

UNRAVELLING THE OFFSHORE WIND ENERGY TOURISM

Yoann Baulaz, Rhoda Fofack-Garcia

Abstract: The study examines the impact of offshore wind farm (OWF) development on tourism and leisure activities in France, focusing on the perceptions of tourism stakeholders and impacts on local tourism practices. It aims to understand how coastal destinations can adapt to the development of OWFs, considering the emergence of new services and form of industrial tourism.

The methodology employs surveys and spatial analysis to assess the impacts on tourism and perceptions for three French OWF project. This study also explores new tourism opportunities related to OWFs, analyses their connections with other forms of tourism, and compares the potential impacts across the three projects. The findings establish a baseline for long-term monitoring of OWF impacts on tourism and recreational activities. The study concludes that OWFs can drive the tourism economy, depending on existing forms of tourism and the industry's ability to capitalize on this new diversification opportunity. It defines offshore wind energy tourism and places it in the broader context of other forms of tourism, based on initial observations from the three case studies.

Keywords: Offshore wind energy tourism, Monitoring tourism development, Mapping practices, social perceptions

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Introduction

The development of offshore wind farm (OWF) projects in France is creating major changes in marine environments, territories and landscapes. As far as tourism and recreational activities are concerned, knowledge of the impacts of offshore wind power focuses mainly on tourists' perceptions of wind energy landscapes, and how these perceptions affect their behavior, activities and, ultimately, tourist attendance [1], [2], [3], [4].

By potentially altering marine and coastal landscapes, user practices and, more generally, societies' relationship with their environment, OWF can sometimes be seen as a hindrance (restricting uses), and sometimes as a development factor for tourism (new tourist services).

In the search for a compromise between tourism development and marine renewable energies development in France, the main question is how can coastal tourist destinations evolve in the context of offshore wind farms? Such a question presupposes a diagnosis and a long-term monitoring of the state and evolution of tourist activities, practices and attendance on the territories where the OWF are built.

In addition, there are methodological challenges to consider. Tourism and recreation involve a wide range of stakeholders, and many factors influence the development of coastal tourism [5]. The installation of an OWF adds elements to the tourism and recreation mix, modify landscapes and perceptions, and encourages changes in stakeholders and tourist behavior [6]. All of this occurs within a changing socio-cultural context, evolving practices and planning policies that (re)shape coastal tourism development. In this context, how can we identify the impact of OWF on tourism, taking into account all the influencing factors? How can we measure changes in tourism practices and the evolution of tourism attendance?

Objectives

This research joins the broad field of research into perceptions of offshore wind and renewable energies in general [7].

This paper proposes an initial fieldwork effort to establish a methodology for monitoring the impacts of OWF on tourism and recreational activities. The objective is to provide a baseline assessment of the tourism-related issues associated with the deployment of OWFs at the early stages of their implementation, using a comparative approach across three OWF projects. Additionally, the aim is to identify the initial manifestations of offshore wind energy tourism and define this form of tourism.

To complement the existing literature, we aim to move away from traditional approaches that focus on tourist behavior and attendance to contribute to the field of studies on tourism practices and perceptions [6]. This approach requires the development of specific methodologies to analyze potential changes in practices and perceptions of local tourism stakeholders, whether institutionalized (tourist offices) or private tourism providers.

Methodology

The study explores how coastal tourist destinations can adapt to the development of OWFs. It employs a geographical approach, enriched with sociological insights, to define “offshore wind energy tourism,” identify its presence in maritime areas, and examine its interaction with other forms of tourism.

This approach aims to characterize tourism services structurally and organically, while also analyzing perceptions from both private and public stakeholders involved in tourism development.

The methodology encompasses surveys and spatial analyses to gather both qualitative and quantitative data. This data will be analyzed and synthesized into maps to illustrate the tourism stakes in these areas and establishing a baseline for long-term studies. Additionally, the potential impacts of offshore wind energy on tourism are identified.

