

Fisheries Transition Analysis Framework

Final Report Summary

Blue Marine Foundation (Blue Marine)

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Disclaimer

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Fisheries Transition Analysis Framework



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Executive summary

This study was commissioned by Blue Marine to explore the 'just transition' concept and its application to a number of hypothetical fisheries transition scenarios, through development of a new Fisheries Transition Analysis Framework ("the framework"). The framework investigates the social, economic and environmental impacts of transitions from higher impact fishing practices such as bottom-towed fishing, to lower impact fisheries, or other maritime industries. The framework is question-based and includes the following steps:

- Scope – identification of the scope of the potential transition
- Baseline data – coverage of data needed and available for the analysis
- Transition scenario modelling - static assessment of the first-order changes in the short term associated with the transition option
- Dynamic impacts and scenarios – assessment of long-term effects once the secondary impacts on habitats, stocks, fisheries and other economic activities have taken effect
- Transition outcome – an overall assessment of the costs/benefits of the proposed transition

The report lays out the steps of the framework based on its application in a number of hypothetical fishery transition scenarios. The transition scenarios were based on our current understanding and knowledge of UK fisheries, transition options and costs. This provided valuable insights on the process of assessing different transition scenarios, and highlighted some limitations and future recommendations for use of the framework.

Overall, the analysis of hypothetical fisheries transition scenarios highlighted that transitioning away from higher impact fishing practices could have significant environmental benefits, as well as affecting socio-economic factors such as jobs and income (both positively and negatively). Costs and negative impacts on affected fishers could be minimised, if not recovered, with support for adaptation and adoption of new opportunities in other fishing activities or emerging sectors. However, this would require careful planning, early engagement with affected sectors, investment, and coordination with the transition timeline. New employment opportunities and required associated infrastructure, financial and wellbeing support, training, and any necessary payments could be provided to minimise disruptions for those affected by new fisheries restrictions.

It is good practice to consult with affected stakeholders (fishers as well as those that rely on the fishing industry at all stages of the supply chain) on changes in management of natural resources and space. This applies to transition analysis, for which it needs to cover the activities being restricted and those that offer alternative livelihoods (i.e. the sectors being transitioned 'from' and 'to'). Greater involvement of affected stakeholders can also allow more robust data to be gathered on the costs, prices, revenues and profits in the fishing industry in a specific area.

In the context of fisheries, a just transition is an increasingly important component of achieving biodiversity

recovery as well as climate change targets. This entails moving away from higher impact fishing practices, alongside decarbonisation, in order to safeguard the health of marine ecosystems, while mitigating the impacts on those who depend on fishing for their livelihoods. This transition requires a multifaceted approach that addresses the environmental, economic and social dimensions of fisheries management. It needs to balance ecological integrity with social justice and economic sustainability which are essential for the long-term sustainability of the fisheries and the communities that depend on them.

The aim is for this framework to be used in future to analyse transition scenarios to provide information needed for decision makers to understand and predict the scale of costs and benefits (environmental, social and economic), and who, and what, will be impacted. This will allow informed management of fisheries and will provide a fair and equitable route to transition to lower impact methods, which also takes into account the impacts on other fisheries. We hope the framework can be considered during the development of Regulatory and Environmental Impact Assessments to assess direct and indirect environmental, social and economic cost and benefits of new fisheries or spatial management decisions, to inform a fairer transition.

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1. Introduction

“Blue Marine Foundation is working to remove bottom-towed fishing from all Marine Protected Areas, helping to effectively protect 30 per cent of the ocean by 2030. Within the whole ocean we are advocating for a just transition to low-impact fisheries to enable communities and livelihoods to thrive alongside restored seas.”

This objective is in line with Target 3 of the Global Biodiversity Framework known as the ‘30by30’ target, which commits Parties to conserve and effectively and equitably manage at least 30 percent of the global sea area by 2030, through protected areas and other effective area-based conservation measures, integrated into the wider seascapes (Convention on Biological Diversity 2021).

Blue Marine commissioned this study to understand the costs and benefits of a just transition for UK inshore fisheries. The study considered realistic options to transition away from higher impact bottom-towed fishing practices to lower-impact marine activities, including alternative fishing methods, and/or to other sectors of the blue economy (e.g. marine energy). To do this, a framework was developed that can be applied to demonstrate the social, economic and environmental impacts of different transition options. The use of the framework was illustrated through the analysis of hypothetical fishery transition scenarios like:

- Scenario 1 which examined the potential for transition from *Nephrops* bottom-towed fishing to creeling in response to a proposed permanent year-round closure to bottom-towed fishing in a Marine Protected Area.
- Scenario 2 which looked at the potential transition from scallop dredging towards employment in the wind power industry and in the tourism sector.
- Scenario 3 which compared a fisheries management Impact Assessment to the transition analysis framework with the aim of understanding how the Impact Assessment could better support a just transition.

The fisheries transition scenarios assessed the potential environmental benefits of the transition, the economic viability of alternative activities, potential employment opportunities and the practical costs of transition, as well as any related social impacts.

The report is structured in the following way:

- **Section 1: Introduction** – provides some context around the concept of just transition and a few examples, including in the fishing sector.
- **Section 2: Fisheries transition analysis framework** – outlines the framework that underpins the transition analysis and includes considerations for its application.
- **Section 3: Application of framework** – provides an overview of different approaches to transition and how the framework can be applied to different hypothetical transition examples.
- **Section 4: Outputs from using the framework** – highlights the main transition options and summarises the key observations and learnings from applying the framework to the transition scenarios, including limitations.

- **Section 5: Conclusions and recommendations** – provides overall conclusions and recommendations for applying the framework in future.

1.1 Context

Destructive fishing is one of the biggest threats to marine biodiversity, causing bycatch of sensitive species, damage to the seafloor and its carbon-storage capacity, generation of substantial emissions and overexploitation of fish populations (IPBES 2019).

Willer et al. (2022) stressed the vagueness in the concept of ‘destructive fishing’, differences in its use in policy, media and academic settings, and the lack of clear indicators. However, a recent study by Fauna & Flora has made some headway in defining this term, to measure progress towards reducing destructive practices globally (McCarthy et al. 2024).

While research tends to stress the environmental impacts of destructive fishing, a broader perspective also recognises the social and economic effects. These can be particularly relevant in the context of conflict between fishers using different gear types targeting the same resource (Williams and Carpenter, 2016), and can extend to other economic sectors, such as reduced tourism relating to reductions in biodiversity (2010). This broader perspective is key to building support for a just transition to low-impact fisheries and other sectors.

The most contentious methods of fishing are those using bottom-towed gear; gear types that require sustained contact with, and often penetration of, the seafloor in a manner that degrades and destroys marine habitats. Bottom-towed fishing alone is responsible for up to half of discarded fish and marine life worldwide which has led to its recognition as one of the most damaging ways to catch fish (Stiles et al. 2010). The impacts of bottom-towed fishing are referenced widely in the literature, with studies showing significant ecosystem recovery when the practice is removed from MPAs (Dureil et al. 2018, Rocliffe et al. 2021, Steadman et al. 2021). Bottom-towed fishing is also often subsidised, and can act to exclude less damaging, smaller scale fishing from large areas.

The transition scenarios which this study used to inform and trial the development of the just transition framework considered realistic options to transition away from bottom-towed fishing, but the framework could be equally applicable to transition from any type of fishing or as part of spatial management decision making. .

