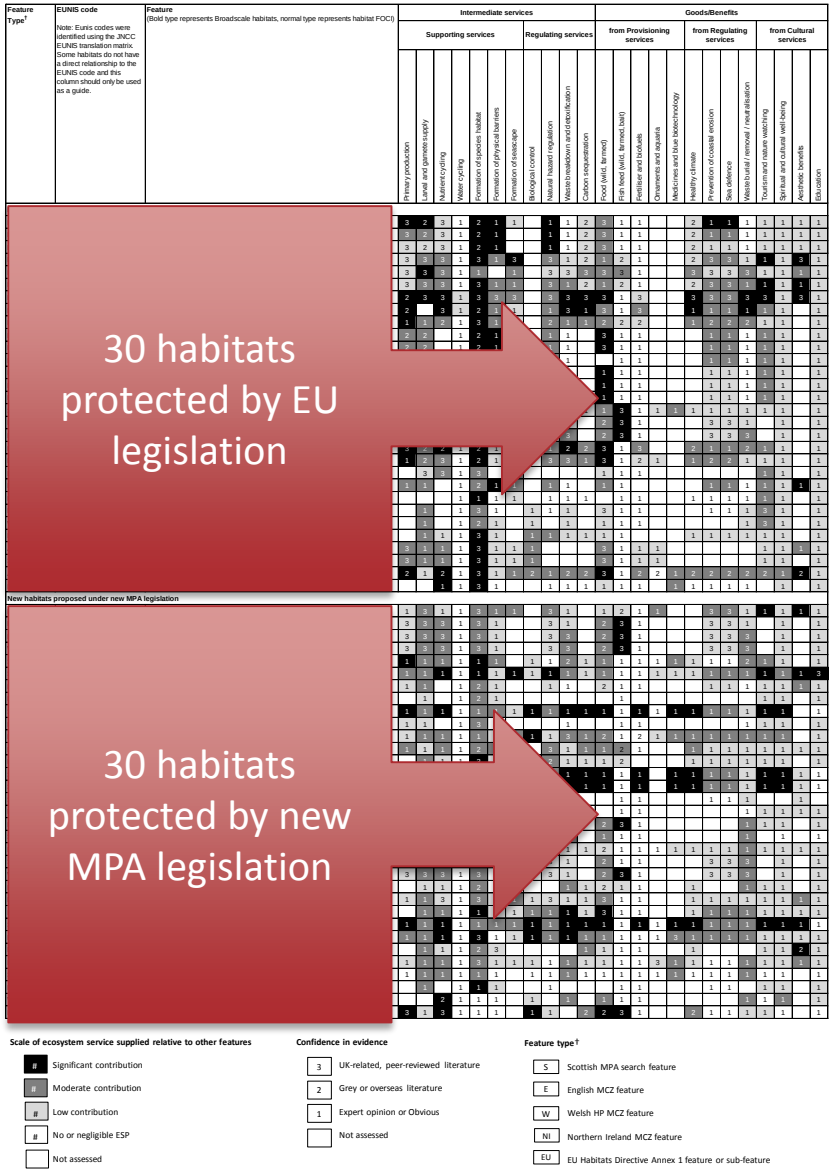
- 3 UK-related, peer-reviewed literature
- 2 Grey or overseas literature
- 1 Expert opinion or Obvious
- Not assessed

Feature type†

- S Scottish MPA search feature
- E English MCZ feature
- W Welsh HP MCZ feature
- NI Northern Ireland MCZ feature
- EU EU Habitats Directive Annex 1 feature or sub-feature

