

Bridging the gap between land and sea

Turning the Tide: Systems thinking
for a sustainable ocean

March 2025



Contents

3	Acknowledgements
4	Introducing Turning the Tide
5	The land-sea interface
8	How can we manage the impact of land use on marine environments?
10	Coastal management approaches
13	Governance and regulation
15	Ocean literacy
18	Systems thinking
19	What next?
20	References
22	Image credits

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This publication reflects the overall balance of views expressed by participants in the Turning the Tide project and do not necessarily reflect the views of the individuals and affiliated organisations listed above.

About the Institution of Environmental Sciences

The Institution of Environmental Sciences (the IES) is at the forefront of uniting the environmental sciences around a shared goal: to work with speed, vision and expertise to solve the world's most pressing environmental challenges, together. As the global professional membership body for environmental scientists, we support a diverse network of professionals all over the world – and at every stage of their education and careers – to connect, develop, progress and inspire.

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Introducing Turning the Tide

At the start of 2023, we launched ‘Turning the Tide: systems thinking for a sustainable ocean’. To mark the end of this project, we will share four publications covering each of the project themes. This publication will summarise the key points included in the first theme: ‘Bridging the gap between land and sea’.

Turning the Tide: Systems Thinking for a Sustainable Ocean was a long-term project covering four key themes in marine and coastal science from a systems thinking perspective: ‘Bridging the gap between land and sea’; ‘Blue carbon’; ‘Blue economy’; and ‘Marine conservation and restoration’.

‘Bridging the gap between land and sea’, and *Turning the Tide* as a whole, opened with a webinar exploring the ways in which human activities affect the marine and coastal environment,¹ which was followed up by a forum on ocean literacy,² giving attendees a chance to learn more about understanding and communicating humanity’s relationship to the marine environment. As our ‘Bridging the gap’ content was being shared, a Treaty to protect the High Seas was agreed upon by the United Nations.³ We shared a guest-authored blog on this historic

development,⁴ reflecting on how it had been achieved and what might happen next.

We hosted an event titled ‘Examining the land-sea interface: Coastal management approaches’, which focused on the application of Integrated Coastal Zone Management.⁵ Finally, we collaborated with Ocean and Coastal Futures (OCF) to facilitate a roundtable discussion which sought to place the land-sea interface within the wider context of marine sustainability, wrapping up ‘Bridging the gap between land and sea’ and providing a foundation for the following project themes. *Turning the Tide* generated a variety of live events along with blogs and articles delving into each theme. To revisit any of the project outputs, follow the links in ‘What next?’, the final section of each *Turning the Tide* publication.

The land-sea interface

Foreword

*Bridging the gap between land and sea necessitates an understanding of, and engagement with, terrestrial processes. Interdisciplinarity and systems thinking is key to our work, and that of the environmental science sector as a whole. **The Foundation for Water Research (FWR)** is part of the IES Communities ecosystem, and is an independent community of professionals from across the water sector and related scientific specialisms. The community comes together for deliberative discussion to support the development of interdisciplinary solutions to water challenges. FWR member and IES Vice President Mark Everard reflects below on the interconnectedness of marine and freshwater environments and processes, and the challenges and opportunities this poses.*

“The land-ocean interface spans not only boundaries between major habitat types and the ecotones between them, but also multiple jurisdictions, regulatory frameworks and cultural associations. For many aquatic organisms, particularly diadromous species such as eels and salmon, free access between fully saline and fresh water is essential for the completion of life cycles, and the diverse, distinctive and productive estuarine ecosystems (or ‘transitional waters’) where these waters meet and blend creates vital recruitment, nursery and feeding habitat for many more animals and plants. Whilst the interface between land, fresh waters and the marine environment is hypothetically a place of great mixing – for ecology, folklore, biogeochemistry, physical processes and livelihoods – often in practice it presents a conceptual and legislative gap. This meeting of habitats is, in reality, more of a continuum than a hard division, providing a wealth of deeply interconnected ecosystem services that are widely exploited: for food production, tourism and recreation and aggregate extraction, as trade routes, and for many more purposes besides. It is also a space where humanity exerts profound influence, fragmenting inherently contiguous environmental processes. It does so directly through port, residential, industrial and agricultural development, fisheries and navigation, from

