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ialeUK
INTERNATIONAL ASSOCIATION FOR LANDSCAPE ECOLOGY

SEASCAPE ECOLOGY:

CONNECTING LAND, SEA & SOCIETY

ialeUK Conference

7–9 SEPTEMBER 2015,
THE UNIVERSITY OF
EDINBURGH, UK

www.iale.org.uk/conference2015

Foreword

These proceedings contain the abstracts of the 22nd ialeUK conference Seascape ecology: connecting land, sea and society held in Edinburgh 7-9 September 2015.

Nearly 70 delegates from nine countries and three continents will attend the conference, covering coastal science, policy and practice. We hope the conference will offer a stimulating opportunity to explore the use of terrestrial, coastal and marine approaches to map seascape, measure spatial pattern and understand drivers of change.

The conference is structured in four symposia:

- Seascape integrity: past and future will illustrate the role historical ecology and environmental change plays in informing current and future seascape policies and practice.
- Seascape connectivity: networks and corridors will discuss seascape connectivity through real-world examples that attempt to maintain or recover ecological functionality in diverse seascape scales and settings.
- Seascape development: opportunities and challenges will examine the evolution of sustainable development practices to provide insights on to how to value and maintain seascape integrity
- Seascape ecosystem services: managing natural capital will allow speakers with different perspectives to advance our understanding of how seascape services can be mapped, valued and enhanced.

The ialeUK conference has been made possible by organisational support from The University of Edinburgh and the ialeUK committee. Student participation was possible through seven grants funded by ialeUK, and generous support from The University. We are grateful to East Lothian Council for their active support in the field excursion, allowing delegates to continue to have discussion whilst learning about the East Lothian coast.

Anja Liski, Marc Metzger and Meriwether Wilson

Edinburgh, August 2015

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Mon 7 Sept am - Seascape integrity: past and future

There are numerous ways in which our knowledge of the past can inform our current thinking of seascape. The historical character of coastal and marine systems across time and space is a cross-cutting aspect of ecology, helping us understand the undergoing change but also learn lessons from the past. This session will illustrate the role historical ecology and environmental change plays in informing current and future seascape policies and practice.

Seascape Ecology - Evolutions of Perception and Practice

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The term seascape evokes a broad range of interpretations and reflections, often suggesting a personal and visual engagement with the sea. The view may be pondering, looking towards the sea as a horizon of potential, or from the other direction, a familiar shore upon from a voyage.

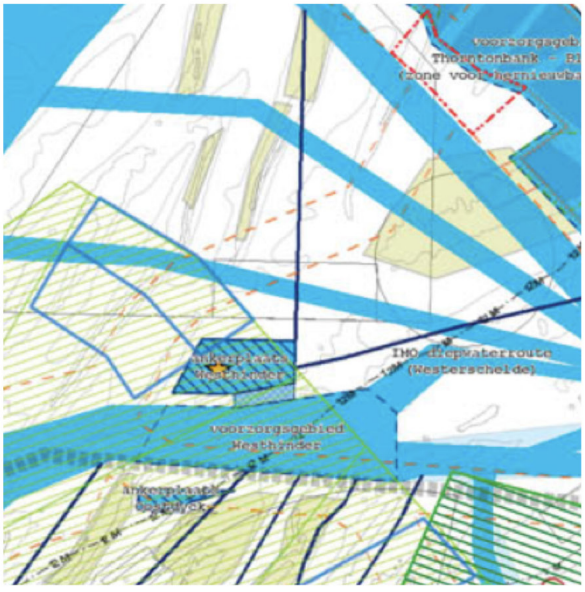
The concept of seascape can also be intended to refer to the biophysical features of particular coastal and marine environments, and is used across a diverse range of scales. Examples include a stretch of intertidal shoreline, such as the geologically spectacular Jurassic coast in England, a collection of oceanic islands and surrounding waters spanning several million kilometers and three countries, such as the Eastern Tropical Pacific Seascape. For some, it might be more akin to the concept of oceanscape - an underwater world of seamonts, submarine canyons and abyssal plains.

Over breakfast last week, while on a retreat on the remote Scottish island of Muck, with my MSc students, I asked my students what does 'seascape' meant to them in about one word. Responses, included - don't know, seawall, ocean horizons, picturesque, waves and currents, submarine canyons, fishing villages and coastal beaches. What emerges, and what is special about the term seascape, is that regardless how the term is used, be it from a personal perspective or more formal categorization, seascape also implies an intersection of society and nature, that comfortably links to the concept of 'heritage'. Heritage, while also a term with multiple meanings, often refers to both natural heritage, e.g. biologically diverse and threatened coral reefs, as well as built heritage with reference to human inspired structures over time, such as historic waterfronts, where trade and civilizations may have thrived or diminished over time. When the concept of seascape is aligned with the word ecology, one may wonder if a more formal interpretation and alignment with scientific correctness is suggested. In preparing for this talk I was surprised how little reference I found with these terms together, be it through google, or more formal academic journal databases, which I thought was actually interesting. Digging deeper, I found several thematic sessions in journals, largely focusing on intertidal ecology. I also found it was beginning to be used by national level planning authorities with regard to emerging need for 'marine spatial planning', in response to new thinking about criteria for zoning and permitting for marine wind farms.

In this talk, I will take a long-term view of the concept of seascape ecology, first exploring its genesis in the late 1800s and natural history descriptions of the 'seaside' and imaginations of seascapes both wild and sublime. Followed by a review of evolutions in marine conservation, biodiversity over recent decades, ending with suggestions for how our seascapes of the past, can provide inspired management for our seascapes of the future.

1850, Turner, Fingals Cave Scotland

1960 Diebenkorn, Seawall, California



2015 Spatial Planning, North Sea

Spanning the Clear Blue Water

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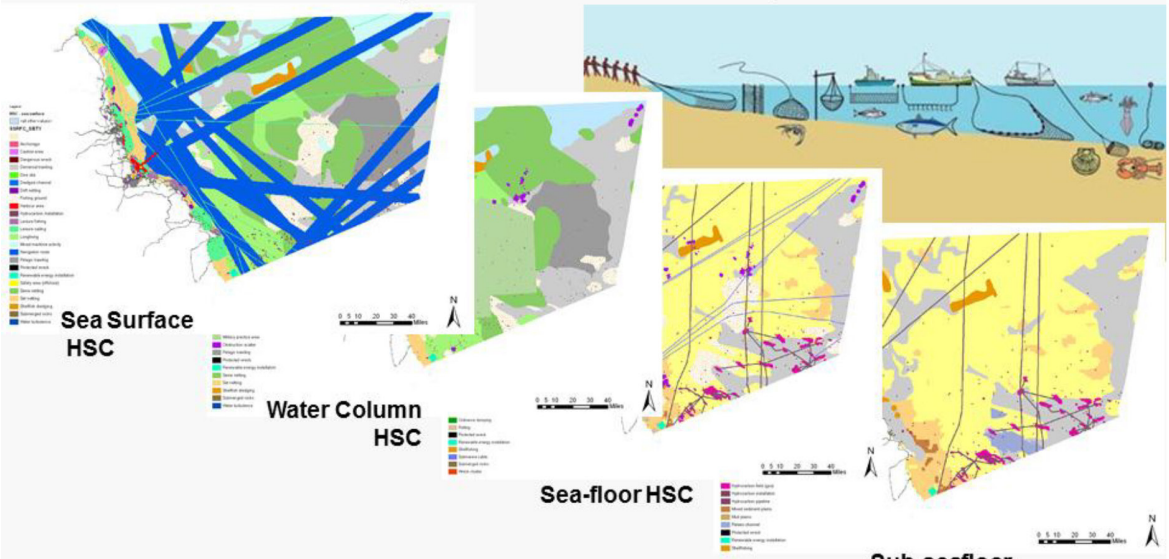
The IALE Mission Statement emphasises that landscape's multi-disciplinary character needs collaborative, integrative approaches across the sciences and humanities to address issues of the present and inform landscape planning and change for the future. Similar thinking underpins European Science Foundation (ESF) Policy Briefing 41 Landscape in a Changing World (1), set in the context of the European Landscape Convention (ELC) which explicitly covers marine areas and so encompasses seascape. The ELC, ratified by the UK in 2006, defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or cultural processes' (2). Connecting people's subjective landscape perceptions with the objective environment, the ELC links the sciences' and humanities' fields of study. We inhabit both the singular physical reality of the 'environment' and the many perceptions of that reality we call 'landscape'. That sits well with IALE's Mission and draws popular landscape perceptions into the scope of our integrative dialogues: broadly-based integration essential in publicly-accountable moves to address the major sustainability challenges facing human societies, from ecological imbalance and climate change to energy provision and food security. But integrative dialogues need to be populated. Land/seascape is about areas and comprehensive area-based data for seas and coasts is notoriously sparse. That applies to the cultural processes shaping seascape character, dominated by digital marine mapping of present activity, lacking time depth, and by scattered 'heritage' point-data, mostly of wrecks. But change is afoot. England's Marine Plan preparation is now informed by Historic England's 'Historic Seascape Characterisation' (HSC): strategic-level GIS mapping of the typical cultural processes shaping seascape character, past and present at each major level of the marine environment. HSC looks forward to help that cultural dimension join other environmental themes in integrated approaches to planning more sustainable future seascape and coastal landscape. Key roles now and ahead lie in informing marine planning, providing cultural narratives that raise public connectivity with seascape and understanding past sustainable practices as well as the origins of present imbalances. Finding sustainable relationships with the environment of which we are a part must be informed by sound science expressed, for example, through ecosystem services assessment, but must also be realised within cultural contexts, not only as cultural goods and services but through debate and consensus. Seascape's plurality across the sciences, humanities and people's perceptions, gives strength in facilitating that necessary cultural engagement.

[1] www.esf.org/publications/science-policy-briefings.html, accessed 27 July 2015

[2] www.gov.uk/government/publications/european-landscape-convention-florenc..., accessed 27 July 2015

Historic Seascape Characterisation (HSC)

layered historic character mapping reflects marine zone's
layered three-dimensionality



'Conflated' & 'Previous' HSC mapping can also be generated

Linked to the GIS mapping, HSC Character Type briefing texts
giving national and regional perspectives on each HSC Character Type

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HSC GIS-linked Character Type texts

Consistently structured, accessible language

- Rapid briefing for other professionals on what HSC Character Types mean
- Readily adaptable as user-friendly web resource to raise public understanding

Using 'Fishing' Character Type as an example:

- **Distinguishing attributes & variety:**
  - Seining, netting, long-lining, benthic, pelagic trawling
  - Impacts of coastal settlement and transport, etc, structure
- **History and processes:**
  - Roles in history of British fishing
  - Traditional long-lining and drifting
  - Coastal 'potting' and mariculture
- **Present Values & Perceptions:**
  - Concerns over sustainable stocks
  - Fishing communities and identity
- **Research, Amenity and Education:**
  - Scope for further historical study (incl. oral history)
  - Trawling and recovery of artefacts from drowned land-surfaces
- **Condition & Forces for Change:**
  - Ecological sustainability, CFP reform, quota impacts
  - Poor financial viability & limited investment in industry
- **Rarity and Vulnerability:**
  - distinctive methods & craft; losses of craft skills; sustainability issues
- **Sources:** Albert Close Chart, CEFAS, NESFC, Documentary, web


Trawlers at Looe © Dave Hooley


Steam Drifters leaving harbour at Hartlepool © Hartlepool Arts, Museums & Events

The Inner Forth Futurescape

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The Inner Forth is one of the most important and dynamic coastlines in Scotland hosting internationally important inter-tidal habitats alongside a rich industrial heritage. It is this contrast between the human and natural landscape that makes the Inner Forth such a fascinating place, with wildlife often thriving in the shadow of huge industrial structures. At the same time however, this contrast creates pressures which threaten the future of many species within the area.

This is most evident through the extensive land reclamation that has occurred over the past 300 years, which has turned large areas of inter-tidal habitat into prime agricultural and industrial land. This reclamation has led to the loss of over 50% of the inter-tidal habitat that once existed within the Inner Forth, dramatically altering the landscape. This habitat, consisting of salt marsh and mudflats, is a vital wintering ground for thousands of birds such as redshanks, knots, dunlins and oystercatchers and as such the loss of these vital feeding and roosting areas has had a major impact on the natural heritage of the Inner Forth.

Large areas of the Inner Forth have since been designated as part of the Firth of Forth Special Protection Area, reflecting the international importance of the landscape to wintering waders and waterfowl, and providing a level of protection against further losses. This habitat is however still under threat, partly through further developments in the area, but also through the ever increasing threat from climate change. With the sea walls protecting the reclaimed land squeezing the coastal habitats in to a narrower, less natural channel, the increasing sea levels and more powerful storm surges caused by climate change have the potential to decrease the extent and function of the existing saltmarsh.

This threat is not only relevant to the wildlife, but also the people of the Inner Forth. Increasing sea levels threaten existing farmland and homes with flooding and the loss of the saltmarsh has increased this threat through removing the natural flood defence that used to protect much of the agricultural areas inland. With sea walls overly expensive to properly repair, and the natural defence of the saltmarsh continuing to erode, it is clear that a 'do nothing' option for the Inner Forth is not viable and that action has to be taken to protect both the wildlife and the people that call the area home.

In response to these threats the RSPB has established the Inner Forth Futurescape, a landscape scale conservation project that aims to deliver 2,000 hectares of habitat creation around the Falkirk area. By creating a network of new wetland habitats we will provide homes for wildlife, help reverse losses in biodiversity and open up a range of other benefits for people such as natural flood management. This a big, ambitious vision but if it is successful it has the potential to create a sustainable future for this unique landscape and the people who call it home.

Figure 1: Mudflats of the Inner Forth with Longannet power station in the background.

Future visions for the Inner Forth coast - Social and cultural meanings of habitat restoration for the local communities

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Restoration of coastal ecosystems in order to rebuild coastal resilience and habitat connectivity is an increasingly common scenario in the Anthropocene. This research examines how visions of landscape-scale habitat restoration in the Inner Forth translate to social and cultural meanings for the local communities.

Cultural ecosystem services in the coast are the physical, intellectual, spiritual and symbolic interactions with seascapes[1]. The definition of demand for cultural ecosystem services (use, need or desire by society[2]) is here extended to include appreciation so that it applies to existing non-use values, such as aesthetics, identity and sense of place. Cultural services can be valued through a diverse range of approaches that examine the importance, need, perception, preference or plurality of a property through symbolic, cultural and ecological dimensions[3]. This research develops a mixed method approach to describe and map social and cultural values, using a combination of individual and social processes of valuation, as well as a multitude of value indicators.

Focus is drawn to examine the impact of deliberation, the process of individual or social appraisal and consideration, on the values that are being discovered during the valuation process[4]. A more deliberative valuation approach is expected to help individuals understand values held by others through discussions on equity and fairness, aiding the inclusion of other regarding values and intangible cultural ecosystem services[5].

The valuation of current and potential coastal ecosystems is conducted through a series of workshops in Alloa (N=100) and one-to-one surveys in Alloa, Kincardine, Grangemouth and Airth (N=400).

To bring the results of the valuation into a policy and management context, the spatial pattern of social and cultural values is examined in relation to the supply of actual and potential coastal ecosystem services. Priority areas for coastal improvements are finally highlighted by identifying opportunities where mismatches in supply-demand could be alleviated through coastal realignment. The Inner Forth provides a truly interesting stage for testing innovative methods for valuing ecosystems from a policy perspective.

[1] Haines-Young R and Potschin M, 2014. Typology/Classification of Ecosystem Services, in: OpenNESS Ecosystem Services Reference Book. EC FP7 Grant Agreement no. 308428.

[2] Villamagna AM et al, 2013. Capacity, pressure, demand, and flow: A conceptual framework for analyzing ecosystem service provision and delivery. Ecological Complexity 15, 114–121

[3] Chan KMA et al, 2012. Where are Cultural and Social in Ecosystem Services? A Framework for Constructive Engagement. BioScience 62, 744–756.

[4] Spash CL, 2012. New foundations for ecological economics. Ecological Economics 77, 36–47.

[5] Crompton T, 2010. Common cause. Available at: http://www.wwf.org.uk, Accessed 20th Aug 2015


Alloa
Airth
Kincardine
Firth of Forth
North Sea
Grangemouth
Existing salt marsh and mudflat
Areas that could be improved
Core paths

The importance of public engagement within a seascape character assessment

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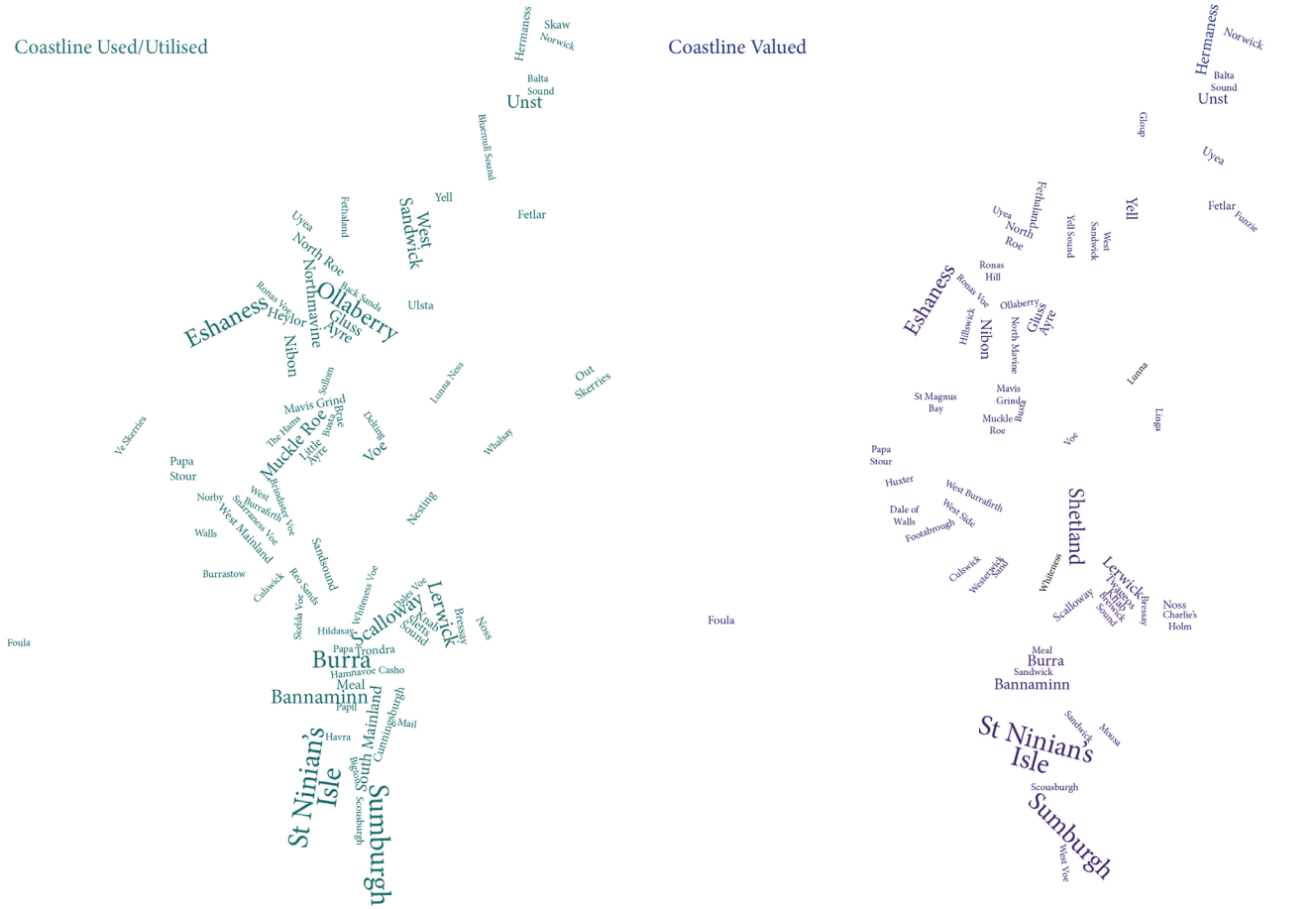
Seascape character assessments are a relatively new concept, with few examples from the UK. They have developed from the long standing methodology of landscape character assessments. Similar to landscape character assessments, how a seascape character assessment is carried out will depend on the intended use of the information gathered, thus the assessment may vary between different regions. However, they should all be done in a structured and robust manner[1]. A seascape assessment has been initiated in the Shetland Islands to support the emerging regional marine spatial planning process.