Study area

Three study areas have been selected, corresponding to the monitoring of three OWF projects in each French seafront:

1. The Banc de Guérande OWF, located off Le Croisic and St Nazaire in the Atlantic coast is operational since September 2022. Tourism in this territory is driven by a diverse range of habitats and landscapes, with three main touristic activities: recreational fishing, sailing, and hiking with landscape observation.
2. The Calvados OWF in Normandy, located off Courseulles-sur-Mer is scheduled to begin operating in 2025. Situated in the English Channel, near the historic Normandy landing beaches from World War II, the area is known for its heritage tourism. Visitors engage in activities such as exploring WWII relics, as well as enjoying coastal and sandy beach activities like sand-sailing.
3. The Gulf of Lion floating wind farm pilot site, located off Leucate in the Mediterranean Sea, is scheduled for beginning 2025. This area is known for its significant seaside tourism and strong wind conditions, making it a famous Mediterranean destination for kitesurfing.

These three projects were chosen because of their positioning (on each of metropolitan France's maritime façades), their technical characteristics (land-based and floating wind turbine technology; commercial and pilot wind farms) and the potential tourism issues to which they are exposed (off the coast of seaside resorts, close to special tourist attractions such as the D-Day landing beaches). The Banc de Guérande wind farm was also chosen because it was recently commissioned, allowing to identify the first potential manifestations of offshore wind energy tourism.

To delimit the study area around the wind farms, the state-of-art information was used, assuming that the impacts of OWF are primarily within the visible range of the turbines. This viewing area was set at 35 km from the turbines, consistent with the work of Sullivan et al. (2013)[8], who suggests that beyond this limit, visual impacts are moderate or even weak or insignificant.

The chosen approach is based on surveys and spatial analyses. In each of the study areas, surveys of tourism service providers were carried out between May

and October 2023. The survey covered all tourist services that could be affected by the OWF (through a loss or gain of economic or non-economic benefits). This mainly concerns nautical activities, beach activities or activities in harbors or on the backshore (e.g. museums). Semi-structured interviews were conducted with service providers offering these activities, with three objectives in mind:

1. identify the content of the tourist services on each study site,
2. analyze potential changes in practices resulting from the construction or operation of the OWF,
3. qualify tourism providers' perceptions of wind farm development.

At the same time, semi-structured interviews were carried out with tourist office managers and elected officials in charge of tourism development in local authorities. The aim of these interviews was to:

1. identify local tourism issues and strategies,
2. describe the specific features of the areas studied from a tourism point of view, and identify the main tourist activities and sites,
3. identify if the development of OWF is included in the community's tourism development strategy,
4. qualify the perception of tourism managers towards the development of OWFs.

A quantitative sampling approach was not chosen. Instead, the aim was to obtain at least one representative from each tourist service and all tourist office directors within the study area. A larger sampling effort was deployed in the Banc de Guérande territory, as the OWF was already operational at the time of the field survey. Therefore, the goal was to obtain three representatives for each of the tourist services present in the territory whenever possible. In this way, 19 people were sampled in the Banc de Guérande area, 12 in the Calvados area and in the Gulf of Lion area.

Table 1 – Number and type of stakeholders met at each study site.

Study site	Calvados	Banc de Guérande	Gulf of Lion
Recreation service providers			
<i>Recreational fishing</i>	1	2	1
<i>Sea excursions (boat, kayak)</i>	2	3	2
<i>Diving</i>	1	1	1
<i>Sea gliding sports</i>	2	3	1
Tourism representative			
<i>Tourist office receptionists</i>	5	6	5
<i>Tourist office managers</i>	3	3	3
<i>TOTAL</i>	13*	17*	13*

*Some service providers propose different recreation services.

Results

1. Characterizing local tourist destinations

In all three study sites, “blue tourism” is identified, involving travel and activities centered around beaches, coastal climates and sea-related activities [9]. This tourism significantly contributes to the economy and coastal development, characterized by specific urban and landscape features, including tourist resorts. Notable examples include La Baule (figure 1,B), and Port-Leucate (figure 1,C) developed under the “RACINE project” to redesign the Gulf of Lion coastline and create seaside resorts infrastructures for 5000 tourist beds between 1960 and 1980.

