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The seascape as an actor in the public acceptance of offshore wind farms

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This study explores the role played by the seascape in the public acceptance of nearshore and offshore wind farms. The transposition of onshore wind farms to the sea has been defended as an alternative to mitigate resistance, assuming that, by locating them offshore, opposition would be halted. However, research indicates that this is a misconception, as offshore sites do not guarantee a problem-free solution for wind farms, and conflicts can persist even when wind parks are planned to be installed away from populated areas. The study discusses how the seascape can be perceived differently by various stakeholders and emphasises the importance of considering it as a key factor in the success of the planned exploration. The proposal of offshore wind parks along the coast of Portugal is used as a case study to analyse how it was received by different sectors of society. Findings reveal that stakeholders with strong ties to the seascape were not included in the decision-making process from the very start, which led to fierce opposition in areas where sea uses are deemed to be in conflict. It is therefore argued that the non-human agency of the seascape should not be ignored, since it can form relations. It is suggested that a comprehensive understanding of the seascape could help build better-informed decisions, as its environmental characteristics and functioning, and the social construct that is formed between different groups and the seascape, are capable of shaping the stakeholder group and influencing the social acceptance of an energy project.

Keywords: energy seascapes, contested places, infrastructure planning, more-than-human

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Introduction

The decarbonisation of the energy sector is seen as an essential step towards achieving the emission reduction targets set forth in international climate change agreements. Under this new paradigm, among other options, finding and implementing new renewable energy sources capable of replacing fossil fuels is a major component of the clean energy transition (European Parliament, 2018). However, whereas it is quite consensual that the meeting of climate goals requires a phaseout of fossil fuels and greater use of renewables, it is also known that the transition is not exempt from challenges. Research has shown that green energy projects can be as socially and environmentally conflictual as fossil fuel projects, as the shift to green energy is not inherently socially and environmentally benign and can, as a result, trigger mobilisation of citizens capable of influencing the results of the project (Temper et al., 2020).

Wind energy has been acknowledged as crucial to meeting the EU's decarbonisation objectives and providing clean, affordable, and safe electricity (European Commission, 2023). Notwithstanding the important role of wind energy, resistance to the development of onshore wind farms is increasing in some countries, and it has been noticed that large-scale undertakings fail due to a lack of support or opposition in society (Firestone & Kempton, 2007). This is because, commonly, a parcel of the public perceives on-land turbines to be a negative element in the landscape (Ladenburg, 2008). The transposition of onshore wind farms to the sea has been pondered as an alternative to reduce or eliminate the disamenities associated with on-land turbines (Henderson, 2002; Ladenburg, 2010), a characteristic deemed to improve the public's perception of offshore wind parks when compared to their on-land counterparts. Indeed, developers have already praised the advantages of relocating wind farms to the sea, as the choice is weighed to present fewer conflicts and have fewer conditions linked to the occupation of the territory (Windplus & Ecobase Consulting, 2015). This trend is so steady that it has already been noticed that the construction of offshore wind installations could become Europe's most extensive technical development in marine habitats at the beginning of the 21st century (Merck & von Nordheim 2000 cited in Garthe & Hüppop, 2004).

Nonetheless, Haggett (2011) notes that the assumption that offshore sites are problem-free surrogates for onshore wind farms may be a misconception and suggests that it is rather naïve to assume that opposition would be halted as conflicts can persist even when wind turbines are planned to be installed over the sea and away from populations.

This study is in line with the interpretation that offshore wind farming, although capable of mitigating some of the impacts associated with onshore wind farms, is not an indisputable solution and its public acceptance cannot be taken for granted. Rajabifard et.al. (2005) recall that the marine environment contains a multitude of resources, but at the same time it is also extremely complex, subject to contradictory economic, social, and environmental pressures and demands. The same authors argue that when dealing with competing interests, achieving a balanced outcome requires information with an inherent spatial dimension. This means that there must be clear spatial certainty about the location and extent of rights, restrictions and responsibilities in the marine environment (Binns et al., 2004). However, they caution that this may not be easy to define, given the mobile nature of maritime boundaries and the three-dimensional character of the marine environment, where different activities take place on the sea surface, in the water column and below the seabed.

