

2. Impact case studies

Centre: Plymouth Marine Laboratory (PML)

Title of case study: Valuing marine ecosystem benefits to inform policy and management approaches and provide evidence for the designation of protected areas

1. Summary of the impact

The marine environment supports human wellbeing and economic growth, yet is subject to multiple pressures that reduce its ability to do so. In order to make informed management decisions a common currency is needed to assess and compare the value of benefits derived from the sea. PML researchers were the first to identify and systematically value these benefits and thus quantify their significance. These valuations enabled a whole-ecosystem approach that has transformed management and governance and provided evidence to underpin the designation of Marine Conservation Zones. PML research was fundamental to the National Ecosystem Assessment which informed government policy including the UK's Natural Environment White Paper and 25 Year Environment Plan. The approaches used have informed other countries' ecosystem assessments and the strategies of UK Government departments.

2. Underpinning research

Natural capital accounting is a way of considering nature as an asset that provides benefits to people and the economy. The ecosystem services that natural capital provides, such as food and climate regulation, support our health and wellbeing and underpin economic activity. To understand the comparative value of the different benefits provided by the marine environment, PML used natural and social science to ensure that all benefits, including those without a direct market value, are included in decision making.

In 2003, when use of the ecosystem services concept was still in its infancy, Environmental Economist Dr Nicola Beaumont (PML since 2002) was the first to identify and calculate the values of a wide range of services provided by the UK marine environment. As a member of a Prime Minister's Strategy Unit, Dr Beaumont's work contributed to the Cabinet Office publication; *Net benefits: a sustainable and profitable future for UK fishing* [3.1]. Dr Beaumont's valuations highlighted that some key ecosystem services had a higher economic value than commercial fishing. This research underpinned recommendations to the Government on how to achieve the best package of policy reforms. The aim being to ensure that the fishing industry is profitable and sustainable, whilst minimising impact on other valuable services of social and economic importance.

In 2006 Dr Beaumont co-authored the most highly cited paper on marine ecosystem services [3.2]. This paper concluded that marine biodiversity loss is impairing the ocean's capacity to provide food, maintain water quality, and recover from disturbances. She also led a team of PML researchers in an economic valuation for the Department for Environment, Food and Rural Affairs (Defra) that informed the need for further protection of the marine environment [3.3; 3.4]. The research provided monetary values of the services resulting from marine biodiversity in UK waters and innovatively used them to demonstrate the changes in value under future conditions of environmental change. The research valued UK marine biodiversity at an estimated GBP2,670,000,000,000, a figure that has been used in Government reports including *Future of the Sea: marine biodiversity* [3.5]. The research also identified non-use values of marine resources, based on the benefits derived purely from the ongoing existence of a species or habitat; these were calculated to be worth at least GBP500,000,000 to the UK each year.

In 2007 Dr Beaumont and Dr Melanie Austen (PML since 1989, Professor from 2014) led an international team to identify and define the services provided by marine ecosystems. This resulted in a paper which set out a framework for the assessment of goods and services and provided examples using a variety of case studies. It demonstrated how the approach can integrate the demands of society, the economy and the environment into management. The development of this approach was fundamental to the National Ecosystem Assessment (NEA).

The first of its kind in the world, the NEA appraised the UK's natural environment in terms of the benefits it provides to society and economic prosperity. It remains the most comprehensive assessment of the UK's natural resources ever undertaken. Dr Austen was appointed to the Expert Panel of Phase 1 of the NEA and was the coordinating lead author of its *Marine* chapter [3.6], which included 5 members of PML staff as lead or contributing authors. Dr Beaumont led the economic analysis of coastal margins and marine habitats, providing values to underpin the chapter she co-authored; *Economic Values from Ecosystems* [3.7]. The Marine chapter of the NEA drew on much of PML's published research referring to 26 papers from 29 different PML researchers as lead or co-authors.

3. References to the underpinning work

PML authors are highlighted in bold type, citation numbers from Web of Science 7 January 2020.