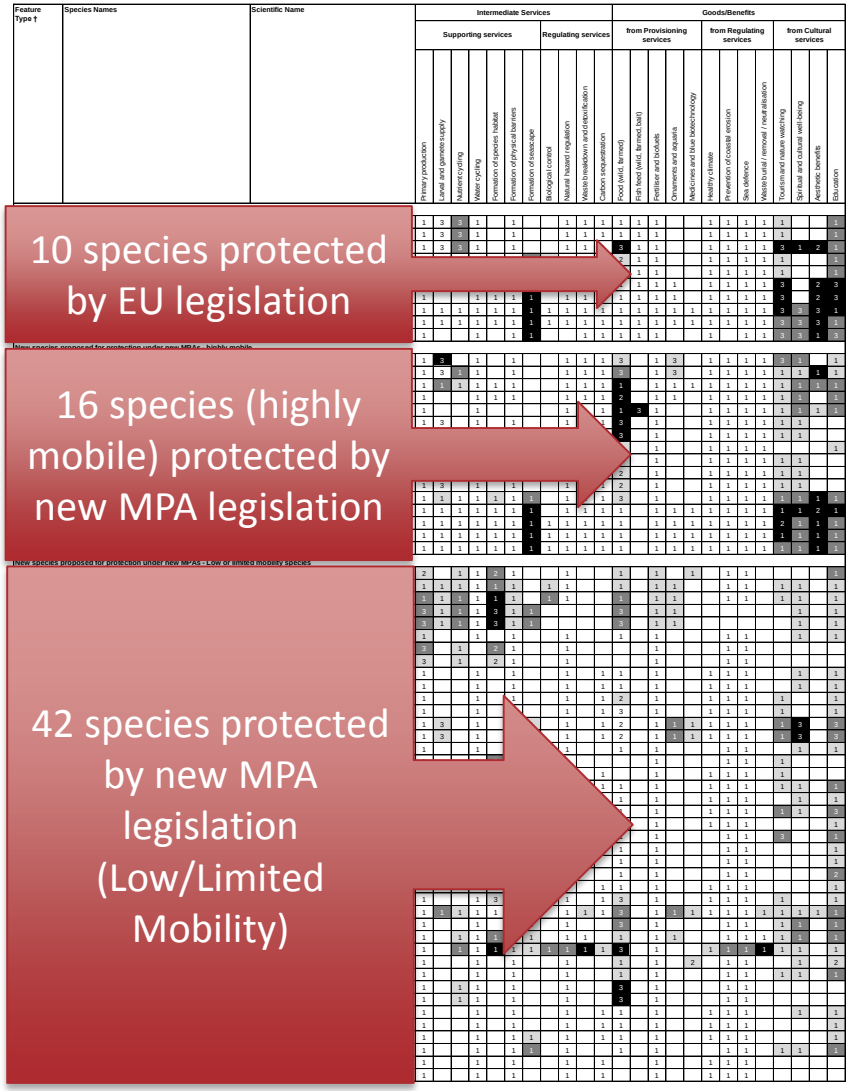
Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull



30 habitats protected by EU legislation

30 habitats protected by new MPA legislation



10 species protected by EU legislation

16 species (highly mobile) protected by new MPA legislation

42 species protected by new MPA legislation (Low/Limited Mobility)

Scale of ecosystem service supplied relative to other features

- # Significant contribution
- # Moderate contribution
- # Low contribution
- # No or negligible ESP
- Not assessed

Confidence in evidence

- 3 UK-related, peer-reviewed literature
- 2 Grey or overseas literature
- 1 Expert opinion or Obvious
- Not assessed

Feature type†

- S Scottish MPA search feature
- E English MCZ feature
- W Welsh HP MCZ feature
- NI Northern Ireland MCZ feature
- EU EU Habitats Directive Annex 1 feature or sub-feature

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

- Matrices were applied to 5 UK cases studies:
  - Moray Firth SAC
  - South Arran pMPA
  - Skomer pMCZ
  - Lundy MCZ
  - Lyme Bay Statutory Fishing Closure