Following this logic, this study revisits the discussion on how to balance the different interests arising, on the one hand, from the exploration of a renewable resource at sea and, on the other hand, from other uses of the sea, as well as the protection of the marine environment. It examines the issue through the lens of the spatial implications of different seascapes that may

exist in marine space and suggests that the seascape itself should be considered as an actor in the shaping of a solution. Given that different stakeholders can relate differently to the same marine space, and that multiple seascapes can coexist within the same disputed area, it is here argued that the spatial analysis, overlap and integration of different seascapes could serve to build a better-informed decision and reduce the sea footprint of the offshore wind project.

Methods

This study briefly reviews the state of knowledge on the uptake of green energy transition projects based on wind energy, both onshore and offshore, and the role that seascapes and landscapes have played in the outcomes of such projects. In addition, the proposal for offshore renewable energy zones along the coast of Portugal is used as a case study to assess its public acceptance among different stakeholders. Portugal was chosen for this study because of its political relevance, as it alone detains almost half of the European Union's Exclusive Economic Zones under its jurisdiction (República Portuguesa, 2021; Leitão et al., 2014). Furthermore, the country already has extensive maritime spatial planning legislation in place, both at the European and national levels, and is now starting to apply the instruments advocated in the legislation, some of them for the first time, as in the case of the allocation of areas for offshore wind farms. Therefore, the case study can be useful in assessing how the provisions proposed in the planning legislation are observed when it comes to translating them into reality, as is happening in Portugal at the time of this study regarding the allocation of areas for renewable energy at sea.

Desk research was carried out to analyse documents produced in the open public hearing process that followed the disclosure of the proposal drafted by the Working Group that was indicated by the Portuguese State to manage the planning process. Semi-structured face-to-face interviews were conducted with a small sample of representatives from the fishing sector to assess their perceptions and positions. The first group selected for interviews was an artisanal (small-scale) fishing association representing around 40 boats operating off the coast of Viana do Castelo, one of the most productive areas for offshore wind energy and one of the most controversial sites for the fishing community. The second group was another artisanal fishing association operating in the Minho estuary The choice of this particular group of stakeholders was motivated by the fact that the European Parliament (2021) has already stated that the exploitation of offshore wind resources must be carried out in a way that is compatible with other uses of maritime space, mainly fishing, and that decisions on the installation of offshore renewable energy production must involve all stakeholders in the area, in particular the fishing communities and their organisations. In addition, the same resolution argues that special attention should be paid to the interests of fisheries and aquaculture and that these groups should not be marginalised (European Parliament, 2021).

Not against but neither subscriber: The tricky problem of acceptance of wind farms

Some authors (Temper et al., 2020) observe that, when it comes to wind and solar energy, communities are not mobilising against renewable energy itself, but against the ways in which the technologies are implemented and the lack of due process in implementation. Walker (1995) also mentions that often the literature reveals that individuals and groups are not intrinsically against wind energy but rather opposed to the scale, location, or other characteristics that a particular development may have.

Warren et al. (2005) recall that conflicts between development and landscape conservation have a long history, and although the debates on wind energy share some of the

characteristics of previous environmental controversies, they differ from the previous ones in a relevant particularity that can make acceptance (or the lack of it) a complicated problem: in the case of wind energy, there are strong “green” arguments on both sides of the debate. The same authors explain that, on the one hand, some environmentalists defend wind farms due to their “clean energy” credentials, while, on the other hand, opposition may be raised due to their landscape impacts. Still, others are caught in middle ground, supporting renewable energy in principle but opposing specific wind farm proposals, so the authors conclude that the wind controversy is characterised as a “green-on-green debate”.

Another layer of complexity is added when it comes to renewable energy landscapes, of which wind energy is one type, as these have the innate characteristic of being site-specific (Pasqualetti & Stremke, 2018), i.e., location options are guided according to a specific set of conditions existing in each landscape or seascape, such as wind resource availability in any case and sea-bottom depth in the case of nearshore and offshore farms (Bray et al, 2016) (Figure 1). Hence, the environmental peculiarities of the site, which condition the exploration, are the first reason why we could consider the landscape or the seascape as an actor in the energy project.