This paper will discuss how public engagement within the planning disciplines, terrestrial or marine, can create a more integrated service with policies, conservation and development opportunities created which consider culture, environment and economics equally. By using public engagement in the seascape character assessment process, the assessment can be better integrated within a marine planning context.

Public engagement has formed a significant part of the seascape character assessment in Shetland, with different methods being trialled to see the response levels. By engaging with residents and visitors to the islands, a seascape character assessment can be used to map areas of recreation and inspiration, value and degradation by the people who may only visit once in a lifetime and people who see the coastline every day. Through considering not only the differing perspectives between visitors and residents, but also between different age groups and different professions such as the creative industries and fisheries, a rich database can be compiled. This data can be used to inform future coastal management strategies locally, regionally and nationally and help to ensure that cultural ecosystem services are considered alongside environmental and economic considerations.

The information gathered can also be integrated with coastal and land-use considerations, helping to ensure integrated coastal zone management, ensuring the coastal zone is protected and enhanced for future use.

[1] Natural England (2012). An Approach to Seascape Character Assessment © Natural England 2012.



Word maps related to where people use and utilise and where people value in Shetland from questionnaire responses

Seascapes and islandscapes of Europe from past to future

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The history of island landscapes and seascapes is fundamental for understanding their present features, for preserving their heritage and for conveying traditional practices to modern developers. In this context, research groups from several countries developed in the ESLAND Projects a methodology to improve the consideration of cultural heritage in European island landscapes of different sizes. Parallel to this, islandscape and seascape concepts have been discussed, their ecosystems studied, the emerging methods applied to case studies, and the final results analysed.

In the ESLAND Project, European Culture expressed in Island Landscapes, the evolution of European island landscapes and seascapes has been described, in view of promoting a common interdisciplinary approach to their classification and identity, and then to a scenario for their future development, which should be more culturally and sustainably oriented than at present.

Islandscape and seascape history, character assessment and perception have been researched employing techniques to characterise the marine, coastal and hinterland zones of the chosen case studies, considering cultural and ecological elements with their original legacy. The results, presented in landscape mapping, e-tools and publications, contribute to the implementation of the European Landscape Convention and the UNESCO-SCBD Joint Programme on Biological and Cultural Diversity in Europe.


EUROPEAN CULTURE EXPRESSED
IN ISLAND LANDSCAPES
ESLAND PROJECT
A partnership working on
European Island Landscapes
and Cultural Heritage
ICELAND
SWEDEN
FINLAND
NORWAY
ESTONIA
DENMARK
IRELAND
UNITED
KINGDOM
THE NETHERLANDS
GERMANY
FRANCE
CROATIA
ITALY
SPAIN
PORTUGAL
GREECE
CYPRUS
MALTA
Coordinator
Co-organisers
Associated Partners
Observers

Seascape Visibility as an Input to Management and Planning

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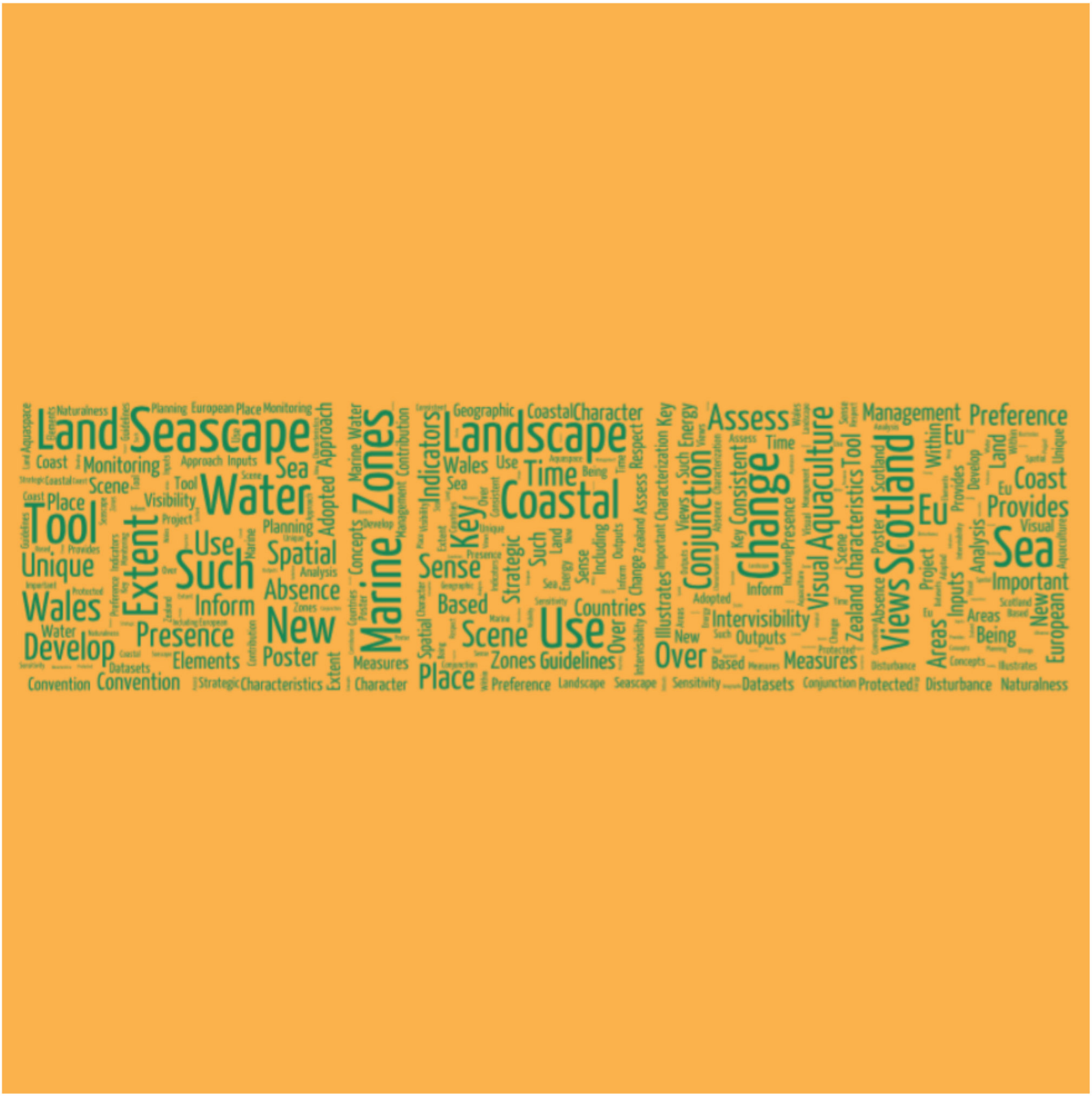
The conjunction of water and land provides unique character to landscape and seascape, with presence of water in a scene important for landscape preference and characteristics such as sense of place. Measures of presence/absence and extent of water in coastal views can be used to develop indicators for monitoring change in seascapes over time, and inform seascape management guidelines, consistent with the European Landscape Convention.

A key tool for strategic assessments of coastal zones and characterization of seascapes is the intervisibility of the coast, an approach adopted in countries such as Scotland, Wales, New Zealand. This poster illustrates uses of spatial analysis of coastal intervisibility for Scotland and Wales to assess the contribution of elements of landscape/ seascape, based on visual concepts (e.g. naturalness, disturbance).

Outputs are geographic datasets of the visibility of sea from land, land from sea, landscape protected areas (including land and sea), zones for marine developments (e.g. aquaculture, energy), for use in assessing sensitivity of seascapes to changes in land and sea use with respect to landscape preferences, and inputs to seascape management. These tools are being developed for use in marine spatial planning of aquaculture within a new EU H2020 project, Aquaspace.


Land
Seascape
Water
Tool
Such
Extent
Unique
Wales
Develop
Presence
New
Spatial
Absence
Poster
Marine
Zones
Landscape
Coastal
Time
Use
Scene
Sense
Place
Change
Assess
Conjunction
Aquaculture
Scotland
Views
Sea
Coast
Provides
Preference
Management
Over
Intervisibility
Convention
Characteristics
Guidelines
Measures
Datasets
Disturbance
Naturalness

Biochemical and physiological study of the invasive mussel Xenostrobus securis in a coastal ecosystem dominated by native Mytilus galloprovincialis (Galicia, NW Spain)

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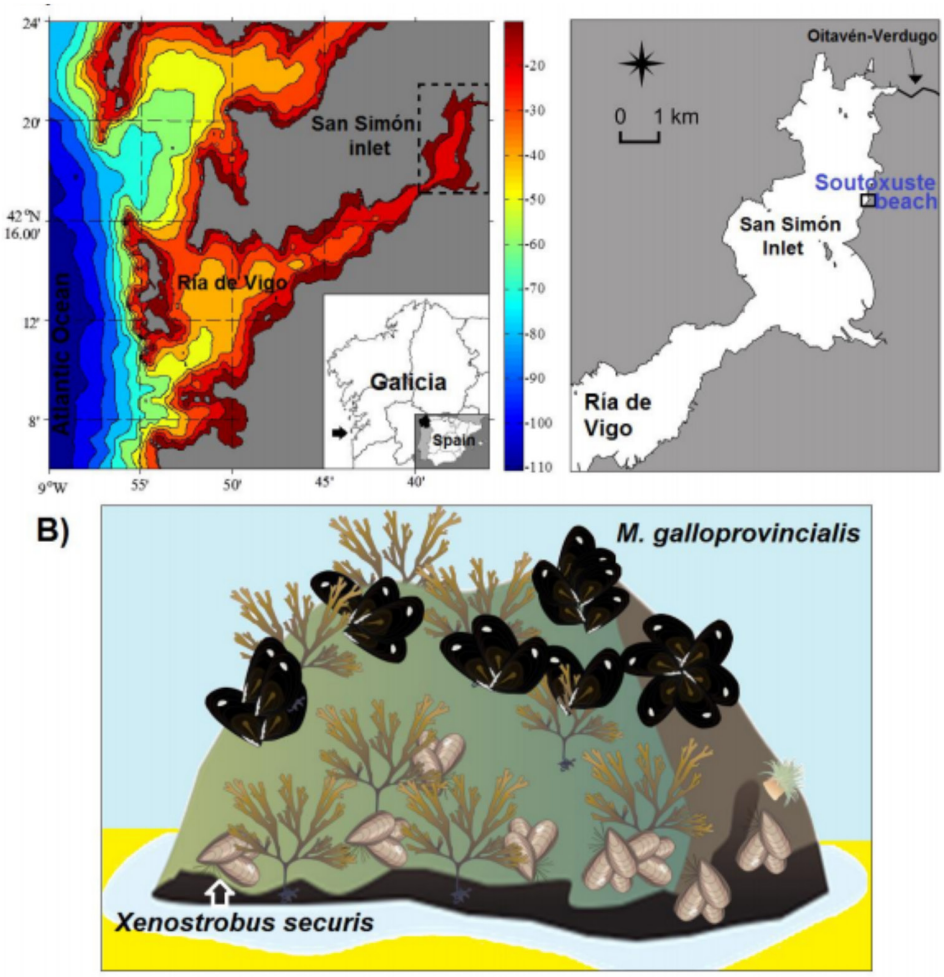
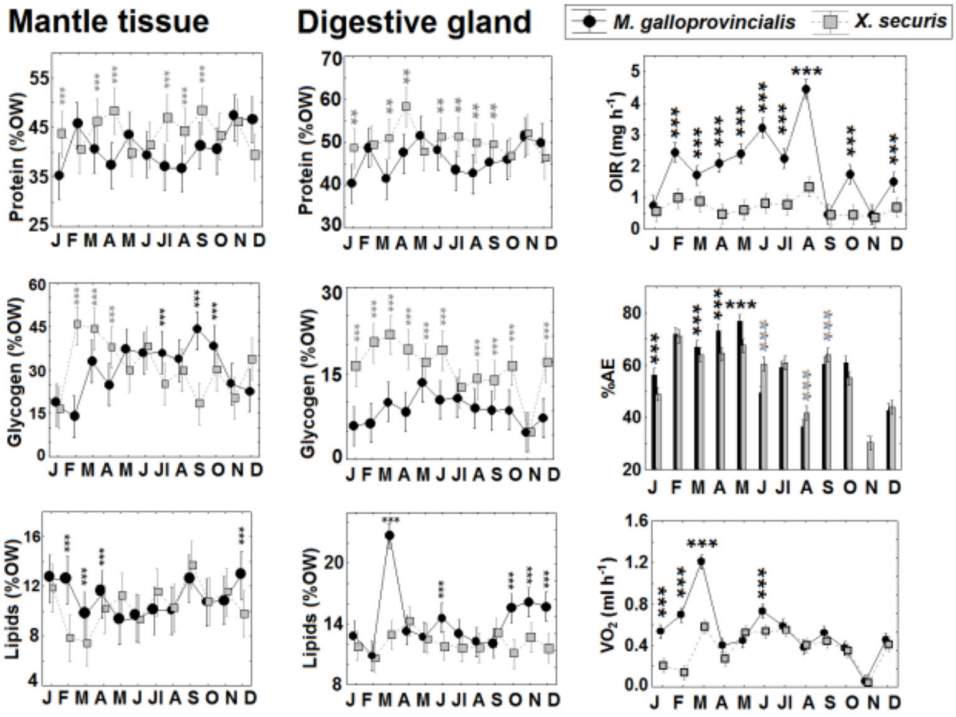
Invasive bivalves like Xenostrobus securis can have an ecological and economic impact on coastal ecosystems. This species coexists with the economically important mussel Mytilus galloprovincialis in the brackish intertidal of innermost Ría de Vigo (Galicia, NW Spain). We aimed to compare the annual biochemical composition and physiological energetics of both species. Xenostrobus revealed comparatively higher proteins and glycogen in the mantle and digestive gland. Proteins might fuel greater tissue and shell growth, while glycogen could provide energy during low tide (anerobiosis) or after conversion to lipids. However, Mytilus accumulated more lipids in the digestive gland and showed higher ingestion rate than invasive Xenostrobus. In mixed mussel beds, native mussels colonize the top of the aggregations. This distribution might explain the higher ingestion rate and lipid levels, owing to easier access to lipid-rich phytoplankton or microphytobenthos compared to the invasive species. Both species responded to an acute salinity decline registered during a very rainy November (from 33‰ to 9‰) by significantly reducing the ingestion rate after closing their valves. In conclusion, the comparable absorption efficiency and greater protein and glycogen levels suggest that the invasive species is well adapted to the intertidal shores of Ría de Vigo.

We are indebted to Dr. Rocío Fragoso for her indispensable collaboration during the study. The authors thank Lourdes Nieto and Beatriz González for the sampling and laboratory analyses. This work was funded by the project FIGEBIV (AGL2013-49144-C3-2-R) awarded by the Spanish ministry of economy and competitiveness.

Fig. 1. A) Study site in the San Simón inlet, innermost region of the Ría de Vigo, south of Galicia (NW Spain). The map on the left indicates the bathymetry (in meters) of Ría de Vigo. The map on the right shows a detail of the San Simón inlet, where native and invasive mussels were sampled from the intertidal shores of Soutoxuste beach. B) Distribution of the two species in mixed mussel beds with invasive X. securis at the bottom and native M. galloprovincialis at the top of the aggregations.

Fig. 2. Proximate biochemical composition (% organic weight, OW) of the mantle tissue and digestive gland of the native bivalve Mytilus galloprovincialis and the invasive mytilid Xenostrobus securis recorded monthly during a year in the intertidal rocky shore of the San Simón inlet (inner Ría de Vigo, NW Spain). Physiological measurements included the organic ingestion rate (OIR), absorption efficiency (AE) and oxygen consumption (VO2). Statistical differences are indicated as ***p<0.001 (two-way ANOVA followed by Tukey's test).


San Simón inlet
Ría de Vigo
Atlantic Ocean
Galicia
Spain
Oitavén-Verdugo
0 1 km
Soutoxuste beach
San Simón Inlet
Ría de Vigo
B)
M. galloprovincialis
Xenostrobus securis


Mantle tissue
Digestive gland
M. galloprovincialis
X. securis
Protein (%OW)
Glycogen (%OW)
Lipids (%OW)
OIR (mg h-1)
%AE
VO2 (ml h-1)
J F M A M J JI A S O N D

STREAMLINE: Enabling public ownership of Orkney's marine energy futures through an engaging, two-way, interactive interview format

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The wave and tidal industry around Orkney is emerging as a poster child for the blue economy. Powered by the infamously rough seas around the northern isles, the marine energy sector is pushed forward as a new source of jobs, infrastructure and economic prosperity. Marine spatial planning has driven research programmes on the future environmental and economic impacts of this budding industry, but there has been less attention for the seascape's cultural value and social drivers of change in the development of Orkney's waters over the next decades.

