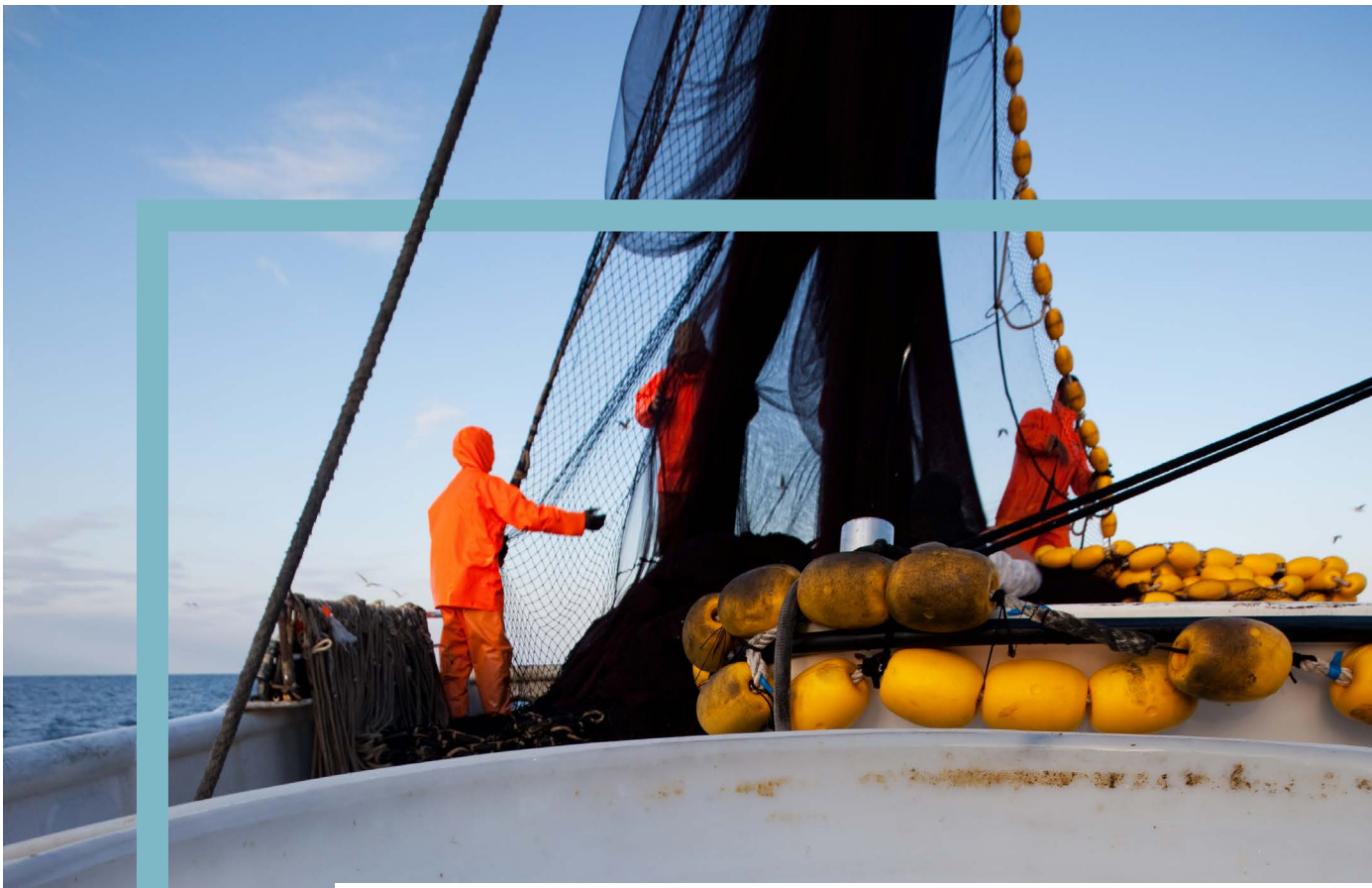
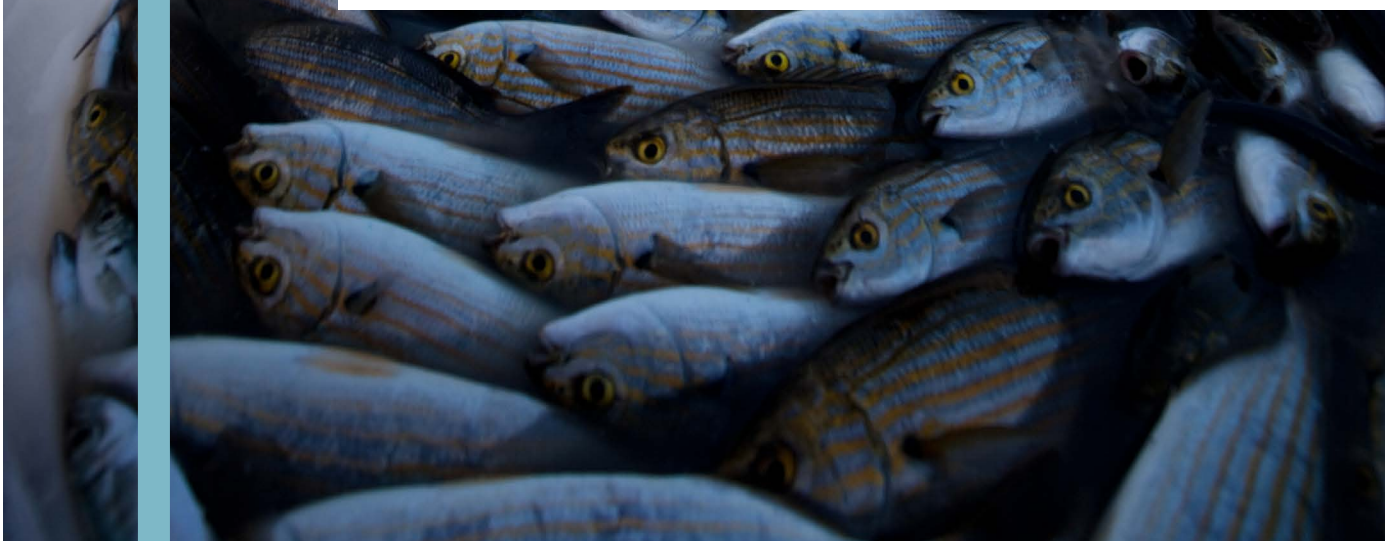
Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION

MOSES
Maritime, Ocean Sector and Ecosystem Sustainability: Fostering Blue Growth in Atlantic Industries



Blue Growth Pathway for Commercial Fishing



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1

Executive Summary

This study assesses the impact of fishing on marine ecosystems, taking into account fish stocks sustainability and the social and economic impacts of the activity. Commercial fishing uses different fishing gears (trawling, long-lines, or artisanal fisheries, among others) that exert various pressures on the marine environment. We identified the impacts of each economic fishing fleet on the marine environment through their impact on specific ecosystem services. The impact of each fishing fleet impact on the marine environment is different depending on their activity and the fishing gear used but also depending on which ecosystem is being affected.

As we are interested in the sustainability of the fishing activity, this study combines an impact index developed in the MOSES project (the interface is available for stakeholders, https://aztigps.shinyapps.io/Moses/, using the password: MOSES_AZTI) with a sustainability factor for the targeted fish stocks.

The impact index considers the impact of the commercial fishing activity on the marine environment including not only the traditional business indicators (Added Value, Profits, Employment) but also indicators related to the use of the sea by this activity (frequency of the activity, extension of the sea needed) and ecological indicators to consider possible impacts of the activity on the marine ecosystem services.

The sustainability factor is a second index based on the status of the stocks comprising the catch-portfolio of each fishing fleet. This sustainability factor considers that diversification of the portfolio is not, necessarily, the best option to guarantee the sustainability of fish stocks when TACs or other management measures are in place. Combining these approaches enables us to better understand the trade-offs between various policy options. For example, if policy focuses on changing the landings portfolio, aiming for a higher sustainability factor, the likely lower efficiency of the new portfolio of landings compared to the previous one may require higher activity than before. This higher activity will result in a higher impact on the ecosystem services. Therefore, both indexes are to be considered jointly to analyse the Blue Growth Pathway of commercial fishing.

In this study, we apply this approach to five different fishing segments in the Basque fishing fleet, including the inshore and offshore fleets. Inshore fleets target different species (fish stocks), many of which have no stock assessment. Offshore fleets target a smaller number of fish stocks and these, normally, face a total catch limit, although the total catches can be as high as those of the artisanal fisheries. We also engaged with key stakeholders to better understand their perception of sustainability within the fishing sector.

The main finding of this study is that consideration of stock status and carbon footprint are important but that these are not the only variables to consider. Issues such as the intensity of the activity or the vulnerability of the area may be of great importance to design future blue growth pathways for commercial fishing.

Commercial fishing uses different fishing gears that exert various pressures on the marine environment

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Introduction

In this study, we assess the impact of the fishing activity on marine ecosystems and consider the sustainability of targeted fish stocks. The Basque fishing fleet, as with most of the Atlantic waters European Union (EU) fleets, are managed under the objective of Maximum Sustainable Yield (MSY) for the stocks they target. The objective is, therefore, to take the necessary actions to drive the individual fish stock size to levels compatible with producing at MSY. Most of the target stocks are scientifically assessed and a catch limit system, the so-called Total Allowance Catch (TAC), is designed to reach MSY.

Beyond the MSY objective, the EU Common Fisheries Policy (CFP) also contains a range of social and economic objectives. These objectives imply that a different set of management tools have been, and are being, implemented to reach them. For example, fishing day limits, daily catch limits, individual quotas and some other technical limitations have been implemented. However, the trade-offs between these objectives and the sustainability of the stocks are not always clear.

This study combines these objectives with the sustainability approach employed by the European Commission for all EU fleets which is based on obtaining biomass levels compatible with producing the MSY at an individual stock level and with the pressure impacts of fishing activity on ecosystem services. It is found that all these elements cannot be analysed separately and that the analysis has to be done at a fleet segment level. Furthermore, the main policy recommendation comes in terms of increasing the industry's awareness of the impact of its activity.

The trade-offs between objectives and the sustainability of the stocks are not always clear

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The Common Fisheries Policy and the Atlantic Action Plan

The main objective of the CFP for the Atlantic fish stocks is to maintain or reach MSY for assessed stocks. This objective provides a guarantee of sustainability. Despite significant improvements in the northeast Atlantic, challenges remain in all sea basins. Some stocks are still overfished and/or outside safe biological limits, and more effort is needed in that respect. Additionally, fishing activity impacts the marine environment not only through the extraction of fishes but also through the interaction with the ecosystems. Although the Atlantic Action Plan[1] does not prioritize the fishing sector, it aims to foster blue growth and promote carbon neutrality through marine renewable energy. In these two strategies, the fishing sector has a non-negligible role, by maintaining the stock abundance and reducing their carbon footprint when fishing and along the overall value chain.

This study examines how sustainable 'Blue Growth' in the fishing sector can be achieved over the long-term. A case study approach, involving the Basque fishing fleet, is employed to explore the impact that the fishing activity has on the different ecosystem services considering the sustainability challenges. The study illustrates how sustainability, as a long term concept, should be analysed combining the impact that the activity has on the environment with the sustainability status of the stocks, and that both cannot be separated. Furthermore, the study illustrates that this combination has to be analysed on a fleet segment basis and we provide policy recommendations to do so.

