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UK PELAGIC
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NCEA Natural Capital and Ecosystem Assessment


Image: Google Earth / Airbus, 2024

Eutrophication monitoring — recommendations for future assessments

HIGHLIGHTS

- Knowledge gaps around eutrophication monitoring and assessment were explored through literature, consultation and review
- 12 priority areas were identified under five main themes of DATA, ALIGNMNENT, INDICATORS, ECOSYSTEM, and CLIMATE
- DATA identifies priority areas linked to collection of high frequency and innovative data, increasing data confidence in monitoring impacts from land to sea
- ALIGNMENT explores the need to match our inshore to offshore processes
- INDICATORS and ECOSYSTEM on developing new ways to assess eutrophication
- CLIMATE considers interactions between climate changes within eutrophication

Our understanding of UK coastal and marine systems is changing, and our approach to eutrophication needs to consider changing baselines, cumulative pressures and new technology

Eutrophication has a substantial impact, limiting access to ecosystem services by acting as a pressure on biodiversity and the ecosystem. Even at relatively low levels, increased nutrient loads and changing nutrient proportions often lead to high phytoplankton biomass and species shifts that affect higher trophic level species.

With improving understanding, eutrophication assessments in the United Kingdom are changing — in multiple ways and in multiple directions. The shift from reporting under EU environmental directives to a nationally based marine strategy and/or natural capital approach is challenging but is a catalyst to rethink how we manage our environment.

Data collected with new technology and at high frequency has also shifted how we assess and manage marine environments. Future assessments need to consider data streams that can fully integrate novel and high frequency data into traditional monitoring, to develop a new understanding of the integrated functioning between our coastal and marine ecosystems.

Our future marine eutrophication work should be focused on developing improved assessments under OSPAR, the UK Marine Strategy and the Water Environment Regulations (Water Framework Directive), developing ecologically relevant assessment areas, which are not constrained by geographical boundaries; developing agreed assessment levels; and applying a harmonised assessment with a much stronger political and stakeholder alignment betweeen nearshore coastal and marine waters.

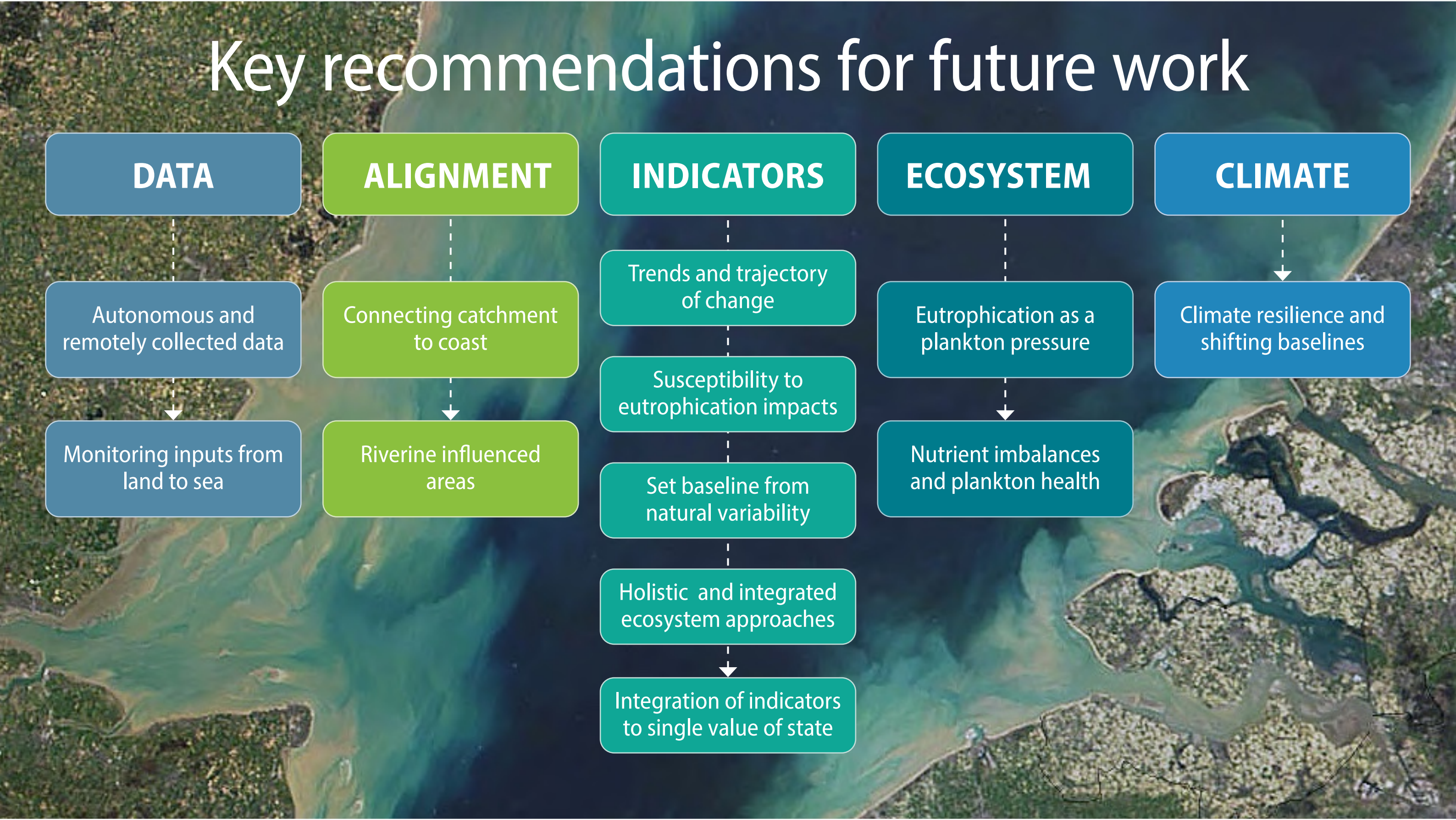
Future work needs to consider improved harmonisation from catchment to coast and the inclusion of new or improved indicators that tell us more about the ecosystem — and the services that mitigate or are impacted by eutrophication.