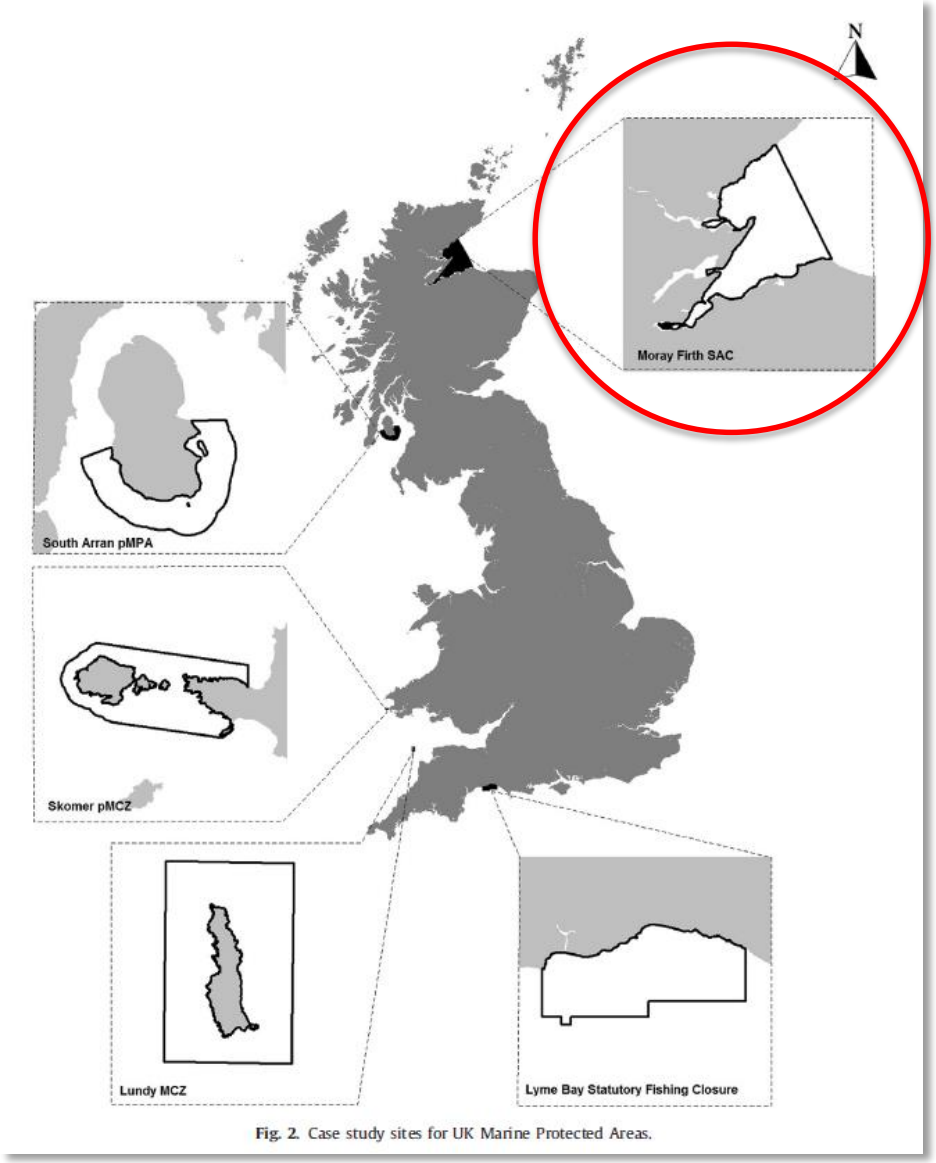
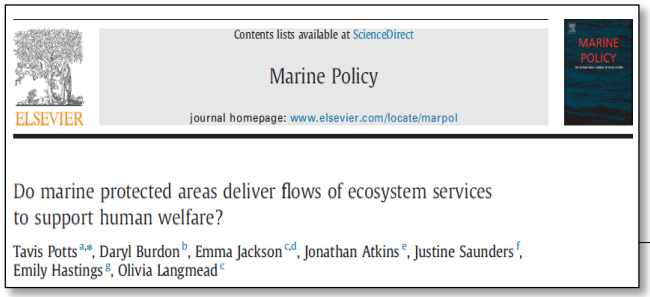


Fig. 2. Case study sites for UK Marine Protected Areas.


Contents lists available at ScienceDirect
Marine Policy
journal homepage: www.elsevier.com/locate/marpol
ELSEVIER

Do marine protected areas deliver flows of ecosystem services to support human welfare?

Tavis Potts[a,*], Daryl Burdon[b], Emma Jackson[c,d], Jonathan Atkins[e], Justine Saunders[f], Emily Hastings[g], Olivia Langmead[c]

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

- Moray Firth SAC under EU Habitats Dir.
- Designated for two features:
  - Sandbanks which are slightly covered by sea water all the time;
  - Bottlenose dolphin.