barrages and other obstructions, and due to hard coastal defences. Many more diffuse impacts also arise from remote sources, such as disruption of sediment flows from rivers and elsewhere in the coastal zone contributing to erosion, and saline intrusion also results from over-abstraction of coastal groundwater. This is critical not just for the integrity of the ecosystems themselves, but also as environmental processes at this interface support diverse livelihoods, nutritional needs, cultures and economies throughout the world. Development of a symbiotic relationship that seeks to conserve vital ecosystem integrity and functioning through sustainable resource use is a goal requiring systemic understanding informing policy formulation and action. There have been some welcome breakthroughs, such as the United Nations Treaty to Protect the High Seas (Biodiversity Beyond National Jurisdiction, or ‘BBNJ’), the explicit inclusion of ‘Life below water’ as Sustainable Development Goal 14 and ‘life on land’ (which includes fresh waters) as SDG13, increasing uptake of Integrated Coastal Zone Management (ICZM) and, in the UK, progress towards Marine Biodiversity Net Gain (BNG) as well as terrestrial BNG. However, these initiatives are just the start of a wider societal reorientation to recognise the values of ecosystems of all types both for their inherent values as well as foundational resources underpinning continuing human wellbeing, including the resilience of the land-ocean interface. Taking a systems approach to knowledge creation informing policy formulation and management practices is vital to ensure that good intentions do not fall between the cracks at the land-ocean interface.”

– Professor Mark Everard

Marine and terrestrial ecosystems are strongly linked through their biogeochemical and socioeconomic processes and therefore, for effective management of both, it is essential that there is a strong understanding of the interconnections and feedback loops between them. However, regulation and management of these environments is often siloed, leading to negative impacts, unintended consequences and a failure to implement solutions to environmental challenges with multiple benefits for people and nature.

The importance of the connection between marine and terrestrial environments is most apparent at the land-sea interface, where the impacts are often more readily seen

and felt by local communities. It is therefore crucial to interrogate the interconnections between land and sea, and thereby support well-informed, sustainable decision-making that supports the protection and restoration of both.

Management of areas within a coastal zone or area of the ocean generally comes from a desire to protect a valued resource or ecosystem service. However, due to jurisdictional boundaries and existing governance frameworks, which are often arbitrary and not aligned with environmental features, management approaches can be fragmented and may not consider the wider ecosystem. With recognition that valued resources and

ecosystem services cannot be isolated from the environment in which they sit, it is imperative that any kind of management plan considers the effects that will spill out of its assigned zone, and not simply account for those within it. Similarly, due to the complex nature of the land-sea interface, it is important that governance is joined-up and transcends borders to act for the global good.⁶ Regulations and management placed on one area of the marine and coastal environment will inevitably impact the wider system; therefore, efforts must be made by policy- and decision-makers to collaborate and ensure sustainability across this interface.⁷

To support such decision-making, it is essential that communities and other stakeholders are treated as experts in their local area and solutions are co-designed with those who will be impacted. Through lived experience local communities will have access to invaluable insights that can inform the most appropriate solution to an issue and can act as natural stewards long after an intervention or new approach is implemented. However, it is necessary to connect people with the marine environment to support this. Ocean literacy, along with mutually supportive concepts like marine citizenship,⁸ represent a clear priority for improvement if marine and coastal scientists are to engage coastal communities – and those further inland – in essential conservation and restoration work. Those who inhabit and visit the coast are undeniably one of the strongest actors in the complex system presented by the land-sea interface.

A key element of ensuring the land-sea interface operates as a resistant, resilient and sustainable system is moving away from extractive blue economy models, and towards those posited by organisations such as the World Bank that specify

sustainable management of resources.⁹ There are many economically-driven activities that take place in coastal zones, ranging from fishing to tourism to renewable energy developments. It is important to note that the blue economy model is led by the wider economy, and as such also needs to support the move towards a circular economy that protects and restores marine and coastal environments and properly values the ecosystem services that they provide. The topic of blue economy will be discussed in more detail in the third Turning the Tide publication.