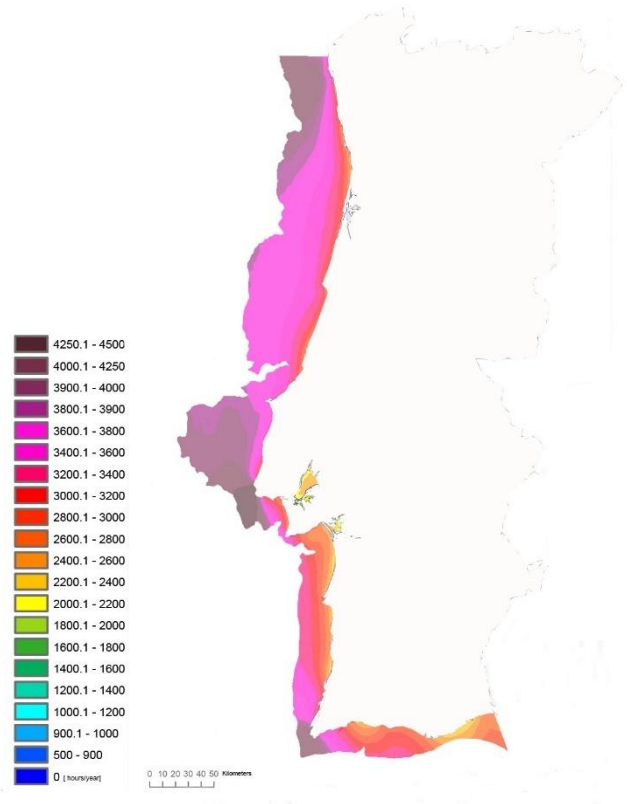

Figure 1. *Atlas of the offshore wind potential along the coast of Portugal (the legend shows wind blow frequency by hours/year). Source: Costa et al. (2010)*

Altogether, it is a fact that public perception and acceptance are seen as crucial to the development of wind energy (Devine-Wright, 2005; Wustenhagen et al., 2007), and that positive social opinions about renewable energy cannot be taken as a guarantee of immediate acceptance of proposed projects. While there may be public support for renewable energy, the physical, environmental, social and economic impacts of a particular project may be controversial and undermine initial support. Here we should bear in mind Pasqualetti &

Stremke's (2018) observation that energy landscapes are co-constructions of space and society, and the appearance, location and recognition of energy landscapes evoke a wide range of perceptions and responses.

As Greider & Garkovich (1994, p. 1) recall, "landscapes are symbolic environments created by human action from a particular perspective and through a particular filter of values and beliefs", meaning that landscapes are not only formed by their objective qualities but can also be understood as a social construct (Balık & Balık Lökçe, 2019). Thus, the standard definition of the seascape as "the spatially heterogeneous area of the coastal environment that can be perceived as a mosaic of patches, a spatial gradient, or some other geometric patterning" (IPBES, 2021) fails to acknowledge its subjective qualities, which can only be perceived when someone relates to it. We prefer to adopt the definition proposed by Nuttall (2021, p. 3) which states that "a seascape is a constructed cognitive place consisting of the physical sea and the coastal zone encompassing the range of practices undertaken by human agents with or within this place". In this regard, Allen (2011) suggests that we should not consider landscape as only a "human" or only a "natural" construct, but as a combination of both. In this sense, as with landscapes, different groups may have different relationships with the seascape, once that relation is established according to the characteristics of the site and to their own social connectedness, defined as the potential or actual link between people and the environment (Hilman et al., 2008). Therefore, the social construct formed between a given society and the seascape is a second reason for recognising the latter as an actor to be considered when planning maritime infrastructure.

The proposal for offshore renewable energy deployment areas along the coast of Portugal and its reception by the public

Wolsink (2010) reminds us that the logic behind the idea of the greater and easier acceptability of offshore wind farming is based on the notion that the choice would avoid impacts on the landscape and questions why we should consider possible impacts on the seascape to be something of lesser importance. The same author points out that, at least for nearshore developments, the theme of visual intrusion, a major concern of projects on land, still stands as a relevant issue capable of raising resistance to OFW. We here expand this discussion and argue, by using the example of the proposal for offshore wind farm areas along the coast of Portugal, that not only visual intrusion, but in addition, other issues that influence the acceptance of onshore projects such as environmental concerns, local ecology and concurrent uses of space can also apply to the case of OFW. In short, in the end, we might not be avoiding conflicts but, instead, transferring them from land to the sea.