The main objective of the CFP for the Atlantic fish stocks is to maintain or reach MSY for assessed stocks

Fishing activity impacts the marine environment not only through the extraction of fishes but also through the interaction with the ecosystems

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Transition Management

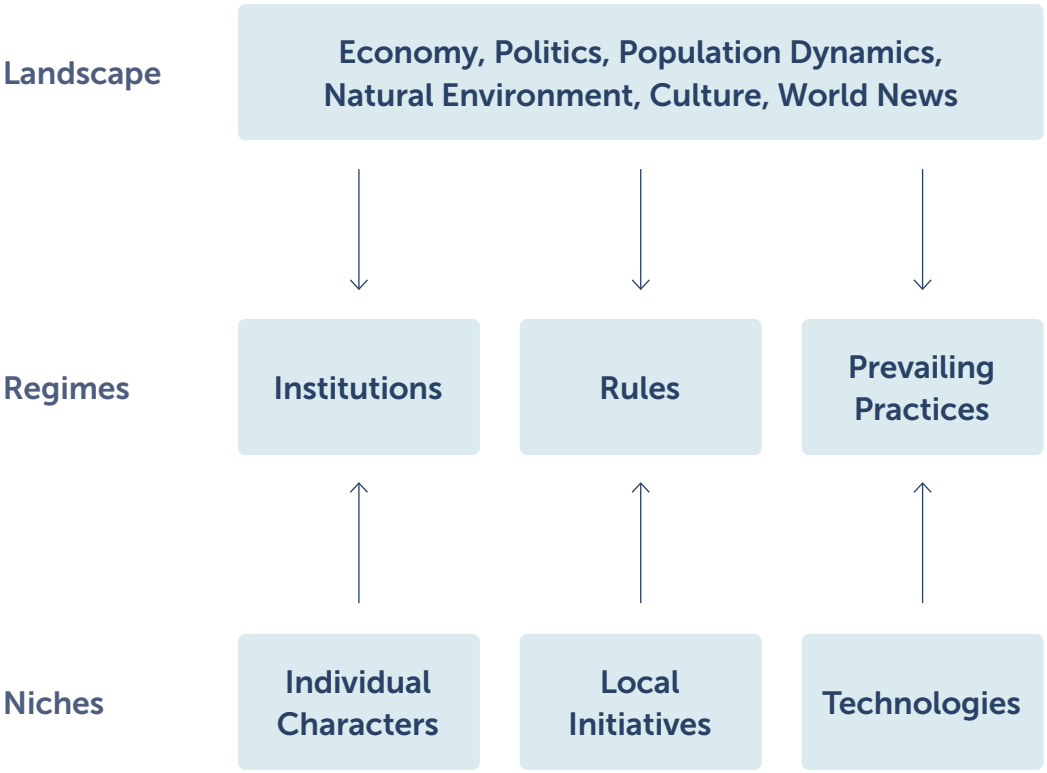
Transition management focuses on coordinating a wide range of actors with the aim of achieving long-term sustainability. It seeks to coordinate these actors through the creation of a shared understanding of a problem and the development of a long-term vision and sustainable pathways through which the problem can be addressed. Sustainable transitions require actors to develop an understanding of the interconnections between the current management regime and the change pressures exerted on it (See Fig 1).

The management regime is the amalgamation of the dominant practices, rules, institutions, and norms that structure activity within a particular policy area. Change pressures can be characterised as landscape pressures and niche practices.

Landscape pressures operate at the macro level and include issues such as economic, political, environmental, and demographic dynamics. These dynamics put pressure on the existing regime to change but cannot be directly controlled by the regime. For example, population growth will place pressure on food and energy regimes to scale up production.

Niche pressures are micro level innovations that exert pressure for regime change from below. Niches can be the actions of individual actors, the development of alternative technologies, or local management practices that do not conform to established practices and put pressure on the regime to adapt to accommodate them. Landscape pressures and niches are, therefore, vital seeds for change and are crucial for path-breaking innovations.

