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**Case studies on the natural capital approach in marine decision making:  
The development of fisheries management byelaws**

***(Research & Review Report)***

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## Summary

Conceptually, there is the potential to apply the natural capital approach in many areas of marine decision making. However, documented real-world applications that demonstrate successful use of the approach are lacking. Therefore, this document presents three short case studies from fisheries and marine protected area management, in- and off-shore, which show that the natural capital approach is beginning to be used to support specific management strategies. More generally, agencies have embraced the concepts the approach encapsulates (particularly ecosystem services and valuation), and have used them for communicating the need for, and aims and objectives of, management measures. Asset registers (based on the approach developed in the Defra Marine Pioneer) were used for both examples of inshore fishery byelaws, but there is little wider evidence of the systematic use of specific natural capital tools or methods. Further engagement and consultation across the spectrum of decision makers is required to discover the range of perspectives on the approach and to determine how it can be used to meet policy and management needs.

Evaluation of early natural capital assessment methods is needed in order to develop best practice. Approved definitions, methodologies and guidance in the marine policy context would further support implementation of the approach.

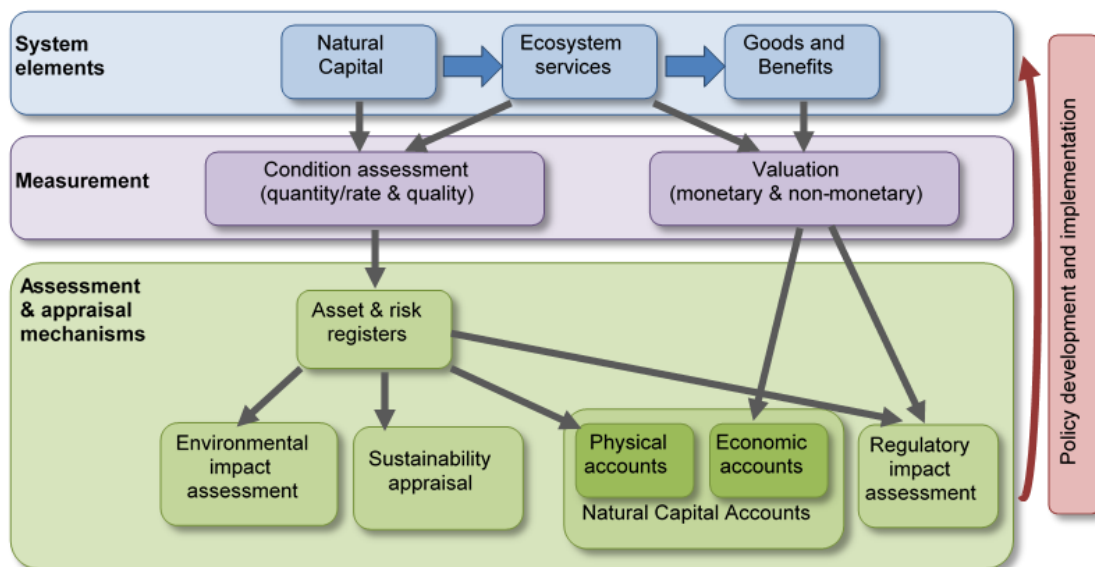
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# 1 Introduction

The 25 Year Environment Plan (HM Government 2018) embeds the natural capital approach within England’s environmental policy framework. The natural capital approach is described by Hooper *et al.* (2019, p2) as “a somewhat broad term that encompasses assessment of the quantity, quality, function and value of environmental assets and the goods and services that flow from them, with the aim of ensuring the sustainable use of natural resources. Fundamentally, the approach is based on recognising the contribution of nature to human welfare, and hence improving the manner in which the natural environment is traded-off against other things that are important to society. The concept of value is central to the natural capital approach, as it seeks to better integrate environmental and economic information and thus to redress the historic trend in which natural capital and ecosystem services were undervalued and overexploited. Equally important is documenting ecological status as the characteristics of assets are usually only partially reflected in monetary values.”