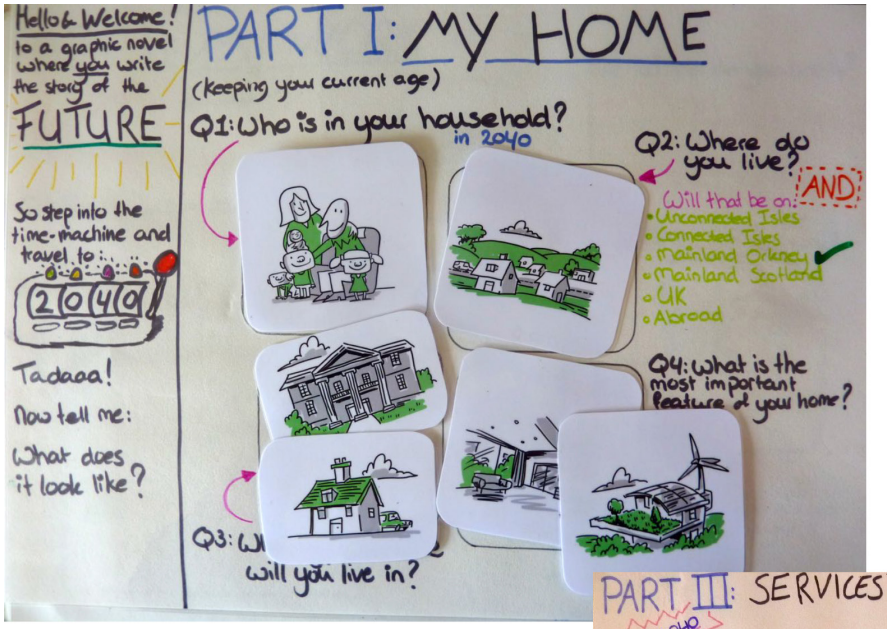
Yet the success of a local wave and tidal industry on an island group as small and tight-knit as Orkney hinges crucially on the support of the local community and its immersion in the planning and development process. It is vital to understand the future of Orkney as a whole and the role of the wave and tidal industry thereon as envisioned by the people most affected by it. This is hampered by the consultation fatigue suffered by the local community who are 'consulted to death' yet do not feel meaningfully engaged with. Planners on the other hand, find themselves in front of people wanting to be heard but unwilling to speak up.

The research objective of this study was to develop a set of visions for how the marine energy industry could take shape on Orkney by 2040, based on a series of interviews and two workshops with people living and working on Mainland Orkney. To overcome the consultation fatigue I developed a bespoke scientific interview format: STREAMLINE, designed to engage in a two-way, interactive and thought provoking consultation that can enable public participation and ownership of comprehensive decision-making. A series of laminated illustrated canvasses allow the interviewees to explore and express their vision of Orkney in 2040 and the MRE industry. STREAMLINE provides a tangible conversation piece that makes it easier for participants to talk and think about the future.

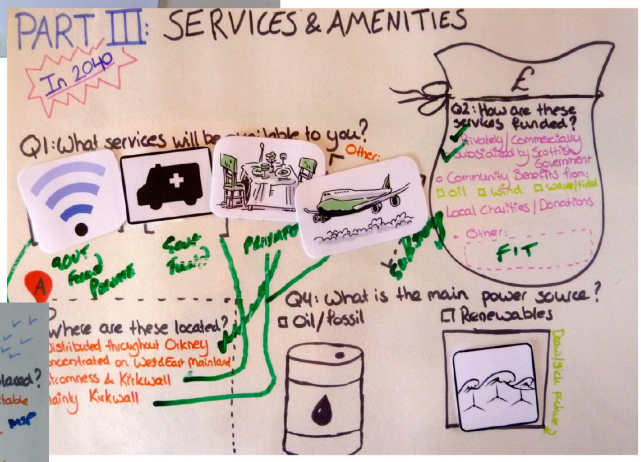
The STREAMLINE interviews resulted in four visions for the development of Orkneys marine energy industry. Each vision is centred on a different cultural driver for change: economy, community, sustainability and technology. These streams form the basis of an adapted SWOT format mapping Common Ground, Tensions, Opportunities and Threats to identify possible support, resistance and creative collaborations to inform an integrated and comprehensive development strategy.

One clear Common Ground emerged, which all participants could agree on: the need for more engaging, meaningful consultation and public ownership of the way the wave and tidal industry is developed on Orkney to secure long term benefits for the local community. STREAMLINE was deemed a good start.

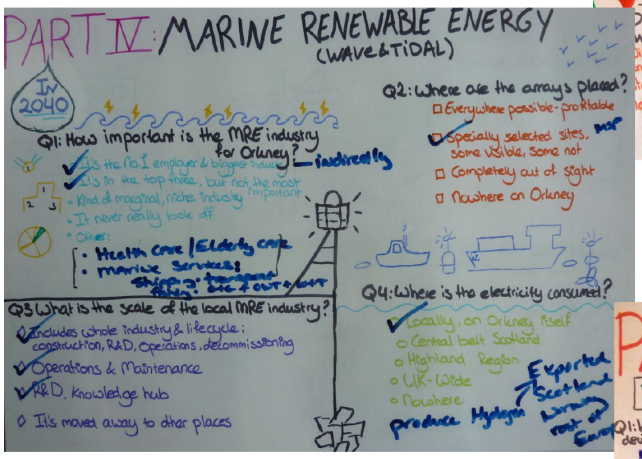
More information on the project can be found on: orkneytidalthesis.wordpress.com



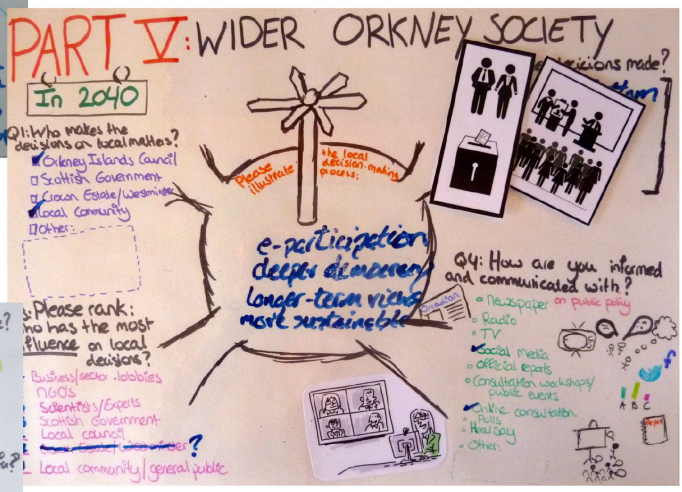
We start small, exploring what living and working on Orkney in 2040 is like



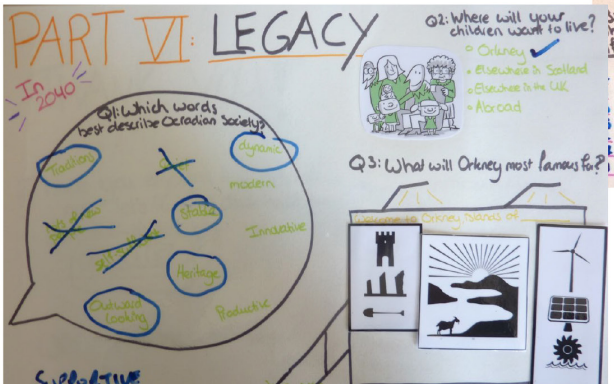
Then it's on to the wider society and the MRE industry



The tricky bit: how should decisions be made?



And finally: what will you leave for your children?



An analysis of the complexities faced by Small Island Marine States (SIMS) in Adapting to Climate Change-Induced Sea-Level Rise

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Small Island Marine States (SIMS) have been presented with a climate change paradox: despite their negligible contributions to greenhouse gas (GHG) emissions, they are among the first nations to be affected by climate change and sea-level rise (SLR), and will suffer far greater than most. The SIMS situation is highly complex as there is no global solution to the cause. Impacts of a 1°C climate warming are already affecting the lives of SIMS inhabitants. Therefore adaptation and mitigation are of the utmost concern. SIMS by definition have predominantly more sovereign marine area than land area, and thus are highly susceptible to changes in sea level.

Three SIMS (The Republic of the Maldives, The Republic of the Marshall Islands and Tuvalu) were selected in order to highlight the interplay between various barriers and influences in driving complexity in the climate change adaptation process. In order to analyse influences and barriers to climate change adaptation, a semi-systematic literature review was conducted alongside a case study review of individual nations. Government National Adaptation Programmes of Action (NAPAs) (equivalent government documents for the Marshalls) were subject to a cursory review to highlight perceived priority issues and responses in each nation. Economic, infrastructural, institutional, cultural and religious barriers have been identified from the literature and were found to significantly hinder adaptive capacity.

Perceptions of climate change threats were found to vary between the global community and SIMS inhabitants, however drivers of perceptions i.e. the media can hinder or inspire adaptation. Disconnect between current international law and policy and climate change science was also found. In order to manage these complexities it is recommended that SIMS decision-makers take proactive measures by considering the likelihood of future inundation, despite inherent cultural beliefs. Existing international laws may be amended to include detailed climate science predictions also, therefore allowing for determination of SIMS' sovereignty in future. Empowerment of SIMS inhabitants at all levels: local, community and national, is also recommended.

Mon 7 Sept pm - Seascape connectivity: networks and corridors

Our understanding of ecological connectivity on land has the potential to expand our knowledge to protect seascape. We invite speakers to share their understanding on seascape connectivity through real-world examples, and explore how lessons learnt from terrestrial connectivity studies can be applied to maintaining or recovering ecological functionality in diverse seascape scales and settings. This embraces ecological and geomorphological processes along a seascape and/or dynamics between nearshore and offshore realms.

Ecological connectivity research: informing marine nature conservation

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Ecological networks and corridors are comprised of the spatial links between species and their environment. They may exist as either structural (physical) connections between habitat patches, or as the spaces between patches over which species or physical processes have ecologically functional connections. Our understanding of these in terrestrial and island environments has been important to a modern philosophy for nature conservation, including their role in facilitating species' resilience and adaptability to climate change. Marine ecologists can apply the same principles but should be aware of contextual differences when considering impacts on connectivity and the most appropriate conservation response.

Although not a reason for complacency, one such difference is that most of our marine ecosystems have not experienced the extent of habitat loss or fragmentation seen on land. On land, many conservation measures involve interventional restoration of habitats or the conditions for connectivity, partly reflecting the history of terrestrial habitat loss but also the feasibility of such intervention. At sea such approaches are likely to be challenging or impractical, necessitating a focus on the management of damaging anthropogenic pressures rather than management of the environment; where possible, we should seek preventative rather than reactive measures.

Also, aspects of species biology and their interaction with the physical environment can differ greatly at sea, such as reproductive and dispersal strategies, or the distance and spatial dimensions of foraging or migratory movements. Furthermore, a lot of marine life experiences a highly dynamic physical environment, both in the water column and on the seabed. This dynamism is reflected in complex ecological variability, both spatially and temporally, and in the resilience of marine species and habitats where these conditions naturally prevail.

Importantly, our knowledge of ecological networks and corridors at sea is relatively poor. We are starting to address this, but the logistical and financial challenges of marine science will remain a limiting factor. Recent examples are used to illustrate how research into ecological connectivity can inform marine and coastal conservation. In particular, various studies tracking the mobility, range and routes of marine fauna have emerged, facilitated by technological advances. Appropriate use of such information may include the designation of protected sites and the introduction of measures to manage anthropogenic impacts upon sensitive habitats and species. However, broader opportunities may emerge from marine planning, which should also take account of ecological and societal connections across the land-sea interface.

Using Our Collective "Super Brain" to Develop a Widely Applicable Recipe for Success in Landscape Scale Conservation

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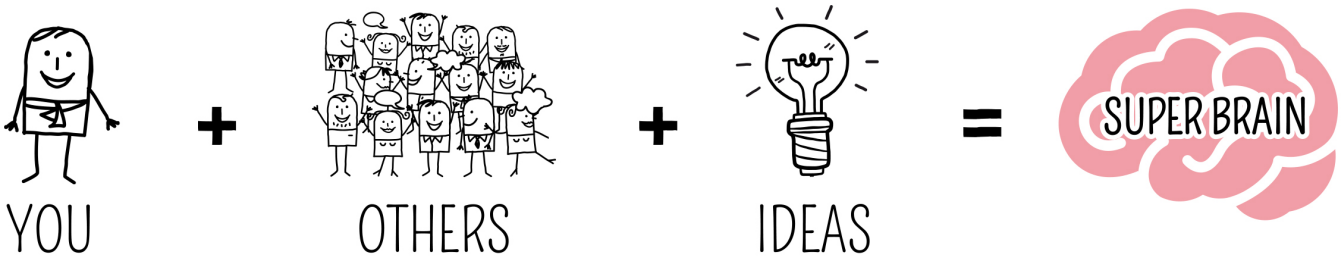
Landscape-scale conservation is coming of age and it is now a clearly recognised approach to biodiversity protection and enhancement. Many academics and professionals support its application, and a wide range of practical "experiments" have been completed, or are underway in the United Kingdom. These include the Wildlife Trusts' Living Landscapes, the RSPB's Futurescapes, Nature Improvement Areas, and Landscape Partnership Schemes funded by the Heritage Lottery Fund. In March 2015 a highly interactive "super brain" workshop was held in Bristol attracting over 150 practitioners and academics from around Europe with a wide range of expertise and background in landscape practice and research, which collectively amounted to over 3,000 years experience. The aim was to co-create a Recipe for Success; a shared approach to landscape-scale conservation that is relevant to the needs of practitioners. The results were arranged around five themes; planning, engaging, doing, evaluating, sustaining, and have been tested by a participatory authoring process in the subsequent months. The presentation will share the highlights of this work, proposing this is a general and practical framework applicable to any landscape, terrestrial, coastal or marine. We also present results of an exercise to marine-proof the Recipe for Success and observations on particular considerations for seascape.

For more information please see the associated website and workshop videos at www.landscapescale.com and on twitter at #landscapescale

Acknowledgements: This project was generously funded by the EU LIFE+ Communications Programme


YOU
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INSPIRING TALKS HERE
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DOING
Toilets
Cloakroom
TASTY FOOD HERE
DELEGATES
BRAIN CELLS
IN HERE

Assessing effects of seascape configuration on seagrass fish communities across latitudes

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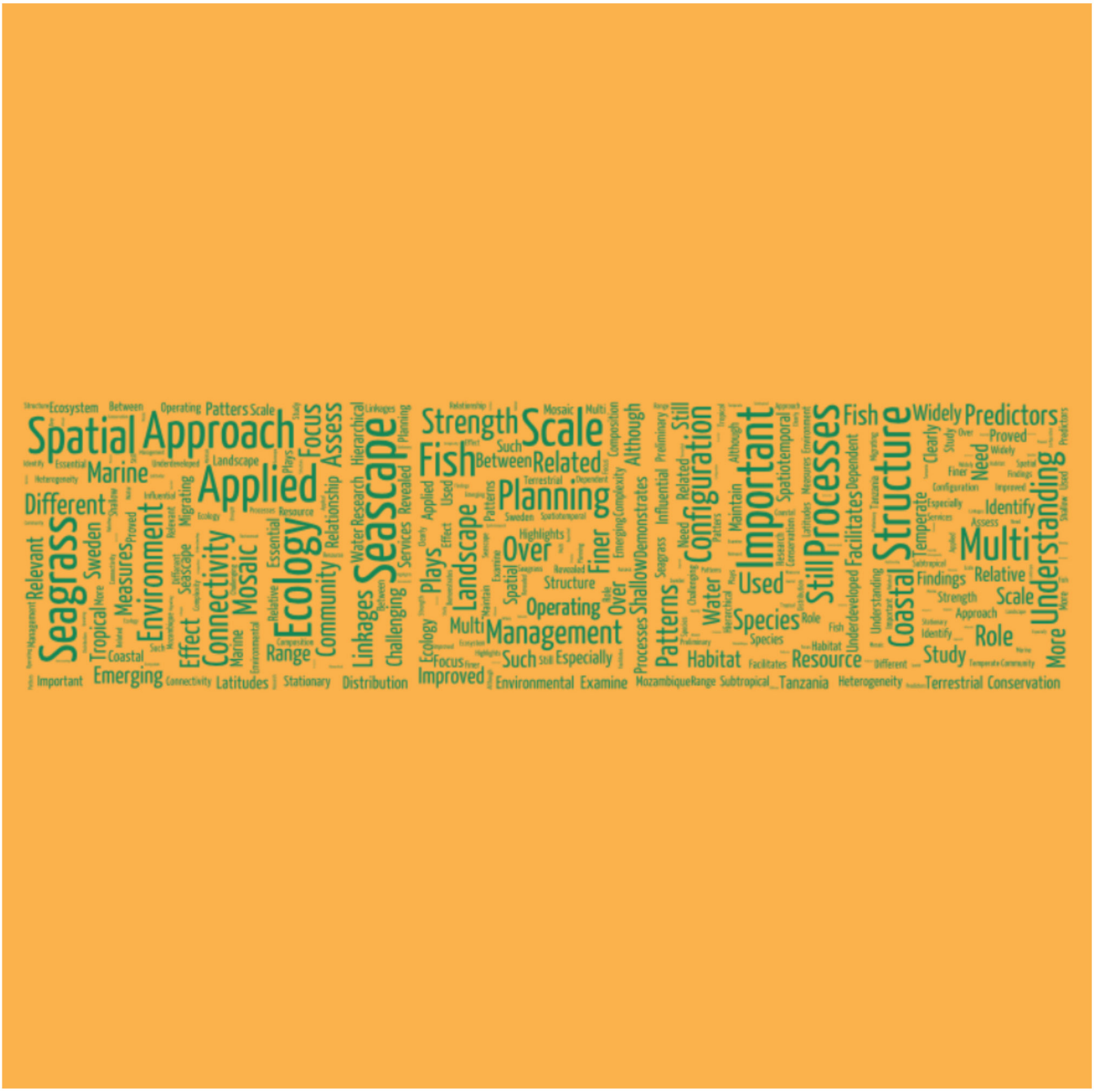
Understanding how the coastal seascape structure is related to ecological patterns and processes operating at different spatiotemporal scales is of emerging importance in applied ecology and facilitates improved resource management and conservation planning. Especially challenging for management and marine spatial planning is to identify habitat linkages across the seascape mosaic and to assess the strength of connectivity over relevant scales. Although widely applied in the terrestrial environment, a multi-scale landscape ecology approach to study the relationship between measures of spatial heterogeneity and ecological processes in seascapes is still underdeveloped. With focus on tropical (Tanzania), subtropical (Mozambique) and temperate (Sweden) shallow-water environments, we used a hierarchical landscape ecology approach to examine the relative importance of seascape configuration and a range of scale dependent environmental predictors on seagrass fish community composition. Preliminary findings revealed that seascape configuration plays a role in structuring seagrass fish communities at all latitudes. The effect of seascape configuration was important for migrating species, while finer scale predictors such as seagrass structural complexity proved more influential for distribution patters of stationary species. Our research clearly demonstrates the importance of understanding the strength of seascape connectivity and highlights the need of a multi-scale seascape approach to maintain essential ecosystem services.