- 3.1. Cabinet Office. 2004. *Net benefits: a sustainable and profitable future for UK fishing*. Prime Minister's Strategy Unit: London, UK, 167pp. <http://www.eurocbc.org/netbenefits.pdf>
- 3.2. Worm, B., Barbier, E.B., **Beaumont, N.**, Duffy, J.E., Folke, C., Halpern, B.S. *et al.* 2006. Impacts of biodiversity loss on ocean ecosystem services. *Science*, 314(5800), 787-790. doi:10.1126/science.1132294 [2221 citations].
- 3.3. **Beaumont, N.**, **Townsend, M.**, **Mangi, S.**, **Austen, M.C.** 2006. *Marine biodiversity: an economic valuation. Building the evidence base for the Marine Bill*. Department for Environment, Food and Rural Affairs (Defra), 64pp. http://randd.defra.gov.uk/Document.aspx?Document=WC04029_4013_FRP.pdf
- 3.4. **Beaumont, N.J.**, **Austen, M.C.**, **Mangi, S.C.**, **Townsend, M.** 2008. Economic valuation for the conservation of marine biodiversity. *Marine Pollution Bulletin*, 56(3), 386-396. doi:10.1016/j.marpolbul.2007.11.013 [145 citations].
- 3.5. Foresight: Government Office for Science. 2017. *Future of the sea: marine biodiversity*. Government Office for Science: London, UK, 35pp. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/663897/Future_of_the_Sea_-_Marine_Biodiversity_Final.pdf
- 3.6. **Austen, M.C.**, Malcolm, S.J., Frost, M., **Hattam, C.**, **Mangi, S.**, Stentiford, G. *et al.* 2011. Chapter 12: Marine. In *The UK National Ecosystem Assessment technical report*, United Nations Environment Programme World Conservation Monitoring Centre, Cambridge, UK, 459-498 <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>
- 3.7. Bateman, I.J., Abson, D., **Beaumont, N.**, Darnell, A., Fezzi, C., Hanley, N. *et al.* 2011. Chapter 22: Economic values from ecosystems. In *The UK National Ecosystem Assessment technical report*, UN Environment Programme World Conservation Monitoring Centre, Cambridge, UK, 459-498 <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>

4. Details of the impact

Providing underpinning evidence for legislation and conservation designations

The Marine Bill was formed in 2008 to establish a new framework for the management of UK seas and improve marine planning. Dr Beaumont's 2006 report [3.3] was written to provide evidence for the Bill and was specifically referenced in the Impact Assessment, which sets out the costs and benefits of its implementation. In particular, it was demonstrated that the economic benefit derived from the Bill would be significantly increased if Dr Beaumont's non-use values were included [5.1]. Dr Austen presented written and oral evidence to the House of Lords and House of Commons Joint Committee on the Draft Bill in July 2008. The Bill was officially adopted as the Marine and Coastal Access Act (MCAA) in 2009. The MCAA includes a legal duty to designate Marine Conservation Zones (MCZs) to ensure the UK meets national and international commitments, such as the EU Marine Strategy Framework Directive.

To date 91 MCZs have been designated in waters around England over 3 phases (2013, 2016, and 2019). Dr Beaumont's work [3.3; 3.4] was used to support the economic case for these designations underpinning the net present value calculations in the Government's Impact Assessment for each tranche of designations [5.2]. The Impact Assessments also drew on evidence from the NEA with 10 references to the *Marine* chapter [3.6] led by Dr Austen. The Impact Assessment for the third tranche of designations in 2019 also used the NEA's economic

analysis of ecosystem services provided by UK coastal margin and marine habitats, which was led by Dr Beaumont. For example, PML's calculations of the value of regulating services were used to demonstrate the existing benefits of the UK marine environment and provided evidence of the need for further designations. PML's work was used to show that protecting a wide range of species and habitats can increase resilience to natural and human pressures.

The designations complete the UK Blue Belt providing protection for [22,000,000ha](#) of English waters and Northern Ireland offshore waters - nearly twice the size of England. This completes the Government's contribution to the ecologically coherent network of protected areas in the northeast Atlantic in terms of the representation of species and habitats.

"Through the Marine and Coastal Access Act 2009, our seas have become a global exemplar of marine conservation. We are leading the world in developing a marine planning system and in encouraging socioeconomic activities such as fishing to be seen as part of the solution to the environmental challenges that our seas face". HM Government, The Natural Choice [5.3]

Shaping national policy

PML scientists had key roles in the development and delivery of the NEA, which formed the basis of the 2011 Natural Environment White Paper, *The Natural Choice: securing the value of nature* [5.3]. The White Paper sets out the principles for incorporating ecosystem services and their value within conventional government decision-making. It states that *"the results of this research [NEA] deserve to be widely known; they are the reason for many of the actions proposed in this White Paper"*. The holistic approach of the NEA, underpinned by PML's contributions to the marine and coastal aspects, is conveyed in the methodology of the White Paper. This policy document includes PML research, such as marine ecosystem trends, and refers to Dr Beaumont's valuations of coastal wetlands, recognizing the valuable natural functions these habitats provide.