Though each of the above topics warrants in-depth exploration, it is essential that they are all considered as part of the same complex socio-ecological system made up by the land-sea interface. The marine environment cannot be tackled in isolation from its coasts: bridging the gap between land and sea has never been more important.

How can we manage the impact of land use on marine environments?

The nature of the land-sea interface means that decisions about land use will inevitably impact the marine environment. For example, nutrient runoff from agricultural land can cause chemical imbalances in coastal waters, leading to effects such as algal blooms, which in turn disturb the delicate balance of existing ecosystems by releasing toxins into the marine environment.¹⁰ Sediment runoff can also occur from agricultural land if soil structure becomes compromised due to overworking, over time altering the geomorphology of coastal zones and disrupting habitats.

In addition, many UK news reports over the last 18 months have covered the topic of wastewater discharges into the sea, with the English Environment Agency revealing that 2023 represented a 54% increase in the number of sewage spills compared to 2022, and a 13% increase compared to 2020.¹¹ This was partially explained by the high levels of rainfall in 2023; this is a weather pattern which may become more frequent or extreme as the climate changes and, as such, something wastewater systems must be able to cope with. Discharges on this scale contaminate coastlines and beyond, rendering waters unsafe to swim in, and negatively impacting coastal ecosystems.

Understanding the land-sea interface as a complex system is a necessity. In the context of management plans, this can seem complicated: how do you define a management zone but avoid viewing it in isolation from the wider system it is a part of? However, there are ways to define the parameters of a zone while acknowledging it exists in a larger system: for example, indicating exogenic pressures (consequences are managed in the defined zone but the causes require global action) versus endogenic pressures (both causes and consequences are managed within the defined zone). This can bring clarity to which stocks (the quantity of any given resources in a system at one time) and flows (the movement of resources) are based within the limits of a management zone, and which may be out of its direct jurisdiction and require further intervention.

Management zones are their own smaller-scale systems. As such, it is important to ask where problems and solutions may be occurring – land or sea – and how they may interact. Since pressures can be naturally occurring or anthropogenic, they may have different potential mitigation strategies. In turn, interventions may lead to knock-on effects within the zone's system and further afield. To ensure the efficacy of management measures, understanding the

nature of discrete yet interlinked factors is crucial.

Elliott et al (2020) separate these factors into activity, pressure and effect footprints: all marine activities have an activity-footprint (defined as the area in which the human activities take place), which result in pressures-footprints and effects-footprints. Pressures-footprints are the area covered by the pressures (defined in this context as mechanisms of change) generated by the human activities on the prevailing habitats and species; effects-footprints are the areas over which any adverse effects occur – this includes effects on the natural system and on ecosystem services from which goods and benefits are extracted.¹²

Management plans are generally instigated when something we have assigned value is affected by a hazard. Once this happens, the hazard is defined as a risk and subject to management strategies in an attempt to protect the valued resource. In the marine and coastal environment, risks are generally due to one (or more) of the ‘Triple Whammy’ issues: increased industrialisation and

urbanisation; increased use of physical and biological resources; decreased resistance and resilience to climate change.¹³

However, knowing there is a risk is not enough on its own, as there are many factors that influence whether a management strategy will be sufficient – and actually approved in the first place. Barnard and Elliott¹⁴ describe 10 tenets of environmental management plans that must be met to improve the likelihood of creating a successful, supported strategy. The tenets span social, environmental and fiscal concerns, referencing the fact that there are many layers of law, finance and public opinion that are as essential in a plan’s adoption as its environmental merits and sustainability. Prioritising issues where we see the most direct effect from land-sea interactions, such as discharges or agricultural runoff affecting water quality, is crucial.

Alongside identifying problems, it is also vital to make clear what strategies could be put in place to solve them.