1.2 Definition of just transition

The concept of “just transition” arose from the US trade union movements in the 1980s and has since gained significant traction in economic and policy circles (Henry et al. 2020). It was first intended as a programme of support for workers who lost their jobs due to environmental protection policies, but over time it has become associated with the effort to plan for and invest in a transition to environmentally and socially sustainable jobs, sectors and economies (OECD 2017), while ensuring that the whole of society – communities, workers and social groups – is brought along in the process. The International Labour Organization (ILO) defines just transition as “greening the economy in a way that is as fair and inclusive as

possible to everyone concerned, creating decent work opportunities and leaving no one behind”¹.

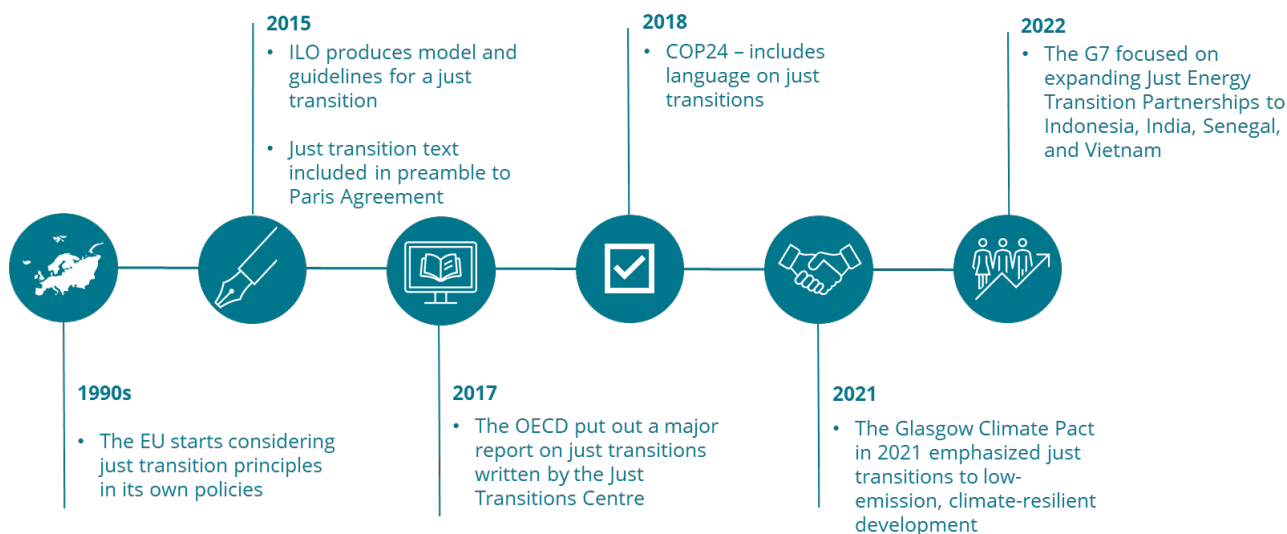


Figure 1.1: Milestones in the definition of “just transition” (source: eftec)

While the concept of just transition has been adopted widely in policy-making (Figure 1.1), to date, there is still no universally accepted definition. The United Nations Development Programme (UNDP) Issue Brief² notes that “the perception [of just transition] varies across different countries and regions”, and the Paris Agreement suggests that it should be realised “in accordance with nationally defined development priorities.”

In the EU, efforts to support just transitions culminated in the creation of a Just Transition Mechanism (JTM) in 2020. The JTM is a tool “to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind”. It provides targeted support to help mobilise around €55 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition.

In the UK, new policies, plans, and commissions are starting to define a proactive approach to achieve a just transition. Existing legislative and non-legislative provisions across the UK include the following:

- The Climate Change (Scotland) Act 2019 embeds just transition principles of sustainable and decent jobs, social consensus, and economic approaches, to address inequality and poverty as cornerstones of Scotland’s climate targets.
- The Climate Change (Northern Ireland) Act 2022 which, in addition to decent jobs and social consensus, references supporting the agricultural sector, eliminating gender inequality, and accounting for future generations.
- The Well-being of Future Generations (Wales) Act 2015 requires Welsh public bodies to consider long-term impacts of decisions and created a Future Generations Commissioner.
- Just Transition Commissions, which are non-statutory independent advisory bodies tasked with

¹ https://www.ilo.org/global/topics/green-jobs/WCMS_824102/lang--en/index.htm

² <https://www.undp.org/publications/issue-brief-just-transition>

supporting the production and monitoring of transition plans, have been established across some of the devolved administrations. Scotland established one in 2018 and Northern Ireland is in the process of establishing one. In response to its Commission's work, Scotland has also launched discussion papers for consultation on just transition plans across several key sectors of the economy, including agriculture, construction, and transport.

- The Scottish Government has committed to a Just Transition Plan for every sector and Scottish region, starting with the energy sector and including fisheries (Scottish Government 2021). Moreover, its 2021 Bute House Agreement comments that it will be guided by just transition principles and will establish a programme to address socio-economic impacts on affected marine industries (Mackenzie 2023).

1.2.1 *Examples of just transitions*

The focus of just transitions in recent years has shifted from pollution to the energy sector, alongside greater focus on low-carbon technologies and low-carbon economic and production activities. In fact, today many examples of just transition policies and actions exist with respect to the phase-out of coal mining and coal-fired power generation. However, increasingly, there are also efforts for a just transition in agriculture and land use. The following are examples of countries' successful approaches to just transitions across different sectors:

- **Scotland** responded to the 2014 decline in oil prices and consequent increase in unemployment in its oil and gas sector with increased investment in renewable energy initiatives. The Government allocated £12 billion to a Transition Training Fund to support unemployed individuals in upskilling and retraining. By 2018, the fund had garnered over 3000 applicants, with 85% successfully securing new employment. The Orkney Islands in particular, historically an energy importer, were an example of successful transition, becoming leader in marine and tidal energy technology (Stone et al. 2018).
- **Spain** introduced the requirement of so-called "just transition agreements" between the government, unions and businesses to offset the negative impacts of climate transitions and finance green projects. The first such agreement was reached in 2018 for mining regions impacted by the closure of pits and the loss of jobs. It included investment in the communities to support early retirement for miners, clean energy initiatives, retraining for green jobs and environmental restoration (Bouyé et al. 2019).
- **China's** local government of Shenyang invested £5.8m (¥50m) under the country's 'Made in China 2025' to develop a high-tech industry and offset the layoffs from state-owned coal mining companies of the late 1990s to early 2000s. The fund was used to implement transition measures such as retraining and overall led to the repurposing of the heavy industry Tiexi District and creation of the Shenyang Economic Development Area (Stone et al. 2018).
- **Mexico** has made poverty reduction a priority in both its national development plan as well as its climate actions. Based on this, any energy infrastructure project is subject to social and environmental impact assessments to ensure tangible benefits for local people, including improved public services, job creation and priority for local supply chains (Tornel 2020).
- **Canada's** national commitment to phase out coal-fired electricity was guided by a national task force made up of representatives of affected sectors, namely industry, labour, environment and coal

communities. The representatives travelled across the country to gather the views of Canadian households on the transition and related government policies, to make them part of the decision-making process (Zinecker 2018).

- **Uganda** has adopted new, pro-poor, long-term and nature-based approaches to improve communities' income and livelihoods in the face of climate change disasters and deforestation. Farmers can decide to receive compensation in return for their land titles or can opt for a transition period during which they can use exposed lands while diversifying their sources of income, including through agroforestry and fishing (Bouyé et al. 2019).