Advancements that move our reliance from common indicators (nutrients, chlorophyll, dissolved oxygen) to better estimates of community shifts such as nutrient imbalances, plankton lifeforms and ecosystem functioning would help develop capacity and confidence in data collected under our monitoring programs.

Knowledge gaps

One of our challenges has been responding to shifts in our understanding of eutrophication and enhancing confidence in national assessments through improved technology, modeling, mapping, better use of high-frequency data, and collaboration across the catchment-to-coast continuum — the pathway along which nutrients travel from their source to the sea. Knowledge gaps span five themes: **DATA**, **ALIGNMENT**, **INDICATORS**, **ECOSYSTEM** and **CLIMATE**, with **12 recommendations** identified to improve eutrophication monitoring and assessment.

Key recommendations for future work



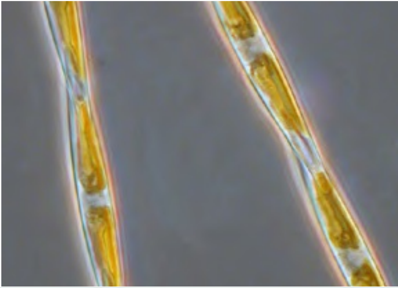
DATA
- Autonomous and remotely collected data
- Monitoring inputs from land to sea

ALIGNMENT
- Connecting catchment to coast
- Riverine influenced areas

INDICATORS
- Trends and trajectory of change
- Susceptibility to eutrophication impacts
- Set baseline from natural variability
- Holistic and integrated ecosystem approaches
- Integration of indicators to single value of state

ECOSYSTEM
- Eutrophication as a plankton pressure
- Nutrient imbalances and plankton health

CLIMATE
- Climate resilience and shifting baselines



A changing perspective

Current eutrophication assessments were developed to meet UK and European directives' legal and technical requirements through a series of cross agency meetings and technical groups. These groups developed a set of tools: a winter nutrient indicator (assessing nutrients and turbidity); an impact indicator (a multi-metric assessment of phytoplankton biomass and abundance); and a dissolved oxygen indicator. These were shaped by our primary understanding of the impacts of high nutrients and available monitoring data. Our perspective has, and is, changing, with more awareness of an ecosystem approach, advances in data and technology, and emerging indicators that describe components of state not considered in the earlier assessments.