Figure 1. The Multi-Level Concept in Transition Studies
Source: Adapted from Geels, 2002[2]



Transition management focuses on the development of sustainable pathways that can overcome barriers and maximize opportunities and can steer innovations to become established within reformed and more sustainable regimes. MOSES has adopted transition management as a broad analytical framework through which to understand existing marine management regimes and to stimulate thinking about how more sustainable regimes may be realized in the future.

A broad analytical framework through which to understand existing marine management regimes

Population growth will place pressure on food and energy regimes to scale up production

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Fisheries Management Regime

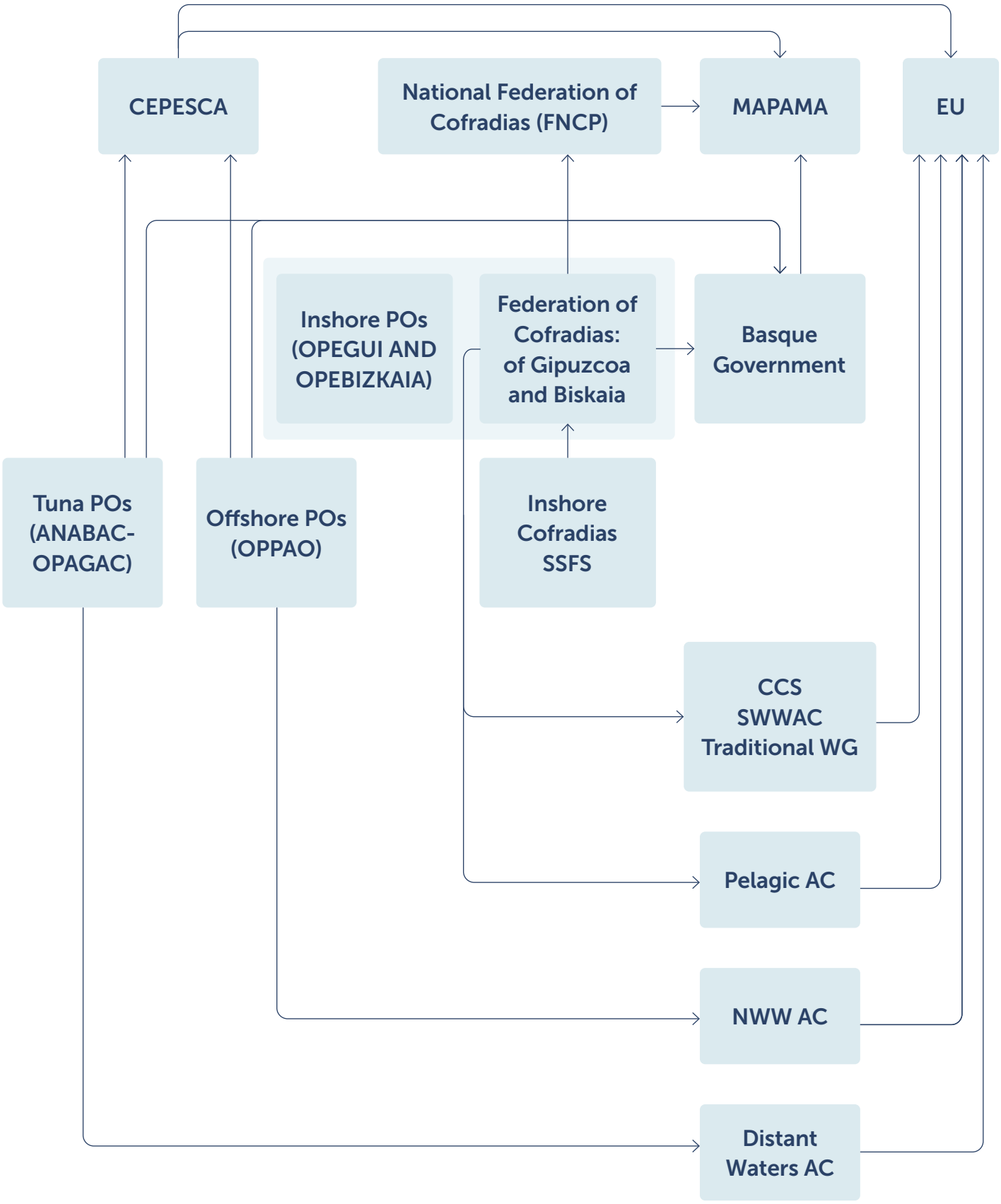
Basque fishing fleet management is developed under a complex governance system, which establishes the relationships between all the involved agents and institutions. The governance system of the Basque fleet is shown in Figure 2. Offshore sectors are represented by the Producer Organizations (POs): ANABAC and OPAGAC (for tropical tuna purse seiners) and OPPAO (for inshore and offshore trawlers). While inshore (non-trawler) fleets are represented by the inshore PO, and two Federations of *Cofradías*. The *Cofradías* are located at each Basque port and almost the totality of the Basque vessels are associated with them. All these institutions have a strong relationship with the Basque Government (Regional Administration) but also with other national (Spain) and European fishing management administrations.