1.3 A just transition for fisheries

The concept of a “just transition” can be applied to fisheries management, but carefully considering the sector’s unique challenges and opportunities is essential. In the context of fisheries, a just transition is an increasingly important component of achieving biodiversity recovery as well as climate change targets. This entails moving away from higher impact fishing practices, alongside decarbonisation, in order to safeguard the health of marine ecosystems, while mitigating the impacts on those who depend on fishing for their livelihoods. This transition requires a multifaceted approach that addresses the environmental, economic and social dimensions of fisheries management.

The Low Impact Fishers report (2021) highlights the need for the EU to embrace lower-impact and more selective fishing methods, with the goal of establishing a low-carbon, low-impact fishing fleet. The report specifically identifies bottom-towed practices, for example *Nephrops* bottom-towed fishing, to illustrate practices that have significant, negative impacts on marine ecosystems. While acknowledging that no fishing method is entirely environmentally benign, the report emphasizes the importance of minimizing the environmental footprint of fishing activities. This could be achieved by transitioning to lower impact fishing gears (i.e. those which are more selective and do less damage to marine habitats) and managing fisheries within sustainable limits.

The Low Impact Fishers report also underscores the social dimension of a just transition, emphasizing the need to ensure that the transition away from higher-impact fishing practices does not disproportionately burden fishers and their communities. This requires providing adequate support and assistance to fishers during the transition period, including retraining and upskilling opportunities, and financial assistance to adapt to new fishing methods or alternative livelihoods (Fintan et al. 2021). Additionally, engaging directly with fishers and their communities is crucial to ensure that their concerns and perspectives are incorporated into the transition process.

In the UK, the New Economics Foundation’s proposal for future just transitions in fisheries emphasises the need for transformative policies in several areas (Heisse, 2019), including:

- Limiting fishing to allow fish populations to recover and become more resilient, by implementing science-based catch limits and quotas leading to healthier ecosystems and more sustainable fisheries.
- Allocating fishing quotas to lower-impact fishing methods which can incentivize the adoption of more sustainable practices and reduce the environmental footprint of fishing activities.

- Building local markets for fish caught in the UK, to retain the economic benefits of fishing within UK communities and to support local economies.

The main tools to support these transitions are likely to include funding for decommissioning and gear conversion, alongside spatial management (Mackenzie 2023).

In conclusion, a just transition in fisheries management is a multifaceted concept that requires a holistic approach and needs to be co-designed and co-delivered by all stakeholders affected (Mackenzie 2023). It needs to balance ecological integrity with social justice and economic sustainability which are essential for the long-term sustainability of the fisheries and the communities that depend on them.

1.3.1 Examples of just transition in fishing

Institutional change has the potential to support a transition towards lower-impact fishing methods. While the existing literature provides little in terms of formalized examples of a just transition specifically tailored for fisheries management, various instances of sustainable fishing transitions have been observed as outlined in Table 1.

Table 1: Just transition in fishing

Reference	Location	Transition Example
<i>Can catch shares prevent fisheries collapse?</i> (Costello et al. 2008)	Global	The study looked at 121 fisheries managed using catch shares known as ITQs, which allocate a scientifically determined transferable total catch to individual fishermen, communities, or cooperatives. The underpinning idea behind this fisheries management is to provide fishermen, communities or cooperatives with a secure asset which results in stewardship incentives. The study noted that before adopting catch shares, would-be ITQ fisheries were on trajectories toward collapse, but after adoption were found to perform much better than non-ITQ fisheries. The study suggested that this type of fish management could halt and even reverse the global trend toward widespread collapse of commercial fisheries.
<i>Changing attitudes 1970–2012: evolution of the Norwegian management framework to prevent overfishing and to secure long-term sustainability</i> (Gullestad et	Norway	Norway introduced policies to restore fish stocks and reduce overfishing, in response to the ecological and economic unsustainability of the fishing industry, following the collapse of the herring fisheries in the 1960s. This included limiting access to Norwegian offshore fisheries, prohibiting scallop dredging and bottom trawling within 12 nautical miles of the shore ³ , reducing subsidies to the fishing sector and reducing the number of fishing vessels by introducing licence aggregation schemes. Measures were introduced to improve the exploitation pattern of fisheries and discard bans, and a new profession of fishery inspection was created. The departure of many from the industry was helped by the low unemployment levels in Norway at the time. Despite a ban on subsidies and the introduction of catch quotas, profitability increased for the remaining fishers, due to the alignment of quotas to the maximum sustainable yield (MSY), which reduced harvesting costs due to increased stock. Close collaboration between fishers, scientists and other stakeholders has aided compliance and helped to ensure the long-term sustainability of the herring stocks, and thus fisher's incomes.

al. 2014)		
<i>At Last, a Trawling Ban for Hong Kong's Inshore Waters</i> (Morton 2011)	Hong Kong	A Hong Kong bottom trawling ban exemplified just transition principles in fisheries management. The initiative, aimed at marine conservation, involved three key elements: legislative prohibition of trawling, a compensation scheme for trawler owners, and training and technical support for fishers transitioning to sustainable practices, including aquaculture and leisure fishing. These measures collectively addressed environmental protection, economic fairness, and social inclusion. The transition support for affected fishers and the trawler buyout scheme aligned with the just transition's focus on equitable economic impacts and procedural justice. Additionally, repurposing decommissioned vessels as artificial reefs reflected an innovative approach to ecological remediation.
<i>Association De Gestion Intégrée Des Ressources (AGIR), Morocco (United Nations Development Programme. 2016)</i>	Morocco	In Morocco, since 2008, the Association de Gestion Intégrée des Ressources (AGIR) has been working to strengthen the small-scale fisheries sector around the Al Hoceima National Park (AHNP). The sector and the marine biome had come increasingly under threat from large-scale coastal fishing operations and the use of dynamite fishing from local inhabitants. The association has helped introduce sustainable fishing practices through capacity building initiatives and the establishment of monitoring and surveillance committees to combat illegal fishing practices, while also allowing the local community to lead the creation of marine resource management plans and strategies. AGIR made significant strides: it has restored 2,000 hectares of coral, secured coastal land for community use, and helped enforce a Mediterranean driftnet ban. This shift to sustainable practices, such as the use of biodegradable bulrush creels, has also supported the local economy. The association's efforts have led to a 30% poverty reduction for fishers and a notable increase in their revenue, amounting to EUR 653,220 as of 2016.
<i>Technical Efficiency of the Shrimp Trawl Fishery in Aru and the Arafura Sea, the eastern Part of Indonesia</i> (Endroyono, 2016)	Indonesia	A post-trawl ban in fisheries in Indonesia's Aru-Arafura Sea highlighted the socio-economic challenges and ecological benefits of transitioning to sustainable fishing. The trawl ban, aimed at protecting seabed habitats, forced a shift from shrimp trawling to alternative methods, such as trap fishing and brush park fisheries. These methods not only prevent the damage to seabed habitats that trawling causes but also allow for the selective capture of mature shrimp, significantly reducing bycatch. The economic impacts resulting from the policy were mixed and included reduced fishing pressure by ex-foreign fishing vessels, on the one hand benefitting fishing vessels nationwide, but on the other reducing employment opportunities for Indonesian crew on ex-foreign fishing vessels. Emphasizing the Ecosystem Approach to Fisheries Management, the project reflected the just transition principles, advocating for a balance between conservation efforts and the needs of local fishing communities. This approach proved crucial for ensuring sustainable marine resource use while supporting the socioeconomic stability of those reliant on fisheries.
<i>Vietnam Yellowfin Tuna</i> (WWF, 2023)	Vietnam	In Vietnam, the Yellowfin Tuna Fishery Improvement Project (FIP) advanced sustainable fishing practices aligned with just transition principles. It introduced circle hooks to reduce bycatch and protected fishers' incomes, reflecting distributive justice by ensuring the economic impacts of environmental conservation were balanced. The FIP's at-sea observer program and the first-of-its-kind traceability initiative for tuna processors contributed to procedural and recognitional justice, incorporating fishers into sustainable practice decisions and recognizing their efforts in the market. Addressing social equity, the FIP adhered to human rights and social responsibility

policies, educating fishers on their rights and establishing a grievance mechanism, which echoes just transition's goal of an inclusive and fair shift to sustainability. These combined efforts showed a commitment to ecological integrity without overlooking the socio-economic well-being of the fishing community.