The decarbonisation of the economy and the energy and climate transition, in close conjunction with the targets set by the EU for cutting emissions and the growth of renewable energy, reinforced by the REPowerEU plan, led the Portuguese Government to set a target of 10GW for offshore renewable energy by 2030 (GTOffshore, 2022). To achieve this objective, in September 2022, an Inter-ministerial Working Group composed of representatives of the government, the ports and the energy sector was created for the planning and operationalisation of electrical production centres based on renewable energy sources of oceanic origin or location. Their mandate was to, notably, propose a set of spatialised areas to be allocated to electricity production in accordance with the National Maritime Spatial Planning and to distinguish "preferred" areas, as defined in the REPowerEU plan (República Portuguesa, 2023). It was considered essential to ensure the participation of all interested parties through a public hearing of the preliminary proposal for the spatialised areas identified by the Working Group (Figure 2) and, to this end, a consultation was opened for 30 days to formulate suggestions and collect contributions (República Portuguesa, 2023).

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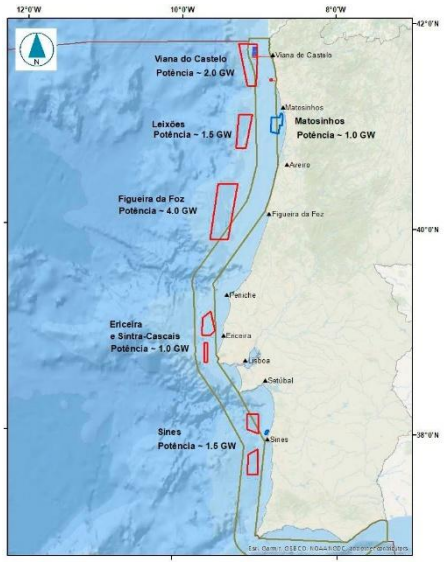

***Figure 2**. Preliminarily proposed nearshore (blue) and offshore wind farm areas (red) and respective indicative powers. Source: GTOffshore (2022)*

A first concern identified by stakeholders was the potential spatial conflicts between the suggested location of some areas and their overlap or proximity to sensitive marine areas under any type of environmental protection or with the possibility of being classified as such in the future (Figure 3). It was suggested that the selection of areas should not only be based on technical-economic aspects of production but also include ecological criteria, and the lack of knowledge of public entities about the reality and conditions of the territory was criticised (GEOTA, 2023).

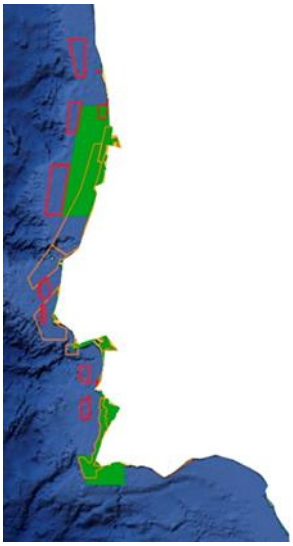

***Figure 3.** Overlap of proposed nearshore and offshore wind farm areas (red) and Limits of Special Protected Zones – ZPE (orange) and Sites of Community Interest – SIC (green). Source: SPEA (2023)*

The superposition of the proposed Sintra–Cascais area of exploration and the Cabo-Raso Special Protected Zone was particularly not well received among the public. Despite the conditions underlying the delimitation of the proposed areas suggested that the areas should preferably be located outside administrative services such as Nature Conservation Areas and the National Ecological Reserve, an exception was made for the area of Sintra–Cascais

(Figure 4).

***Figure 4**. Overlap of proposed Sintra–Cascais offshore wind farm area (red) and Cabo Raso Special Protected Zone–ZPE (green). Source: GTOffshore (2023)*

The exception was justified by the Working Group because the chosen area is "located close to urban areas with high energy consumption (Lisbon Metropolitan area) and because it is in one of the areas with the greatest energy resources" (GTOffshore, 2022). Different stakeholders manifested their opposition to the exception made in favour of the Sintra–Cascais exploration area and questioned the prioritisation of technical and economic aspects over the needs of the marine environment (GEOTA, 2023; SPEA, 2023; de Medeiros Raposo, 2023) considering the economic-driven justification for the potential impacts on the marine fauna as a reductive and irresponsible conception (SPEA, 2023). Still, it was highlighted that the exception made to the Sintra–Cascais area was predominantly based on a socioeconomic logic of exploitation and, therefore, did not observe the principle imposed by the Maritime Spatial Planning Framework Directive, which states that planning should rest on an ecosystem approach (European Parliament, 2014) and also inverted the logic given by the Marine Strategy Framework Directive, which states that "by applying an ecosystem-based approach, priority should be given to achieving or maintaining good environmental status in the Community's marine environment" (European Parliament, 2008).