This governance system is combined with a set of well-established management rules. Basque fishing fleets' management is based on the objectives set by the EU CFP. In the Atlantic Ocean, this implies that the main management tool is the Total Allowable Catch (TAC) regime, which, in fact, determines the sustainability of the stocks. Beyond that, stocks under these TACs are also constrained by the Landing Obligation, which aims to reduce discards levels by forcing vessels to land all their catch and therefore, counting ex-discards on the quota consumption, and promoting a paradigm change in the EU fisheries policy.

Regional/local management rules – Niches.

Beyond the general regime presented above, there are also other management tools oriented to the profitability of the fishing fleets which are specific to the Basque fleet segments. The most common ones are the daily catch limits, which apply to the pelagic species (anchovy and mackerel) caught by the artisanal and purse seiners segments. The objective of these limits is to maintain a constant price (and hence a higher average catch) along with the fishing session and avoid daily over-supplies. Pelagic fisheries are seasonal and days at sea limited so that the inshore fleets have a share of the market when the species are close to the coast. The concentration of the abundance means that without these daily limits all the landings would be concentrated in a short period depressing prices. Other measures are also promoted locally as the introduction of spatial-temporal closures of the fishing activity.

Figure 2. Regime: Governance (institutions and relationships)



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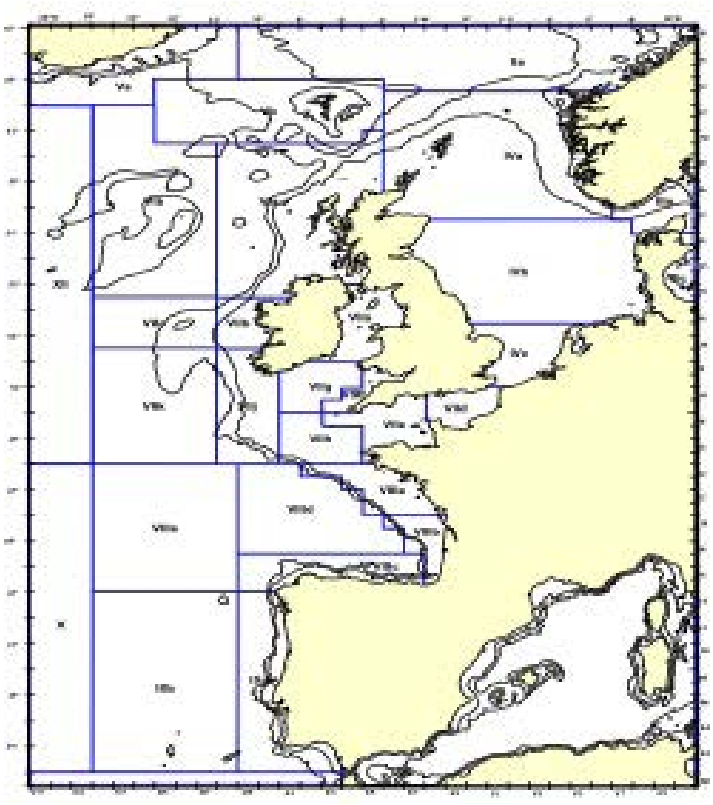
MOSES Basque Fishing Fleet Case Study