Coastal management approaches

There are a range of different management approaches when considering the land-sea interface. From a systems perspective, some have particular strengths and weaknesses in their ability to avoid an insular perspective and consider a zone's impact on its wider environment. Ultimately this is essential to ensuring the consequences of any interventions do not cause unintended consequences, either spatially beyond the zone's boundaries or temporally after a management scheme comes to an end. As such, systems thinking is the lens through which the following approaches are evaluated.

Integrated coastal zone management (ICZM)

Integrated Coastal Zone Management (ICZM) is, at its core, a tool for the conservation and sustainable management of marine, coastal and freshwater biodiversity. It is also a decision-making process and should begin with issue identification involving all stakeholders in an affected area. The more clearly the problem can be defined, the more likely it is that solutions will be appropriate and effective. Engaging varied stakeholders has the added benefit of contextualising issues in terms of a wide range of perspectives, thus ensuring

solutions can take these into account. ICZM takes a systems-based approach to coastal management, identifying numerous interlinked yet distinct factors that need to be accounted for when managing, and planning for the future of, an area. Combining expertise from environmental science, law, education and economics, it attempts to tackle problems through an interdisciplinary lens to avoid siloed thinking.

Ecosystem-based management (EBM)

Another approach is ecosystem-based management (EBM). Haugen et al (2024) describe it as “the best practice for managing multiple ocean-use sectors, explicitly addressing trade-offs among them” but acknowledge “implementation is perceived as challenging and often slow”¹⁵ To advocate for an approach that applies the principles of systems thinking the perceived challenges will also have to be addressed. Haugen et al identify a range of cross-sectoral barriers including governance, stakeholder engagement, and a lack of support for the approach. They propose a variety of solutions to tackle these issues, with improved communication, capacity building, the creation of certification schemes, and promoting the business case for ecosystem-based

management (EBM) hailed as the four most important interventions.

There are practical steps being taken to advance ecosystem-based approaches: in the case of offshore wind development, for example. In the UK, there is pressure to increase power generation from offshore wind farms to meet decarbonisation targets with the National Energy System Operator suggesting in 2024 that the UK must “contract as much offshore wind capacity in the coming one to two years as in the last six combined”¹⁶ to achieve Net Zero by 2030. However, there is concern around the damage offshore wind farms can inflict on marine ecosystems, meaning there must be balance between fulfilling clean energy demand and protecting already-threatened habitats.

Strategies like the implementation of regional ecosystem-based monitoring programmes (REMPs) can help to make these decisions and support the implementation of EBM. This has been successfully carried out in UK marine environments, such as the Bristol Channel, with dredging work (to harvest gravel and sand from approved sites) subject to a form of REMP – a Regional Seabed Monitoring Plan (RSMP). This involved collecting baseline information about seabed habitats and monitoring them, and reporting took place to “identifying conditions which should remain favourable for faunal recolonisation”, enabling habitat restoration to take place more effectively post-dredging.¹⁷ Though avoiding activities such as offshore wind farm construction, or dredging, altogether, would avoid impacting habitats, this may not be practical – especially in terms of a green energy transition. As such, it is important to balance any harmful activities with a deep understanding of the ecosystem they are affecting so that decisions can be made to minimise the long-term impacts by having

the data to restore affected areas back to baseline levels. Monitoring is an important part of any management approach, identifying what is needed to support a given area and evaluating whether the approach is working over time compared to identified baselines.

Shoreline management plans (SMPs)

Shoreline Management Plans (SMPs) are a method of protecting coastlines, in which the coastline is divided into sections and the most appropriate protective measures identified for each part. SMPs are ideally developed in liaison with local communities. The broad categories that can make up an area’s SMP are: ‘hold the line’ – maintain or upgrade protection from flooding or erosion by holding the shoreline in broadly the same position; ‘no active intervention’ – maintain or encourage a more natural coastline, which may involve discussing adaptation to the risk from flooding or erosion; ‘managed realignment’ – change the position of the shoreline in a controlled way, such as by slowing erosion or creating areas of habitat to help manage flooding; or ‘advance the line’ – actively move shoreline defences significantly seawards.¹⁸ However, these options are very focused on the terrestrial space, focusing on how to limit the land’s impact on the sea rather than the inverse.