Feature Type †	Species Names	Scientific Name	Intermediate Services											Goods/Benefits															
			Supporting services							Regulating services				from Provisioning services					from Regulating services					from Cultural services			
			Primary production	Larval / Gamete supply	Nutrient cycling	Water cycling	Formation of species habitat	Formation of physical barriers	Formation of seascape	Biological control	Natural hazard regulation	Regulation of water & sediment quality	Carbon sequestration	Food	Fish feed	Fertiliser	Ornaments (incl. aquaria)	Medicines & blue biotechnology	Healthy climate	Prevention of coastal erosion	Sea defence	Clean water and sediments	Immobilisation of pollutants	Tourism / Nature watching	Spiritual / Cultural wellbeing	Aesthetic benefits	Education
Highly mobile species																													
EU	Common seal	*Phoca vitulina*	1						1															3		2	3
EU, S	Bottlenose dolphin	*Tursiops truncatu*	1	1	1		1	1	1	1	1	1		1		1	1	1	1	1		1		3	3	3	1
EU, S	Harbour porpoise	*Phocoena phocoena*	1	1	1		1	1	1	1	1	1		1		1	1	1	1	1		1		3	3	3	1

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

- Humber Habitats

Feature Type†	EUNIS code Note: Eunis codes were identified using the JNCC EUNIS translation matrix. Some habitats do not have a direct relationship to the EUNIS code and this column should only be used as a guide.	Feature (Bold type represents Broadscale habitats, normal type represents habitat FOCI)	Intermediate services										Goods/Benefits											
			Supporting services							Regulating services				from Provisioning services					from Regulating services				from Cultural services			
			Primary production	Larval and gamete supply	Nutrient cycling	Water cycling	Formation of species habitat	Formation of physical barriers	Formation of seascape	Biological control	Natural hazard regulation	Waste breakdown and detoxification	Carbon sequestration	Food (wild, farmed)	Fish feed (wild, farmed, bait)	Fertiliser and biofuels	Ornaments and aquaria	Medicines and blue biotechnology	Healthy climate	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism and nature watching	Spiritual and cultural well-being	Aesthetic benefits	Education
Existing Habitats protected under EU legislation																								
E,EU,W	A1.1	**High energy intertidal rock**	3	2	3	1	2	1	1		1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,EU,W	A1.2	**Moderate energy intertidal rock**	3	2	3	1	2	1			1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,EU,W	A1.3	**Low energy intertidal rock**	3	2	3	1	2	1			1	1	2	3	1	1			2	1	1	1	1	1	1	1
E,W	A2.2	**Intertidal sand and muddy sand**	3	3	3	1	3	1	3		3	1	2	1	2	1			2	3	3	1	1	1	3	1
E,W	A2.3	**Intertidal mud**	3	3	3	1	1		1		3	3	3	3	3	1			3	3	3	3	1	1	1	1
E,EU	A2.4	**Intertidal mixed sediments**	3	3	3	1	3	1	1		3	1	2	1	2	1			2	3	3	1	1	1	1	1
E	A2.5	**Coastal saltmarshes and saline reedbeds**	2	3	3	1	3	3	3		3	3	3	3	1	3			3	3	3	3	3	1	3	1
EU,E,W	A2.6	**Intertidal sediments dominated by aquatic angiosperms**	2		3	1	2	1	1		1	3	1	3	1	3			1	1	1	1	1	1		1
EU,E,W	A2.7	**Intertidal biogenic reefs**	1	1	2	1	3	1	1		2	1	1	2	2	2			1	2	2	2	1	1		1
EU,E,W	A3.1	**High energy infralittoral rock***	2	2		1	2	1			1	1		3	1	1				1	1	1	1	1		1
EU,E,W	A3.2	**Moderate energy infralittoral rock***	2	2		1	2	1			1	1		3	1	1				1	1	1	1	1		1
EU,E,W	A3.3	**Low energy infralittoral rock***	2	2		1	2	1			1	1			1	1				1	1	1	1	1		1
EU,E,W	A4.1	**High energy circalittoral rock****	2	2		1	2	1			1	1		1	1	1				1	1	1	1	1		1
EU,E,W	A4.2	**Moderate energy circalittoral rock****	2	2		1	2	1			1	1		1	1	1				1	1	1	1	1		1
EU,E,W	A4.3	**Low energy circalittoral rock****	2	2		1	2	1			1	1		1	1	1				1	1	1	1	1		1
S	A5.1, A5.2	**Offshore subtidal sands and gravels**	1	1	1	1	1	1		1	1	1	1	1	3	1	1	1	1	1	1	1	1	1		1
E,W	A5.2	**Subtidal sand**	3	3	3	1	3	1			3	1		2	3	1				3	3	1		1		1
EU,E,W	A5.4	**Subtidal mixed sediments**	3	3	3	1	3	1			3	3		2	3	1				3	3	3		1		1
EU,E,W	A5.5	**Subtidal macrophyte-dominated sediment**	3	2	2	1	2	1			1	2	2	3	1	3			2	1	1	2	1	1		1
EU,E,W	A5.6	**Subtidal biogenic reefs**	1	2	3	1	2	1			3	3	1	3	1	2	1		1	2	2	1	1	1		1
EU	X02	**Saline lagoons**		3	3	1	3		1					1	1	1							1	1		1
EU, E, NI	A1.32	Estuarine rocky habitats	1	1		1	2	1	1		1	1		1	1					1	1	1	1	1	1	1

