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The Impacts of Offshore Wind Farms (OWFs) on Local Tourism and Recreation -- Evolving Lessons from Practice

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Abstract

The article examines the nature of impacts of the rapidly growing Offshore Wind Farm (OWF) industry on tourism and recreation in coastal communities, especially in the UK. The multi-methods research approach includes reviews of literature, content of OWF Environmental Statements (ESs) for predicted impacts, recent practice for actual impacts, and the use of mitigation and enhancement measures. Findings from literature indicate that the overall impact on tourism appears relatively benign, and sometimes positive. The UK ES review identified tourism as an important topic, identifying mostly no/negligible predicted negative impacts, and some examples of predicted positive impacts. There is limited use of enhancement measures, including visitor centres and boat trips, and a previously under-reported use of developer community benefits funding for local area recreation and tourism facilities. Recommendations include early engagement with the community, developer long-term commitment to mitigation and enhancement measures, plus monitoring of tourism and recreation impacts over time.

Keywords
Offshore Wind Farms; impacts on local tourism and recreation

1. Introduction – Mixed Messages

Offshore wind is a dynamic and rapidly evolving renewable energy industry, and a vital element in the transition to a greener energy future. This is particularly so in Europe, and especially in the UK. Offshore Wind Farms (OWFs) are usually large projects in terms of spatial spread and development expenditure. Such projects normally require specific planning and assessment procedures, including an Environmental Impact Assessment (EIA), in advance of any development consent. For OWFs, the focus of EIA activity, and the content of resulting Environmental Statements (ESs), has been on the biophysical impacts, especially on birds and marine mammals. There has been much less ES content on the impacts on the human environment, and especially on those local and regional coastal communities near to offshore projects. Human environmental impacts include a wide range of social and economic issues.

There is a growing recognition of the importance of local community support in the development of major projects such as OWFs, encapsulated in the concept of a social licence to operate [1]. There is also a growing international interest in assessing socio-economic impacts of major projects, as evidenced in IFC/World Bank performance standards [2] and the IAIA Guidelines for Social Impact Assessment [3]. In England, statutory guidelines for the assessment of OWFs [4] specify a set of socio-economic impacts for consideration, including workforce lifecycle, jobs, training *and effects on tourism.*

The aim of this article, and its innovative content, is to examine the nature and balance of the impacts of OWFs on tourism and recreation activities in adjacent coastal communities using a multi-methods approach. This approach includes a review of relevant literature, an examination of the content of predictive Environmental Statements, assessment of actual practice case studies, and appraisal of mitigation and enhancement measures, including the little covered topic and potential of tourism and recreation Community Benefits. The conventional wisdom on such tourism and recreation impacts is mixed. Are impacts generally positive, or might they be negative and a deterrent to visitors and locals alike? How do impacts vary with distance from coast, and between the construction and operation and maintenance (O&M) stages of the OWF project life? What approaches do developers and other stakeholders use to mitigate and enhance impacts, including for example community involvement; visitor centres; boat trips; and community benefit schemes? The article draws partly on research for the European Offshore Wind Deployment Centre (EOWDC) Environmental Research and Monitoring Programme supported by the EU and Vattenfall, and based on the EOWDC (Aberdeen, Scotland) OWF.

Much of the focus of relevant literature has been on tourism and recreation impacts of *onshore* wind farms, reflecting their early predominance in the wind farm industry. There have been many such UK studies, relating to the growth period for onshore developments up to c2015. A brief review of such studies provides some guidance to the potential impacts of offshore wind. A Scottish Power Renewables study [5] provides a good summary of key literature on onshore wind farms, especially from studies in Scotland and Wales, as does work by Aitchison [6] who sums up the general findings

in the following quotation. "*Previous research from other areas of the UK has demonstrated that windfarms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction). Moreover, to date, there is no evidence to demonstrate that any windfarm development in the UK or overseas has resulted in any adverse impact on tourism"*. Later studies by Regeneris [7] for locations in Wales and Biggar Economics [8] for locations in Scotland reinforced this conclusion.

The *offshore* wind farm industry is a more recent but rapidly growing phenomenon, especially in the UK, which in 2020 had c25% of European OWF operational capacity (c10 Gigawatts [GW]) in more than 40 projects) [9]. Whilst early OWFs were quite small, recent developments are regularly over 500 Megawatts (MW) and many over 1000 MW. Early developments tended to be close to shore and very visible; in contrast, many of the recent developments are further off coast, some over 100 km, and not at all visible from the shore. This of course raises questions as to whether some OWFs are of any significance for tourism at all --- *out of sight and out of mind.* However, all OWFs come ashore at coastal locations, and have construction and especially O&M stage impacts. Whilst impacts vary from stakeholder to stakeholder, findings from the literature indicate that the overall impact of OWFs on tourism appears relatively benign, and sometimes positive. Indeed, in some cases, OWFs may be a tourism attractant by virtue of their modern, innovative and novelty factors, and have a positive impact on tourism. Table 1 provides some contextual material from the literature, as summarised by Smythe et al. [10].