Adaptation pathways coastal management

Another approach to managing the land-sea interface currently favoured in the UK is Adaptation Pathways Coastal Management (APCM). This strategy takes a long-term view of a chosen zone, recognising the locked-in effects of climate change, such as rising sea levels, as well as other interlinked consequences like erosion. APCM plans recognise that there is

uncertainty in terms of the exact effects of these factors but ensure they are taken into account, ultimately choosing an appropriate ‘pathway’ for the management of an area. However, these ‘pathways’ are iterative, meaning that decisions are checked and altered should circumstances change in the future. This allows for those involved in resourcing plans to have an idea of the costs involved along a projected pathway, to help investment remain consistent throughout, but does not lock a coastal zone into a single approach that may be insufficient should circumstances change: something which all stakeholders are made aware of throughout.¹⁹ The English Environment Agency’s Humber Strategy 2100+ takes this iterative approach – it was created due to the risks climate change could pose to the “half a million people,

14,000 businesses, and more than 120,000 hectares of agricultural land” already at risk around the Humber,²⁰ and will implement agile strategies from now until 2100 and beyond to ensure that the most appropriate interventions are in place.

Ultimately, there is no one-size-fits-all option, as approaches must be chosen based on the needs of the location, its communities and its environmental condition. However, key factors to prioritise are systems thinking, to ensure management zones are not viewed in isolation from the rest of the land-sea interface; stakeholder engagement, to ensure that those most affected have a say in plans; and the ability to iterate, to ensure that there is agility when dealing with inevitable uncertainty.



Governance and regulation

The boundaries of governance are often blurred when considering the marine and coastal environment. There is a real risk of different departments not working in a coordinated way or a lack of prioritisation for coastal environments. This presents a risk far beyond Westminster, as activities in one part of the marine environment will inevitably impact others, potentially on a global scale: joined up policy- and decision-making is desperately needed.

There is a complex system of international and national governance that applies to marine environments. In England and Wales, marine and coastal environments are primarily governed through the Marine and Coastal Access Act 2009 (MCAA), through a system of marine licensing, conservation zoning and the management of marine fisheries. The regulator for the MCAA is the Marine Management Organisation, responsible for making decisions around these three areas. There are also a number of policy targets relevant to the marine environment, such as those laid out in the Environmental Improvement Plan.²¹

There is a Defra-led cross-governmental Coast and Ocean Applied Systems Thinking Committee (COAST), which brings together chief scientific advisors from different government departments and the devolved administrations to address challenges

facing the marine and coastal environment in the UK using systems thinking approaches, which is a positive step towards taking an integrated approach to environmental challenges. However, the UK Government has recently been criticised for slow progress on environmental issues – including in the marine and coastal environment. The Office for Environmental Protection has requested a review on the existing Environmental Improvement Plan (EIP), with the Chair of the Office for Environmental Protection for England and Northern Ireland pointing out that the Government is “largely off track” in terms of meeting its targets as set out in the EIP.²²

Five priorities have been identified, with two (‘Speed up action in marine environments’ and ‘Set out clear mechanisms for reconciling competing demands for use of land and seas’) explicitly referencing the marine and coastal environment. Though this brings into focus a lack of action thus far, it may represent a pivotal moment in terms of the Government’s future environmental priorities.

In decision-making, focus is often on the land, with marine environments left to absorb the negative externalities of terrestrial policies. Key to changing this is framing the sea as vital to human health

and wellbeing, highlighting the ecosystem services and societal goods and benefits it provides and supporting people to understand that it needs to be something to protect and restore. Supporting communities in understanding the role of the marine and coastal environment in human wellbeing can help to create connections between communities and the sea.



Ocean literacy

Ocean literacy is an evolving concept. It is deeply personal, as it is increasingly taken to encompass not only our understanding of the marine environment but our connection with it. This means it is an ever-changing and adapting area of discussion with endless individual interpretations.

The 10 Dimensions of Ocean Literacy²³ is a framework which identifies the key drivers behind improved ocean literacy. Included in this are ‘Emoceans’ (our emotions about the ocean); Access and Experience; and Knowledge. The mixture of pedagogical, subjective and experiential framings is intentional and aims to capture a wide range of perspectives about marine and coastal spaces, as well as suggesting gaps in connection which can be developed to improve overall ocean literacy.