A nature tourism is also strongly developed in the backshore, focusing on nature appreciation and observation in locations away from urban areas. Several itineraries aim to showcase the natural heritage in the protected areas. This tourism is generally linked with a green tourism, that emphasizes “small scale, modest development using local labor, traditional style buildings, consumption of local product [10]. Nature, sport and blue tourism often intersect, as seen in Leucate area particularly renowned for board sports on water, known for the largest French coastal Mediterranean area dedicated to kite-surfing. In the Calvados, nautical sport such as sailing and sand yachting are also well-developed and recreational fishing in Banc de Guérande area.

Another form of tourism found on port coasts is industrial tourism, which showcases industrial sites and facilities where tourism is not the primary activity [11]. Activities include visits to companies, manufacturing facilities and both abandoned and active industrial sites. Industrial tourism often overlaps with business tourism, relative to business travel [12]. This form of tourism is prominent around the industrial port of Saint-Nazaire (Figure 1, B). The tourist office offers visitors the chance to explore the liners at the Escal’Atlantique museum, the World War II submarine base, blending industrial tourism with history and heritage tourism. In addition, some industrial companies, such as Chantiers de l’Atlantique and the Grand Port Maritime, offer tours of their facilities. In contrast, industrial tourism is less evident at the other two study sites, although Port-la-Nouvelle hosts significant port facilities (figure 1,C).

Lastly, cultural tourism, which involves discovering, understanding and appreciating the cultural, historical and artistic heritage of a destination, is still somewhat present. In the Calvados, remembrance tourism is predominant, due to the region's historical significance from World War II. This includes the D-Day landing beaches, museums like Juno Beach Centre (Courseulles-sur-mer), or the D-Day Museum (Arromanche), as well as memorials, military cemeteries and emblematic sites. There's a strong cultural identity associated with this period of history.