The volume of guidance and tools to support implementation of the approach in the marine environment continues to expand, particularly within the academic sector but increasingly also in terms of resources developed directly by, or for, Defra and the Statutory Nature Conservation Bodies. Examples include: Natural England’s indicators and atlases (Luisardi *et al.* 2018; Wigley *et al.* 2020); pilot marine natural capital accounts (Thornton *et al.* 2019); exploration of a marine natural capital asset index for Scotland (Tillin *et al.* 2018); and the various outputs of Defra’s Marine Pioneer programme, such as pilot asset and risk registers, which document the extent and condition of natural capital assets (habitats and species) and the degree to which their ability to deliver ecosystem services is under threat (Rees *et al.* 2019). Conceptually, there is the potential to apply the approach in many areas of decision making (Figure 1). However, documented real-world applications that demonstrate successful use of the approach are lacking. Therefore, this document presents three short case studies from fisheries and marine protected area management as examples of emerging use of the natural capital approach in practice to support marine decision making.



**Figure 1.** Examples of possible mechanisms for implementation of the natural capital approach within the UK policy framework (adapted from Hooper *et al.* 2019).

## 2 Inshore fisheries byelaws

Under the Marine and Coastal Access Act 2009, Inshore Fisheries and Conservation Authorities (IFCAs) are empowered to make byelaws for the management of inshore fisheries and the protection of marine conservation zones within their districts (which, as defined under the subsequent Inshore Fisheries and Conservation Orders 2010, extend out to six nautical miles). The guidance for IFCA best practice includes regular review of any byelaws to ensure that they are evidence based, appropriate and timely (Defra, 2011). Examples are given of how a natural capital approach has been used during this review process by two IFCAs, Sussex and the Isles of Scilly, which focus on imposing fisheries restrictions for, respectively, the recovery of kelp habitats and subtidal reefs.

### 2.1 Sussex IFCA: Nearshore trawling byelaw

Prior to March 2021, there was a Trawling Exclusion Byelaw in place within the Sussex IFCA district that prohibited trawling in certain narrow nearshore strips between May and October each year, to protect juvenile fish. As part of the review of this byelaw, it was proposed (following informal public consultation in June 2018 and statutory public consultation in September and October 2019) to extend the existing seasonal restrictions, which covered 58km<sup>2</sup> of the district, to a year-round trawling exclusion in an area of more than 300km<sup>2</sup> (Sussex IFCA 2020a). In January 2020, the IFCA resolved to approve the new Nearshore Trawling Byelaw (Sussex IFCA 2020b).

The Impact Assessment for the new byelaw makes clear how natural capital concepts informed the revision process. Discussion of the rationale for the proposal includes the statements that:

- *“It aims to allow the natural capital of valuable sensitive sites (essential fish habitats) within the nearshore area to reach its full potential, and so deliver improved ecosystem services”* (Sussex IFCA 2020a, p11).
- *“Fishers and the general UK public derive benefits from the nearshore marine environment in Sussex and the ecosystem goods and services which the habitats within it provide. If fishing with trawls continues within the nearshore area then the benefit from ecosystem services would diminish”* (ibid, p12).
- *“Failure to consider the true costs resulting from the degradation of ecosystems can result in a reduction of those beneficial flows which humans derive from nature”* (ibid, p12).

In describing the concepts underpinning the proposed management, extensive reference is also made within the Impact Assessment to the marine natural capital review commissioned by Defra (Hooper *et al.* 2019, which is further cited in the later sections on methods for empirical assessment) and to the work of the Natural Capital Committee (2017, 2019). This demonstrates a direct connection between high level documents produced within the English policy sphere and implementation of the approach in practice. Too much significance should not be attached to this connection, however, as it may simply reflect the lack of alternative recognised guidance.

In developing the evidence base for the new proposal, the IFCA (Sussex IFCA 2020a, p22) sought explicitly to consider:

- *the type and extent of natural capital assets within the district, their sensitivity, diversity, associated ecosystem goods and services and value;*
- *an indication of current natural capital assets condition and risks to these.*

The empirical assessment also incorporated explicit natural capital methods and concepts, including:

- adoption of the principles from the asset register developed by Rees *et al.* (2019) as part of Defra’s Marine Pioneer programme to determine extent and condition of habitats and species;
- a matrix of ecosystem service provision by the main habitat types (to EUNIS Level 3) on scale of zero (very low) to five (very high);
- a multicriteria analysis to attribute “environmental value” (on a four-point scale) to the different habitats, which was also used as a proxy indicator of potential risks to the flow of services and benefits;
- commissioning a valuation of the ecosystem service benefits that could arise from the recovery of kelp beds off the coast of West Sussex (Williams & Davies 2019).