Another approach involves thinking in layers and supporting communities to increase their sense of belonging in coastal environments by dissecting their own locale’s relationship to it. Plover Rovers identify four key layers: communicating the science; using art to convey emotion; activism; and heritage and storytelling.² Progressing through the layers may be relatively straightforward for seaside communities, where the ocean is visible

and tangible, and there is a more obvious connection between inhabitants and the coast. For those further inland it may take more work, but can likewise be achieved by illuminating links between an area’s industrial past and the seaports that enabled it, or the effect that management of a local river may have by the time it meets the sea: regardless, the importance is in emphasising that we are all intrinsically linked to the marine environment.

Key is instilling the belief that anyone, anywhere, can contribute to marine stewardship and be part of the solution. Concepts such as marine citizenship, which extends beyond personal pro-environmental behaviours to include “public and political acts of collectivism and public engagement”, can mutually support ocean literacy by helping citizens to understand their political and civic rights to participate in marine decision-making.⁸

One of the Ocean Decade Project’s challenges is to ‘Change humanity’s relationship with the ocean’, but in 2024 a White Paper²⁴ recommended that the wording should be changed to “Restore society’s relationship with the ocean”. This makes clear that the link between people



and marine environment is something that has been disrupted, and that connection is the natural state – something we need to return to rather than develop anew. It is of paramount importance that this reconnection includes diverse communities who are currently under-represented in marine and coastal fields: ‘society’ must include varied perspectives and lived experiences, otherwise it is another exclusionary term.

It should be noted that there is a lack of diversity in the marine and coastal sector, particularly in terms of the amount of people of colour represented – something that is reflected across the environmental sciences. Ocean and Coastal Futures’ (OCF) report ‘Ethnic diversity in the UK Marine and Coastal Sector: Accelerating Change’, posits four reasons for this: 1. Inequality of access to blue spaces; 2. Pre-sector and school issues; 3. Higher education issues; and 4. Within sector issues. Though they

are discrete problems, they are also a cumulative collection of barriers that will affect someone throughout their life course and reduce their likelihood of entering into the marine and coastal sector. Focusing on the former, as access to blue spaces is a key factor in the development of an interest in them, OCF’s report suggests a range of reasons as to why this is currently so unequal in the UK, including the proximity of the ocean to where people of colour are living (disproportionately in urban centres further from the coast); financial barriers; and a lack of representation in media depicting coastal pursuits such as walking, surfing or swimming.²⁵

In a study looking into the associations between connection to green and blue spaces and mental health,²⁶ 18 countries were ranked in terms of their population’s sense of nature connection. The UK placed 16th (with 1st being most connected).

UK residents were also found to be visiting coastal blue spaces significantly less than many of their European counterparts in locations such as Spain, Portugal, Italy and Greece. On average, people surveyed in these countries were visiting a coastal blue space upwards of 8 times per four-week period, compared to under four times in the UK. Unsurprisingly, Spain, Portugal, Italy and Greece all ranked higher than the UK in terms of nature connection. As such, it seems the barrier to ocean literacy in the

UK is twofold in comparison with our European neighbours: we are not visiting our coasts as often, nor do we feel as much connection to them. Though there are a variety of factors that may influence someone choosing to spend time in a green or blue space, such as more favourable weather in many European locations, or ease of travel, it is important that UK residents are encouraged to make the most of their coastlines to develop a closer connection with them – come rain or shine!



Systems thinking

As discussed throughout, the marine and coastal environment is an interlinked, transitional space, and as a result needs to be viewed as a complex system rather than as its component parts. The application of systems thinking is crucial.

Progress has been made through the creation of a marine horrendogram²⁷ which illustrates the complex nature of the legislation currently being used to manage and protect our transitional waters, coastal and marine environments. However, no terrestrial counterpart currently exists, and a combined map of the sea and the land is called for to ensure that their interconnectedness is widely understood.