Spatial
Approach
Applied
Ecology
Seascape
Seagrass
Connectivity
Strength
Scale
Fish
Planning
Management
Important
Configuration
Processes
Structure
Multi
Understanding
Predictors
Coastal
Species
Used
Marine
Different
Environment
Mosaic
Landscape
Linkages
Resource
Habitat
Role
Study

Offshore seascape factors influence shallow water fish assemblages

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Understanding the influence of seascape configuration on fish assemblages is a critical step towards a more holistic management approach. The oceans are being altered by climate change leading to increased severe weather events, deep water upwellings and species distribution shifts. The exchange of water between the open sea and the coasts is essential for providing the coastal habitats with an influx of oxygenated, nutrient rich water that supplies both zooplankton and phytoplankton [1] allowing for increased ecosystem resilience through higher genetic diversity, and has been shown to benefit fisheries through increased primary productivity [2]. It is important to recognize how shallow water species are affected by factors such as latitudinal position, distance to open ocean, distance to deep water and exposure, as such factors may change with a changing climate. Using Remote Underwater Videos (RUV) provides a valuable tool for studying marine fauna and habitat connectivity through species migrations, in particular for highly mobile taxa such as fish[3]. We examined 30 seascapes in Skagerrak, Sweden, using RUV over two seasons, in order to describe the fish assemblages within seagrass meadows and the influence of offshore seascape factors. Regression analyses were preformed for fish family abundance and offshore seascape factors and it was found that all families (Gadidae, Gasterosteidae, Gobiidae, Labridae and Syngnathidae) were positively correlated with distance to the northern most latitudinal line. Additionally, it was found that fish within the Gadidae family increase in abundance with increased distance from the open ocean but sufficient access to deep water, such as within the fjords of the Swedish west coast. The Gasterosteidae family consists of species with preference to deep water and it was found that abundance for this family was also positively correlated to proximity to deep water ($p=0.002$). The understanding of seascape connectivity and the influence of factors that may exhibit changes in the future is critical for resource management. Specific species differ with regard to dispersal ability, life-history and tolerance to environmental conditions and thus will vary in their expected responses to future changes related to climate. Therefore, determining differences and implications between family groups is an important step to ensure the possibility of the most holistic ecosystem management approach.

[1] G. Björk et al. 2003. "Upwelling along the Swedish west coast during the 20th century," Cont. Shelf Res., vol. 23, no. 11–13, pp. 1143–1159.

[2] M. Madhupratap et al. 2001. "Arabian Sea oceanography and fisheries of the west coast of India," Curr. Sci., vol. 81, no. 4, pp. 355–361.

[3] E. Harvey et al. 2003. "The accuracy and precision of underwater measurements of length and maximum body depth of southern bluefin tuna (Thunnus maccoyii) with a stereo–video camera system," Fish. Res., vol. 63, no. 3, pp. 315–326.

Habitat patches at the hectad scale: what can they tell us about how the structure of the coast influences biodiversity?

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We know of many landscape effects that can potentially shape the distributions of marine species. Stretches of unfavourable habitat can act as barriers to dispersal. Headlands can interact with near shore oceanography to collect or disperse the larvae of marine organisms. The shaping of coastal ecosystems by natural and anthropogenic processes can be identified from case studies, but scaling up ecological pattern from individual study sites is hampered by a lack of extensive data. Fortunately, resources such as the National Biodiversity Network (NBN) offer a means to examine variation in species ecology at the coastline scale.

The NBN gives species lists for individual hectads (10 x 10 km). Clustering of coastal hectads on the basis of recorded species results in groups consistent with rocky shores, estuaries and open coast beaches. A contiguous group of hectads from the same group can be thought of as a patch of habitat, with patches of different sizes found around the coast of Great Britain. The importance of patch size varies between habitat types. Comparisons of species richness across patches suggest that mean rocky coast species number per hectad is influenced by patch size, while no relationship is found for estuaries and beaches. The lack of a patch size effect on sedimentary shores may reflect the links between these habitats and subtidal population sources. A larger number of sediment-dwelling species are found subtidally than is the case for typical rocky shore species. Isolated hectads of sedimentary habitat have more species than might be expected. Examination of the species involved suggests that this is due to species more typical of rocky shores being present. Analysis of coastal hectads therefore suggests that hectad scale habitat patterns can shape the local species richness. The links between patch size and species present also have implications for biodiversity in cases where coastal habitats are subject to extensive modification (e.g., seawalls).


Nbn
Coastal
Hectad
More
Species
Therefore
Individual
Examine
Act
Extensive
Effect
Number
Group
Case
Interact
Rocky
Found
Km
Shore
Marine
Patch
Habitat
Biodiversity
Present
Near
Coast
Typical
Due
Sites
Distributions
Larvae
Disperse
Landscape
Data
Individual
Scale
Suggest
Same
Lack
Richness
Ecology
Identified
Links
Shape
Many
Size
Pattern
Lists
Mean
Between
Collect
Subtidal
Natural
Such
Up
Open
Stretches
Know
Barriers
Beaches
Sedimentary
Estuaries
Processes
Unfavourable

Fragmentation and reconnection in aquatic metacommunities

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Fragmentation and connectivity in aquatic systems can be encountered in coastal environments such as interconnected lagoons, salt marshes and rock pools. These coastal systems contribute significantly to global primary productivity, which in turn may sustain productivity at higher trophic levels and ensure a multitude of ecosystem goods and services to our society, including fisheries, aquaculture, carbon sequestration and absorption of contaminants[1]. In contrast, increasing anthropogenic disturbances beyond the tolerance of these systems, such as nutrient-laden inflows and landscape fragmentation due to man-made structures, may lead to eutrophication and degradation of these habitats. Furthermore, this degradation may be exacerbated by climate change. Assessing the combined effects of nutrient loading and habitat fragmentation on the structure and functioning of microalgal communities, which we do herein, will provide important insights in future management plans for these areas.

Using laboratory microcosms, we tested the effect of nutrient loading and fragmentation on different microalgal community attributes (i.e., species composition, diversity and productivity) within a metacommunity framework. Experiments consisted of fragmented natural phytoplankton assemblages that self-organized to steady state under different nutrient pulsing frequencies. These self-organized assemblages were then connected at varied rates of dispersal forming metacommunities. Following fragmentation (during the period of self-organization), nutrient pulses of decreased frequency resulted in increased species richness and functional diversity. In the fragmented patches of intermediate pulsing frequency, a single, highly productive species came to dominate the microalgal assemblages. That species, when introduced by dispersal to patches of low and high frequency pulses, came to dominate the metacommunities, thereby increasing overall productivity. The two processes of fragmentation and reconnection seem to be directly linked, with an optimal ecosystem function (maximal species richness, functional diversity, and productivity) achieved when the interval between nutrient pulses exceeds the generation times of constituent species (Fig.1), and when patches are connected at intermediate levels of dispersal (Fig.2).

Due to their crucial implications for both our understanding of ecosystem functioning and socioeconomic aspects related to coastal zone management, our future focus on this research is to determine if these findings can be generalized beyond particular environmental conditions and beyond particular species. If generalized, these finding might be useful for a more robust management strategy, where coastal zone development can sustain ecosystem services and enhance biodiversity.

[1] Costanza R. et al., 1997. Nature: 387, 253-260.

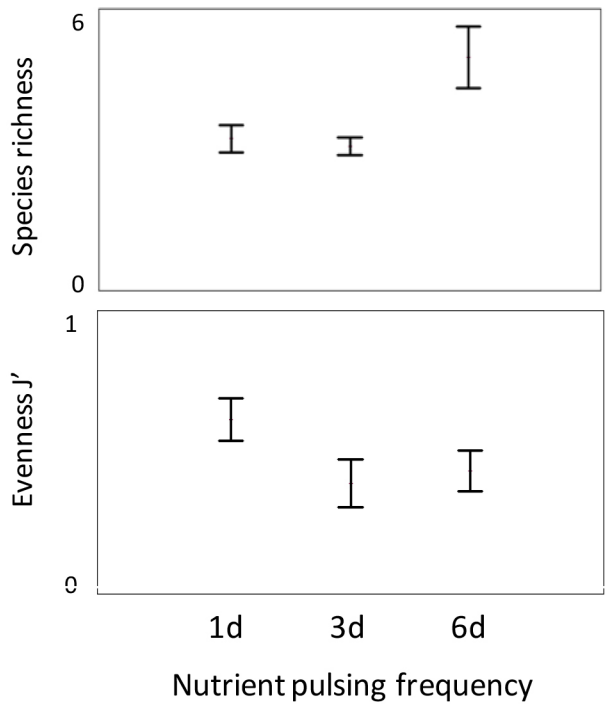

Fig.1. Species richness and evenness after fragmentation

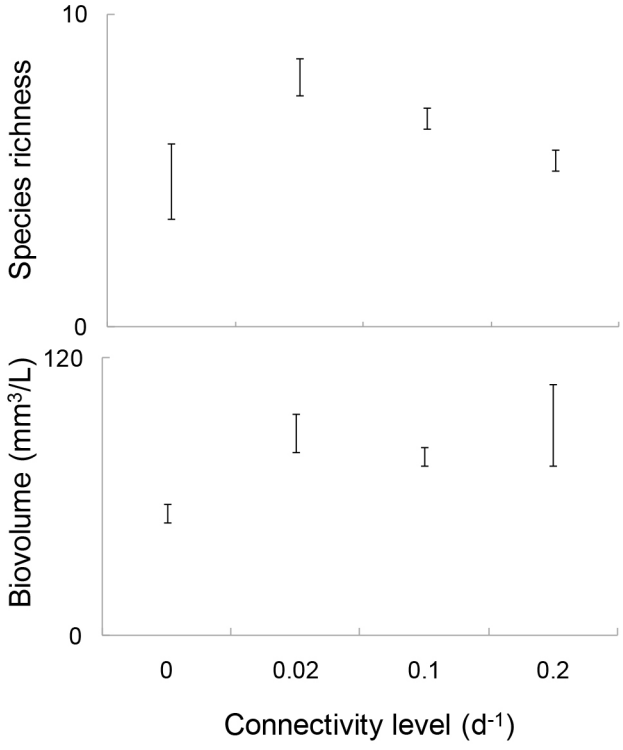

Fig.2. Species richness and productivity at different connectivity levels.

Mapping priority habitats and supporting habitats for the North West Regional Monitoring Programme

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gemma.bell@envsys.co.uk

A North West Regional Monitoring Programme, funded by the Environment Agency, was set up in 2008 to provide a coordinated, risk based, monitoring system for the collection and analysis of coastal data to inform sustainable coastal defence management, and inform the program and statutory bodies of coastal habitat change.

The ecological mapping component of this project began in 2014, led by Sefton Council and carried out by Environment Systems Ltd., with a remit to map priority Biodiversity Action Plan habitat extents for the North West Region, covering the coastline and all major estuaries from the Solway Firth to the River Dee; a varied section of coastline ranging from low-lying saltmarsh and mudflats, to steep cliffs above rocky shores (Fig 1).

The main objectives of the mapping project were to provide Priority BAP extent data for:

- Establishing baseline datasets for the North West where they are missing or inadequate.
- Identification and quantification of regional coastal change
- Assessing losses and gains for the Regional Habitat Creation Programme.
- Identification and strategic consideration of coastal flood and erosion risks.
- Assisting development of Biodiversity Action Plans.

Habitats were mapped in a two-stage process using high resolution aerial photography and elevation (LiDAR) datasets, which had been captured during 2012 and 2013.

The first stage employed image analysis techniques to segment the imagery into small objects according to their size, shape, colour and height above sea level (Fig 2). The second stage brought in a team of aerial image interpreters to classify the objects within a Geographical Information System (GIS). A dual-system classification was carried out, so that each segment was classified in both Phase 1 and Integrated Habitat System (IHS) notation (Fig 3). A range of other information was also linked to each habitat segment, including elevation and associated NVC habitat types. As part of the project's extensive quality assurance arrangements, ground surveys were undertaken to validate the accuracy of the digital mapping output. Surveys were spaced out across the geographical range of the North West region, sampling as many of the Priority habitat types as possible. This detailed habitat map dataset will be a valuable tool for Sefton Council and partners such as Natural England for shoreline management, habitat reporting, change detection and planning. It can also be used for wider landscape modelling, including habitat connectivity and ecosystem service analyses. The project has been designed such that the outputs from the coastal and terrestrial habitat mapping can be made freely available on the Channel Coastal Observatory website; (www.channelcoast.org) work to enable the online hosting of this dataset is ongoing and anticipated to be complete by early 2016.

Fig 1: The limestone coastline at Silverdale, Lancashire.

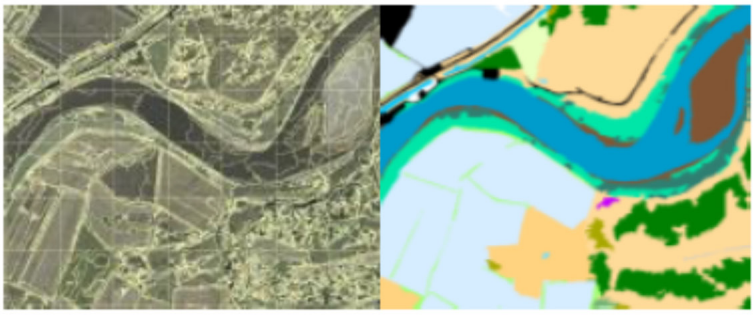

Fig 2: Image segmentation (left) used to create the habitat map (right).

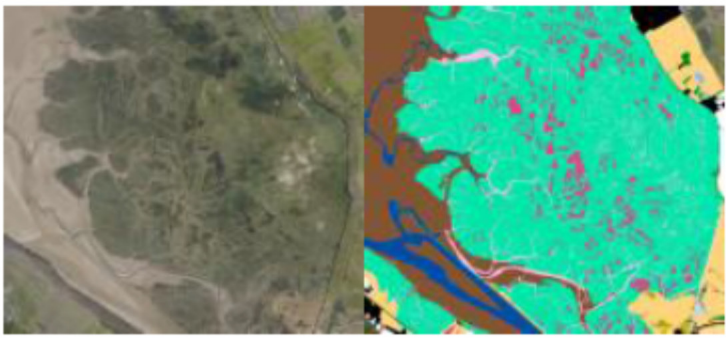

Fig 3: Detailed mapping of small scale habitats such as saltmarsh creeks and saline lagoons.

Ecological coherence assessment in practice across the Central Scotland Green Network to benefit wildlife and people

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EcoCoLife[1] is an EU Life and partner funded project that aims to demonstrate how innovative mapping approaches underpinned by ecological coherence principles can identify the most beneficial places for people and wildlife for habitat management. It will do this through the development of an "ecological coherence protocol" that will test selected sites and identify new ones using habitat network mapping combined with social, ecosystem services and geophysical data.

This is an exciting challenge where;

"Ecological coherence is a legally-defined term that lacks any clear conceptual or empirical basis in ecological science. Its definition, assessment and implementation are directly linked to the statutory duties associated with the designation and management of Natura 2000 sites, i.e. Special Protection Areas and Special Areas of Conservation" [2].

EcoCoLife is working with partners to explore and measure improved ecological coherence using the protocol and implementing works at a range of pre-selected sites extending the scope described above beyond designated Natura sites to the wider landscape environment. This is to incorporate opportunities for creating ecosystem resilience and extending habitat connectivity across a range of habitats and area scales. The project will use the learning from application of the protocol to select new sites for implementing habitat management measures.

In identifying and validating sites the protocol will consider representation of valued features that include; patch size distribution of different habitats, species richness, structural connectivity, functional connectivity, presence of priority rare or endangered species, designation importance and benefits to people using an ecosystem services score.

This session aims to explain the project approach and results so far using terrestrial and coastal examples.

[1] EcoCo LIFE Scotland, "Implementation of integrated habitat networks to improve ecological coherence across the CSGN. LIFE13 BIO/UK/000428

[2] Catchpole, R. (2012), Aspen International. "Ecological Coherence Definitions in Policy and Practice - Final Report". Contract report to Scottish Natural Heritage, No. 41102

"Ecological coherence assessment in practice across the Central Scotland Green Network to benefit wildlife and people" Paul Sizeland, SNH, EcoCo Project Manager.

e.g. Restoring a coastal quarry site with RSPB & tarmac

EcoCo

Life

Joining up nature across central Scotland

Butterfly Conservation Scotland

buglife

EAST AYRSHIRE COALFIELD ENVIRONMENT INITIATIVE

rspb giving nature a home

Scottish Wildlife Trust

SEPA Scottish Environment Protection Agency

Scottish Natural Heritage
All of nature for all of Scotland

Investigating the water quality of an urban impoundment: Case study of the Seafield Pond, Dunbar.