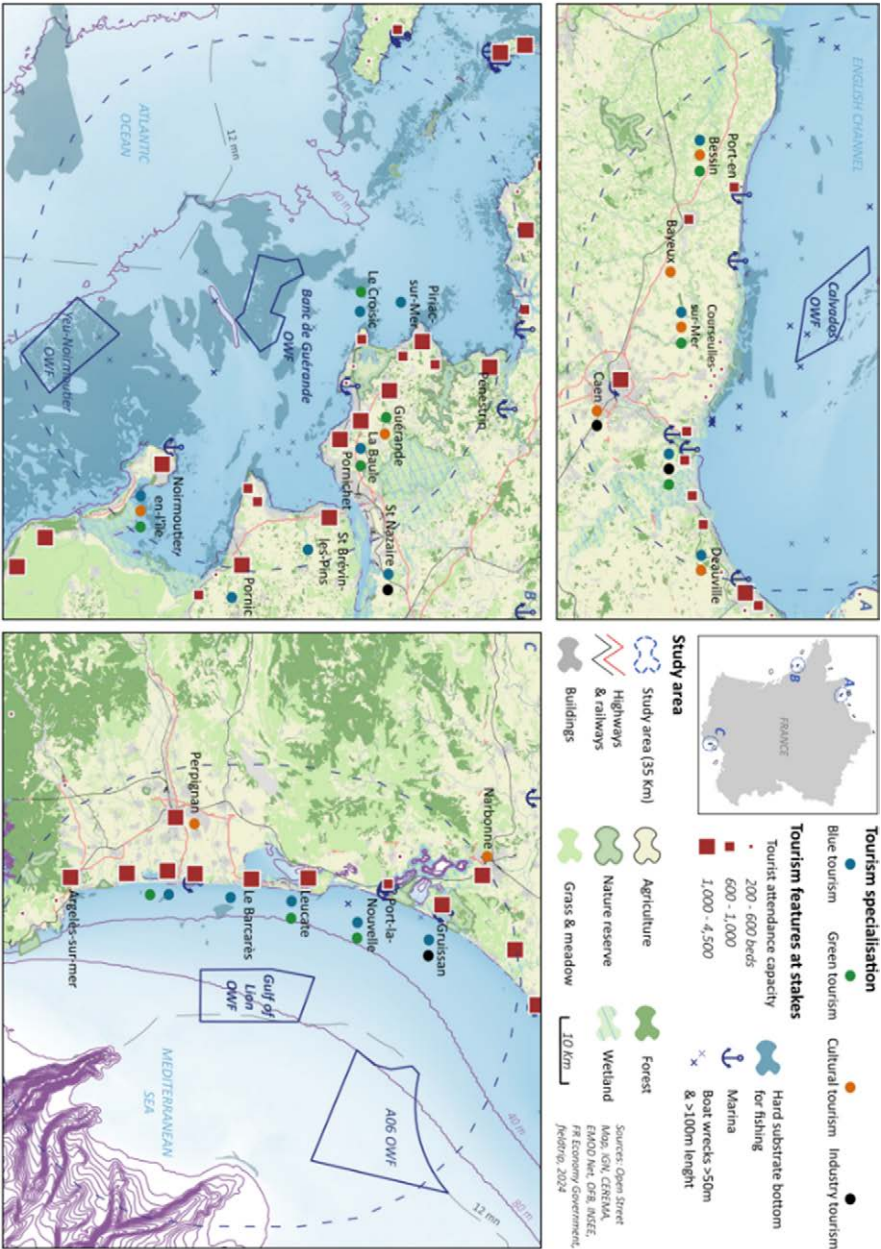


Figure 1 – Mapping of tourism issues near the three OWF case studies. The tourism features at stake were obtained from online digital data analyses, and the tourism specialisations was gathered from interviews with tourism management stakeholders.

2. Comparative analysis of the impacts of OWF on tourism and recreational activities

Fieldwork has empirically highlighted the need to distinguish between two types of potential impacts of OWF development on tourism activities. Firstly, a "material" impact, which refers to the influence of a wind farm on users' ability to carry out their activities and their spatialization. Secondly, an "immaterial" impact, relating to users' perceptions, emotions and representations of their environment, the territory and landscapes. This section, differentiate between these two types of impacts and present the new recreational practices and first manifestations of offshore wind energy tourism.

2.1 Influences of offshore wind farms on practice areas

Field surveys indicate that OWF impacts of the practice area is a crucial parameter, as the development of OWFs impose direct limitations on navigation activities. This encompasses restrictions on access to turbines, cables and inland infrastructure construction areas, as well as limitation on activities during the operation phase. While most northern European countries prefer to prohibit access to OWFs except in designated shipping lanes, France wants to minimize the impact on shipping and fishing. For the Banc de Guérande OWF, navigation is permitted within 50 meters of the turbines and 200 meters of the substation for boats less than 25 meters in length. These boats must maintain a speed limit of 12 knots and be equipped with an AIS (Automatic Identification System) transponder. Anchoring, underwater and towing activities and dragging are strictly prohibited. During construction, certain recreational activities outside the wind farm area may also be restricted, such as diving. In the Gulf of Lion OWF, diving sites along the cable route were closed for several months for example.

Activities on the beach may also be affected during the construction, with potential access prohibition of the "cable connection beach" for several months, typically outside the summer season. In return, OWF developers generally implements compensatory measures. For the Banc de Guérande OWF, the developer has funded improvements to beach services, including extending the parking area, building a ramp for disabled access, and installing sanitary facilities. In the Calvados OWF, the developer financially compensated a beach restaurant that was forced to cease operations during construction.

Other potential OWF impacts concern landscape modifications. Co-visibility issues may arise at sites where a heritage or landscape element and a wind farm are simultaneously visible, potentially affecting the attractiveness of these sites due to their associated scenery.

Assessing the landscape impact of OWFs is challenging due to its dependence on subjective parameters and its dynamic nature. Visibility of OWFs varies with distance, as wind turbines can be seen up to 40 km away or even more [8], depending on weather conditions and the turbines' technical characteristics (size, number, alignment, distance from the coast). Topography also plays crucial role, extending the horizon and making turbines visible over greater distances. Views of the ocean and OWF may be obscured by vegetation and buildings. Local weather phenomena, like coastal fog can either obscuring the turbines or enhancing their

visibility through sunlight reflection. Finally, the combination of atmospheric pressure conditions and relief can create “magnifying glass effects,” making the turbines appearing larger and closer. This phenomenon is particularly noticeable in the city of Guérande (Figure 1, B). Situated 40 meters above sea level and 7 km inland, Guérande offers an unobstructed view down to the sea, and this specific phenomenon gives the feeling that the turbines are positioned right on the coast.