A ‘best available evidence’ approach was taken in compiling the evidence base (Sussex IFCA 2020a). For characterising habitats, this included a habitat map developed from over 2500 data points from video, grab and dive surveys, and the identification of essential fish habitat from small fish surveys (which have been conducted by the IFCA since 2010). It was acknowledged that very little condition information is available from surveys, so a proxy approach was taken based on the vulnerability of the habitats to pressures to which they are sensitive (with sensitivity information taken from the Marine Life Information Network data). Historic records, including reports from divers in the 1980s and 90s were used to estimate the previous extent of kelp beds. Fisheries information was determined from sources including fishing activity sightings data that has been collected for almost 20 years and effort maps, as well as the landings data compiled by the Marine Management Organisation. Ecosystem service assessment was conducted through a Sussex IFCA funded MSc project (Nelson 2017), which was subsequently peer-reviewed and published (Nelson & Burnside 2019). This included using data from peer-reviewed literature to assess the ecosystem services provision of each of the district’s seabed habitats.

Sussex IFCA appeared confident in their use of this data. In the consultation response, they noted that for the habitat assessment, *“The data used is high quality, and verified with local knowledge which includes first hand observations. We believe that the SCHIP [Sussex Coastal Habitat Inshore Pilot] habitat maps are the best available representations of the seabed habitats in the Sussex IFCA District and use robust data at an appropriate spatial scale”* (Sussex IFCA 2019, p3). They also concluded that the peer-review and publication in an academic journal of the ecosystem service assessment was important in *“supporting the robustness of the underpinning research”* (Sussex IFCA 2020a, p29).

The byelaw review process also illustrates how the IFCA is adopting natural capital thinking more generally: *“Central to [the 25 Year Environment Plan] are embedding natural capital approaches into the decisions we take, where natural capital is managed effectively to deliver multiple benefits to the environment, conservation and people. It is this more holistic approach to managing fisheries which is being adopted by Sussex IFCA”* (Sussex IFCA 2020a, p13,14). Other evidence of this commitment, beyond the byelaw process specifically, include the publication by the IFCA of a public-facing fact sheet that explains the terms essential fish habitat, ecosystem services and natural capital, concluding: *“So we can see that, in essence, natural capital gives rise to a flow of ecosystem services. Essential fish habitats are part of our marine natural capital that deliver ecosystem services which support fish populations and fisheries”* (Sussex IFCA, undated).

This case study provides an example of comprehensive application of the natural capital approach throughout a decision process, as the overarching conceptual framework as well as in the language adopted and the tools used to assimilate the supporting evidence. The

byelaw was approved by the Secretary of State in March 2021, demonstrating that the approach is sufficiently robust to support the development of legally enforceable management measures.

## 2.2 Isles of Scilly IFCA: Fishing gear permit byelaw

The Isles of Scilly IFCA's Fishing Gear Permit Byelaw 2013 is under review. Its purpose is to manage fishing activities (particularly towed gear) within the District and so provide the IFCA with the ability to protect habitats and species within the Special Area of Conservation (SAC) and the wider District (Isles of Scilly IFCA, undated). As a designated SAC (for features including subtidal sandbanks and reefs), fishing activities are managed according to Defra's revised approach to the management of fisheries in protected areas (Defra 2013). According to the associated matrix of fishing gear and feature interactions (MMO 2014), bottom trawls and scallop dredges present red or amber risks to the designated features and the mixed sediment habitats within the wider area. This latter group includes extensive areas of reef 'vener' habitat, where a thin sediment layer covers underlying circalittoral rock, and which is colonised by reef-associated bryozoan and hydrozoan species (Ashley *et al.* 2020).

The current byelaw (Isles of Scilly IFCA 2013) contains, for specified areas, restrictions on gear types, vessel size limits, specifications for permitted dredges and nets, and the requirement for vessels using towed gear to install and operate inshore Vessel Monitoring Systems (iVMS). The key changes in the draft revised byelaw (Isles of Scilly IFCA 2021a) would be (i) to establish a no-trawl zone throughout the SAC and for adjacent areas containing sensitive habitats, and (ii) to extend throughout the District the limit on the number of scallop dredges that can be deployed. The byelaw review process is less well advanced than that of the Sussex IFCA, but the Impact Assessment has been prepared (Isles of Scilly IFCA 2021b) and a formal consultation on the revised byelaw opened in April 2021.