2. Fisheries transition analysis framework

To support analysis of the costs and benefits of a just transition for UK inshore fisheries, the study team developed a Fisheries Transition Analysis Framework (“the framework”) that aims to predict and demonstrate the social, economic and environmental impacts of transition options. The Framework includes five key steps as illustrated in Figure 2.1 and elaborated in Section 2.1:

- Scope – identification of the scope of the potential transition
- Baseline data – coverage of data needed and available for the analysis
- Transition scenario modelling - static assessment of the first-order changes in the short term associated with the transition option
- Dynamic impacts and scenarios – assessment of long-term effects once the secondary impacts on habitats, stocks, fisheries and other economic activities have taken effect
- Transition outcome – an overall assessment of the costs/benefits of the proposed transition

It should be stressed that using the framework is not a one-time, linear process and iterations between sections should be expected.

The framework is question-based drawing on the stepwise and question-based format used in the ‘Blueprint for MPAs’ guide (Blue Marine Foundation 2023: see Box 1) with the aim to provide a process for analysing a fisheries transition.

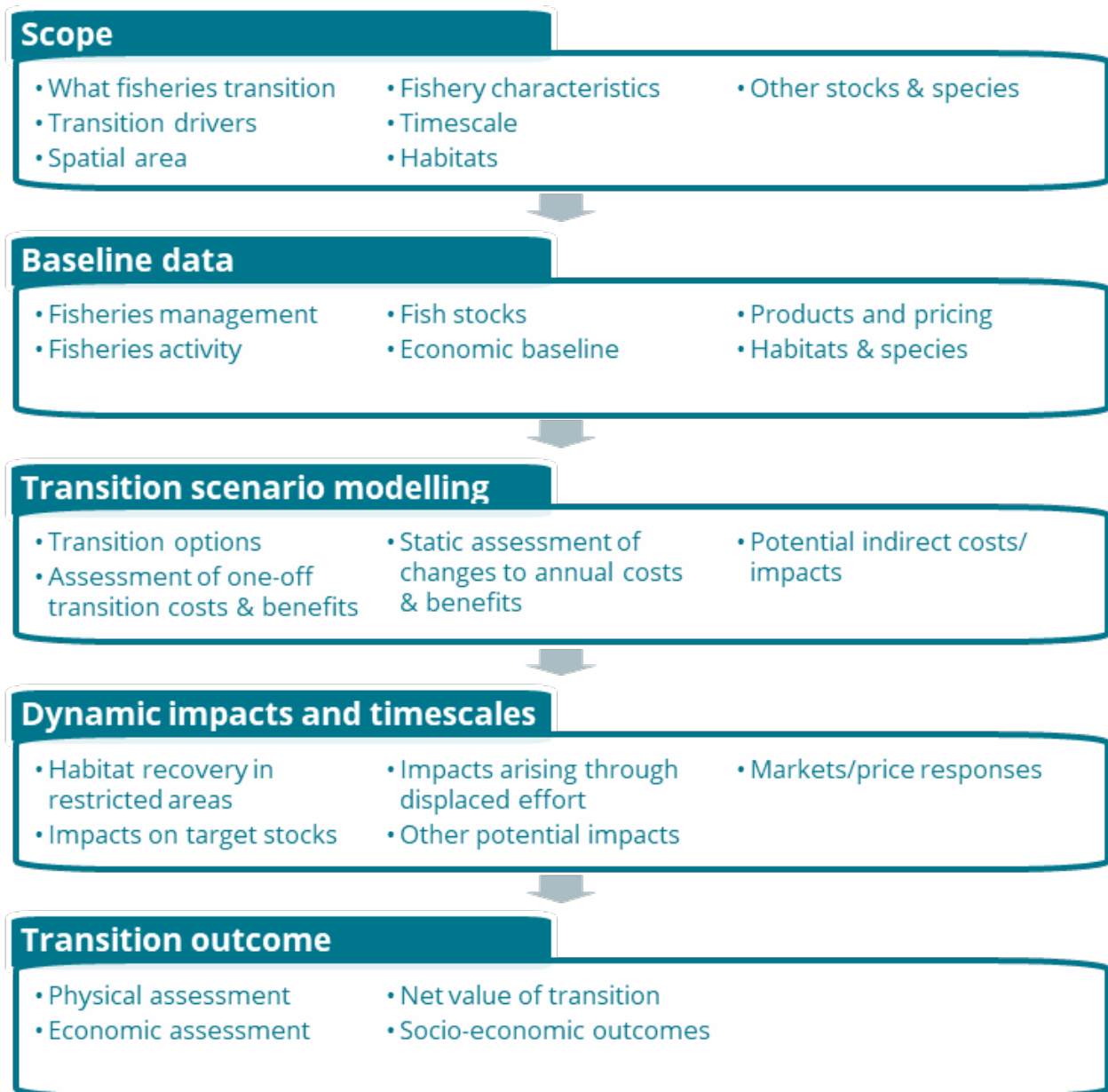


Figure 2.1: Five step Just Transition Framework outline.

Figure 2.1 Box 1: Blueprint for MPAs approach

The main questions and actions in the Blueprint for MPAs are split into before, during and after (MPA designation) and across four categories: information, people, economics and financing, and management.

	Before	During	After
Information	<ul style="list-style-type: none"> Why is a MPA necessary in this location? What current baselines exist or are needed? What are the key research and data shortfalls and questions? How will data be collected? 	<ul style="list-style-type: none"> Keeping stakeholders informed Quality, continuity and consistency of data 	<ul style="list-style-type: none"> Reporting results Long-term research planning
People	<ul style="list-style-type: none"> Stakeholder mapping Stakeholder engagement Establishing a stakeholder group/forum Setting marine management objectives 	<ul style="list-style-type: none"> Resolving stakeholder conflict Knowledge exchanges 	<ul style="list-style-type: none"> Training Education Communications
Economics/financing	<ul style="list-style-type: none"> Costing the initial MPA set-up Current marine management funding systems Understanding current financial gains from area use Investigating potential alternative financing streams 	<ul style="list-style-type: none"> Establishing sustainable finance models Generating revenue for sustainable fisheries Developing sustainable tourism revenue 	<ul style="list-style-type: none"> Continual assessment and review of funding streams
Management	<ul style="list-style-type: none"> Establishing the highest level of protection possible Ensuring no incompatible activities are occurring within the MPA Understanding current management measures Reviewing current legislation and policies 	<ul style="list-style-type: none"> Defining a Management Plan Fully protected area management Fisheries management Codes of Conduct Adapting to new management measures 	<ul style="list-style-type: none"> Reviewing progress

Source: Brown et al. 2023

2.1 Considerations when applying the framework

Step 1: Scope

Explains why a transition is being considered, where exactly the proposals apply, the timescales involved for implementation and effects, as well as the fishing sectors, fish stocks, habitats and other species that may be impacted and will need to be included in the analysis. The scope may need to be updated iteratively, for example if the analysis of transition outcomes or stakeholder feedback lead to modifications in the proposed transition, or improved information on likely behavioural responses in terms of fishing methods or areas.