2.2 Perception of the risks of offshore wind energy on tourist activities

This section presents a comparative analysis of the perceived impacts of OWF on tourism for each study area. The analysis is based on two axes: 1) qualitative perception of the potential impacts of OWF development on recreational activities and tourism development, 2) a semi-quantitative assessment of these perceptions. It is important to note that the semi-quantitative evaluations were conducted on a small sample of stakeholders. While valuable for inter-site comparisons and risks assessments across different items, the quantified values should not be considered in another context.

The first item surveyed addressed the impact on the landscape. We observed significant variations between sites, with predominantly negative perceptions in the Atlantic and Channel regions, and more benign to positive perceptions in the Mediterranean region. In banc de Guérande OWF, the impact on the aesthetic quality of the landscape elicited mixed views from stakeholders. Perceptions were more negative in Le Croisic and Batz-sur-Mer compared to St. Nazaire. Several stakeholders mentioned a sense of “injustice”, noting that St. Nazaire benefits from the OWF project in terms of employment, tax revenues, and image, while Batz-sur-Mer and Le Croisic experience limited benefits and maximised landscape impacts. In the Calvados region, stakeholders report difficulties in visualizing the wind farm’s impact on the landscape due to the fact that the wind farm construction was not finished at the time of field survey, leading to generally negative perceptions of potential impacts. Conversely, Leucate is the only area where perceptions are rated as benign to positive. Stakeholders highlight that over 200 onshore wind turbines are already visible in the retro-littoral landscape, suggesting that the OWF is unlikely to have a significant additional impact. Finally, potential landscape impacts are often weighed against the benefits of renewable energy. Many stakeholders at each site mention they are “prepared to tolerate visual nuisances if offshore wind energy helps to combat climate change.” Some also mentioned a preference for wind energy over nuclear or fossil fuels concerning the landscape impacts. A sense of habituation is also evident among some stakeholders in La Baule and Le Pouliguen (figure 1,B), who mentioned that the OWF has already become a part of the landscape, six months right after the end of its construction.

Stakeholders then assessed the impact of OWFs on their activities and shared their personal opinion. Consistently negative assessments were found in the Calvados, whereas potentially positive impacts were noted in the Atlantic and Mediterranean regions. In Calvados, a small portion of local stakeholders are voicing concerns about the “image” and representations that an OWF can bring to the territory. They fear that OWFs, seen as symbols of technological innovation, could overshadow the duty of preserving historical heritage. Conversely, in the other two regions, the impacts on activities are considered benign by coastal service

providers, who believe that OWFs is too far away to affect their activities. For offshore stakeholders like sailors, the impacts are seen more positively, as the OWF presents opportunities for developing new boat tour or to complement activities of fishers and pescaturism operators.

Regarding the impact of wind power on local tourism development, perceptions were slightly negative in the Atlantic and English Channel regions, but slightly positive in the Leucate region. In Banc de Guérande, at the time of this survey, tourism stakeholders do not perceive any significant changes due to the OWF. In Calvados, the arguments often reflect personal opinions, highlighting concerns about a potential conflict between offshore wind energy tourism and remembrance tourism, demonstrating how deeply this concern is rooted in the community. Institutional tourism stakeholders emphasize the economic benefits of offshore wind energy tourism, including OWF visits, marine energy exhibition centers, and educational projects. These initiatives, already present in Banc de Guérande territory, inspire Normandy's tourism sector to develop a sea-themed exhibition center that honors both D-Day events and the OWF development. This example shows that these tourism forms are not seen as conflicting by all stakeholders. In this regard, the wind farm developer even proposed naming each turbine after a D-Day landing boat. One final element that highlights the positive attitude of tourism stakeholders towards the OWF development is that in Leucate they lament the wind farm's location over 12 km from the coast. At this distance, navigation is prohibited for most recreational boaters, preventing the offering of boat trips, or other potential services.

In line with perceptions of the impact on tourism development, the effects on tourist attendance are considered benign to positive. In most cases, stakeholders mention that coastal areas are experiencing strong attractivity since COVID-19, and they believe that the OWF presence is not a factor that influence the choice of coastal destinations for tourists. Some even mentioned that OWF could attract new tourists, curious or enthusiastic about industrial tourism.