Case Study 2: Marine Protected Areas

UNIVERSITY OF Hull

- Humber Species

Feature Type †	Species Names	Scientific Name	Intermediate Services											Goods/Benefits											
			Supporting services							Regulating services				from Provisioning services					from Regulating services				from Cultural services			
			Primary production	Larval and gamete supply	Nutrient cycling	Water cycling	Formation of species habitat	Formation of physical barriers	Formation of seascape	Biological control	Natural hazard regulation	Waste breakdown and detoxification	Carbon sequestration	Food (wild, farmed)	Fish feed (wild, farmed, bait)	Fertiliser and biofuels	Ornaments and aquaria	Medicines and blue biotechnology	Healthy climate	Prevention of coastal erosion	Sea defence	Waste burial / removal / neutralisation	Tourism and nature watching	Spiritual and cultural well-being	Aesthetic benefits	Education
Existing species protected under EU legislation																									
EU	Allis shad	*Alosa alosa*	1	3	3	1		1			1	1	1	1	1	1			1	1	1	1	1			1
EU	Twaite shad	*Alosa fallax*	1	3	3	1		1			1	1	1	1	1	1			1	1	1	1	1			1
EU	Atlantic salmon	*Salmo salar*	1	3	3	1		1			1	1	1	3	1	1			1	1	1	1	3	1	3	1
EU	Sea lamprey	*Petromyzon marinus*	1	3		1		1	1	2	1	1	1	2	1	1			1	1	1	1	1			1
EU	River lamprey	*Lampetra fluviatilis*	1	3		1		1		2	1	1	1	2	1	1			1	1	1	1	1			1
EU	Grey seal	*Halichoerus grypus*	1			1	1	1	1		1	1	1	1	1	1	1		1	1	1	1	3		2	3
EU	Common seal	*Phoca vitulina*	1			1	1	1	1		1	1	1	1	1	1	1		1	1	1	1	3		2	3
EU, S	Bottlenose dolphin	*Tursiops truncatu*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	1
EU, S, NI	Harbour porpoise	*Phocoena phocoena*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	1
EU	Otter	*Lutra lutra*	1			1		1	1			1	1	1	1	1			1		1	1	3	3	1	3
New species proposed for protection under new MPAs - highly mobile																									
E	Smelt	*Osmerus eperlanus*	1	3		1		1			1	1	1	3		1	3		1	1	1	1	3	1		1
E	European eel	*Anguilla anguilla*	1	3	1	1		1			1	1	1	3		1	3		1	1	1	1	1	1	1	1
S	Blue ling	*Molva dypterygia*	1	1	1	1	1	1			1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
S	Orange roughy	*Hoplostethus atlanticus*	1			1	1	1			1	1	1	2		1	1		1	1	1	1	1	1		1
S	Sandeels		1			1					1	1	1	1	3	1			1	1	1	1	1	1	1	1
NI	Sole	*Solea solea*	1	3		1		1			1	1	1	3		1			1	1	1	1	1	1		
NI	Plaice	*Pleuronectes platessa*	1	3		1		1			1	1	1	3		1			1	1	1	1	1	1		
E	Undulate ray	*Raja undulata*	1			1		1			1	1	1	1		1			1	1	1	1				1
NI	Spotted ray	*Raja montagui*	1	3		1		1			1	1	1	2		1			1	1	1	1	1	1		
NI	Thornback ray	*Raja clavata*	1	3		1		1			1	1	1	2		1			1	1	1	1	1	1		