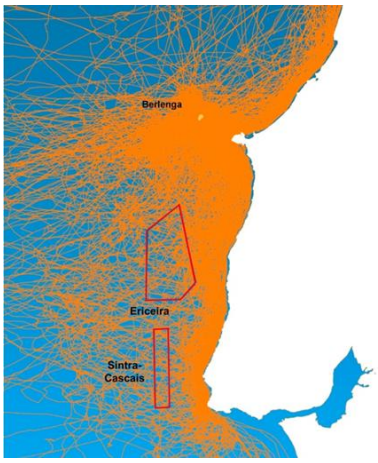

***Figure 5**. Geolocation of feeding routes of Cory´s shearwaters (Calonectris borealis) between the Berlengas archipelago and the entrance to the Tagus (estuary). Source: SPEA (2023)*

A second identified concern regards the cumulative and still little studied effects brought by OFWs to local marine ecology, especially avian fauna, such as removal and disturbance, collision, barrier, destruction, and habitat modification, and their implications for nesting and migratory species (SPEA, 2023). Stakeholders highlighted the need for a better understanding of spatial usage within the location or vicinity of exploration areas as practised by different species (Figure 5).

During the public consultation process, there was a considerable degree of opposition to the proposal of nearshore exploration areas, with surrounding municipalities like Matosinhos and Porto, stakeholders with relevant political power, expressing concerns over the visual impact of wind farms on the seascape (Negócios com Lusa, 2023). For instance, the Porto City Council has expressed its disagreement regarding the location of the Matosinhos exploration area, which was situated a mere three kilometres away from the "Site of Public Interest of Foz Velha". The local authority feared that a near-shore wind park could potentially result in a significant visual and landscape impact, which might interfere with the relationship the protected public area establishes with the encompassing landscape, including the Douro river mouth and the sea (Porto Canal, 2023).

Finally, there have been heated discussions about and opposition to the concurrent uses of marine space, particularly among fishermen (O Minho/Lusa, 2023), a group that unanimously contested the preliminary proposal for deployment areas (GTOffshore, 2023; Associação de Pescadores Ribeirinha de Viana, personal communication, September 2023; Pesqueiras Associação de Pescadores do Rio Minho, personal communication, September 2023). The exploitation of offshore and nearshore wind energy is a topic of great concern for fishermen operating at the mouth of the river Minho and on the coast of the district of Viana do Castelo - until now the only ones in Portugal who have had experience in dealing with the changes imposed by an infrastructure of this type installed on the coast with the experimental project "WindFloat Atlantic". In addition, the proposed area is also a matter of interest for the fishermen who use the "Pesqueiras", the fishing grounds of the river Minho (Pesqueiras - Associação de Pescadores do Rio Minho, personal communication, September 2023) even though these sites may be located up to 90 km away from the proposed exploration area (Figure 6). The reason for this is that the latter group relies on anadromous species, such as the sea lamprey and shad, which migrate between the sea and the river basin, and it is currently unknown what impact OFWs could have on these endangered and vulnerable species (DGRM, 2023a).

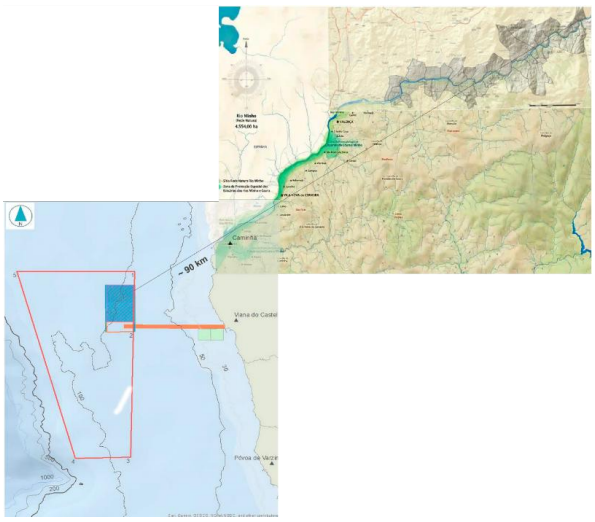

***Figure 6**. Location of "Pesqueiras"- fishing grounds of the river Minho (gray, top right) and Viana do Castelo preliminarily proposed offshore wind farm area (bottom left). Source: GTOffshore (2022) (left); Maria Fernanda Pacheco (2013) (top right)*