The White Paper provided the legislation for including natural capital within the UK Environmental Accounts, laid the way for the UK's 25 Year Environment Plan (25YEP) and established the Natural Capital Committee (NCC) to advise the Government on environmental assets. As the first and only marine representative on the NCC, Dr Austen ensured that the marine environment was fully incorporated into their 2019 Annual Report and led their first marine advisory paper to the Government. The White Paper influenced the content of the National Planning and Policy Framework, delivered the Biodiversity Strategy for England and set-up Nature Improvement Areas and Local Nature Partnerships [5.4].

"The ecosystem services valuation work carried out as part of the UK NEA represents a clear example of where valuation activities have contributed to a decision-making process. The results of this valuation work made ministers in the UK realise that a 'business as usual' path was not an optimal route to follow in terms of the benefits and services provided by the natural environment. The impact achieved by the publication of the UK NEA was that it fed directly into a Natural Environment White Paper and many other policy initiatives". European Commission [5.5]

The 25YEP [5.6] states that the NEA *"has been hugely influential in the development of natural environment policy in England, the devolved administrations, and internationally"* and a second assessment is planned for 2022.

Informing international assessment approaches

The first of its kind in the world, the UK NEA inspired and informed similar approaches all over the world, influencing the way other nations approach their own assessments. Dr Beaumont is directly cited in the NEA for Norway and France and at a global level in The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services' Global Assessment [5.7]. In the EU, the UK NEA has been used as an evidence source and a methodology for the EU Biodiversity Strategy [5.8]. The NEA currently being developed by Singapore is drawing on the approaches used in the UK NEA. In particular they are using the marine and coastal chapters to inform their approach.

"Singapore took lessons from the approaches applied by Dr Beaumont and Prof Austen of PML as lead authors for the Marine and Coastal chapters of the NEA. This helped us refine the scope of our assessment and what ecosystem components should be assessed and how. We took lessons from the valuation approaches applied and choices of indicators. This saved us an invaluable amount of time, not having to create this framework from scratch and learning from the previous discussions around different approaches." Project Coordinator, Natural Capital Singapore [5.9].

Shaping the approach of Government departments

The NEA was revolutionary in its approach to assessing the UK's natural environment by considering the value of the services it provides. The approach was cemented into UK policy through the Natural Environment White Paper and radiated out to key Government departments. Natural capital now features in the strategies for the Joint Nature Conservation Committee (JNCC) and Natural England. The JNCC 2017-2020 strategy '*supports new policy approaches based on the concepts of natural capital and integrated management of natural resources. These concepts will shape our future work*' [5.10]. Natural England's Conservation Strategy for the 21st century calls the concept of natural capital a '*powerful new tool*' that '*offers the potential to make environmental planning central to local and national decision-making*' [5.11].

"The NEA, because it was compiled by a wide community of scientists and produced coherent, quantified evidence showing the values to society of natural ecosystems, was a key part of a cultural shift to focus on people, as much as other species, as beneficiaries of nature conservation. The natural capital approach is now pivotal to much of JNCC's activity. Understanding the economic value of, for example, flood protection and carbon capture and storage by coastal habitats is leading to new approaches such as restoration of salt marshes, seagrass and oyster beds." Marine Natural Capital Leader, JNCC [5.12]

Informing delivery of the Government's 25 Year Environment Plan

The 25YEP explicitly states that "*over the coming years the UK intends to use a 'natural capital' approach as a tool to help us make key choices and long-term decisions*". The North Devon Marine Pioneer is 1 of 4 Government initiatives that have been set-up to inform delivery of the 25YEP and test the application of a natural capital approach. PML has been fundamental to the delivery of the Pioneer through involvement in the NERC-funded South West Partnership for Environment & Economic Prosperity (SWEEP).

"PML's contribution to the Marine Pioneer has been substantial, building the evidence base and co-developing knowledge and tools to shape and progress the pioneer. The pioneer is a key programme to test delivery of the Government's 25YEP, the approaches developed will help the Government work towards enhancing nature for the next generation and achieving environmental net gain", Marine Pioneer Programme Lead, MMO [5.13].

Through SWEEP, Sustainability Appraisals were identified as a key legislative process where natural capital can inform decision making. Dr Tara Hooper (PML since 2012) has developed a methodology for incorporating natural capital into these appraisals which evaluate the economic, environmental and social effects of a local plan. This methodology, which is now being applied to local and marine planning in the southwest, had not previously been attempted for either marine or terrestrial environments. Through this work Dr Hooper has been influential in the development of the North Devon Marine Natural Capital Plan, the first ever local marine spatial plan using a natural capital approach, which is informing the management strategy of the UNESCO Biosphere Reserve.