The final question concerned the impact of OWF development on territorial media coverage and promotion of the territory. Here, the results were uniformly positive, with some stakeholders feeling that their territory is being talked about much more in national news and medias because of the OWF project. This is particularly the case in Normandy. Also, the "wind's significance" in Leucate's identity greatly influences tourism stakeholders' perceptions. Known for kitesurfing and windsurfing events like "Mondial du Vent" and "Defi Wind", the region's strong association with wind and water sports suggests that offshore wind energy is well-suited, offering collaboration opportunities between wind energy developers and local sports communities.

The development of OWFs has elicited varied perceptions from tourism stakeholders across the different studied regions. In the Banc de Guérande area, the wind farm is viewed as an opportunity, with stakeholders highlighting potential economic benefits and the enhancement of existing industrial tourism. In Normandy, there are plans to integrate offshore wind energy into tourism strategy, but significant concerns remain about potential conflicts between wind farm tourism and World War II heritage tourism. In Leucate, the strong association with wind sports and existing investment in onshore wind energy has led to a more

neutral stance, with potential for collaboration between wind energy developers and local sports communities. Overall, while perceptions vary, there is a general recognition of the potential benefits of offshore wind energy tourism.

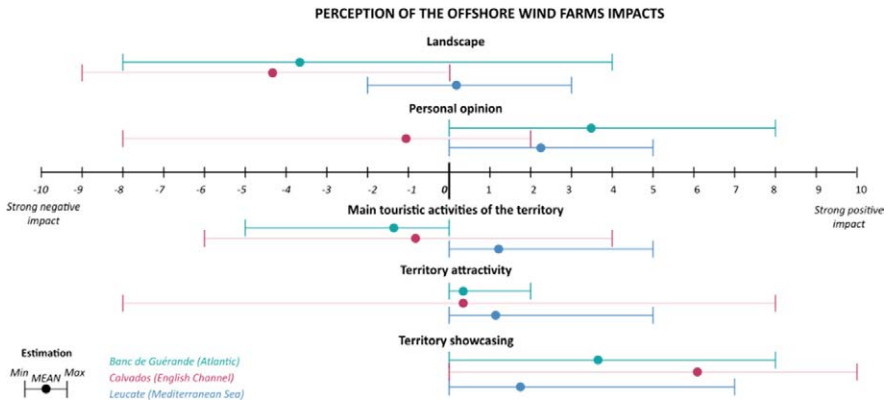


Figure 2 – The summarized evaluations of the perceptions of the impacts of OWF development on various topics related to recreational activities and tourism development strategies on the three case studies. These evaluations were averaged from the perceptions of all stakeholders interviewed. The scale used to estimate perceptions ranged from -10 (strong negative impact) to 0 (no impact) to +10 (strong positive impact).

2.3 New recreational practices linked to offshore wind energy tourism

The Banc de Guérande serves as an excellent example of how an OWF can present opportunities to further expand the already well-developed industrial tourism in the region. Local tourism stakeholders have seized the opportunity to develop a specific “offshore wind energy tourism,” that can be defined as a specific type of industrial tourism attracting people interested in the technical, engineering and ecological aspects of marine renewable energies. This form of tourism appeals to various groups, including young people, families, intergenerational groups, or companies. This form of tourism reflects the evolving preferences of visitors to seaside resorts and coastal destinations. A tourism office director explains that nowadays, tourists seek more than just relaxation, beach time, or sports activities; they are increasingly drawn to experiences that offer discovery and learning. In the Banc de Guérande area, offshore wind energy tourism takes two main forms: boat tours to visit the wind farm and a museum dedicated to offshore wind energy - the EOL Center.

Since construction began in 2022, several tourism operators have incorporated the wind farm into their offerings. By the summer of 2023, four operators were offering guided boat trips to visit the OWF. The two main companies, offer cruises for large groups (25 to 130 people), and two smaller providers offer discovery tours for less than 20 people, usually combined with other activities such as introduction

to fishing and visits to the coast or marshes. On average, a visit costs 70 euros per person, this activity is very popular, with all boat tours selling out fairly quickly from the start of the season and quite beneficial for operators. For example, one of the two main operators ran six cruises during the summer of 2023, allowing 1057 people to visit the wind farm, represented 28 620 € sales. In terms of content, a commentator trained by the wind farm developer and familiar with the history and operation of the OWF presents the project, its history and technical features.