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The revised proposal

After conducting public hearings and supplementary sectoral meetings, the Portuguese government adjusted the suggested locations by redesigning, suppressing or splitting some areas and moving the polygons further away from the coastline (Figure 7), citing reasons related to commercial fishing, nature conservation, and national defence (GTOffshore, 2023). Despite the changes, some stakeholders, such as the Viana do Castelo fishermen's associations, opposed the result and protested that it did not fully reflect the agreement reached during the making of the plan, regretting that the polygon area still affects one of the most important fishing grounds of the region, the one known as "Secos de Viana" (Agência Lusa, 2025).

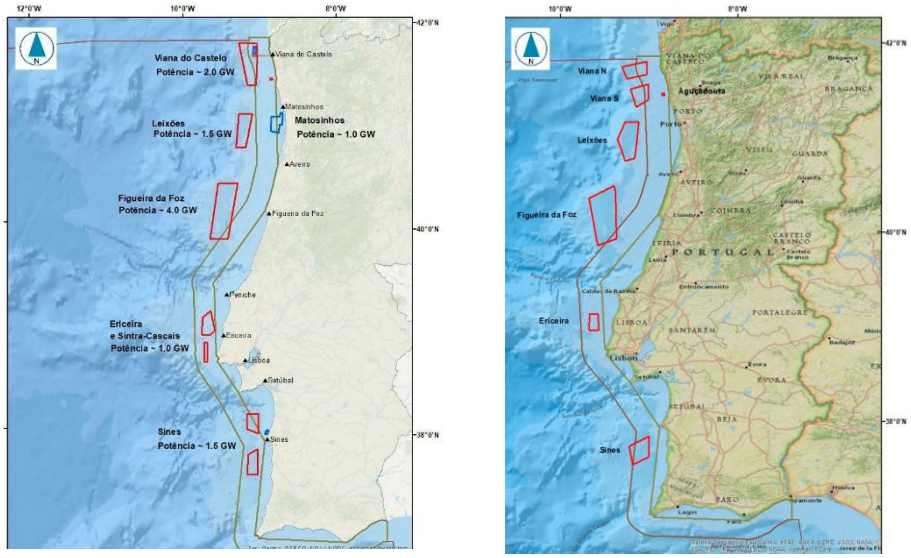

Figure 7*. Comparison of oreliminarily proposal (left) and final proposal (right). Source: GTOffshore (2022) (left) DGRM (2023b) (right)*

Discussion

The EU strategy to harness the potential of offshore renewable energy for a climate-neutral future recognises that the fulfilment of its goals will require the identification and use of a much larger number of sites for offshore renewable energy production (European Comission, 2020). However, the same strategy also assumes that spatialisation is a delicate process, as the ecological and socioeconomic impacts of exploiting designated sea spaces must be carefully balanced while also integrating other uses of the sea. We argue that a balanced outcome requires a comprehensive understanding of the seascape, recognising that the productive energy seascape is only one aspect of it, while others may also exist. It can be seen from the case that, initially, only the productive energy seascape was considered, while during the public consultation and supplementary meetings other types emerged according to the different stakeholders and networks involved (Table 1).

***Table 1**. Comparative view of the different relationships with the seascape. Author: Luís Carlos Martins Mestrinho de Medeiros Raposo*

Stakeholder	Seascape trait	Defining characteristic	Mediator
Offshore Energy Explorers	productive (wind resource)	wind potential	wind/sea bottom
Environmental NGO	existence	protected area	marine ecosystem
Environmental NGO	existence	fauna corridor	avifauna
Viana do Castelo fisheries	productive (fishing grounds)	fish habitat	ichthyofauna
Minho Estuary fisheries	productive (fishing grounds)	fish habitat	anadromous species
Municipality	cultural (scenic)	view	seascape

Interests are derived from the network of relationships established between stakeholders and the seascape in a variety of ways. Some of these relate to the qualities of the seascape, while others relate to its functioning. A number of these interests are mediated by the way the territory is used, not by the stakeholders themselves, as might initially be thought, but by non-human species. This phenomenon has been demonstrated by the examples of the Berlengas archipelago, where the proposed “Ericeira area” was later suppressed, and the coast of Viana do Castelo, where a particular fishing ground still sparks controversy. Furthermore, in the case of the Minho estuary, the way in which the anadromous fish use the marine territory has considerably expanded the area in which there are stakeholders in the development of the offshore project. Consequently, when planning the spatial arrangement of maritime infrastructure such as offshore platforms, it is essential to recognise a three-dimensional space that is embedded in a network of social relations between different actors operating within a broad ecosystem that includes human and non-human users of the seascape.