Table 1 Summary of contextual material from the literature on impacts of OWFs on tourism and recreation.

- "*When an offshore wind energy project is proposed, people in communities near the proposed site and other interest groups frequently raise concerns that the project will affect tourism and recreation* [11, 12]. *Although there is often a presumption that wind energy projects threaten tourism (via visual impacts and resource-use conflicts), people also raise the potential of offshore wind farms acting as an asset to the tourism industry* [13]*".*
- *"There is little empirical evidence for how wind energy projects have affected tourism and recreation; however, the literature suggests that wind farms do not negatively influence tourism to a substantial degree, and in fact, they may act as a minor attraction* [14]. *Most works on windfarm tourism impacts examine the potential impacts of a proposed wind farm, based mostly on the responses of tourists or residents to visual simulations. These studies provided mixed results for whether a wind farm would dissuade or attract visitors to an area".*
- *"With relative consistency, researchers find that stakeholder concerns about visual impacts of offshore wind farms decrease as distances of the wind farm from shore are increased* [14-18]. *There is some evidence that frequent visitors to an area may be most concerned about potential wind farms, based on their desire to preserve natural or pristine settings* [15, 16]. *Researchers stress that tourists are not a singular group, and that their attitudes towards wind farms are influenced by personal factors, beliefs about renewable energy and the environment, and motivations for tourism and perceptions*

about the landscape [17-19]. *There is also evidence that wind farms can attract tourists or revitalize tourism sectors* [20, 21]*".*

Overall, research has been on the perceived impacts of operational OWFs, with much less on the construction stage. There is also little hard evidence of actual, or lack of, impacts. Keuhn [22] points to the continued existence of a tourism industry close to an OWF site and there is reference to the success of the Scroby Sands OWF visitor centre, with 35,000 visitors in one summer season [23]. However, because of much uncertainty of impacts, and lack of empirical evidence, Rudolf [12] concludes that -- "*a comparison of changes in definite numbers of tourists, before and after the construction of a wind farm, is the only sound indicator to measure impacts on tourism that may likewise have noticeable economic repercussions".*

The next section sets out the research approach, followed by a discussion of the impacts predicted in ESs by developers and their consultants, and actual experience and findings from practice.

2. Research Approach

The research Includes impacts on both local recreation and tourism, especially for the maritime environment in the UK, but with some comparative experience from the EU and the US. Recreation and tourism can represent different stakeholders and some different, but also some overlapping, activities. Recreation for example includes swimming, local fishing, yachting, and cycling and walking on the coast. Tourism visits are for all the usual tourism activities (e.g. sightseeing, beach/coastal walking, local touring, heritage site visits, coastal entertainment facilities, and dining). Further definitions of maritime tourism are set out in the *EU Maritime Spatial Planning platform* [24]. This shows some overlaps between maritime tourism and recreation, and between water-based and land-based activities (e.g. recreational fishing from shore or from a boat). Many activities may be publicly and freely available; the private and public sectors may provide others for a price.

There is a variety of stakeholders involved in the tourism and recreation activities, with a variety of perspectives on the impacts of OWFs. Broadly, there are user groups and provider groups. A US study for a Rhode Island site on Block Island [10] identifies four main categories, two user (recreationalists and tourists) and two provider (recreational and tourism professional) groups. There can be conflict between these groups with, and indeed without, the presence of an OWF. Local people may resent the seasonal pressure on their recreational resources, whereas local businesses may welcome such pressure as a main source of their income. The presence of an OWF adds an additional element into the tourism and recreational mix. The EU MSP platform [24] notes examples of potential stakeholder conflicts associated with an OWF, as set out in Table 2.

Table 2 Examples of potential stakeholder conflicts associated with an OWF.