Visits of turbine construction sites and manutention bases are also proposed, including tours of port facilities where the machines are stored before being deployed at sea, as well as factories where turbine components are manufactured. Most offshore wind energy tourism services occur within the wind farm viewing area, though factory visits may require travel to more distant locations (e.g. the Siemens Gamesa factory in Le Havre is located 50-100 km from the Calvados OWF).

In addition to boat and factories trips, exhibition centers dedicated to offshore wind energy are being developed. The EOL center, inaugurated in 2021 in ST Nazaire port, educates and raises public awareness of offshore wind energy. The museum welcomed 25 625 visitors in 2022. It comprises four rooms and a rooftop observatory, offering interactive exhibits and information on the history and operation of the Banc de Guérande OWF. A second exhibition center is planned in Le Croisic, focusing on marine energies and their relationship with biodiversity. Similar projects are also being considered in the Calvados region.

Finally, a significant aspect of offshore wind energy tourism is the dissemination of information regarding the wind farm's construction, operation, and environmental impact. This is achieved through permanent exhibits on information panels located along the coast facing the wind farm and at various viewpoints. Additionally, temporary information panels are set up in tourist offices and public buildings. Similarly, the enrichment of the discourse and content of guides on the various activities on the coast can also be considered here.

Discussion - conclusion

The integration of offshore wind energy tourism with marine-coastal territories presents a multifaceted opportunity for regional development. This form of tourism is, by nature, strongly intertwined with blue tourism, encompassing a wide range of activities both on the coast and at sea (UNWTO, 2008). This connection extends to various forms of tourism, including adventure, cultural, urban, rural, and nature tourism. The presence and the construction of OWF industrial projects can also enhance business tourism and the region's image as a proactive player in combating climate change, thereby promoting green and sustainable tourism.

The study conducted in three OWF case studies in each French seafront provides valuable insights into the potential impacts of OWFs development on local tourism and recreational activities. Initial findings indicate changes in recreational boating and fishing practices, as well as coastal activities within the visual range of the wind farms. These observations align with existing international literature, suggesting that the primary impacts of OWFs on tourism are localized

around the vicinity of the farms and their visible areas [1], [3], [10], [13]. OWFs offer new visitor experiences, such as boat tours and exhibition centers, which have proven to be popular in the first French OWF region. More indirectly, OWF developers often contribute to local tourism development by funding local sporting and cultural events or museum restorations. These contributions represent the potential positive impacts of OWF on local tourism development.

The study underscores the varying perceptions among coastal, offshore, and institutional tourism stakeholders. While most tourism providers and tourist office staff anticipate a benign or even positive impact on tourist activities, they do not expect the wind farms to significantly influence tourists' choice of destination.

Several factors influence perceptions, including the size of the wind farms, their distance from the coast, and the importance of wind and renewable energies in the local territorial identities. Differences in territorial representation and tourism specializations play also a crucial role in shaping these perceptions. Regions with multiple tourism activities and a wide diversity of tourism forms, may be potentially less affected by OWF development, as it may diversifies local recreational opportunities. If industrial tourism is already well-developed, as in the Banc de Guérande area, then the development of an OWF can significantly boost the local tourism economy. Conversely, regions with specialized tourism, without relation to industrial tourism, such as Calvados, may view OWFs more negatively. These areas may require more targeted and innovative efforts to integrate wind energy tourism within their existing services.

Moreover, the tourism impacts of OWFs are rarely considered in relation to other socio-economic sectors or territorial development strategies. This oversight is significant, as fiscal contributions from wind farms often support tourism enhancement [6]. Additionally, tourism can sometimes conflict with other activities, such as professional fishing [14]. Given tourism's importance in public policy and coastal governance, the indirect effects of OWFs on tourism warrant careful consideration.

Future research should explore these dimensions further to better understand how to integrate tourism benefits with OWF development. The associated key question is whether the offshore wind energy tourism, driven in large part by the tourist curiosity, can be sustained in the long term.

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