This study focuses on the case of the Basque fleet operating mainly in the EU Atlantic Area (ICES Areas 8abd, 8c, 7, and 6, can be seen in Fig.3) but also, in the Indian and Pacific Ocean. We analyse each fleet segment (fishing activity based on the fishing gears used) separately. We based our work on the impact index developed in MOSES. This impact factor is adapted to include the sustainable factor and applied to each defined fleet segment. A detailed explanation with supplementary material is provided in the documents available on the MOSES website.

In this study, five different segments have been considered, including inshore and offshore fleets. Inshore fleets operate exclusively within the EU Atlantic Area and target different species many of them without stock assessment. However, offshore fleets include tropical tuna purse seiners working out of the Atlantic Area, in the Indian and Pacific Oceans, and target fewer species than inshore fleets. The species targeted by offshore fleets typically face a total catch limit, although total catches can be as high as those of artisanal fisheries.

Figure 3. Atlantic ICES Areas where Basque fleets operate



The three inshore fleets considered are:

1. *Artisanal fleets* using a different set of passive gears that target a multipurpose catch composition (ICES area 8c and 8b).
2. *Purse seiners*. They are a sequential fishery, fishing mackerel, anchovy and sardine using the purse seine, and moving to template tuna during the summer and autumn sessions using live bait. (ICES areas 8c and 8abd)
3. *Inshore trawlers*. A mixed fishery only allowed to fish in the ICES Division 8c (Cantabrian sea). They target hake, blue whiting, mackerel, and horse mackerel.

The three offshore fleets:

1. *Otter trawlers*. Fishing in the Bay of Biscay (ICES area 8abd), with a mixture of species, mainly demersal (hake, megrim, and anglerfish) but also some pelagic species such as mackerel and horse mackerel.
2. *Pair trawlers*. Fishing in the Bay of Biscay (ICES area 8abd), targeting hake (95% of the catches).
3. *Tropical purse seiner*. Fishing in the Atlantic and Indian ocean's tropical areas, targeting tropical tuna, such as yellowfin skipjack, bigeye, and skipjack. For this segment, the impact index is not calculated as the area extent is zero (they operate outside the North Atlantic Area).

The impact index is created by building sector-pressure-socio-economic-ecological component linkages. This index introduces some pressure assessment criteria and categories considering both a socio-economic system and a natural capital system. The socio-economic system introduces the blue growth assessment using traditional business indicators, employment, and other proxies but also, the size and scale of use of the sea needed to produce those business results. The natural capital system is included in two ways: on the one hand, by considering the sensibility of the benthic habitats to the maritime economic activities. On the other hand, the natural capital system is included by identifying whether these activities have an impact or not on the so-called marine ES – notice that it is not pretended to quantify those impacts on ES.

Each species caught by the Basque fleet is evaluated according to their stock status, based on the 2019 Reports of ICES[3],[4] (ICES 2019 a, b), ICCAT (ISSF)[5] and IOTC (ISSF).

The objective is to evaluate the impact that each fishing activity has on each ES, but taking into account the status of the stocks. To this end, a scoring system is designed in which the highest sustainability score is assigned if the stock is at MSY level, while the lowest one is assigned if the stock is in danger of depletion. The intermediate situations are those where some form of overfishing or overexploitation occurs. The difficulty is that each fishing fleet fish more than one stock, therefore, the final sustainability score should be calculated as a weighted sum of the score obtained by each stock and the number of landings of them. This weighted score is then multiplied by the impact index.