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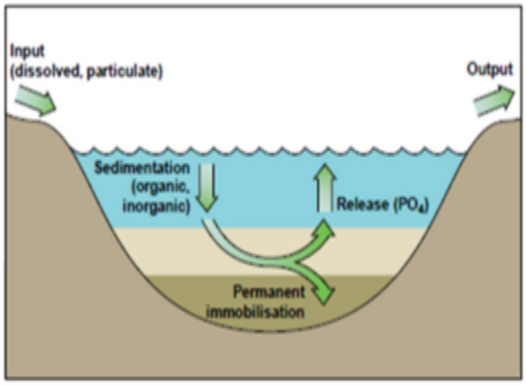
Given the scarcity of open water bodies in East Lothian, the Seafield Pond in Dunbar is an important resource for wildlife but also significantly for local recreation and children education. In recent years however the aesthetic and recreational services the pond provides have been suspended due to a decline in water quality as a result of faecal pollution and nutrient enrichment. The small catchment size of ponds makes them vulnerable to pollution as a result of stormwater runoff from domestic and agricultural land practices. This study was carried out to provide a better understanding of the water quality issues of the Seafield Pond in order to identify the likely source(s) of pollution and suggest future management options for the pond. Surface water samples across the pond and at all the inlets flowing into the pond were collected and analysed for water quality parameters – dissolved oxygen, pH, TOC, nutrients (nitrate and phosphate) and microbial indicators (coliform bacteria and intestinal Enterococci). The results identified the culvert at the v-notch weir which is the major inlet as the primary source of pollutants with high levels of nutrients (nitrate and phosphate), total coliform, E coli and intestinal Enterococci. Analysis of the surface water samples showed significantly lower concentrations of nutrients and microbial parameters within safe levels of the requirements of the EU WFD and Bathing Waters (Scotland) Regulations 2008. The combined effect of dilution, adsorption, filtration and uptake by emergent aquatic vegetation predominantly the common reed – Phragmites spp, biological uptake by phytoplankton, sedimentation and die-off of bacteria by sunlight may have resulted in lower concentrations of these pollutants across the surface water. This study provides a significant step in characterising the water quality of the Seafield Pond from which potential solutions needed to prevent pollution and ensure continued use of the pond for recreational purposes can be implemented. It also highlights potential restoration and management practices for improving water quality in similar freshwater urban impoundments.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inorganic)
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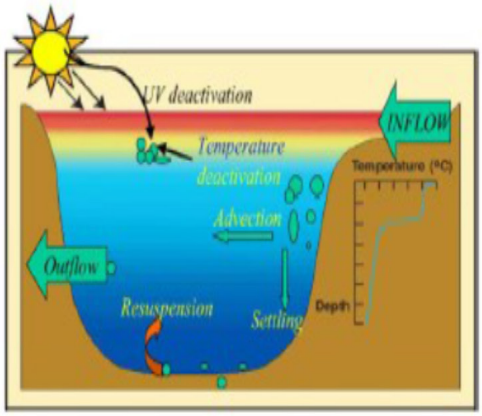
immobilisation


UV deactivation
INFLOW
Temperature
deactivation
Temperature (°C)
Advection
Outflow
Resuspension
Settling
Depth

Assessing the potential of marine litter cleanup initiatives to influence volunteer behaviour in Scotland

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Marine litter is recognised as a global pollutant (Santos et al., 2005), and a significant anthropogenic challenge of the 21st Century alongside climate change and biodiversity loss (Sutherland et al., 2010). Plastic and other synthetic materials constitute the majority of marine litter, with plastic consistently accounting for 60-80% marine litter at a global level (OSPAR, 2007), and more than 70% within the UK (MCS, 2014). Although it has many environmental and socio-economic impacts, marine litter is a social problem, inherently linked with existing production, consumption and disposal behaviours prevalent in modern society, especially relating to plastic litter and other synthetic materials (Depledge et al., 2013; Hartley et al., 2015). Accordingly a social solution is required to deal with the root causes of marine litter (Campbell et al., 2014).

The Marine Litter Strategy for Scotland (2014) aims to build on existing initiatives in Scotland to improve public attitude and behaviours around marine litter, reduce marine and causal sources of litter and treat waste as a resource as part of the EU Marine Strategy Framework Directive. Marine litter cleanup initiatives (MLCI) are considered a successful way to engage the public in the removal of litter, to reduce the level of litter in the marine environment while raising awareness of the issue. However, they are considered reactive strategy to address marine litter, with little attention paid to their potential to become 'proactive' measures through influencing volunteer behaviour to help reduce the amount of litter entering the marine environment. Using the existing literature on behaviour change a framework was developed to determine the potential influence of MLCI on volunteer behaviour. A case study approach was adopted (Yin, 2009), focusing on three MLCI in Scotland. The present research indicates that marine litter cleanup initiatives can positively influence volunteer behaviour, making it more likely that volunteers will adopt positive behaviours relating to marine litter. These behaviours include reducing littering, increasing recycling and reducing the consumption of non-biodegradable, single-use items, which, if adopted broadly by society could make a material difference to the levels of marine litter in the environment.

Tues 8 Sept am - Seascape development: opportunities and challenges

Old and new built environments in coastal and marine settings are re-shaping the seascape both above and beneath the waves. Examining the evolution of sustainable development practices and conservation areas on land may provides insights for learning with regard to how to value and maintain seascape integrity. In this context. A larger question remains - can we assume that we have sufficient evidence for positive examples of a 'green economy' on land, that we can apply the same aspirational logic for a 'blue economy' of the ocean?

Challenges faced in Coastal Development

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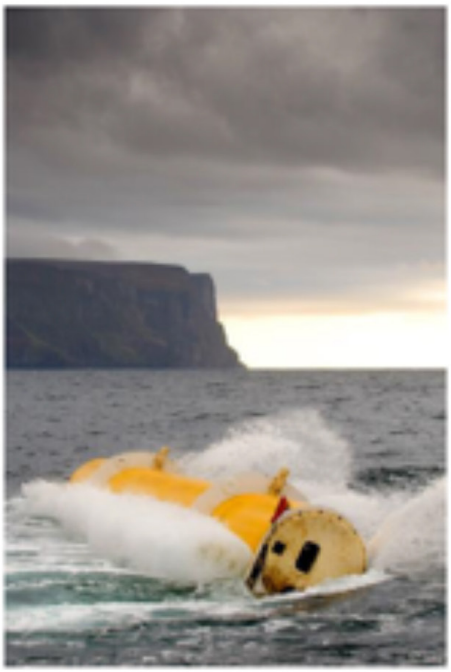
Our seas and oceans cover 72% of the surface our planet; the oceans provide populations with food and livelihood and is the means of transport for 80% of the global trade. The marine and coastal environment constitutes a key resource for global tourism, hydrocarbons, seabed mineral resources, and, more recently, offering the vast potential for large scale renewable "blue energy" production from wind, wave, tidal thermal and biomass resources. The potential of tapping into the marine environment's resources on a sustainable basis is enormous; but this leads to challenges in exploiting these resources while maintaining seascape integrity. Coastal development has taxed the resilience of the marine and coastal resource base, from overfishing and loss of biodiversity, ecological function and decline in provision of ecosystem services.

In the UK, coastal and offshore development is increasing, with developments such as offshore wind farms, wave and tidal renewable energy, new nuclear builds, and other infrastructure such as coastal protection. Round 3 offshore wind development round, released in 2010, is the biggest offshore renewable energy development initiative, and features nine zones across the UK, with the largest, Dogger Bank, having the potential to generate up to 13 GW of power and is one of the largest energy projects anywhere in the world. The UK Government's energy national policy statement in June 2011 confirmed eight sites as suitable for new nuclear power stations by 2025; all are coastal sites. Pre-consent works are underway for sites such as Hinkley Point, Sizewell and Moorside.

Impact assessment of such developments on the marine environment can present a significant challenge to consenting. Challenges such as uncertainty over the potential cumulative impacts of projects can lead to significant delays in achieving consent. For example, application for consent of Docking Shoal in 2012 was refused on the grounds of cumulative collision impacts on breeding birds on a nearby SPA. This was the first time an offshore wind farm had been refused consent in the UK and the first in which a biological threshold was used to inform the decision.

This has led to a number of studies carried out with the aim of producing guidelines, or a way forward, on how to address these challenges using a lessons-learnt model of both onshore and offshore developments as case studies. From reviewing a number of case studies, it became clear that there were two key issues: not starting cumulative impact assessment early enough in the EIA and HRA process and a lack of clarity over what projects to include. Ultimately, research is important to inform the decision-making process and to avoid over-precautionary judgments which may limit development unnecessarily.



Marine conservation: global biodiversity hotspots and the cold continuum

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A focus on 'global biodiversity hotspots' (GBH) was first proposed as a strategy for conserving the maximum number of species at least cost[1]. Marine GBH have since been defined variously in relation to irreplaceability and vulnerability[2], resulting in questions about their identification (Figure 1). In addition, other issues raise concerns as to whether focusing conservation on GBH will achieve this strategy's original intentions. GBH cover small areas leading to doubts about their persistence in isolation, which are reinforced by climate change and the need for species to shift range[3]. Indeed, species-rich areas may simply reflect past climatic conditions, as leading-edge range expansions occur faster than trailing-edge contractions, resulting in overlap between distributions of species of high and low latitudes. In addition, the concept of biodiversity hotspots has been transposed to 'regional' and national spatial scales, confounding its original intents. At a strategic level, we explore whether the concept of GBH resonates with biodiversity-centric or anthropocentric thinking and if, ultimately, a focus on GBH could lead to loss of biodiversity elsewhere with consequences for ecosystem services on which people rely. We consider what conservation has been trying to achieve in the 'cold continuum' between GBH and implications of such efforts for conserving the widest biodiversity globally[4]. We also explore interactions between a focus on GBH and increasing emphasis being given to natural capital and ecosystem services. Finally, from an operational perspective, we consider what actions could be prioritised in the cold continuum to support rather than confound a focus on conserving GBH. Our analysis reveals that a biodiversity-centric focus on GBH needs to be complemented by an anthropocentric focus on conservation elsewhere. Such an approach would promote natural-capital accounting and the ecosystem-services agenda, but may question some current biodiversity-centric actions, in the cold continuum.

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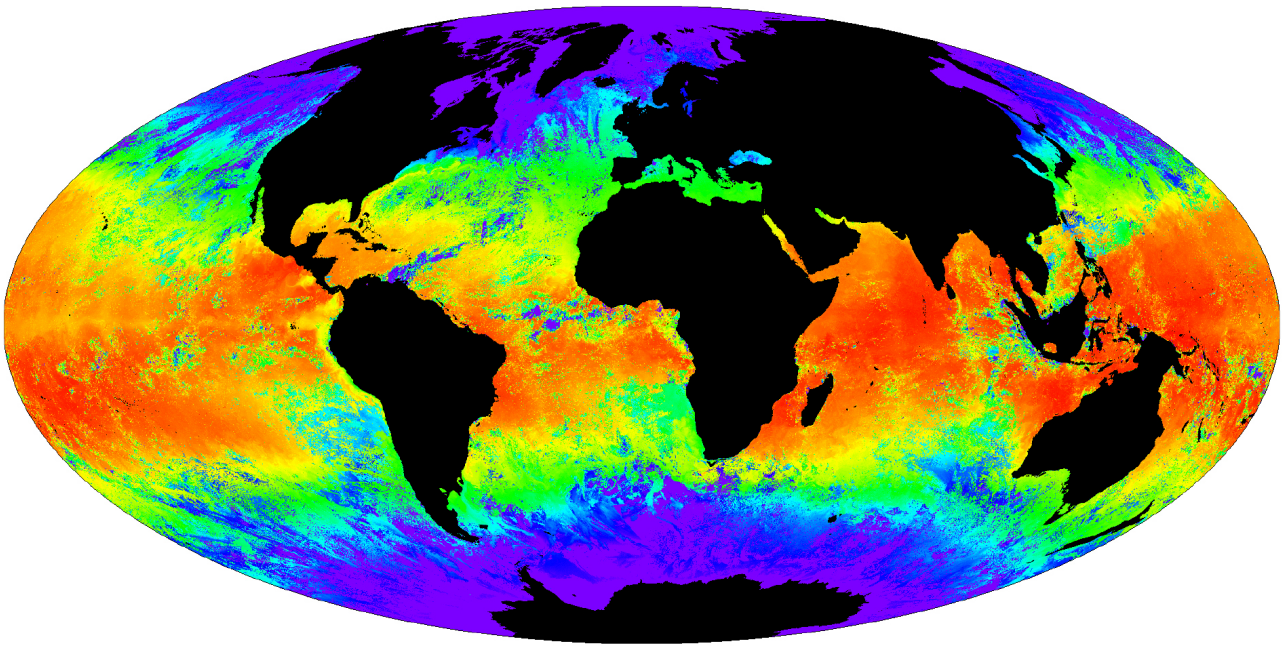
Figure 1. Issues with identifying marine global biodiversity hotspots in terms of irreplaceability and vulnerability, as related to climate zones

Climate zone	Irreplaceability	Vulnerability
Tropical	Sea-surface temperature is the only common environmental predictor of species-richness (5). Areas of species-richness differ across taxa and between coastal and oceanic taxa but are concentrated in the tropical zone (5).	Multiple drivers of impact affect many marine or coastal areas (8). Impacts fall into four broad categories: climate change, fishing, land-based pollution, and ocean-based pollution. Management interventions required for each category may be quite different (2). Climate change and fishing are the biggest stressors in GBH (2).
Temperate	Measures of species-endemism (5) and functional diversity (7) reveal other GBH, including in temperate zones.	
Polar *(or global)*	The species-richness of open- or deep-ocean ecosystems is likely to be underestimated, as data are limited (6). Marine and coastal ecosystems that are relatively low in species-richness and endemism can be highly-productive (2).	Worldwide, human drivers of impact leave no marine or coastal regions unaffected, although extensive areas are at present relatively less affected, particularly near the poles (8).

Image: Sea-surface temperatures (NASA)



Thailand East Coastal Landscapes: Typology, Livelihood, and Sustainability

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Gulf of Thailand coastal landscape are characterized by geologic nature of landforms as sandy beaches and dunes, tidal flats, marshes, rocky coast and coastal wetlands[1]. Coastal communities gain an extraordinary range of both direct and indirect benefits from those ecosystem habitats[2]. Due to socio-economic driving forces- ecosystems are changing and disappearing at a frightening rate. Land development processes are changing and converting natural coastal landscape to the more fragmented habitats[3]. While some of the natural patches, such as beach forests, coastal wetlands, and sand dune forests, were preserved, the remaining question is whether the local communities see those natural preserved areas as their opportunities or not. The goal of the study is to examine and categorize landscape typologies along the East coast of Thailand. Also identify the relationship of the livelihood and the coastal environment which might lead to sustainability in the future practices. Landscape typologies could be use as an application tools to understand the interaction between ecological landscape linked with the cultural aspects on the landscape. This research is focused on, 300 kilometers, the long and narrow stretch of the coastal ecotone from Laem Pak Bia in Petchaburi to Bang Berd Sand Dune in Chumpon. The research use GIS as spatial analysis tools, make on site observation detail on the diverted ecosystems, and interview with the local communities. The result shows fragmented landscape structure of various ecosystem habitats along the east side of Thailand[4]. The preservation patches obviously bring ecotourism to the local communities which could strengthen or weaken their livelihoods connected with the natural resources[5]. The connection between man and nature seems relatively sensitive, depending on the changing lifestyle of the community as well as the landscape planning and management.

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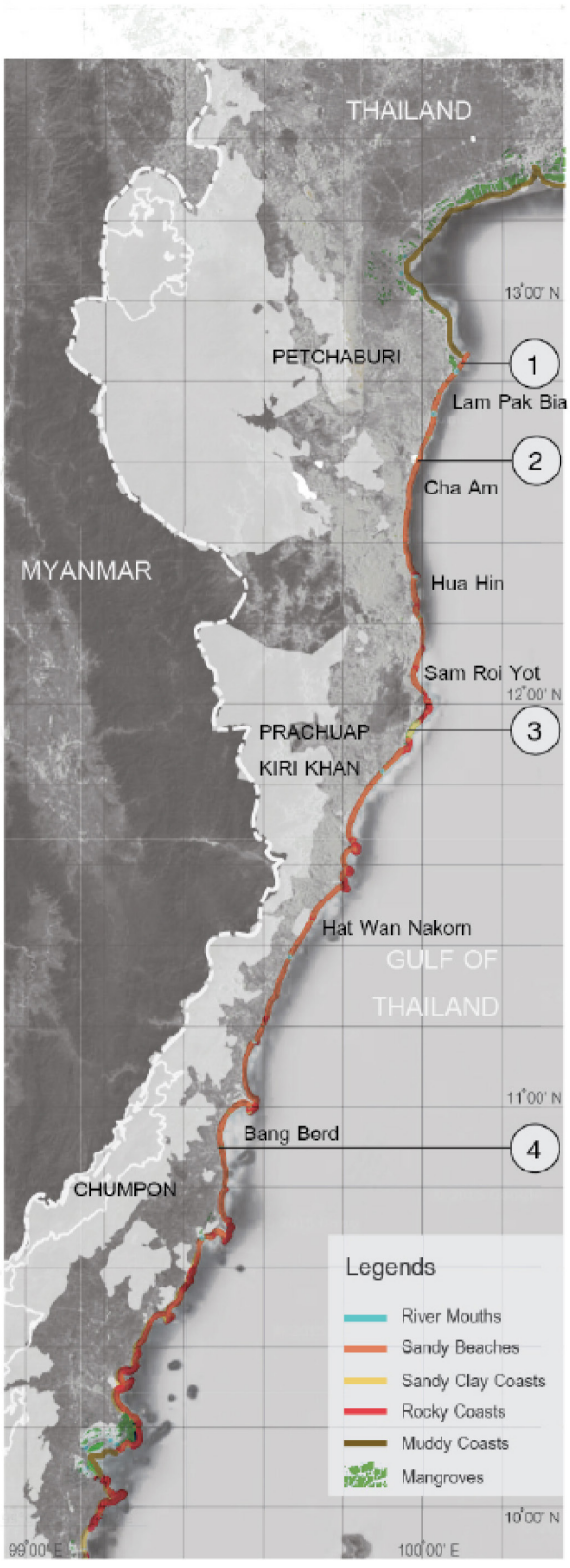
Coastal Landscape Typologies



1. Beaches
Lam Pak Bia , Petchaburi

2. Beach Forests
Cha Am, Petchaburi

3. Mangrove Forests
Baan Khoa Dang, Prachuap Kiri Khan

4. Sand Dunes
Bang Berd, Chumpon

A Collaborative Approach to Marine Conservation Planning in Puget Sound Washington: Examples from the Snohomish County Marine Resources Program

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This presentation will describe a citizen-driven Marine Resources Program in the United States that has leveraged funding and provided key insight and knowledge for restoration and planning projects in Snohomish County, Washington, United States. Located in Puget Sound, now often referred to as the Salish Sea, Snohomish County is in Washington State, on the West Coast of the United States. According to the 2010 US Census, the County has a total of 2,196 square miles (5,690km^2) of which 2,087 square miles (5.410 km^2) is land and 109 square miles (280 km^2) is water[1]. Snohomish County is part of the Northwest Straits and is one of seven counties that are partnering with the regional Northwest Straits Initiative[2]. This presentation will summarize the context of the Snohomish County Marine Resources Program and two key projects which demonstrate the success of collaborative stakeholder processes and partnerships to create and plan for a thriving ecosystem and built environment.