Table 2: Scope

Headings	Content / Questions to consider	Potential Considerations
<i>What is the fisheries transition</i>	How are the stocks targeted at present, and how will that change in the transition scenario(s)? What are the key expected differences between the transition options (e.g. different gears)? These features are expanded on in other sections; here the information is high level to set the scene for the analysis.	Relative scales of the area and fisheries under discussion, recent history of fisheries management and gear conflict, and any previous actual/proposed protections or restrictions in the fishery.
<i>Transition drivers</i>	What are the reasons for the closure or transition? For example, closures for offshore wind farms, designation of MPAs, or protection of fish stocks.	For example, closures for offshore wind farms, designation of MPAs, or protection of fish stocks.
<i>Spatial area</i>	What are the spatial boundaries for the analysis? This includes the area of fisheries restrictions/ closure, the area of possible ecological impacts (local recovery, impacts on populations outside the transition area) and fisheries impacts (displacement of effort).	This could include: <ul style="list-style-type: none"> - Area of fisheries restrictions/ closure - Area of possible ecological impacts (local recovery, impacts on populations outside the transition area) - Fisheries impacts (displacement of effort).
<i>Fishery characteristics</i>	What are the targeted stocks the assessment will cover? This may be a single species, or multiple species where vessels using bottom-towed gear catch commercial fish from several stocks. This should include fleet characteristics, the locations of fishing effort and any communities potentially affected (e.g. landing ports and supply chains).	This could include: <ul style="list-style-type: none"> - Fleet characteristics (e.g. size, gear type) - Target stocks - Locations of fishing effort - Any communities potentially affected (e.g. landing ports and supply chains).
<i>Timescale</i>	What are the relevant timings necessary for transition to occur? What are the short, medium and long-term economic/social impacts? How long will it take stocks to react to changed fishing pressure and for marine habitats to recover? A full cost-benefit assessment should allow for all impacts (HM Treasury guidance on how to appraise policies, programmes and projects suggests 60 years as default option), but it is equally relevant to present short-term results, that will be highly salient for fishing communities and that could inform discussion of any short- to medium- term support or compensation.	Full cost-benefit assessment should allow for all impacts (HMT guidance suggests 60 years as default option), but it is equally relevant to present short-term results, that will be highly salient for fishing communities and that could inform discussion of any short- to medium- support for transition costs, or mitigation for any losses.
<i>Habitats</i>	What are the habitats the assessment will cover? This will be driven largely by the area proposed for	What is the current condition of the habitats, and what is the recovery timescale for those habitats?

	transition, but also by the fishery – i.e. there are situations in which fishing does not occur over the entire area, but only part of it. What other habitats might be affected as a result of a transition to other activities or displacement of the fishing effort?	What habitats might be affected by the displacement of fishing effort?
<i>Other stocks and species</i>	What other fish stocks and other species (e.g. seabirds, sea mammals) are likely to be impacted by the transition? This will be driven partly by the area, habitats and species present within them, and partly by the fishing methods and transition options.	Consider impacts within the management area as well as outside if fishing effort will be displaced.
Summary	Brief summary of the scope of analysis and implications for the next steps.	

Step 2: Baseline data

Covers the main aspects for which data is required, and summarises the sources of available data, the time periods and spatial scales for which data are available, and any gaps or uncertainties. Application of the framework may help to reduce uncertainties (for example via feedback from stakeholders) and should enable identification of which remaining data gaps are most important in terms of assessing the costs and benefits of transition. This could then lead to further investment in data collection.

Table 3: Baseline data

Headings	Content / Questions to consider	Potential Considerations
<i>Fisheries management</i>	What management measures are in place e.g. quota, mesh sizes, time/effort restrictions, spatial and temporal restrictions, other management measures? How would this change under full or partial transition?	
<i>Fisheries activity</i>	What are the levels of activity within the current fishery and in recent history (past 5-10 years)? Are there any trends in key variables, such as landings, or number of vessels? This may include spatial mapping of fishing effort or catches where possible and should include fleet characteristics e.g. number of fishing vessels, vessel size. Consider onshore and offshore jobs related to fishing.	This may include spatial mapping of fishing effort or catches and should include fleet characteristics (e.g. number of fishing vessels, vessel size). Consider onshore and offshore jobs related to fishing.
<i>Fish stocks</i>	What evidence is there on the current status of the fish stocks and historically over time?	
<i>Economic baseline</i>	What data are available on the key economic baseline factors: fisheries catches, catch value, sector turnover, profits, jobs? Ideally, this would include the most recent year and over 5-10 year history, with trends. What other blue economy sectors are significant in the transition area either due to current activity, or proposed developments (e.g. for marine energy)?	Note that some potential uses may be excluded under present conditions, e.g. potential for static gear fishing, currently excluded due to bottom-towed fishing. Estimating the potential economics of possible future uses may involve transfer of data from comparable activities in other locations.
<i>Products and pricing</i>	What are the main products and prices? What markets are they sold in (e.g. frozen/ fresh, local/domestic/export), and who participates in the value chain (e.g. processors, wholesalers)? Ideally,	Ideally, this would include the most recent year and over 5-10 year history, with trends.

	this would include the most recent year and over 5-10 year history, with trends.	
<i>Habitats and species</i>	What data are available for habitat extent and condition, and other target and non-target stocks/species present?	
<i>Summary</i>	Summary of data availability and key data gaps, with consideration of implications for the modelling sections.	

Step 3: Transition scenario modelling

A static assessment of the first-order changes in the short term associated with the transition option(s). The dynamic / longer-term impacts are considered in the next section. In many cases, the first-order changes can be split into one-off transition costs/benefits, covering changes in fishing vessels and gears, and the changes in costs and benefits of fishing resulting from those changes, including changes in catches, prices and fishing costs. In other cases, transition options can involve transition away from fishing to other activities, such as marine tourism activities or support for other marine industries such as wind power.

Table 4: Transition scenario modelling

Headings	Content / Questions to consider	Potential Considerations
<i>Transition options</i>	What are the potential transition options within the fishing sector (targeting other stocks, switching gears) and other parts of the marine economy (e.g. energy, research, tourism economy, identified in 2.2). These could include partial / gradual transition options, such as phasing in the transition over several steps. There may be different possible scenarios associated with a single transition option, since fishers could respond in different ways.	These could include partial / gradual transition options, such as phasing in the transition over several steps. There may be different possible scenarios associated with a single transition option, since fishers could respond in different ways.
<i>Assessment of one-off transition costs and benefits</i>	For each transition option, what are the net costs (net capital and other transition costs) of switching to the transition option(s)? This covers both manufactured capital (e.g. boats, fishing gear) and human capital (e.g. training). There may also be transition benefits, in particular any include residual values for selling existing vessels or gear that will no longer be required.	This covers both manufactured capital (e.g. boats, fishing gear) and human capital (e.g. training) and may include residual values for selling existing gear that will no longer be required.
<i>Static assessment of changes to annual costs and benefits</i>	The first round of analysis focuses only on the immediate impacts on fishing (catches, costs, prices, profitability) due to the transition. Depending on the case, these changes may be increases (benefits) or decreases (costs). The assessment must consider how fishermen will respond to the transition, in terms of the type, location and intensity of fishing effort, and what that means for catches and financial variables.	The key consideration here is how behaviour changes in the fishery, with respect to gears, effort levels and locations. In cases in which fishing ceases entirely in an area, the costs will include lost fishing revenues, while the benefits will include incomes from other activities, as well as reductions in costs associated with fishing.
<i>Potential indirect costs/impacts</i>	Are there any indirect impacts arising notably through increased crowding/ competition in other areas? At this stage of the analysis, focus is on the initial shift of effort, not the dynamic / long-term impacts after habitat and stock changes. Indirect impacts include market and	At this stage of the analysis, focus is on the initial shift of effort, not the dynamic / long-term impacts after habitat and stock changes.