What we obtain is that the impact index only provides part of the message when sustainability issues are to be considered. A low impact can be unsustainable if the stocks are heavily depleted, whereas a high impact can be sustainable if the stocks composing the catch-portfolio of each fishing fleet have a high sustainability score. This is the case of the trawl fleets of the Basque fleet. Otter and inshore fleets have similar impacts, but different sustainability scores. The pair trawls have a lower sustainability index because landings are comprised (almost) solely by hake (northern stock) which is at biomass level compatible with producing the MSY.

More interesting is that both elements, sustainability and impact cannot be decreased or increased without one affecting the other. For example, if a different species combination is desired by one fleet segment, its income, can be affected, a different fishing area selected (affecting the vulnerability) and or the area extent changed. Therefore, sustainability cannot be analysed separately from the impact. Adopting the transition management framework our research identifies the following Landscape, Patchwork of Regimes and Niches for commercial fishing.

Table 1. Landscape, Patchwork of Regimes and Niches for commercial fishing in the Basque Country

The Multi-Level Concept	Commercial fisheries aspects	Notes
Landscape	• Market-based economy (market prices, consumer demand, imports, ...) • Natural targeted stocks status • Marine environment quality degradation (turbidity of the sea, litter, ...)	• EU common frameworks are considered as the Common Fishery Policy (CFP) and the Marine Strategy Framework Directive (MSFD)
Patchwork of Regimes	• Governance structure (Figure 2) • Specific management rules	• A Top-down governance model (from the EU to Spain, as a member state) • Management rules in practice: TACs, Landing Obligation
Niches	• Decentralized management rules (self-management at a local level) • Local and activity-related sustainable initiatives. These local initiatives to be promoted by the Basque Federations, *Cofradías*, and Producers Organizations (Figure 2) • Local initiatives to improve the stakeholders' knowledge of the impacts and sustainability of their activities	• Rules in practice: daily limits and spatial-temporal closures • The sustainability factor is based on the status of the stocks comprising the catch-portfolio of each fleet segment • Carry out the fishing activity with a portfolio of targeted species following a pair-wise individual strategy: balancing the sustainability and impact index values • Provide, all together, business indicators, impact indexes and sustainability factors • Differentiate the sustainability strategy for each fishing activity. Actions for sustainable growth to be assessed at the individual segment level • Stock status and carbon footprint are important (although not only) to turn blue growth into green by each segment level

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Pathway for Sustainable Development of Fisheries

- The study illustrates how the disaggregation of the environmental pressure among different fishing activities provides a different picture than the overall analysis of the Basque fleet. Each fleet segment's impact on the marine environment is different depending on their activity and the fishing gear used but also on which ES is being affected.
- The study illustrates that both indexes must be considered jointly in order to analyse the Blue Growth Pathway of commercial fishing.
- The sustainability factor is based on the status of the stocks comprising the catch- portfolio of each fleet segment. When TACs or other management measures are in place, diversification is not always the best option to guarantee more efficient portfolios. This must be taken into account when selecting between different policy options. For example, if a policy induces changes in landings portfolio to increase sustainability and fishing activity increases to maintain the fleet's efficiency, this may lead to a higher impact on ecosystem services (changing the impact index).
- It has also been observed that evaluating the actions on average levels does not provide a good overview of the resulting pressure on the environment, at least at the individual ES level. Actions for sustainable growth of the fishing sector have to be assessed at the individual segment level. Therefore, there is not a specific general action that will determine the final value of the pressure on the environment.
- Finally, broadening stakeholders' perception of sustainability plays an important role. The main recommendation of this study is to make them see that stock status and carbon footprint are important to foster sustainable blue growth paths, but they are not the only variables to take into account. Issues like the intensity of the activity or the vulnerability of the area may be of great importance to design future blue growth pathways for commercial fishing.

8

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