Port Susan Marine Stewardship Area (PSMSA):

Between 2009 and 2012, over 30 federal, state, local, tribal and nonprofit partners worked to create a Conservation Action Plan for Port Susan. Port Susan has been indentified as an biodiversity hotspot by The Nature Conservancy and others[3]. This plan is unique in that it included the development of a prioritized list of target species and habitats and compares them with known threats to create a matrix of strategies. Target species and habitats includes Chinook salmon, Dungeness crab, Shellfish, Forage Fish, Shorebirds, Beaches, and River Delta. The Port Susan Marine Stewardship Area was officially designated by Snohomish County Council in 2014. One of the keys threats in Port Susan is shoreline hardening (armoring). The Puget Sound Partnership has developed a series of vital signs to measure the health of the Sound. One of these vital signs is shoreline armoring and despite the development of shoreline restoration projects around the region, new armoring continues to be built at a pace of almost 1 mile a year[4]. The Conservation Action Plan developed through this approach created a variety of actions that partners are working collectively to implement. The Snohomish MRC with a variety of partners has taken on the challenge of addressing this key threat with our partners.

Snohomish County Nearshore Restoration Project:

This project is a large-scale shoreline restoration and enhancement project to address the disruption of sediment supply and transport processes along the Puget Sound shoreline between Mukilteo and Everett, Washington. Like other long stretches of shoreline in the region, the project area is lined by continuous shoreline armoring associated with the railroad. Given the likelihood of existing shoreline armoring structures remaining in place

for the foreseeable future, habitat restoration solutions that work within the constraints existing on our shorelines are necessary to improve habitat quality and support natural nearshore processes. Snohomish County is conducting a large-scale shoreline restoration project along a 4.5 mile stretch of shoreline. The success of the project development (planned for construction in the fall of 2015) has stemmed from a collaborative stakeholder process and technical design expertise. The stakeholder process has led to significant partnerships that have been crucial for this project and are noteworthy for future restoration in other shoreline areas. In particular, the U.S. Army Corps of Engineers is providing suitable dredge materials to be beneficially re-used for beach nourishment and beach restoration. Work is continuing to develop a long-term management program (i.e., re-nourishment). Burlington Northern Santa Fe Railroad (BNSF) is also a key collaborator as much of the work will occur within their right-of-way. Local volunteer groups have also expanded the County's ability to collect baseline biological data.

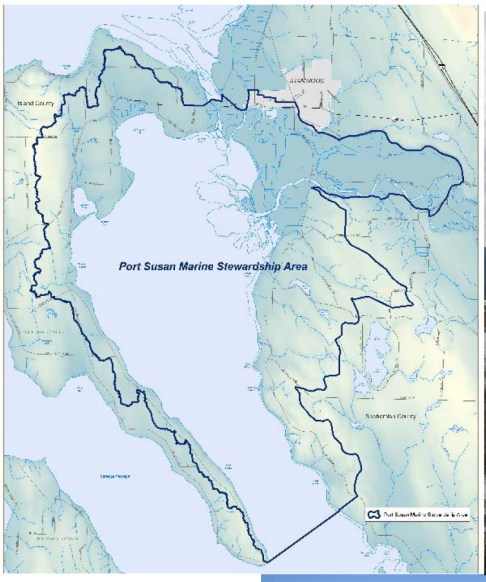
[1] http://www.census.gov/2010census/, accessed August 2015

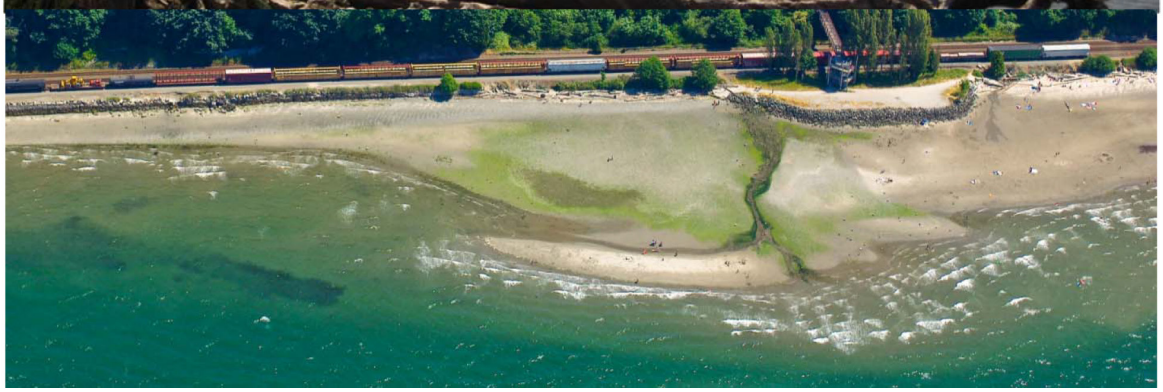
[2] http://www.nwstraits.org/ , accessed August 2015

[3] Floberg et al. 2004. Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Volume One: Report. Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre.

[4] http://www.psp.wa.gov/vitalsigns/shoreline_armoring.php, assessed August 2015

Illustrations:





ES/NC based management strategy can boost the management of the Mediterranean urban dune ecosystems

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ES/NC based management strategy can boost the management of the Mediterranean urban dune ecosystems

Most of sand beaches of Catalonia (NE Spain) can be considered urban beaches and endure the combined impacts of intensive recreational use, increasing erosion and flood risk, and mono-functional management practices. So, there is a need to go beyond the Integrated Coastal Zone Management (ICZM) concept and test new strategies based on the ES/NC vision, taking into account coastal morphodynamics, dune ecology, shore governance structure, the sustainable economic and recreational use with over 7.000.000 visits each year.

The Hybrid dune project is an "exemplar" of the EU funded OPERAs project, and has been funded by the Metropolitan administration of Barcelona. It includes different experiences focused on the reconstruction of dune morphology, control of invasive species, and analysis of the impacts linked to social use.

Some of the first outcomes of the project (now at midterm of the project) shows that dune management emerged as a much cheaper alternative to the traditional beach nourishment and sand translocation on the submerged beach (which had no significant effects on the emerged beach profile). Some of the key causal drivers that impairs the natural construction process of dune structures and ecosystems are being identified. The extremely high demand of ES shows the importance of visitor's behaviour and the very high efficiency of dune management in terms of cost/benefit analysis.

A classical approach to dune construction and management would involve at the best knowhow and scientific improvements, and a communication program oriented to inform and to try to reduce conflicts with the high human use. The ecosystem services optics has provided this project with a much wider methodological range mainly on 3 main aspects:

A much better social interaction methodology:

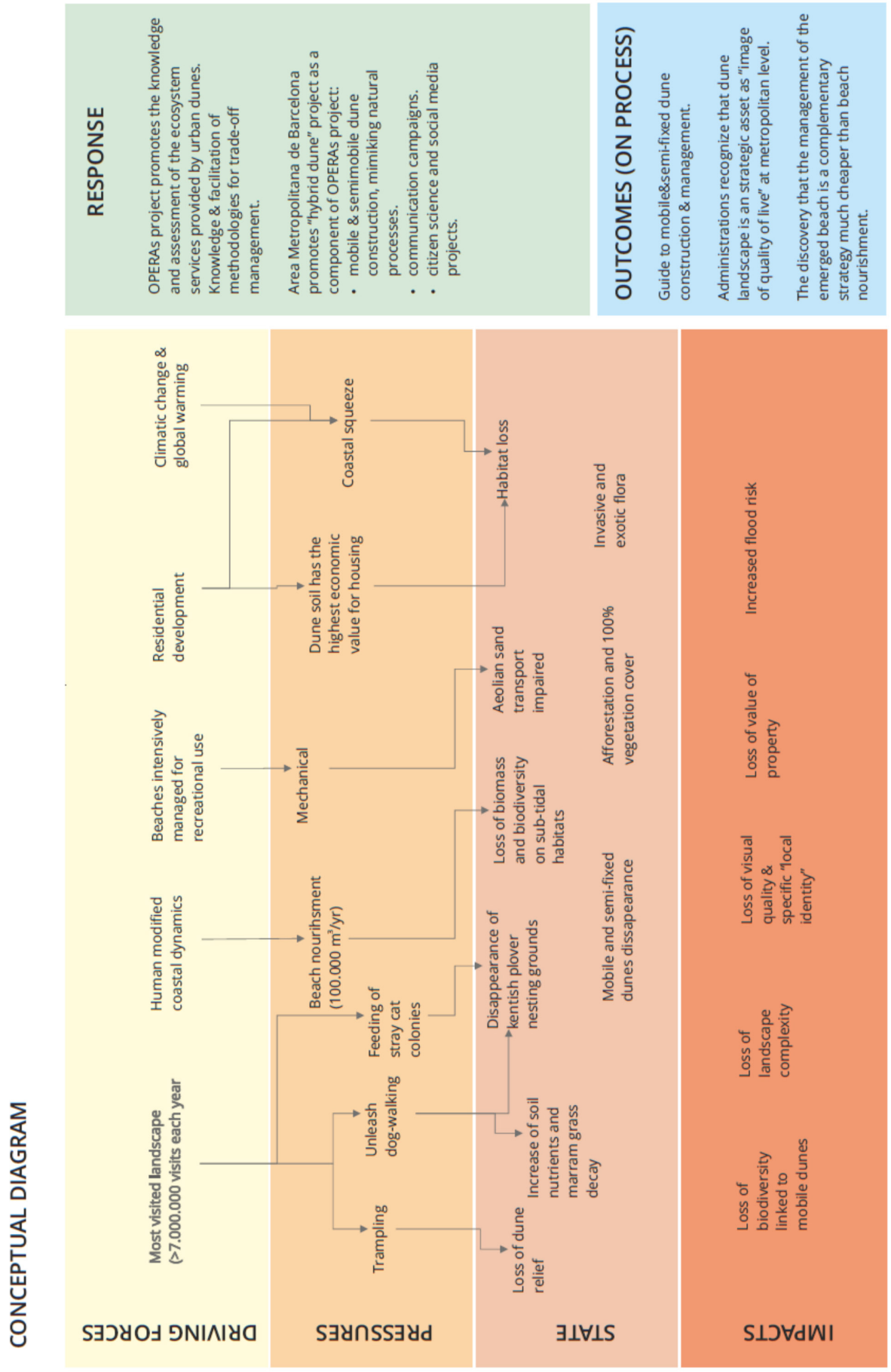
- Going far beyond awareness and indoctrination, but promoting social engagement.
- Improved methods to identify not only the different stakeholder groups but uncovering the different narratives that shape their attitudes in order to help to solve trade-offs.
- New metrics linked to social media.

New ways of economic income:

- Improved methods to assess the economic gains linked to better quality landscapes.
- Improved methods for cost/benefit analysis.

Governance:

- New governance insights, with local administrations discussing alternative and more cost-efficient strategies on coastal defence.
- Providing decision-making with objective information on public opinion with improved metrics relating to geographical aspects, numeric relevance, capacity to lead opinion, etc...
- Adding transparency and clarity to the decision making process.


CONCEPTUAL DIAGRAM
DRIVING FORCES
PRESSURES
STATE
IMPACTS
Most visited landscape (>7.000.000 visits each year
Human modified coastal dynamics
Beaches intensively managed for recreational use
Residential development
Climatic change & global warming
Trampling
Unleash dog-walking
Feeding of stray cat colonies
Beach nourihsment (100.000 m³/yr)
Mechanical
Dune soil has the highest economic value for housing
Coastal squeeze
Loss of dune relief
Increase of soil nutrients and marram grass decay
Disappearance of kentish plover nesting grounds
Loss of biomass and biodiversity on sub-tidal habitats
Aeolian sand transport impaired
Habitat loss
Mobile and semi-fixed dunes dissapearance
Afforestation and 100% vegetation cover
Invasive and exotic flora
Loss of biodiversity linked to mobile dunes
Loss of landscape complexity
Loss of visual quality & specific "local identity"
Loss of value of property
Increased flood risk
RESPONSE
OPERAs project promotes the knowledge and assessment of the ecosystem services provided by urban dunes. Knowledge & facilitation of methodologies for trade-off management.
Area Metropolitana de Barcelona promotes "hybrid dune" project as a component of OPERAs project:
• mobile & semimobile dune construction, mimiking natural processes.
• communication campaigns.
• citizen science and social media projects.
OUTCOMES (ON PROCESS)
Guide to mobile&semi-fixed dune construction & management.
Administrations recognize that dune landscape is an strategic asset as "image of quality of live" at metropolitan level.
The discovery that the management of the emerged beach is a complementary strategy much cheaper than beach nourishment.

Tides of change: recreating coastal habitats in response to climate change

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Decision-makers are starting to plan for future flooding and climate change impacts. Coastal flooding is a high cost risk and needs long-term planning but also raises prescient questions of how Scotland, more generally, should adapt appropriately to climate change. There is growing acceptance that coastal habitats can protect and climate-proof our coasts in an uncertain future and provide other valuable benefits. By working with nature and recreating coastal habitats through managed realignment, we can adapt to the threat of coastal flooding and climate change with a long-term, sustainable and cost-effective solution.

To realise this opportunity we need to recreate a swathe of lost habitats along our coasts to protect us from flooding as well as providing more homes for nature. In 2003 RSPB Scotland undertook Scotland's first managed realignment project at Nigg Bay in the Cromarty Firth. 10 years on a new report shows excellent results for birds, wildlife and the ecosystem. This positive outcome must be learnt from, and rolled out more widely, as soon as possible. Business as usual is no longer an option. Natural habitats provide a tool to manage coasts in a sustainable way that adapt to change and are themselves adaptable and resilient.

Integrating economies and conservation in UK seascapes: the role of seabird research

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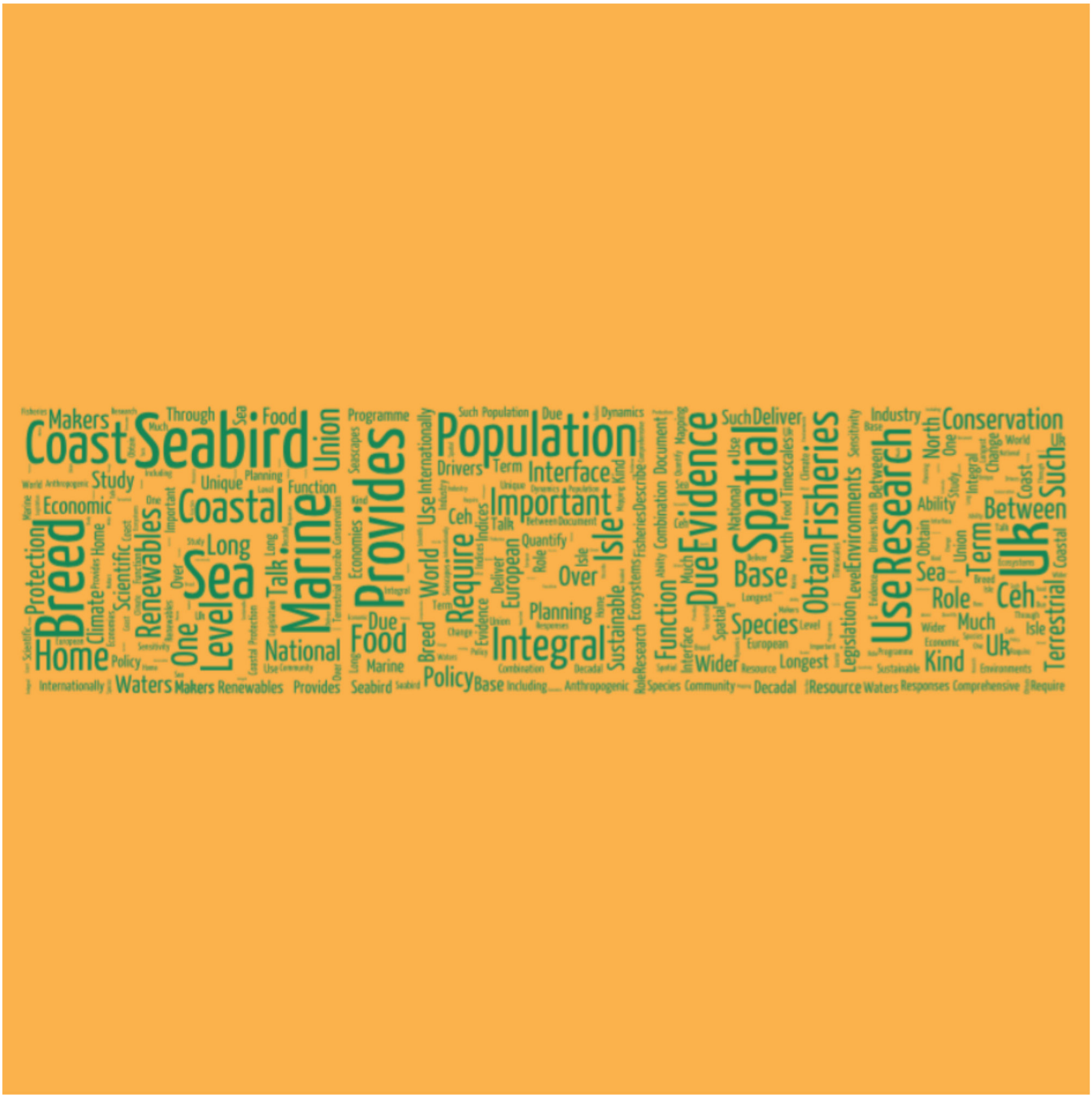
The UK is home to internationally important populations of breeding seabirds. These species function at the interface between the terrestrial and marine environments, since they breed on the coast yet obtain their food from the sea. Seabirds are integral to coastal and marine spatial planning due to their protection by European Union and national legislation. As such, research on seabird populations provides the scientific evidence base that policy makers and industry (fisheries, marine renewables) require to deliver sustainable use of UK coasts and coastal waters by integrating economic and seabird conservation requirements. CEH's long-term study of seabird populations on the Isle of May is one of the longest and most comprehensive of its kind in the world, and has provided much of the evidence on seabirds and their role in the North Sea and wider marine ecosystems. This programme of research provides a unique resource, through its ability to document population-level and community-level responses over decadal timescales, and to quantify important anthropogenic drivers including climate change, fisheries and marine renewables. In this talk, we will describe how we use a combination of spatial mapping, population dynamics and sensitivity indices to integrate economies and seabird conservation in seascapes.