- *Conflicts arise over the attachment people have to a particular landscape (fears of the visual impacts of wind turbines) and access to certain sea areas.*
- *Stakeholders related to beach and coastal tourism are concerned that the visibility of OWFs from the coast reduces the attractiveness of the place. This can negatively influence the number of visitors and could have effects on the local economy.*

- *Not only tourists, but also local property owners (residents and second homeowners) are concerned that OWFs could decrease the attractiveness and therefore the value of their house. Stakeholders related to sea-based tourism, such as recreational boating, may have more difficulties accessing the open sea. OWFs can block potential sailing routes, or restrict the available space for other recreational activities, such as windsurfing or diving.*
- *The visual impact of OWFs – whether real or expected – can give rise to emotional discussions. People can be very attached to a particular place and may strongly resent the visual intrusion caused by an OWF.*
- *Although the conflict over an OWF may appear small, it can quickly escalate if concerns are not taken seriously.*

Section 3 focuses on predictions and includes a review of secondary sources on predicted impacts of actual OWF projects, drawing on a contents analysis of ESs and associated reports for OWF developments in the UK and in some EU states. Section 4 includes some evidence on actual impacts documented in a number of case studies from the UK, EU and US. To complement these, the researchers undertook a small number of case studies across the British nations of specific OWF project coastal locations that provide a primary and more detailed and targeted examination, by direct survey, of impacts and of mitigation and enhancement responses to those impacts. These include Aberdeen (Scotland), Scroby Sands (Great Yarmouth, England), Rampion (Brighton, England) and Gwynt-y-Mor (North Wales). The article provides findings from one of these, the Aberdeen OWF. Section 5 draws on the ES review and case studies to identify emerging approaches to the mitigation of negative impacts and the enhancement of positive impacts of OWFs on local tourism and recreation. Section 6 highlights the increasing significance for local recreation of community benefits agreements, of various types, associated with OWFs.

The article notes some possible factors that underpin the findings, including the changing nature of OWF projects (especially size and location), and the shifting power relationships between the key stakeholders. Section 7 draws together key findings from the multi-methods approaches on the impacts of OWF developments on local area tourism and recreation, and their possible determinants, concluding with some recommendations for future practice.

3. Predicted Impacts – A Review of Environmental Statements (ESs)

Under the EU EIA Directive [25], implemented by various national regulations, it is mandatory to carry out EIAs for large OWFs (e.g. of at least 50 MW in the UK). Such assessments are set out in Environmental Statements (ESs). Our UK research reviewed 62 projects -- 37 commissioned and operational, with the earliest operational station dating back to 2000. In general, projects up to 2010 are quite small at less than 100 MW. There is then a major growth in number and MW size. Hornsea 1 at 1200 MW, which became operational in 2020, is currently the largest UK operational OWF. Many other projects are in the construction and/or planning and assessment stages, and some of these will be up to 2000 MW. The research found ESs for most projects, although for some it was only the Non-Technical Summary (NTS). The EU study reviewed 43 projects in eight Member States – Netherlands, Belgium, Denmark, Germany, Finland, Sweden, France and Ireland. The largest number of projects were for the first four countries in this list. Thirty of the projects are operational.

Many date from the early 2000s, especially in Denmark, and are small at well below 100 MW, compared with subsequent later and larger projects, for example in Germany and the Netherlands. ESs were located for about half of the projects.

The projects were divided by distance from the coast into four categories: (1) up to 16 km offshore (turbines considered a major-focus); (2) up to 29 km (turbines noticeable to casual observer); (3) up to 40 km and beyond (turbines visible with extended or concentrated viewing); and (4) >60 km (turbines not visible) [26]. The review of ESs used a template to identify any coverage of tourism and recreation impacts (negative/positive), assessment of impact significance, and mitigation and enhancement measures (including, for example, a visitor centre and various entrepreneurial enterprises such as boat trip businesses).

The review of ESs identified tourism as an important impact topic in almost all the reviewed UK ESs; although interestingly there was some scoping out of the topic for some recent Scottish based ESs (e.g. Inch Cape; see Table 3). Tourism is addressed along with socio-economic factors, with visual impact at the forefront. For example, the East Anglia 2 ES [5] states, "*During the offshore windfarm's operation, the potential effect is driven mainly by the visual change to the seascape"*. The UK ESs predict mostly no or minor/negligible impact on tourism and recreation, although there are a few examples of predicted positive impacts. The majority of ESs separate impacts by project stage and onshore and/or offshore impacts are considered; again, there is little variation in the nature of predicted impacts. Table 3 below sets out some examples of impact predictions.

Table 3 Some summary examples of UK OWF ES predicted tourism and recreation impacts.

OWF	Summary comments
Beatrice	The effect on tourism is defined largely by the findings of other assessments, such as the seascape, landscape and visual assessments. Significance of impact considered minor.
Aberdeen	The ES assessed impacts on tourism, for example from visual effects on landscape and seascape potentially to deter tourist visits, and effects on local coastal recreation activities, as of negligible significance.
Hywind	Overall, the ES assessed impacts on key tourism attractions and recreation activities as of negligible significance for both construction and O&M stages. Economic impacts specifically for new boat tour operations considered positive, although of minor impact and significance.
Kincardine	The development is expected to have a negligible impact on tourism and recreation in the local area. The distance of the development from the shore and very limited onshore development element means there is no impact on existing tourism and recreation uses and users in the local area.