	processing supply chains e.g. where is the catch processed, where is it sold? How many jobs and Gross Value Added (GVA) are involved in those aspects? What are the linkages of the fisheries with exports of landed catch versus domestic consumption?	
<i>Summary</i>	Summary of the first-order impacts of transition in the short term	

Step 4: Dynamic impacts and scenarios

Consideration of the long-term or ‘equilibrium’ effects once the secondary impacts on habitats, stocks, fisheries and other economic activities have had time to take effect and work through the system. This may include bioeconomic modelling of the fish stock and fishing effort, but this is a resource-intensive exercise and will only be justified if significant changes are expected, and if those changes could influence the ‘bottom line’ assessment of the transition scenario. In cases in which transition appears to be justified without considering the additional benefits arising through expected stock increases, it may not be necessary to invest in formal modelling.

Table 5: Dynamic impacts and scenarios

Headings	Content / Questions to consider	Potential Considerations
<i>Habitat recovery in restricted areas</i>	Consider dynamic effects related to habitat recovery. What is the extent and speed of habitat response? This will depend on the transition measures/ scenarios e.g. specific protections, intensity of alternative fishing effort, spatial scale, the history of fishing and other pressures, and the recovery capacity of different stocks.	This will depend on the transition measures/ scenarios (e.g. specific protections, intensity of alternative fishing effort, spatial scale), the history of fishing and other pressures, and the recovery capacity of different habitats.
<i>Impacts on target stocks</i>	What are the dynamic effects related to the response of stocks to changes in pressures? Stock responses depend on current population levels, fishing effort, habitat recovery, mobility and other characteristics of species (e.g. fecundity, age at maturity). There will be effects in the fishing zone, and potentially in neighbouring areas with potential for spillover effects.	Stock responses depend on current population levels, fishing effort, habitat recovery, mobility and other characteristics of species (e.g. fecundity, age at maturity). There will be effects in the fishing zone, and potentially in neighbouring areas (with potential for spillover effects).
<i>Impacts arising through displace effort</i>	What are the impacts of any displacement of effort onto other stocks and habitats? There are two main forms this could take: displacement of towed gears to fisheries outside the gear-restriction areas, or a higher concentration of alternative gears within the restricted areas. Impacts could be on habitats, stocks, by-catch species, and/or catch per unit effort / profitability.	There are two main forms this could take: displacement of towed gears to areas outside the gear-restriction areas, or a higher concentration of alternative gears within the restricted areas. Impacts could be on habitats, stocks, by-catch species, and/or catch per unit effort / profitability.
<i>Other potential impacts</i>	Are there any other negative effects or unintended consequences of the changes? This could include impacts on other species for example bycatch or changes in trophic food chains.	
<i>Markets/price responses</i>	Consider external responses to the changes – will the market price change (e.g. a small premium if	Where the transition involves separate markets it may be necessary to consider the

	the fishery is certified, or a price reduction due to increased supply?). Where the transition involves separate markets it may be necessary to consider the consequences of decreasing supply to one market and increasing it to another.	consequences of decreasing supply to one market and increasing it to another.
<i>Summary</i>	Summarise the combination of dynamic impacts.	

Step 5: Transition outcome

Brings together all the evidence/analysis from the previous sections to develop an assessment of the costs/benefits of a transition. This step should include identification of the key sensitivities and data gaps, leading to consideration of possible data collection and modelling requirements, possible modifications to the transition scenario that might optimise the outcomes, and additional stakeholder consultation requirements associated with the outcome and potential changes.

Table 6: Transition Outcome

Headings	Content / Questions to consider	Potential Considerations
<i>Physical assessment</i>	Focus on physical units relating to the fish stock (catches, landings, discards, average sizes, stock size) and fishing (number of vessels, days at sea, number of jobs (including both part-time and full-time/direct employment, and indirect employment throughout the supply chain), fuel use, and product supplies to different markets). The physical assessment also covers impacts on the marine environment and changes in other target and non-target species.	
<i>Economic assessment</i>	The translation of the physical assessment into monetary units: landings values, turnover, costs, profitability.	
<i>Net value of transition</i>	Taking into account the one-off costs and the changes in flows (compared to assumed baseline of 'business as usual'), and applying discounting, what is the net value in the short (0-3 years) , medium (3-10 years) and long term (>10 years)? When is the 'break even' point, i.e after how many years are any initial costs 'repaid'? This does not include all of the benefits of transition (e.g. biodiversity benefits not monetised) therefore results here are likely an underestimate.	In most cases, this will not include all of the benefits of transition (e.g. biodiversity benefits are usually not monetised) therefore results here are likely an underestimate.
<i>Socio-economic outcomes</i>	Assessment/discussion of associated changes in social metrics: employment, quality and diversity of employment, resilience of employment, job satisfaction, wider impacts on individuals and local communities.	
<i>Summary</i>	Summarise the conclusions on the costs and benefits of transition and their distribution. What does this imply for policy / progress towards transition?	This should include identification of the distributional impacts of transition and any resulting requirements for mitigation, as well as requirements for further stakeholder consultation and iteration in the analysis.

Step 6: Review

Transition may require several iterations of the above steps, including extensive stakeholder consultation, and design and implementation of supporting policies for implementing the transition and for managing the fishery after transition. Once the transition is implemented, monitoring and evaluation will be important, both for sustainable management of the fishery, and for learning about transition in order to improve the analysis framework and database, and better support future transition in other fisheries.

Table 7: Review

Headings	Content / Questions to consider	Potential Considerations
<i>Monitoring</i>	Transition analysis identifies the potential estimated costs and benefits of a given scenario. To manage the impacts of the transition key indicators identified from the analysis should be monitored on an annual basis. For, example landings volume and value, number of vessels using different gear, number of people employed in particular sectors pre-transition and post-transition, habitat recovery, species diversity and abundance.	Monitoring can inform evaluation of the robustness of the transition analysis, and be used to improve this framework, and subsequent transition analyses.
<i>Evaluation</i>	Evaluate the overall impacts of the transition plan every 5 years, including analysis of the indicators monitored and stakeholder surveys to assess qualitative impacts.	
<i>Adaptation</i>	Based on the evaluation, consider additional measures needed to achieve the purpose of the transition, and/or mitigate its effects.	Note mitigation can occur at a variety of scales (e.g. national, regional or local policy measures), so does not have to be carried out at the scale of the transition analysis

3. Application of framework

The framework has been applied to a number of hypothetical transition scenarios including changing fishing methods (from mobile fishing gear to static) and changing industry (mobile fishing to offshore wind). The framework has also been used to review an Impact Assessment (IA) of a proposed bottom trawled fishery restriction to evaluate it in comparison to current fisheries analysis approaches.

3.1 Transition approaches

The following provides a more detailed description of the different transition approaches covered by the hypothetical scenarios. Note that these approaches are not mutually exclusive.