Coast
Seabird
Population
Conservation
Provides
Marine
Sea
Coastal
Breed
Home
Important
Integral
Evidence
Spatial
Fisheries
Research
Use
Uk
Ceh
Food
National
Waters
Policy
Species
Base
Terrestrial
Between
Interface
Level
Renewables
Makers
Study
Economic
Union
Kind
Role
Much

Jersey Coastal National Park – Co-production in Practice.

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Engaging stakeholders in coastal management has become the norm. Projects vary in the quality of the engagement, and the extent to which stakeholders influence the outcome, but tend to have one thing in common: once the main process is completed, the responsibility for ongoing governance and implementation defaults to pre-existing organisations or partnerships, resulting in social capital dissipating along with potential resources.

A pioneering project for Jersey's new Coastal National Park (CNP) sought to change that by adopting a co-production approach.

The Park includes wild heaths, small settlements, steep wooded valleys, marshlands and small walled fields. It has dramatic cliffs, sweeping bays, azure seas, flower rich dunes and boat wrecking rocky headlands. This stunning land and sea-scape is enjoyed by visitors and islanders alike.

In 2009 it was agreed that the CNP was adopted in the Island Plan. Enhanced planning controls and a detailed landscape assessment followed, but there was no sense of a common identity nor integrated management. Most people on Jersey didn't even know the Park existed.

In 2014 we were commissioned to facilitate a Stakeholder Dialogue (SD) to agree a management plan. At the outset, the cross department steering group expressed aspirations which sounded like co-production (Box 1) and after we explained what that was (Box 2) they adopted the approach relinquishing any final say or veto.

In practice co-production is an equitable endeavour which means everyone has responsibility to: share in understanding the challenges and opportunities, make decisions, share resources for delivery, share commitment to implementation, and crucially share governance of the ongoing project (Table 1).

On Jersey the Dialogue helped people to create a vision, plan action, offer resources for co-delivery (including funding, time, equipment, data, buildings, and volunteers), and crucially agree the composition, role, style, and responsibilities of a co-governance group comprising 12 people from across sectors. The group will: be responsible to the stakeholders; work for the common good; and individuals on it will speak for all from their interest or sector (not just their own area or organisation).

The remaining challenge is establishing the group legally. Co-production requires new co–operative models with a two part governance structure - pioneering for a National Park.

Whilst lessons from the process continue, Jersey is pioneering new approaches to the conservation of land and seascapes.

Box 1

- Generate co-delivery and action
- Result in change on the ground
- Build consensus around principles and actions
- Be action focussed
- Create synergies of effort
- Result in increased and shared ownership

Box 2

Co-production is a 'reciprocal relationship between citizens, the 3rd sector, and public bodies which draws on the resources (such as time, effort, energy, information, know-how, innovations, skills and funds) of each to share in the design, development and delivery of agreed actions to result in shared benefits'. *Diana Pound.*

Table 1. The responsibility spectrum

		Responsibility for designing & planning what happens		
		Professionals	**Shared**	**Users and community**
Responsibility for delivery and governance	**Professionals**	Traditional professional service	All design. Professionals deliver (typical participation approach)	Users design, professionals deliver
	Shared delivery	Professionals design, shared delivery	**Full co-production**	Users design, shared delivery
	Users and communities	Professionals design, users/community deliver	Shared design. Users/community deliver	Self-organised user/ community provision

Adapted from Carnegie Trust 2006

Capacity of offshore wind development to ecologically enhance adjacent marine habitats.

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The evidence base for both the positive and negative impacts of offshore wind farms during their operational phase is limited. With the continued industrialisation of the marine environment it is fundamental to fully understand the environmental impacts of these developments. It has been documented that offshore wind turbines may have the potential to ecologically enhance their adjacent marine habitats by functioning as artificial reefs. This study examines the capacity of offshore wind farms to promote ecological enhancement by examining the current scientific understanding of this artificial reef function that is present in the available scientific literature and the EIAs of Scottish offshore wind developments. This study examines the concepts associated with ecological enhancement that include increasing design considerations of the turbine foundations and scour protections to increase habitat complexity, this can be targeted through the EIA process. Increasing the understanding of the operational impacts, both positive and negative, will require a synergy between the literature and project EIAs that will ultimately benefit the environmental planning process. EIAs will then have the potential to increase the positive environmental footprint of these developments. The results suggest that the negative operational impacts are negligible compared to the localised ecological enhancement that arises from offshore wind turbines, providing that they are appropriately sited. It should be considered in future whether the deployment of offshore wind farms should be designed to limit their their environmental footprint or maximise and potential ecological benefits.

The Authenticity of Tourism in Northern Norway

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Tourism in Northern Norway has been growing since the 1800s. In recent decades an increasing number of drivers have led to this upward trend in the number of visitors coming to Northern Norway. Cruise tourism and Indigenous Sami tourism are two branches of tourism prevalent here, however both have issues concerning a mismatch between the tourists' expectations and reality. Both are heavily advertised and marketed online, with the key focus being on nature, and the amazing experiences on offer. So how important are these Arctic imaginaries in the tourist experience, and does an authentic tourist experience exist in Northern Norway? The Norwegian coastal boat, the Hurtigruten, is advertised as an authentic sea voyage along the coast of Norway, and in some ways does act as a link between the authenticity of the Sami people, the environment and the tourism opportunities on offer.

From visual content analysis carried out for websites, the most common picture category was bird's eye or natural views, and/or blue sky and water, emphasising the natural beauty found here. TripAdvisor reviews revealed that most people give a high rating and are satisfied with activities in Northern Norway, such as on the coastal boat, the Hurtigruten. However the feeling rippled through that the Hurtigruten doesn't quite live up to expectations and it is the nature that is amazing. Cruise tourism may not be the most effective way to fully experience all that coastal Norway has to offer to gain a truly authentic experience, but it is useful for a 'quick skim' of the sorts of experiences that are available. Importantly though, it does control tourist access to vulnerable areas, through the use of planned excursions, limited access and time constraints.

Tourism in Northern Norway may be reaching a consolidation and maturity stage, where it will grow more slowly and then start to decline, based on Butler's Tourism Area Life Cycle. Potential future scenarios are outlined using this life cycle. Last chance tourism is prevalent in Northern Norway, and manifests itself through the Sami people rather than explicitly through the changing environment.

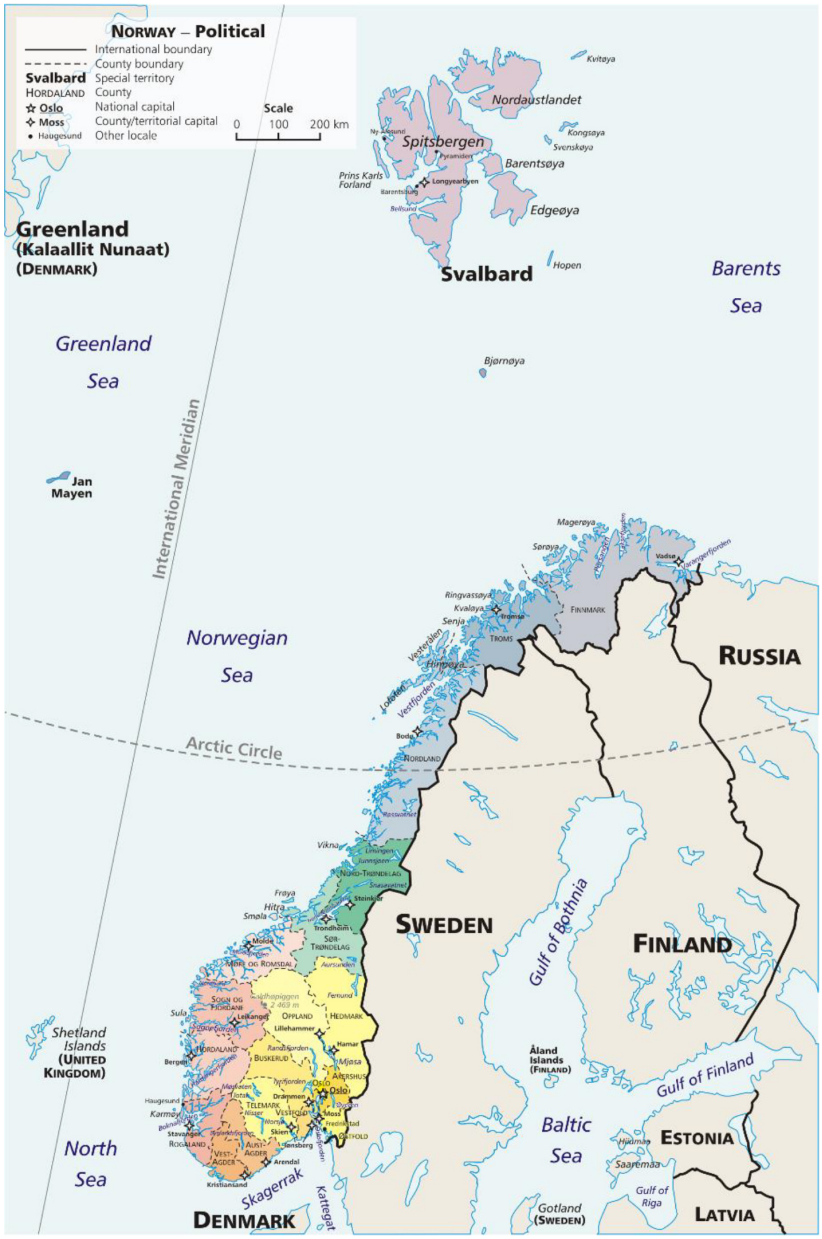

Figure 1. Map of Norway, and its positioning against Northern Scandinavia, including the Svalbard archipelago. Counties in Norway are shown by the different colours, including the 3 counties that fall within the Arctic Circle; Nordland, Troms and Finnmark (Wikipedia, 2010)

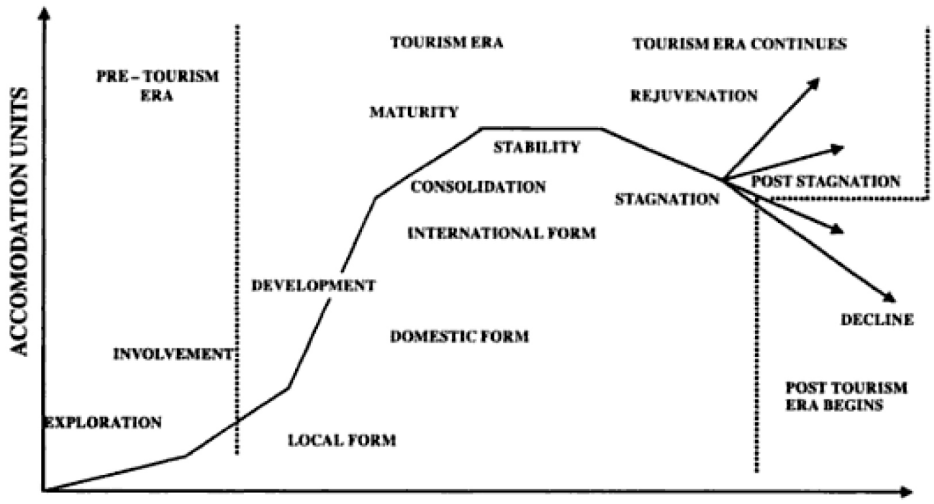

Figure 2. An updated version of Butler's 1980 model of tourism growth stages for a destination, showing growth, stabilisation and decline (Lagiewski, 2006)

Tues 8 Sept Pm - Seascape ecosystem services: managing natural capital

The functions and processes of the seascape that maintain human well-being are multidimensional, covering ecological but also socio-cultural and economic value domains. This session invites speakers from with different perspectives to advance our understanding of how these seascape services can be mapped, valued and enhanced.

Marine transitions: from value depletion to value creation in our oceans

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Global maritime history is littered with examples that demonstrate how failure to give heed to the constraints of nature can result in devastating effects on communities and wider economies. Yet human activities continue to put pressure on our seas, causing ecosystem degradation and biodiversity loss, reducing the ability of the oceans ability to provide the goods and services on which we rely. With the gap between what we as a society demand from marine systems and what those systems can provide ever widening, we are in urgent need of a response that restores healthy and resilient marine ecosystems in the long term.

Our collective response to date has centred on legislation and policy largely dealing with sector specific threats and the protection of species and habitats. While this approach has seen some notable successes (e.g. the Habitats Directive), the background trend is one of natural capital depletion.

However, we know that value creation in our oceans is possible and can lead to positive societal outcomes, yet we have so far failed to adopt systems of decision-making that suitably take account of the value of protecting and enhancing marine natural capital from which essential ecosystem services flow.

We are at a point of transition in the EU with the implementation of measures (e.g. Marine Strategy Framework Directive) that promote taking an ecosystem-based approach, with clear goals to enhance ecosystem health and services.

If grasped fully, taking an ecosystem-based approach to managing human activity at sea in an integrated way offers a huge opportunity. Success will only come if natural capital becomes a common language for decision-makers, managers and stakeholders, and if a truly holistic approach is taken to ensure all human use of marine environment is within ecological boundaries. A key tool will be marine spatial planning, which should incorporate ecosystem services thinking to allow for the prioritisation of management actions, and create win-wins when deciding on the allocation of finite marine resources.

Challenges remain in our ability to fully assess the condition of marine natural capital, and we lack the mechanisms to fully account for the value of marine ecosystem services in economic decision-making; more tangible provisioning services such as seafood carry favour, whereas regulation and maintenance services such as carbon sequestration and cultural services that also provide a spiritual connection to the sea are overlooked.

Perennial challenges are that existing policy has rarely been implemented fully or timeously, and that individual policy goals are rarely coordinated. So we must also recognise that policy alone will rarely provide a 'silver bullet' and more fundamental changes to our systems of production and consumption may still be required if we are to avoid the escalating cost of degrading marine ecosystems.

The Blue Yonder – what's in it for us?: a case study of the Brighton & Lewes Downs Biosphere

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The Brighton & Lewes Downs has recently been recognised as a Biosphere Region by UNESCO, to serve as an international demonstration area of sustainable development that pioneers a positive future by connecting people and nature. This 'world-class' environment – situated in central coastal Sussex in south-east England – covers an area of 38,900 hectares, one-quarter of which is composed of the near-shore marine environment of the English Channel. The marine 'buffer zone' of the Biosphere is made up of part of the new Marine Conservation Zone (MCZ) of Beachy Head West, that forms an elongated chalk reef along the intertidal and subtidal zones, with the remainder of the open sea classed as a Biosphere 'transition area'. The Biosphere programme aims to support the conservation and sustainable use of the MCZ, and better connect marine conservation and development agendas through the promotion of local and sustainable sea fisheries. It also seeks to engender greater awareness of the nature and benefits of the marine environment's diverse ecosystem services more generally, amongst both residents and visitors. New habitat mapping of the seabed led by the Sussex Inshore Fisheries & Conservation Authority is to be incorporated with the better-surveyed terrestrial environment to create a new integrated resource across the Biosphere to help inform environmental management and interventions. The scope to add the supply of marine ecosystem services, such as fisheries and recreation, to the existing terrestrial modelling of services is also to be investigated. Beyond the potential technical applications that improved characterisation of the local marine environment can allow, there is considerable scope for its use also in communications to enhance public awareness and understanding. For example, a new campaign is being developed to raise local consumer awareness of sustainable seafood, through voluntary marketing initiatives that go beyond any relevant regulatory byelaws for the MCZ and inshore fisheries district of Sussex. Substantial potential exists also to develop new materials for visitors to the coast and sea environment, as part of the Biosphere's eco-tourism initiative linked to a sustainable 'blue growth' agenda. For example, new coastal visitor centres are planned with innovative media, such as digital models to visualise the underwater environment, as a way of communicating shared messages about the Biosphere. In conclusion, we consider that work planned under the Biosphere programme to develop and incorporate new marine mapping and modelling for nature conservation ends can also be used for socio-economic purposes, helping to improve applied stakeholder and public understanding of ecosystem service benefits from the sea with the potential to add value to the local economy also.


Henfield
Hurstpierpoint
Ditchling
East Chiltington
Barcombe
Clayton
Plumpton
Cooksbridge
Hamsey
Ringmer
Small Dole
Poynings
Pyecombe
South Downs Way
Offham
Steyning
Edburton
Fulking
Upper Beeding
LEWES
Stanmer
Glynde
Falmer
Kingston
Iford
Firle
Rodmell
SHOREHAM BY-SEA
PORTSLADE BY-SEA
HOVE
BRIGHTON
Woodingdean
Southease
Lancing
Rottingdean
Piddinghoe
Saltdean
Telscombe
Peacehaven
NEWHAVEN
Brighton & Lewes Downs Biosphere
Zones
Protected Nature Sites (SSSIs)
South Downs National Park area
Urban Areas
Marine Conservation Zone
English Channel Sea
SSSI data, and Marine Conservation Zone data reproduced with permission of Natural England © Natural England copyright 2015. Contains Ordnance Survey data © Crown copyright and database rights 2015.
N
0 1 2 3 4 5 Km
Beachy Head West MCZ - Seaford

Carbon Sink capacity of seagrass (Posidonia oceanica) meadows.

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Coastal vegetated ecosystems are hot spots for carbon sequestration and play an important mitigation role against anthropogenic greenhouse gas emissions. Among seagrassess, the largest carbon sink capacity has been described for the Mediterranean endemic species Posidonia oceanica. However, P. oceanica meadows rank among the most threatened ecosystems worldwide due mainly to the increase of coastal anthropogenic pressure during the last century. The few estimates of carbon sequestration in P. oceanica meadows available reveal substantial variability across meadows, suggesting a potential effect of local environmental and anthropogenic factors. We explored the carbon stocks and burial rates in 11 P.oceanica meadows around The Balearic Islands, under a different degree of wave exposure (fetch) and anthropogenic pressure. We found important carbon sinks in the meadows examined: the sediment top meter carbon stock (12.9 ± 2.1 Tg Corg) was more than twice the carbon stock estimated for the Balearics forests and the carbon burial rate (26.5 ± 9 g C m^{-2} yr^{-1}) was much higher than the global estimates for temperate forests. Fetch did not show a significant effect in the carbon accumulation but the incidence of human pressure was determinant in the carbon burial rate that generally increased in the sites examined after the booming of anthropogenic pressure that took place around the 1960's.