CONCLUSIONS

- The inclusion of ecosystem service concepts into MPA designation and management is at an early stage in the UK.
- The priority for designation is one of protecting nationally 'important' habitats and species—usually those that are considered endangered, threatened or rare.
- Few UK designation processes have explicitly taken the ecosystem services concept into account in terms of site selection despite recognition of its importance.
- We argue that this is due to a lack of information and policy guidance rather than explicit omission.
- While the data on identifying and evaluating ecosystem service flows is incomplete, the concept is important in understanding our relationship to coastal systems and the benefits of conservation and protection.

(Source: Potts *et al.*, 2013)

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

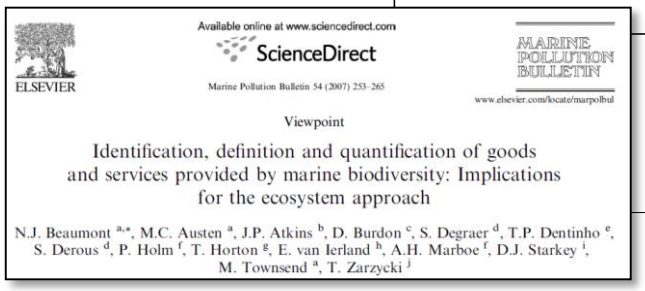
- EU-funded Network of Excellence (2004-2009).
- 53 Partners across Europe.
  - Theme 1 – Global patterns of marine biodiversity across ecosystems.
  - Theme 2 – Marine biodiversity and ecosystem functioning.
  - Theme 3 - Socio-Economic importance of marine biodiversity.

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

- Identified and defined goods and services provided by marine biodiversity.

Category		Good or service
Production services	1	**Food provision** - extraction of marine organisms for human consumption.
	2	**Raw materials** - extraction of minerals and organisms not for human consumption.
Regulation services	3	**Gas and climate regulation** - balance and maintenance of the atmosphere.
	4	**Disturbance prevention** - flood and storm protection by biogenic structures.
	5	**Bioremediation of waste** - removal of pollutants by storage, burial and recycling.
Cultural services	6	**Cultural heritage and identity** - value associated with the marine environment itself.
	7	**Cognitive values** - education and research resulting from the marine environment.
	8	**Leisure and recreation** - refreshment and stimulation of the human body and mind through the perusal and study of, and engagement with, the marine environment.
	9	**Feel good or warm glow** - value derived from the marine environment without using it.
Option use values	10	**Future unknown or speculative benefits** - currently unknown future uses of the marine environment.
Over-arching support services	11	**Resilience and resistance** - environmental life support by the marine environment.
	12	**Biologically mediated habitat** - habitat provided by living marine organisms.
	13	**Nutrient cycling** - the storage, cycling and maintenance of nutrients by marine environment.



Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

- The MarBEF CVM survey was designed to gain insight into how visitors to the various case study sites value their marine biodiversity.
- At Flamborough Head, 222 face-to-face interviews were conducted at 4 sites around the headland (September to November 2007).