- **Change of method within the same fishery/target stock**

This transition option continues to exploit the same resource but using lower impact fishing methods. This is a transition option which involves a relatively low level of change from the current fishing activity. Although lower impact methods may have lower catches per day of effort, they may be cheaper in capital and fuel expenditure. Additionally, they may give higher market values per unit of catch, due to better condition of the catch and premium prices. In most cases, the transition option is expected to result in a decline of catch in the short term, but these other factors may result in incomes and profits falling by a smaller proportion, or even rising in some cases. In the longer term, reduced habitat damage and recovery would be expected, with anticipated positive consequences for fisheries productivity, particularly if the fishery was previously overexploited. There may also be a need for additional management measures to ensure that benefits associated with the transition can be sustained.

- **Moving to a different target stock / area**

This option implies the cessation of fishing activity in the transition area and could apply where the option above is not possible (e.g. if the restriction covers all gears / strict MPA protection), or alternative fishing methods are not viable. In which case, the fishers might then choose to fish elsewhere, likely with the same methods, and potentially on the same stocks/species, though switching to other stocks/species is also possible. In the short term, this will increase the pressure on the fisheries outside the protected area, and it is important to consider whether or not this is sustainable (i.e. are there suitable target stocks that are not already fully exploited) as well as additional management measures that may be required to ensure sustainability. The cumulative impacts should also be considered, for example, where the availability of fishing grounds is also reduced by other marine activities such as offshore wind, cables and pipelines. There could also be increased negative environmental impacts on the new fishing grounds targeted. Fishers may incur higher costs, including fuel costs and time costs, if travelling further to fish, and higher fuel costs would also imply additional carbon emissions.

In the longer term, cessation of fishing should allow recovery of fish stocks in the protected area, with possible fisheries benefits arising outside. The extent of these benefits will depend on the behaviour of the stocks (i.e. whether they demonstrate movement or show site fidelity) and biological factors (such as the dispersal of larvae/juveniles from the area to recruit to stocks elsewhere).

- **Moving to a different marine industry**

This option involves stopping fishing and moving to alternative marine industries, for example associated

with marine energy, monitoring and research, tourism or supply/support for other marine industries. For this type of transition, it is important to assess the match of skills, the necessary qualifications needed to transition and the potential costs of retraining and re-equipping vessels. Moreover, for an effective transition, the timing of socioeconomic opportunities is crucial to minimise disruptions for displaced workers who transition to other industries. This means that enabling and supporting actions associated with investments, such as regulatory approvals, need to be coordinated to bring forward the alternative employment opportunities they can offer in line with the pace of restrictions and changes in the transition. This option is likely to have the greatest impact in terms of habitat and stock recovery, but will likely have the greatest socioeconomic effects with respect to livelihoods and cultural values associated with inshore fishing. Fishing communities often have strong cultural and historical ties to their occupation, and are part of social networks and support systems that are built around the occupation and thus transition could impact their sense of identity and belonging.

3.2 Comparison to a Regulatory Impact Assessment

The current Regulatory Impact Assessment (IA) model, already provides valuable data to inform policy-making and to assess the socio-economic and environmental impacts of fisheries regulation. However, application of the framework could also support a further just transition analysis. The objective of the review of the Sussex Nearshore Trawling Byelaw IA was to assess where and how it took account of each aspect of the transition framework, and to identify any additional assessments and engagement approaches that might better support a just transition in future fisheries and conservation management impact assessments. This is outlined in more detail in section 3.4

The Regulatory IA process currently includes a pre-consultation stage which tests the list of management options and identifies and fills in knowledge gaps. This analysis is usually performed internally by the authority managing the fishery facing potential restrictions to their activities and thus requiring some level of transition, with requests for further information and evidence from external stakeholders. To ensure the robustness of the IA process, it is vital to initiate early discussions and maintain engagement with a broad range of stakeholders, including industry representatives, environmental NGOs, and other local community representatives. This dialogue can unveil diverse perspectives, ensuring that the assessment encompasses the full spectrum of social, economic, and environmental impacts.

The IA builds on the evidence gathered from consultation to produce more detailed quantitative and qualitative analysis of the costs, benefits and risks of the shortlisted options, identifying a preferred option. Expanding on the socio-economic impacts, especially on local communities and economies reliant on fishing, will provide a clearer picture of the potential repercussions and benefits of various management options. By conducting thorough socio-economic analyses, the IA can offer actionable insights into mitigating adverse effects while promoting sustainable development.

3.3 Reporting transition analysis framework outputs

The application of the framework developed through this study for a transition analysis followed the steps outlined in Section 2 (see Figure 2.1), and summarised below:

1. The analysis started with the **scope** of the assessment defined by environmental aspects.

2. This was followed by an understanding and gathering of available **baseline data**, a crucial part of the process which helped determine the degree of accuracy of the analysis, and covered ecology, economics and social aspects such as any conflicts. Whilst this was not possible for this study (the team only engaged a few fishermen to inform part of the analysis for the Inner Sound case study), ideally, the collection of baseline data would include a consultation with all affected stakeholders to understand the likelihood of different transition scenarios. Baseline data gathered informed all subsequent steps.
3. The next step looked into the **initial modelling of transition scenarios** covering a static assessment of the first-order changes.
4. The **dynamic impact and timescales** then considered the long-term and equilibrium accounting for secondary impacts.
5. All this analysis and evidence was drawn together in the **transition outcome**, providing an overall assessment of the costs and benefits of the transition in the short and long term.

3.4 Review of Sussex IFCA Nearshore Trawling Byelaw 2019

The framework was compared to the content of the Sussex IFCA Nearshore Trawling Byelaw 2019 Impact Assessment (Sussex IA). This comparison identified some potential adjustments that could be made to the IA process to better support just transition planning.

The Sussex IA was found to be a sound example of an IA for fisheries and conservation management measures in relation to the scope and remit of an IA. It represents a good starting position for developing a transition analysis, giving insight into the broader policy context, and providing robust baseline data for the analysis, including very detailed habitat, species and fisheries data, and evidence on the impacts of bottom-towed fishing. It also provides an assessment of the environmental and economic impacts of a number of fisheries management options.

That said, the review pointed out that a fuller analysis could be beneficial in promoting and managing a just transition for affected fisheries, namely across the following three themes:

- Cost-benefit assessment timescale

The IA covered a relatively short time horizon (10 years) which means that the longer-term impacts of habitat recovery could not be fully represented. A longer timeframe should be looked at and the structure of the IA template allows to extend that up to 50 years.

- Economic impact and opportunities assessment

Alternative economic opportunities for the boats and workforce affected should be considered in the IA analysis, including potential timings of when alternative opportunities may become available and viable. Ideally, this should be supported by early dialogue and engagement with stakeholders affected and overseeing the transition.

- Impact Assessment structure

The analysis noted that accessible presentation of data and findings is essential for stakeholders to engage effectively with the transition process. The Government's new IA structure is better suited relative to the previous one to assess distributional impacts, and for proposals of mitigation actions.