Thus, as shown, the allocation of space to support maritime infrastructure is likely to be more comprehensive if, as suggested by Fang et al. (2024), it is conceived in terms of the vertical stratification of the sea and considers its heterogeneous and distinct sub-layers composed of the space above, below and at the sea surface. Each component of these different layers, such as wind potential, sea bottom configuration, fish habitats, anadromous species, bird feeding grounds, can influence how different groups relate to the seascape and ultimately how they respond positively or negatively to the arrival of a new sort of seascape such as an energy seascape dominated by wind farms. This perspective may require changes in the way maritime planning is approached. For example, biodiversity is often viewed as a passive recipient of the planning process, and non-human agency is not recognised, even though, as we have seen, non-human entities can significantly influence the relationship. This was exemplified by the importance attributed to the present seascape characteristics and its relationship with the public realm, as evidenced in the case of Porto.

In this context, the quality of the urban environment is inextricably linked to the preservation of the current seascape *status quo*, and the seascape functions as a symbolic environment, mediating the relationship between the city and the sea. To mitigate this complexity, Jay (2012) proposes a relational approach, where space is seen as a dynamic sphere of interactions rather than a static plane for organising and mapping things. In fact, the European Parliament (2021) has already stressed the importance of early spatial planning to address both the placement and the layout of OFWs in a way that includes all the relevant stakeholders

and calls for effective participation to be set up at an early stage, to reduce and avoid conflicts. Nevertheless, the case study demonstrates a phenomenon that has been identified in the literature: in sustainable transition processes, there is a tendency to focus more on human agency and less on non-human agency (Contesse et al., 2021). What derives from the case is that when non-human agency is considered in spatial planning, it is mainly in economic terms of productivity (in this case wind potential and sea bottom configuration). However, as demonstrated, it should be noted that non-human agency may influence other stakeholder relationships with the seascape, expanding this group both in terms of its diversity and territorial extent. In addition, the case study shows that the process can easily take an economically driven approach[1], and that extensive participation may only occur at a later stage, leading to mistrust and avoidable conflicts.

Conclusion

Based on the analysis of the case study, it is likely that seascapes can be as controversial as landscapes in the planning of wind farms. This study reinforces what has already been noted in literature, that OFWs cannot be seen as a simple solution to mitigate resistance to onshore wind farms, as marine areas, like their land counterparts, can be seen as contested places. The case study also revealed that, despite recommended best practices and political guidance, stakeholders with strong ties to the seascape were not involved in the decision-making process from the earliest stages. This has led to mistrust and strong opposition in areas where the use of the sea is seen as conflicting, as in the case of the “Secos de Viana” fishing grounds, which remain controversial even after the legal diploma (República Portuguesa, 2025) approving the spatial allocation of the exploration areas has been sanctioned.

Given the urgent need to develop energy infrastructure at sea, future research should focus on investigating best practices or models for early stakeholder identification, including non-human stakeholders as suggested by Hernandez-Santin et al. (2023) and foster early engagement, as the public hearing tool has shown its limitations in building trust among stakeholders. Finally, it has been shown that certain aspects of the seascape, such as the dynamic flows that take place above and below the water level, cannot be overlooked when assessing the location of a marine infrastructure, as they have a non-human agency and are capable to influence how the different groups would relate to the seascape and have the potential to greatly affect how we measure the footprint of the project. This paper contributes to the field by demonstrating that the environmental characteristics associated with the seascape and the social construct formed between society and the seascape are capable of conditioning project viability and acceptance. It highlights the fact that the planning of offshore wind infrastructure is not only about considering how the spatial arrangement affects stakeholders, but also about understanding how the actor-network relationship is formed in such a way that the seascape itself is an actant capable of shaping this relationship with the public, resulting in the composition of the stakeholder spectrum and the level of social acceptance of a project.

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[1] The composition of the Interministerial Working Group supports this evidence.

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