The IFCA's Byelaw Working Group (Council of the Isles of Scilly 2020, p3/20) proposed that the aims for the updated trawling byelaw should include:

- *Maintain the quality of the marine environment and the ecosystem services it provides*
- *Ensure that the economic benefits are sustainable and spread across businesses and society*

The Impact Assessment reiterated these policy objectives, and further stated within the summary of key non-monetised benefits: "*The protection of these habitats will have wider ecosystem service benefits such as nursery grounds and storage of carbon. The removal of abrasive and penetrating pressures of mobile gear on sensitive reef habitats will benefit a range of ecosystem services; which in turn will provide benefits to static gear fisheries and recreation*" (Isles of Scilly IFCA 2021b, p5). The wider summary rationale for the preferred option (*ibid*, p11) notes: "*The proposed no-trawl zone will protect sensitive and valuable habitats both inside and outside of MPAs within the Isles of Scilly district. It aims to allow the natural capital of valuable and sensitive sites to reach full potential, and ensure continuity of ecosystem services*", referring also to how the "*natural capital approach enables a more holistic view of options to be taken.*"

Policy drivers that support the proposed approach were also listed in the Impact Assessment, which linked to the 25 Year Environment Plan (HM Government 2018) and the Dasgupta Review (Dasgupta *et al.* 2021) but also outlined how 14 further policy documents and legislative instruments make reference to natural capital and ecosystem goods and services. These include the initial draft of the South West Marine Plan, Conservation 21 (Natural England 2016), and the UK Marine Strategy (HM Government 2012a; Defra 2015), as well as those at the European level. Drivers explicitly for fisheries management were also



discussed: *“In proposing the recommended option, Isles of Scilly IFCA has responded to Government’s current steer on the best fisheries management approach for the achievement of sustainable fisheries through an ecosystem approach which balances ecological well-being with human and societal well-being”* (Isles of Scilly IFCA 2021b, p18).

In developing the evidence base, a natural capital asset and risk register (Ashley *et al.* 2020) was commissioned. The work was undertaken by the University of Plymouth, following the same general process the team had applied in developing the methodology as part of the Marine Pioneer (Rees *et al.* 2019). The asset and risk register included:

- For habitats: the extent, extent trend, condition and condition trend (combining quantified data where available with use of a three-point categorical scale);
- For commercial fishery species: the quantity and condition of the stocks (and trends in these) and the quantity and trend in benefits in terms of food landed (again combining quantified data and categorical scales);
- Matrices showing the risk (on a categorical scale) to (i) continued delivery of ecosystem services from subtidal habitats; and (ii) the continued suitability of subtidal biotopes as habitats for commercial fishery species.

The risk register approach used by Ashley *et al.* (2020) extended the previous work of Rees *et al.* (2019) by considering how risks would change under management scenarios. The Impact Assessment describes how *“the most significant part of the Ashley et al. (2019) [sic] study are the ‘risk register under future scenarios’ described in section 6. These scenarios were designed to replicate possible outcomes from the review of the fishing gear permit byelaw, and are therefore highly relevant for this impact assessment and comparing how different use scenarios would impact on ecosystem services”* (Isles of Scilly IFCA 2021b, p19).

The potential economic costs to fisheries are detailed in the Impact Assessment, although it is noted that the *“figures do not represent a loss to existing activity, since no new permits have been issued since 2013”* (Isles of Scilly IFCA 2021b, p62). The limitations of monetary valuation are also raised, with economic figures for benefits not presented because *“there are too many uncertainties for how the static gear sector or other potential benefits can be reliably monetised”* (ibid, p65). Overall, the Impact Assessment concludes that *“Based on the evidence presented, it is considered that the environmental, societal and economic benefits of introducing the proposed management outweigh the potential monitoring, administrative and enforcement burden and costs to industry”* (Isles of Scilly IFCA 2021b, p73).