Anthropogenic
Oceanica
Carbon
Effect
Estimates
Rate
Stock
Sink
Pressure
Meadows
Hot
Forests
Coastal
Burial
Ecosystems
Around
Sequestration
Increase
Important
Balearic
Role
Spots
Gas
Worldwide
Vegetated
Potential
Mediterranean
Emissions
Sites
Islands
Endemic
Mitigation
Examined
Fetch
Local
Play
Capacity
Accumulation
Substantial
Seagrassess
Available
Reveal
Factors
Posidonia
Greenhouse

A geospatial model of coral reef vulnerability: The Society Islands French Polynesia

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Coral reefs are a valuable, yet vulnerable, marine resource that provide local sources of food, aquaculture, coastal protection, and underpin lucrative tourism industries. Understanding the spatial and temporal context will inform proactive management and policy decisions. Drawing on remote sensing, extensive field data sets, and maps of important bio-physical parameters, we develop a geospatial model of coral reef vulnerability. Satellite data from the commercial satellite WorldView-2 are used to conduct a spatial audit of underwater habitats, at meter scale resolution across thousands of square kilometers of seascape. Other, often free, remote sensed or modelled data are used to map cyclones and wave damage, thermally induced coral bleaching events, nutrient levels around reefs, spatial patterns in marine harvest, coastal runoff and watershed management. While reef systems may be isolated from one another, our analysis of HYCOM Ocean circulation data reveals distinct connectivity patterns between reef sites. Such connections may facilitate recovery of coral populations following a disturbance, but conversely also allow the spread of the coral predator Crown of Thorns Starfish (Acanthaster plancii). Assessments of the health and prognosis of a given reef system must therefore consider both the distribution of impacts, but also connections across the seascape and coastal hinterland.


Vulnerable
Data
Reef
Coral
Map
Valuable
Tourism
Connections
Used
Coastal
Patterns
Marine
Model
Provide
Spatial
Sensed
Management
Remote
Scale Protection Resource
System
Satellite
Lucrative
Inform
Free
Audit
Industries
Understanding
Acanthaster Marine Starfish
Bleaching
Disturbance
Recovery Watershed Harvest Food Thousands
Parameters

Current Provisioning Ecosystem Services of Krabi River Estuary for the Local Communities

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Land reclamation for agriculture and urbanisation are among the main pressure of mangrove shrinkage and fragmentation of coastal ecological patch. Climate change may exacerbate the impacts of these threats through increases in temperature, precipitation pattern changes, and sea level rise. Climate change impact projection show that Krabi's mangrove forests tend to shrink seaward (START, 2008). Krabi River estuary and mangrove that fringe along Krabi's coastline play an important role in lowering impact from climate change by buffering coastal communities and their croplands from storm surges. Provisioning ecosystem services are defined as products obtained directly from nature. Coastal ecosystems include biologically and economically important ecosystem; mangrove, mud flat, beach forests, coral reefs and seagrass beds. Mangrove forests provide functions as nursery grounds for marine species and shrimp production. Coastal communities also use them as collection areas for subsistence, especially during the monsoon season that prohibits small fishing boats going out to the ocean. Coastal communities have traditional ways of life that are closely linked to the ecosystem goods and services. So they are consider vulnerable to environmental change impacts due to their fisheries-dependent livelihoods. So, the outcome of this study aims to clearly identify ecosystem products to state the value of coastal ecosystem to the local communities of Krabi province before the change by global climate and development.

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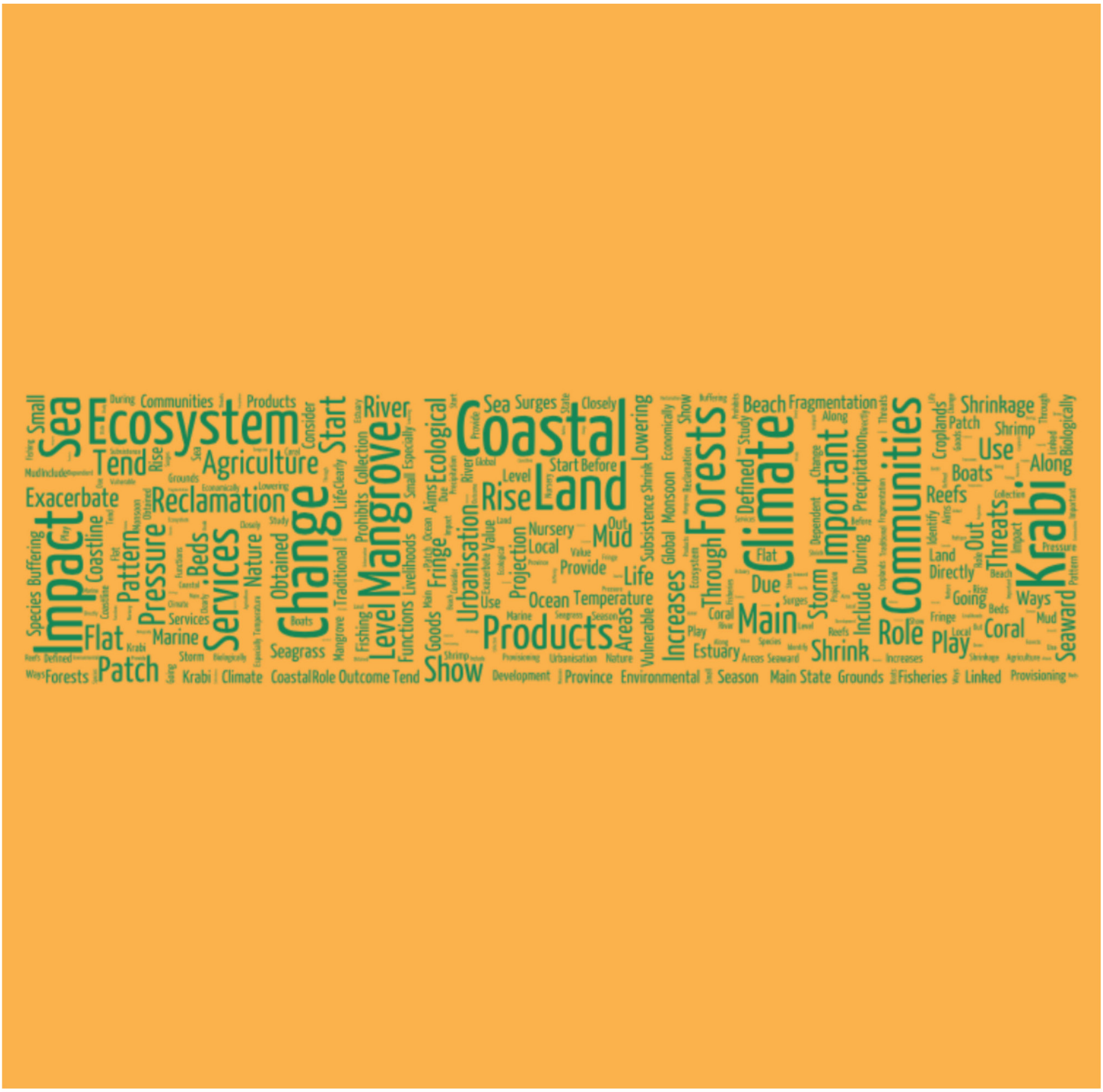
TEEB (The Economics of Ecosystems and Biodiversity), 2009. The ecological and economic foundations. Integrating the Ecological and Economic Dimensions in Biodiversity and Ecosystem Service Valuation. www.teebweb.org (accessed 08.04.15)


Sea
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Impact
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Products
Tend
Agriculture
Reclamation
Exacerbate
Coastline
Pattern
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Services
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Forests
Change
Obtained
Seagrass
Start
Consider
River
Mangrove
Level
Ecological
Coastal
Rise
Land
Sea Surges
Closely
Start Before
Nursery
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Mud
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Life
Ocean Temperature
Urbanisation
Products
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Lowering
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Fisheries
Linked
Provisioning

Coastal landscapes in Estonia and threats to the provision of ecosystem services.

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The objective of the present work is to demonstrate the use of an environmental stratification as a framework for the assessment of habitat types and ecosystem services provision in the coastline of Estonia.

Estonia has 3794 km of coastline, varying from low cliffs to boulder beaches, shallow sandy shores and more than 1500 islands and islets. During the Soviet period (1944 - 1991), the coastline became either security exclusion or closed economic zones, public access was forbidden and development was limited. Therefore, the coastal belt contains many preserved habitats which provide a wide range of ecosystem services.

The Environmental Stratification of Estonia has recently been constructed as described in[3] using data for climate and topography. Eight classes were obtained and four contain coastline as shown in Fig 1. The strata have been validated with independent data using orthogonal regression. The share of each coastal stratum is shown in Fig 1.

The strata are used as a framework to compare the provision of five ecosystem services[2], ranked in order of importance: habitats diversity, landscape character, coastal erosion protection, timber production and cultivated crops.

The study area is the strip defined by a buffer of 200m inland from the coastline. The proportions of habitat types[1] present in the coastal strata are given in Fig 2, which shows strong contrast in the provision of services between the strata. Thus, strata 1 and 2 are dominated by coastal meadows and Nordic alvars. Stratum 3 is mainly western taiga and stratum 4 is characterized by deciduous forest, wooded dunes and sandy beaches. Coastal habitats have a multifunctional character and deliver a wide range of services. For instance, coastal meadows play an important role as stopover for migrating birds, but also prevent erosion and provide fodder.

The results of the climate change model described in[4] show a shift from the Nemoral Zone into the milder Atlantic North Zone (Fig 3). Some plausible impacts of climate change are: In terms of the shifts in strata, western species currently in strata 1 and 2 could move into strata 4 and 5. Changes in the proportion of coastal habitats are also expected to happen. Milder winters and wetter summers will bring dense and more closed vegetation and as a consequence, a loss of species in alvars and coastal meadows.

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[3] Metzger MJ et al., 2005. A climatic stratification of the environment of Europe. Global Ecol. Biogeogr. 14: 549 – 563.

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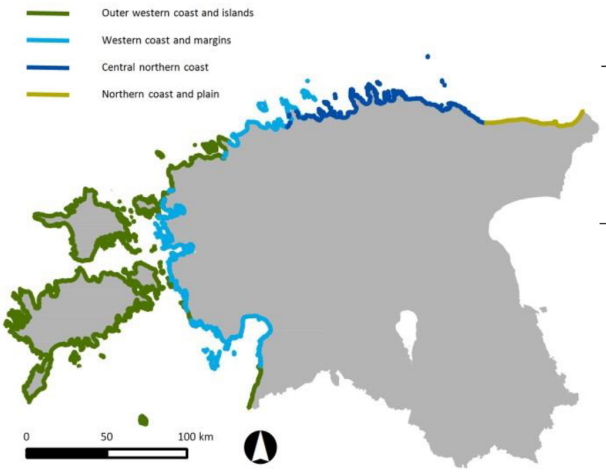
Fig 1. Distribution of the four coastal strata and percentage of coastal area covered by Natura2000 sites. The study area is defined by a buffer of 200 m inland from the coast.



Coastal strata	Percentage of total coast area	Percentage of coastal area covered by Natura2000 sites
1. Outer western coast and islands	61.2	57.6
2. Western coast and	25	47.5
3. Central northern coast	11	37.6
4. Northern coast and plain	2.8	29.2

Fig 2. Proportion of Habitats Directive Annex I habitat types present in each coastal stratum.

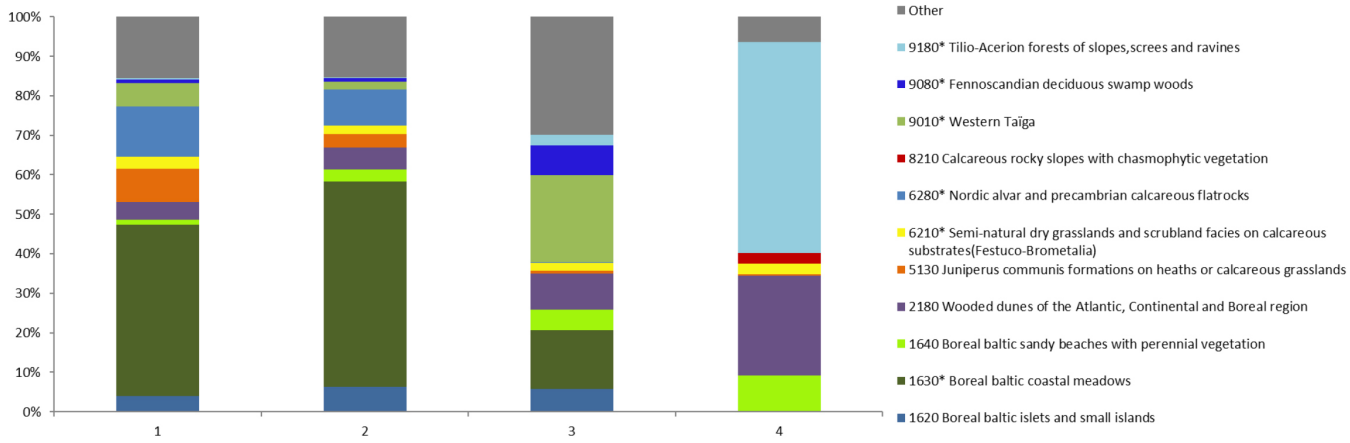


Fig 3. Shifting coastal strata based on CGCM2 general circulation model and A2 emissions scenario, according to (4).

Understanding shared socio-cultural values in relation to planning the Marine Environment

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Public policy is understood to reflect shared values, but these values are complex to identify and difficult to incorporate into valuation systems commonly used in environmental planning and management. The establishment of Marine Protected Areas (MPAs) and the protective policies that direct their management aim to achieve public benefits, but the ability of these policies to reflect the values of all stakeholders has been questioned. In a research project established under the UK NERC Valuing Nature Network (VNN) existing data was used to test the hypothesis that integrated modelling of economic values and socio-cultural values, with ecosystem characteristics can help identify a focus for new policies to achieve marine health and sustainability and public benefits. A Bayesian Belief Network (BBN) analytical method was used to manipulate data in an MPA context. The aim was to provide a framework by which to model components based on the identification of key values of different disciplinary sciences in relation to marine policy analysis which would allow the construction of scenarios to provide an assessment of policy impacts. This paper reflects on the issue of shared values which emerged within the research process as one that is poorly understood within environmental planning such as MPAs.


Provide
Planning
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Hypothesis
Complex
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Reflect
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Within
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Identify
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Cultural
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Policy
Vnn
Marine
Network
Public
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Valuation
Understood
Research
Achieve
Protected
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Bbn
Test
Management
Nature
Established
Health
Mpa
Uk
Nerc
New
Systems
Framework

Perspectives of Small-Scale Fishermen on policies, management and the fishing industry in Sri Lanka. A Q-study to assist government in compliance of gear laws and marine resource management to reduce resource conflicts.

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Small-scale fisheries have been closely associated with poverty and more specifically marginalization, vulnerability, exclusion, exploitation, and discrimination (Nyak, 2014). Béné's (2003) typology on origins and dynamics of poverty and impoverished process includes economic exclusion, social marginalization, class exploitation and political disempowerment as key mechanisms that accelerate poverty. This typology has recently been developed to incorporate the processes of environmental change and degradation by Nyak et al. (2014). By using this typology as a framework for Q-methodology, this study attempts to understand the perceptions of small-scale fisher people on policies, resources, and the fishing industry. Q-methodology is a way in which social perspectives can be revealed by analyzing the patterns in the way people associate opinions (Webler et al., 2009). By having a better understanding of the perspectives and the drivers for human behaviours then more effective policy recommendations can be made. The conflicts from different gear use that are arising will be explored through two case studies being carried out in two fishing communities; Galle and Kalpitiya, as they engage and comply with the policies differently. Ideally the results from this study will be applied to the theories of access benefit sharing (ABS), and provide improved policy recommendations.

A Mobile Species Marine Protected Area and the Sustainability of the Whale Watching Industry in West Scotland

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Under the Marine Conservation (Scotland) Act 2010 it was required that the Scottish Government designate Nature Conservation Marine Protected Areas (MPAs) in order to contribute to the development of a network of MPAs in the United Kingdom.[1] This will further the United Kingdom's commitment to The Convention of Biological Diversity and OSPAR Convention to protect biological diversity.[2] As a result, Scotland has designated four mobile species MPAs, one of which is located in the Sea of Hebrides on the West Coast of Scotland.[3]

The aim of this study was to establish what impact MPA designation may have on the whale watching industry in West Scotland. There has already been massive growth in the industry in the last twenty years,[4] and whale watching tours provide an important source of income for rural communities in West Scotland.[5] Protected area status can also change the perception people have of an area, and as a result there is the potential for increased tourist numbers to the MPA.[6] It is therefore important to consider the possible management strategies that will be effective in regulating the industry in order to protect marine wildlife and ensure sustainability of the industry.

There is no legislation that directly relates to whale watching, and the industry is currently regulated by voluntary codes of conduct. Sightings surveys were carried out on a whale watching boat on the west coast, where the operator follows codes of conduct to minimize disturbance to marine wildlife. The results of the survey showed that there were very low levels of behaviour change observed in the cetaceans, which could determine that if used appropriately, codes of conduct can be effective in minimising disturbance to marine wildlife.

However, there are some inconsistencies in the recommendations found in the different codes of conducts used. It would therefore be recommended that the first management strategies for whale watching in the MPA are developed around community based management in the form of a Sea of Hebrides Code of Conduct. This would encourage community engagement on a commercial and recreational level to adopt the code of conduct in order to reduce the likelihood of operator non-compliance.[7,8]

If tourism in the area increases or monitoring finds that the codes are not effective in limiting disturbance to marine wildlife, then there is the possibility of introducing stricter regulation in the form of permits. This, combined with an enforced operator developed code of conduct, would limit the number of operators allowed to operate in the MPA, and as a result limit disturbance to marine wildlife.9 Therefore, there may be the need to integrate bottom-up and top-down management in order to protect marine wildlife and sustainability of the industry.

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