Further actions that could be applied in future regulatory impact assessments to support a full transition analysis include:

- i) Collect data on possible alternative (non-fishing) employment opportunities that could be of interest to any fishermen impacted by the transition. This could involve local economic development authorities as well as marine businesses and other potential employers. This is to be able to gather the necessary baseline data to conduct a comprehensive transition analysis which considers direct and indirect impacts, and to identify alternative socio-economic activities and training and support requirements for transition.
- ii) Include consideration of alternative employment opportunities in consultation with impacted fishermen at appropriate stages in the process. This could be in an exploratory context to understand the needs and desires of the individuals involved. In the context of consultation around an Impact Assessment, care may be required to avoid any impression of having a pre-determined result. Additional information would also be needed to make assessments of the potential investments needed in infrastructure, or to support the transition towards other sectors, and more broadly, how these fit in the current policy landscape (e.g. strategic targets at local level, investment plans, etc).
- iii) Considerations of losses and benefits should use Gross Value Added (GVA) terms. This would provide a more comprehensive picture, especially for a local economic perspective. 'Landings values' is not a good indicator of losses because it does not consider costs. Profits take into account all costs, but that includes wages, which although a cost to fishing, are at the same time a benefit to those employed in fishing, and support the local economy.
- iv) The use of multipliers would better capture the impact of transition changes, including across the value chain.
- v) Consider potential lags/timelines in the transition. In particular, the timing of alternative employment opportunities, and of the speed of habitat and species / stock recovery. Consideration of the time horizon is key to be able to provide a comprehensive analysis.
- vi) Accessibility to clear, actionable information is crucial for stakeholders to understand and engage with the transition process effectively. Ensuring that data, findings, and proposed changes are presented in an accessible manner could facilitate smoother adaptation and alignment with new practices and regulations. This would include translating complex scientific and economic analyses into understandable formats and providing platforms for dialogue and feedback.

3.5 Future application of the framework

Testing the framework with the different hypothetical fishery transition scenarios which yielded valuable

learnings on how it can be applied, as well as some limitations of the framework. Section 2.1 summarises considerations which can help future application of the framework.

The questions set out in the framework focused on transition scenarios from higher to lower impact fishing practices and aim to provide information needed for decision makers to understand the scale of costs and benefits (environmental, social and economic) and who, and what, will be impacted. This helps to highlight key considerations for evaluating the effect of transition options and allow informed management of fisheries and provide a fair and equitable route to transition away from destructive activities in a logical, structured way. Application of the framework should follow a step-by-step process as summarised in Section 3.3. However, it should be stressed that using the framework should not be a one-time, linear process. Iterations between the steps should be expected, for example with initial assessment of transition outcomes leading to identification of key sensitivities, feeding back to further data collection and analysis. Interaction with stakeholders is a crucial component of any successful, just transition. In moving from desk-study analysis to use of the framework in supporting actual transition and policy implementation, communicating with and integrating the views of a wide range of stakeholders will be essential. Engaging with these groups will require iterative application of the framework, for example with stakeholder views and evidence feeding back into refinement of transition options and identification of likely behavioural changes.

Key stakeholders are those affected by a proposed transition as well as all relevant organisations with information, management powers and expertise related to the economic, environmental and social issues involved in any given case. The list includes, but is not necessarily limited to:

- Fishermen, including different fishing gear sectors;
- Supply-chain actors, both upstream (supplying fishing industry) and downstream (fisheries products);
- Local communities (as economic actors, residents, and custodians of culture and tradition);
- Organisations involved in management of fisheries, local economies, and/or the marine environment;
- Other stakeholders whose interests may be affected, for example recreational users of the marine environment, environmental NGOs, general public; and,
- Potential funders for transition (who will be from one or more of the above groups).

4. Conclusions and recommendations

This study and the application of a just transition analysis framework to hypothetical fisheries transition scenarios provided insight into the potential impacts and benefits of moving from higher to lower impact fishing practices. These findings should help inform the emerging dialogue among various stakeholders, including policymakers, industry, academics and eNGOs, aimed at devising comprehensive just transition policies for equitable use of our marine resources, and the fisheries and coastal communities that depend on them.

Moving away from higher impact fishing methods could provide significant benefits in environmental terms. Based on extensive literature where bottom-towed fishing has been removed from an area, a transition away from this activity could lead to improvements in benthic habitats in the short term and could lead to significant increases in biodiversity and fish stocks over time (Cunningham et al, 2022).

From an economic perspective, any transition would involve costs, particularly in the short term, including vessel refitting, gear costs, compensation for time out of the water, and potential costs for retraining. It could also entail losses in terms of jobs and incomes, and additionally some losses across the fishing and seafood supply chain including the processing and wholesale/ retail industry.

At the same time, it could create opportunities for less damaging fishing practices such as potting in areas protected from bottom-towed fishing. Opportunities could involve targeting the same stocks or diversifying to target other species. Moreover, some of the costs of transition could be offset by switching to other fishing activities or new employment opportunities in other, emerging sectors such as offshore wind, marine tourism or recreational fishing.

For the transition to deliver overall positive results for fishermen, it would need to be underpinned by careful planning and investment. New economic opportunities, support, training and any necessary payments could be coordinated across the transition timeline, to minimise disruptions for those affected by new fisheries management restrictions. Support for affected fishers could help mitigate their losses in the near term, incentivise early transition and ultimately enable the benefits of the transition to be reached more quickly. There could also be additional need for fisheries management initiatives, for example to avoid overfishing in emergent static-gear fisheries, or to address other problems associated with them, such as cetacean and shark entanglement with creel lines. Entanglement mitigation methods are already being trialled in Scotland to reduce this impact (Scottish Entanglement Alliance, n.d).

Any statutory move towards transition should begin with open discussions with all affected stakeholders, including fishers and those who rely on the fishing industry throughout the supply chain. Early engagement with stakeholders was also suggested by the review of the Sussex IA. The fisheries organisations leading the IA might benefit from external expertise to help develop the analysis looking at the nature and timing of alternative local economic opportunities in non-fishing industries.

Early engagement with affected stakeholders would also allow collection of more robust data on the costs, prices, revenues and profits in the fishing industry in a specific area, and identify potential options for supporting affected fishers to transition into other gear types, other fisheries, or other industries.

Recommendations when using the framework for just transition

The framework tested through hypothetical fisheries transition scenarios can, in future, be used to analyse just transition options. Below are a number of recommendations for its use.

- Robust data are required to allow for a comprehensive analysis of the economic (fisheries) social and environmental costs and benefits. The data also need to match the scale at which the transition scenario would take place. The scale needs to be coherent from the perspective of:
 - Ecology, with a clear area of marine habitat that can benefit from the transition,
 - Data availability for the affected fisheries that are specific enough (i.e. not based on regional averages) to inform the assessment.
- 1. Choice of timeline is important and needs to incorporate the timeframe of proposed policy change, including long-term environmental improvements, with increasing uncertainty and declining relevance of impacts further into the future.
- 2. It is clear that attempting to project economic activity, costs and benefits beyond the 10-year default horizon will introduce increasing uncertainty. However, it is also clear that for many environmental responses to reduce fishing impact, the main benefits arise in the longer term and thus require a longer time horizon for analysis (Lotze, H.K et al. 2011). For example, asset valuation in the ONS Marine Natural Capital Accounts uses a 100-year horizon for renewable resources¹, while the UK National Ecosystem Assessment Follow-on Phase report on coastal and marine ecosystem services¹ considered a period from 2013 to 2060 (i.e. almost 50 years)
- 3. The analysis should consider potential lags in achieving the transition outcome. In particular, this could be due to when alternative employment opportunities arise, and the speed of recovery of different habitat types.
- 4. Future economic impact assessments of fisheries management measures related to achieving targets for sustainable fisheries, biodiversity recovery or renewable energy should be expanded to assess alternative employment options including to other industries or alternative fishing gears. The assessment also needs to take into consideration the skills profile of existing fishers, scale of transition in terms of area and time, and the infrastructure, training and support systems required to actively and fairly support a just transition.
- 5. Early engagement with all potentially affected stakeholders is crucial to identify potential transition options and support that would be required to facilitate a just transition.
- To fully assess potential re-deployment opportunities for existing fishers, development of impact assessments for transition options should involve local partners to provide economic expertise and analysis of local non-fishing sectors.
- Communication and access to clear, actionable information is crucial for stakeholders to understand and engage with the transition process effectively.

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