Group	**Reported number of species**	**Source**
Marine Invertebrates	270	George *et al.*, 1988; Titley, 1988
Marine Fish	124	Jones *et al.*, 2004a; Jones *et al.*, 2004b
Sea Mammals	14	Sea Watch Foundation, 2007
Sea Birds	32	Jones *et al.*, 2004a; N. Cutts, IECS, pers. comm., 2007
Marine Algae	112	George *et al.*, 1988; Titley, 1988

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

Marine Invertebrates

***c.* 270 Species**

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

"...Suppose the only way to prevent a loss of species living in the sea around Flamborough Head was to establish a neutral conservation trust fund which could only be legally used for marine conservation of various types. Would you be willing to contribute in a once only payment to such a conservation trust fund?..."

Willing to support	Frequency	% Frequency
Yes	140	63
No	82	37
Total	222	100

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

"...What would be the maximum amount you would be willing to pay, in a once only payment to such a conservation trust, in order to avoid a decline in the number of species of marine invertebrates by 10% (c. 27 sp)?..."

Group	n	Min(£)	Max(£)	Mean(£)	Std. Dev.(£)	Median(£)
Marine Invertebrates	139	0.00	100.00	**12.26**	17.90	10.00
Marine Fish	139	0.00	100.00	**12.30**	17.67	6.00
Sea Mammals	139	0.00	100.00	**14.64**	19.98	10.00
Sea Birds	139	0.00	100.00	**13.71**	19.50	10.00
Marine Algae	139	0.00	100.00	**12.65**	19.15	6.00
Marine Biodiversity	139	1.00	1,000.00	**71.91**	123.41	40.00

Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

E) SOCIO-DEMOGRAPHIC QUESTIONS

The following socio-demographic questions are required for data and results validation. In order to validate the present study your cooperation in answering these questions is greatly appreciated. Remember that the answers are anonymous and confidential.

21) Gender

a) Male	
b) Female	

22) Age

[18-24]	
[25-34]	
[35-44]	
[45-54]	
[55-64]	
[65-74]	
Over 75	

23) Where do you live?

Country	
Region/state/province	
City/town	
Postcode	

24) How many people constitute your household? _____

25) What is your net monthly household income (after taxes)?

Less than €600	Less then £400	
€600-€1200	£401 - £800	
€1201-€1800	£801 - £1,200	
€1801-€2400	£1,201 - £1,600	
€2401-€3600	£1,601 - £2,400	
€3601-€4800	£2,401 - £3,200	
€4801-€6000	£3,201 - £4,000	
More than €6000	More than £4,000	

(Conversion rate of €1 = £0.66)

26) What is the highest form of education you have reached?

a) Primary Education	
b) Secondary Education	
c) Higher Education	
d) Postgraduate	