### 3 Offshore

Development of inshore fishery byelaws is only one aspect of marine decision making. In offshore areas, the Marine Management Organisation (MMO) has jurisdiction over defining management measures for Marine Protected Areas (MPAs), supported by advice from Statutory Nature Conservation Bodies. The third case study is an application in this context, which demonstrates how natural capital concepts have begun to be incorporated into conservation advice and subsequently within the development of management measures for Special Areas of Conservation (SACs) in the southern North Sea.

#### 3.1 The evolution of conservation advice

As outlined by Cornick (2016), conservation advice supports MPA management decisions by setting out the objectives of the MPA and advising on which human activities have the potential to impact the site and in what ways. These conservation objectives typically take the form of an overarching statement of intent with further detail provided on ecological

characteristics or ‘attributes’ of the habitat or species which together describe the desired condition or state of the MPA features (Cornick 2016). JNCC reviewed its approach to conservation advice in 2016 to accommodate recommendations from the European Commission’s (2012) note on setting conservation objectives, and the UK’s Habitats and Birds Directives implementation review (HM Government 2012b). The latter report reiterated the Government’s perspective that consideration of natural capital and ecosystem services would result in better informed and integrated management decisions, and cited studies that assessed the economic value of protected area networks (HM Government 2012b).

One of the six key themes emerging from feedback about the existing conservation advice was that “*The current advice does not effectively communicate what is special about a site that requires protection or in other words, what conservation benefits does it bring?*” (Cornick 2016, p7). In response, updated advice packages will include clear statements on “*the ecological benefits that protecting i.e. managing a site, can bring to the UK MPA network and the wider marine environment, noting any socio-economic benefits of doing so. This information better supports users in assessing the impact of their proposal as this now requires consideration of impacts on ecosystem services under the newly amended Environmental Impact Assessment (EIA) Directive (2014/52/EU4).*” (Cornick 2016, p11). Similarly, in the supplementary advice on conservation objectives, “*Information on the ecosystem services which an offshore MPA can or does provide is included in the structure and function attribute and is taken from the statement of conservation benefits*” (ibid, p13).

These intentions have now begun to be adopted in practice. For example, the Supplementary Advice for the Dogger Bank SAC includes reference to three particular ecosystem services that may be provided by sandbanks within the site, namely: as a feeding site for commercial fish; in supporting bird and marine mammal populations which in turn support local wildlife tourism; and in climate regulation through the burial of carbon (JNCC 2018).

### 3.2 Draft byelaws for southern North Sea SACs

A consultation on the draft assessments and management measures proposed for four offshore MPAs opened on 1 February 2021 (MMO 2021), which included two SACs in the southern North Sea: Dogger Bank, and Inner Dowsing, Race Bank and North Ridge (hereafter shortened to Inner Dowsing). Sandbanks which are slightly covered by sea water all the time are a protected feature for both sites, with reefs (specifically those formed by the ross worm, *Sabellaria spinulosa*) also protected in Inner Dowsing. The proposed measures as described in the draft documents published for the consultation would prohibit the use of bottom towed gear within the SACs and, for Inner Dowsing, would further restrict the locations in which static gear can be placed.

Application of the natural capital approach is most apparent within the Regulatory Triage Assessment (RTA) for each site (MMO 2021a, b). Within the early section “*Initial assessment of impacts on business*” (p2), both documents include explicit reference to how the benefits of the proposed measures include protection or improved provision of ecosystem services. The RTAs later provide lists of the ecosystem services provided within the site (based on a study by Fletcher *et al.* 2012). Eleven services are listed in the case of Inner Dowsing and fourteen from Dogger Bank. These differ between the sites, but, overall, include erosion control, formation of species habitat, fisheries, regulation of pollutants, climate regulation, and research/education. Although now somewhat dated, the Fletcher *et al.* (2012) report is still considered best available evidence in this context, given its direct connection to UK marine protected areas. The opportunity to present other and more recent data is provided during the formal and informal consultation periods.

Not all of the documents use the term ‘ecosystem services’, although the way in which the material describes the importance of habitats and the expected effects of change is very much in line with the concepts of the approach. For example, the Summary Information Sheets for the sites (MMO 2021c, d) include a section on “*Why these management measures matter*”, which describes the importance of the habitats for commercial fish and shellfish, seabirds and marine mammals. Summary Information Sheets are targeted to the general public and are designed to be accessible to all, which is not the case for documents such as the RTA. The choice of language reflects the limitations on using natural capital terminology when communicating with non-specialists.