Using systems approaches is important in making better decisions, understanding trade-offs, and protecting coastal areas. They are a great way of communicating the importance of certain coastal ecosystems and the multiple layers of ecosystem services and societal goods and benefits they provide. Systems thinking is fundamental to understanding the interactions between land and sea and ensuring that environmental scientists are equipped with the knowledge to understand the impact of their work on the wider environment and to implement multifunctional solutions.



What's next?

The work done by the Marine and Coastal Community to develop and deliver Turning the Tide is reflected in the IES' updated Message to Government.²⁸ This document puts forward the key priorities identified by our Communities to ensure that the climate crisis is addressed with clear direction and urgency.

We will be releasing summary publications for the other three themes covered in Turning the Tide: Blue Carbon; Blue Economy; and Marine Conservation and Restoration.

The next theme, Blue Carbon, examines the crucial role played in climate mitigation and carbon storage by three key vegetative coastal ecosystems: seagrass; saltmarshes; and mangroves. Their conservation and restoration is crucial, as is research to better understand the carbon storage properties of other marine life such as kelp. Threats are posed to blue carbon ecosystems by a range of anthropogenic pressures, such as coastal aquaculture and the effects of climate change on ocean temperatures.

If you haven't already joined, why not become part of the IES' [Marine and Coastal Sciences Community](#)? You can also request to join our [Marine and Coastal Science LinkedIn group](#) to connect with like-minded peers working, or interested in, the sector.

References

¹ Elliott, M., and Davies-Vollum, S. (2023)

#IESTurningTheTide - IES Webinar: The impact of land use on marine environments. <https://youtu.be/A9M5EOsgjCE> (Accessed: 17 January 2025).

² McKinley, E. et al (2023) #IESTurningTheTide - Ocean Literacy: how to change humanity's relationship with the ocean. <https://youtu.be/X27ONosQlgl> (Accessed: 17 January 2025).

³ United Nations (2023) Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction. https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-10&chapter=21&clang=en#EndDec (Accessed: 17 January 2025)

⁴ Rey, N. (2023) #IESTurningTheTide - New global ocean treaty: Historic action for the High Seas. <https://www.the-ies.org/analysis/iesturningthetide-new-global> (Accessed: 17 January 2025)

⁵ Turner, J. (2023) #IESTurningTheTide Forum: Examining the land-sea interface: Coastal management approaches. <https://www.youtube.com/watch?v=OA3kDYoENvI&t=1s> (Accessed: 17 January 2025)

⁶ Cormier, R., Elliott, M. and Borja, Á. (2022) Managing Marine Resources Sustainably – The 'Management Response-Footprint Pyramid' Covering Policy, Plans and Technical Measures. <https://doi.org/10.3389/fmars.2022.869992> (Accessed: 12 February 2025).

⁷ Bradshaw, N. et al (2023) #IESTurningTheTide Roundtable: The role of the land-sea interface in achieving a sustainable ocean. https://www.youtube.com/watch?v=_kHiS877kuU&embeds_referring_uri=https%3A%2F%2Fwww.the-ies.org%2F&source_ve_path=MjM4NTE (Accessed: 17 January 2025)

⁸ Buchan, P. et al (2023) Marine citizenship: The right to participate in the transformation of the human-ocean relationship for sustainability. <https://doi.org/10.1371/journal.pone.0280518> (Accessed: 17 January 2025)

⁹ World Bank (2017) What is the Blue Economy? <https://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy> (Accessed: 17 January 2025)

¹⁰ Natural Resources Wales (2025) Marine algal blooms. <https://naturalresources.wales/guidance-and-advice/environmental-topics/water-management-and-quality/water-quality/marine-algal-blooms/?lang=en> (Accessed: 17 January 2025)

¹¹ Environment Agency (2024) Environment Agency publishes storm overflow spill data for 2023. <https://www.gov.uk/government/news/environment-agency-publishes-storm-overflow-spill-data-for-2023> (Accessed: 25 November 2024)

¹² Elliott, M., Borja, A., Cormier, R. (2020) Activity-footprints, pressures-footprints and effects-footprints – walking the pathway to determining and managing human impacts in the sea. <https://doi.org/10.1016/j.marpolbul.2020.111201> (Accessed: 12 February 2025).