"PML has been instrumental in shaping the development of the Marine Natural Capital Plan for North Devon, changing our approach to management of the UNESCO World Biosphere Reserve. The experience we have gained from working with PML means that we can share the good practice with other UNESCO sites around the world as part of the intergovernmental science programme". Biosphere Reserve Co-ordinator and Services Manager [5.14].

Adding value to marine management

PML's research has brought marine ecosystem services valuation into the mainstream. This approach has informed coastal site management at the local level including the Tamar Estuary Management Plan and North Devon Biosphere Reserve.

In 2016 PML hosted a workshop for regional site managers on applying the ecosystem services approach. As a result of the workshop and ongoing collaboration, a section on 'Nature's Value' was added to the Exe Estuary Management Plan [5.15]. For the first time it details the benefits the estuary provides to society and how valuation of these services enables direct comparison of the economic and societal impact of different uses. It uses findings from the NEA to provide evidence throughout the report and specifically acknowledges PML's contribution [5.15].

"The NEA has led to an increased understanding of the significance of safeguarding ecosystems goods and services and the usefulness of an ecosystem based approach for management". Tamar Estuary Management Plan [5.16].

5. Sources to corroborate the impact

- 5.1. HM Government. 2008. *Draft Marine Bill*. Cm 7351. Department for Environment, Food and Rural Affairs, London, UK. 687pp. PML work cited in the Impact Assessment https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228636/7351.pdf
- 5.2. PML (ed). 2020. *Valuing marine ecosystem benefits to inform policy and management approaches and provide evidence for the designation of protected areas*. A compilation of Impact Assessments created by Defra to inform the designation of Marine Conservation Zones (MCZ). 305pp. https://www.pml.ac.uk/Research/Our_impact/NC_IA.pdf
- 5.3. HM Government. 2011. *The natural choice: securing the value of nature* London, UK, 76pp. Quote from section 2.88, page 32 <https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature>
- 5.4. Department for Environment, Food and Rural Affairs. 2014. *Natural Environment White Paper - Implementation update report. October 2014*. Defra. 33pp. <https://www.gov.uk/government/publications/natural-environment-white-paper-implementation-updates>
- 5.5. Ling, M.A., King, S., Mapendembe, A., Brown, C. 2018. *A review of ecosystem service valuation progress and approaches by the Member States of the European Union* Cambridge, UK, 73pp. Quote from page 51 https://ec.europa.eu/environment/nature/capital_accounting/pdf/eu_es_valuation_review.pdf
- 5.6. HM Government. 2018. *A green future: our 25 year plan to improve the environment*. Department for Environment, Food and Rural Affairs, 151pp. <https://www.gov.uk/government/publications/25-year-environment-plan>
- 5.7. IPBES. 2019. *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES Secretariat: Bonn, Germany <https://ipbes.net/assessing-knowledge>
- 5.8. Living with Environmental Change. 2012. National Ecosystem Assessment achieves international impact. [online] [Cited 2 January 2020]. <https://webarchive.nationalarchives.gov.uk/20120713152844/http://www.lwec.org.uk/stories/national-ecosystem-assessment-achieves-international-impact>
- 5.9. 17 January 2020. Statement from Natural Capital Singapore [letter]. *Project Coordinator, Natural Capital Singapore*.
- 5.10. Joint Nature Conservation Committee. 2017. *Strategy 2017-2020*, 12pp. <http://data.incc.gov.uk/data/ccb9f624-7121-4c32-aefa-e0579d7eaaa1/JNCC-Strategy-2017-2020-final.pdf>
- 5.11. Natural England. 2016. Growing natural capital. In *Conservation 21. Natural England's conservation strategy for the 21st century*, Natural England, p.8 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/562046/conservation-21.pdf
- 5.12. 3 January 2020. Letter of support [email]. *Marine Natural Capital Leader, Joint Nature Conservation Committee*.
- 5.13. 6 January 2020. Letter of support. *Marine Pioneer Programme Lead, Marine Management Organisation*.
- 5.14. 7 January 2020. Letter of support [email]. *Biosphere Reserve Co-ordinator and Services Manager*.
- 5.15. Exe Estuary Management Partnership. 2016. *Exe Estuary Management Plan 2016–2021*. Devon County Council: Exeter, UK, 50pp. <https://www.exe-estuary.org/publications/partnership-documents/>
- 5.16. Tamar Estuaries Consultative Forum. 2012. *Tamar Estuaries Management Plan 2013–2018*. Tamar Estuaries Consultative Forum: Plymouth, 57pp. http://www.plymouth-mpa.uk/wp-content/uploads/2018/10/tecf_temp20132018.pdf