There is no explicit reference to ecosystem services within one of the principal evidence documents, the Fisheries Assessment. However, its aim is to assess the need to introduce management based on the conservation objectives of the site against the levels of fishing activities taking place, and as such pressures and impacts are discussed primarily in terms of species and biodiversity (MMO 2021e, f). This is, of course, compatible with the natural capital approach, as such ecological assessments reflect the condition of marine assets, which is the fundamental foundation of the approach.

The potential costs of the proposed measures (for which market prices exist) were stated in monetary terms within the RTAs (MMO 2021a, b). The RTA is the only document within the package in which it is practical to evaluate the financial implications following management. It is compiled to fulfil the regulatory requirement to ensure proposed management is considered fully in accordance with the Green Book (HM Treasury 2020), and Better Regulations Framework guidance (BEIS 2020). No attempt was made in the RTA to put a monetary value on the environmental benefits, and the challenge of doing so was noted. The wider economic concepts that apply to the natural capital approach were, however, emphasised, for example in discussing how the byelaws aim to reduce or mitigate externalities (where the costs of environmental damage is not fully borne by those causing it), and to address the market failures that allow fishers to benefit financially from the sale of seafood while at the same time damaging the habitats that produce that seafood and reducing their biological diversity.

## 4 Conclusions

The case studies presented demonstrate that the natural capital approach is beginning to be used to support specific management strategies for fisheries and marine protected areas, and, more generally, has been adopted as an overarching philosophy by at least some agencies involved in marine decision making. The case studies further suggest that agencies have embraced the concepts the approach encapsulates (particularly ecosystem services and to a lesser extent economic perspectives and valuation), and have used them for communicating the need for, and aims and objectives of, management measures.

However, there is little evidence of the systematic use of specific tools or methods, although this would be difficult to demonstrate across a small number of examples. Natural capital asset registers (as developed by Rees *et al.* 2019), are common to both inshore fisheries byelaw examples, demonstrating their usefulness as a tool for organising underlying evidence. However, the work of Rees *et al.* (2019) is the only published example of a methodology for an asset register developed in the context of English marine policy. There is a need for independent evaluation of the marine natural capital tools that are beginning to emerge, to ensure that they represent best practice, before their use becomes widespread in decision making.

Asset registers, or other similar proposed natural capital assessment tools, were not used in the development of the proposed SAC byelaws. That the application of the natural capital

approach in marine decision making is somewhat *ad hoc* is not surprising, as agreed definitions are lacking (Hooper *et al.* 2019), and methods are in relatively early stages of development or are challenging to apply in marine contexts. The absence of guidance has led to some reticence amongst decision makers, for example as observed by Hooper and Austen (2020) while developing a process for applying the natural capital approach to Sustainability Appraisal (SA): “MMO have explored the inclusion of natural capital through the SA process. MMO have discussed with academia, lead experts in government and the SA consultancy team as to what could be possible at this stage of the SA and in the future. As marine natural capital is still in its infancy, it was ultimately deemed too early to incorporate a robust natural capital approach into the SA. At the time of the SA being undertaken, no clear definition of what the natural capital approach is for the marine area exists. It is therefore unfeasible to define and implement any methodology within the sustainability appraisal process. Once a definition and agreed approach is confirmed at a national level, it may be possible to include natural capital in a marine plan SA.” (MMO 2019, p9). This creates a cycle, whereby a lack of guidance restricts application in practice, thus restricting the opportunities to evaluate usage in ‘real world’ decision making, and further limiting confidence in use of the approach.

Therefore, while the natural capital approach has potential to support marine decision making, and examples are beginning to emerge of how this can be done in practice, further engagement and consultation across the spectrum of decision makers is required to discover the range of perspectives on the approach and to determine how it can be used to meet policy and management needs. Typical questions that arise with regard to operationalising the natural capital approach include: understanding what changes need to be made to formal processes such as Environmental Impact Assessment; which departments and agencies beyond those directly involved in environmental policy and management need to be engaged; whether the right mechanisms are in place to allow trade-offs to be accounted for; and the role of valuation. Approved definitions, methodologies and guidance in the marine policy context would further support implementation of the approach.

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