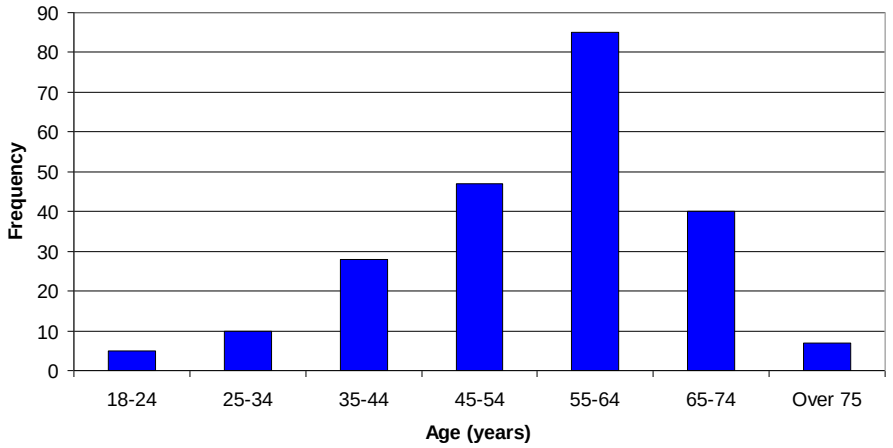
27) Professional occupation

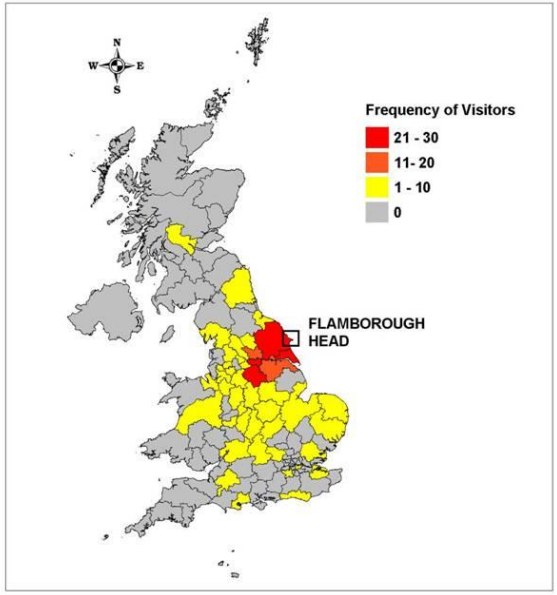
a) Farmer	
b) Fisherman	
c) Employee Public/government	
d) Employee/Private Sector	
e) Independent professional (self employed)	
f) Student	
g) Retired	
h) Unemployed	
i) Homemaker	
j) Other (please specify)	

28) Do you have any comments on our questionnaire survey?

_____
_____
_____
_____

Thank you for your kind cooperation!

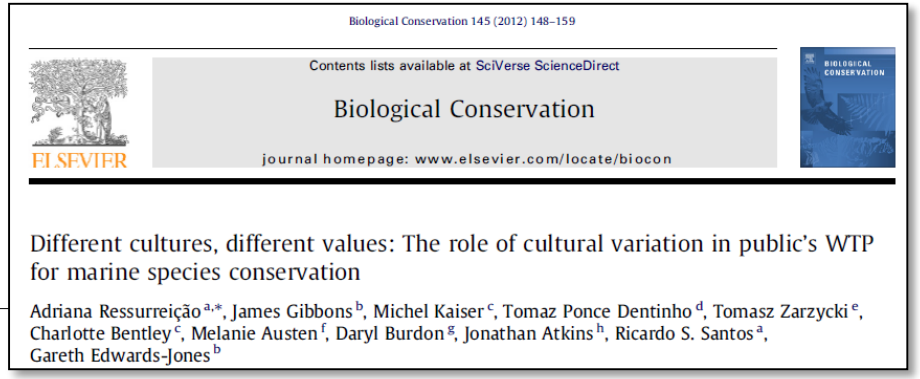




Case Study 3: Biodiversity Valuation

UNIVERSITY OF Hull

- Combined analysis of the Azores, Gdansk & Isles of Scilly data (n=1502).
- Analysis concluded:
  - Income, education and environmental awareness were significant predictors of WTP.
  - Species valued differently in each study:
    - Azores – fish & mammals.
    - Gdansk – mammals>fish>birds>invertebrates>algae.
    - Isles of Scilly – mammals & algae.
  - Charismatic species therefore do not necessarily reflect WTP.
  - Conservation policy must take account of cultural diversity alongside biological diversity.


Biological Conservation 145 (2012) 148–159

Contents lists available at SciVerse ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Different cultures, different values: The role of cultural variation in public's WTP for marine species conservation

Adriana Ressurreição [a,*], James Gibbons [b], Michel Kaiser [c], Tomaz Ponce Dentinho [d], Tomasz Zarzycki [e], Charlotte Bentley [c], Melanie Austen [f], Daryl Burdon [g], Jonathan Atkins [h], Ricardo S. Santos [a], Gareth Edwards-Jones [b]

Summary/Conclusions…

- Ecosystem services are the link between ecosystems and the benefits that they provide for society.
- Enable us to bridge the gap between natural and social sciences and gain an understanding of wider ecosystem issues.
- Potential to lead to benefits for human well-being therefore it is appropriate to consider their value.
- A range of methods is available to assess the values that are placed on these goods/benefits by society.
- Provide a useful tool for monitoring and management purposes.
- Concept has been applied to a wide range of estuarine, coastal, and marine issues.

UNIVERSITY OF Hull

Any Questions?

Daryl Burdon
Senior Ecological Economist,
Institute of Estuarine & Coastal Studies (IECS),
University of Hull

D.Burdon@hull.ac.uk