¹³ Elliott, M. et al (2019) A Synthesis: What is the future for coasts, estuaries, deltas and other transitional habitats in 2050 and beyond? <https://www.sciencedirect.com/science/article/abs/pii/S09780128140031000010> (Accessed: 25 November 2024)

¹⁴ Barnard, S. and Elliott, M. (2015) The 10-tenets of adaptive management and sustainability: an holistic framework for understanding and managing the socioecological system. <https://www.sciencedirect.com/science/article/abs/pii/S1462901115000817> (Accessed: 25 November 2024)

¹⁵ **Haugen, J. B. et al. (2024)** Marine ecosystem-based management: challenges remain, yet solutions exist, and progress is occurring. <https://www.nature.com/articles/s44183-024-00041-1> (Accessed: 20 December 2024)

¹⁶ **National Energy System Operator (2024)** Clean Power 2030. <https://www.neso.energy/publications/clean-power-2030> (Accessed: 20 December 2024)

¹⁷ **Cooper, K. M. and Barry, J. (2017)** A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed. <https://www.nature.com/articles/s41598-017-11377-9> (Accessed: 20 December 2024)

¹⁸ **UK Government (2024)** Guidance: Shoreline management plans. <https://www.gov.uk/guidance/shoreline-management-plans> (Accessed: 20 December 2024)

¹⁹ **UK Parliament (2021)** Coastal Management. <https://researchbriefings.files.parliament.uk/documents/POST-PN-0647/POST-PN-0647.pdf> (Accessed: 20 December 2024)

²⁰ **Environment Agency (2023)** Humber Strategy 2100+ Adaptation Pathway Project. <https://engageenvironmentagency.uk/engagementhq.com/humber-strategy-2100-adaptation-pathway-project?preview=true> (Accessed: 20 December 2024)

²¹ **Defra (2023)** Environmental Improvement Plan 2023. <https://www.gov.uk/government/publications/environmental-improvement-plan> (Accessed: 17 January 2025)

²² **Office for Environmental Protection (2024)** EIP Rapid Review Advice Letter. <https://www.theoep.org.uk/report/oep-submits-advice-governments-review-its-environmental-improvement-plan> (Accessed: 22 November 2024).

²³ **McKinley, E. et al (2023)** The evolution of ocean literacy: A new framework for the United Nations Ocean Decade and beyond. <https://www.sciencedirect.com/>

[science/article/pii/S0025326X22011493](https://www.sciencedirect.com/science/article/pii/S0025326X22011493) (Accessed: 20 December 2024)

²⁴ **UNESCO (2024)** Ocean Decade Vision 2030 White Papers: Challenge 10: Restoring society's relationship with the ocean. <https://unesdoc.unesco.org/ark:/48223/pf0000390126?posInSet=10&queryId=d61fb5dd-1226-4649-a508-7dd636d457fe> (Accessed: 20 December 2024)

²⁵ **Ocean and Coastal Futures (2024)** Ethnic Diversity in the UK Marine and Coastal Sector: Accelerating Change. <https://coastal-futures.net/wp-content/uploads/2024/05/EDI-Marine-Sector-Strategic-Report-Final.pdf> (Accessed: 20 December 2024)

²⁶ **White, P. et al (2021)** Associations between green/blue spaces and mental health across 18 countries. <https://www.nature.com/articles/s41598-021-87675-0> (Accessed: 22 November 2024)

²⁷ **Elliott, M. and Boyes, S. (2014)** Marine legislation – The ultimate ‘horrendogram’: international law, European directives & national implementation. <http://dx.doi.org/10.1016/j.marpolbul.2014.06.055> (Accessed: 23 January 2025).

²⁸ **Institution of Environmental Sciences (2025)** Our shared Mission for Sustainable Wellbeing: 2024-2029 priorities for the UK Government. https://www.the-ies.org/sites/default/files/reports/our_shared_mission.pdf (Accessed: 17 January 2025)

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