Inch Cape	No impact: consideration of the potential for tourism and recreation visual effects during the construction (and decommissioning) stage and the O&M stage scoped out of assessment.
Westermost Rough	The assessment concluded that during the O&M stage of the wind farm, the visual effects will be limited by the elevated coastal edge of the Holderness Peninsula and the Humber Estuary and impact will be no more than moderate for users of the coastal areas.
Hornsea 1	Negligible adverse. Overall, the evidence suggests that offshore wind farm developments generate no or a very limited negative impact to offshore tourist and recreational users during the construction and O&M stages.
Dogger Bank Creyke Beck	No or minor adverse impact. May be moderate adverse associated with onshore recreation receptors of high sensitivity – e.g National Cycle Network Route 1.
Greater Gabbard	Due to its position offshore, the wind farm is unlikely to produce any significant impacts, positive or negative, on the Suffolk coast. Anecdotal evidence suggests that wind farms enhance local generic attractions by providing 'more to see' in the vicinity. However, local feeling in Aldeburgh, as stated in a public exhibition questionnaire, indicated that the town already had too many tourists. No respondents to this survey felt that the wind farm would discourage day-trippers and tourists visiting the area.
London Array	Very unclear, however, NTS states, "Visual impacts arising on these marine based receptors would generally be negligible/slight to moderate".
Kentish Flats Extension	The impact on tourism and recreation from construction of Kentish Flats Extension anticipated as of minor adverse. Operational project - overall the impact considered to be of negligible significance.
Rampion	Construction -- moderate impact from temporary beach closure. Offshore anticipated that the impact on tourism will be minimal with relevant mitigation measures. Operational - introduction of the wind farm 13 km out to sea is unlikely to have a serious impact on elements of the rural experience.
Ormonde	Appears to be neutral to positive about impacts. The existence of OWF may generate new business offering small boat trips for tourists or sports anglers to visit the wind turbines, thus increasing local revenue.

The assessment practice by the developers and their consultants is largely desk based with research utilizing baseline data, pre-existing research studies relating to perceived impacts on tourism, and consulting with local partners. There were some examples of new surveys investigating public attitude at some locations, for example, for North Hoyle and Gwynt-y-Mor OWFs off the N.

Wales coast. There was some recognition that there is limited up to date information regarding impacts on tourism associated with OWFs.

The coverage of tourism and recreation impacts in the EU Member States ESs is more difficult to identify, largely because of unavailability of documents. Whilst ES coverage of tourism and recreation is sporadic, in general tourism and recreation are important considerations where evidence is available. This may partly be a function of the near coastal location of many projects. Most of the Dutch, Belgium and Danish projects are in the first two distance categories. In contrast, some of the more recent German projects are further offshore, and tourism and recreation impacts are regarded as less significant. Where there is coverage of tourism and recreation, impact predictions are similar to those in the UK, that is, on balance largely benign and of low significance, although there is somewhat more coverage of potential tourism and recreation opportunities. Table 4 provides two examples from the Netherlands and Denmark.

Table 4 Two summary examples of EU ES predicted tourism and recreation impacts.

OWF	Summary comments
Friesland, Netherlands	Coverage of tourism and recreation included sailing, recreation on the beaches, swimming, windsurfing and kitesurfing. The ES addressed impacts on tourism and recreation comprehensively in a study conducted by the European Tourism Futures Institute. Research concluded that a negative economic impact through the introduction of an OWF is not expected, but cannot with certainty, be completely ruled out. There were also opportunities for positive impact on tourism.
Horns Rev 1,2,3 Denmark	There is no reason to anticipate adverse socio-economic effects of Horns Rev 3 offshore wind farm in relation to offshore recreational activities. Instead, there is the opportunity for Horns Rev 3 to build further on the successful local tourism initiatives already launched in connection with the Horns Rev 1 and Horns Rev 2 projects, where researchers found no decrease in tourism levels (visits/expenditure).

Sources: EU MSP [24]; Stiftung Offshore Windenergie [27].

4. Actual Impacts – Actual and Perceived, Some Cases from Recent Practice

An assessment of actual impacts, compared with those predicted in ESs, draws on a review of recent practice, and associated research, from the UK, EU and the US, plus our own primary research studies. Even here, many assessments, including our own, are of perceived impacts of operational OWFs, with much less hard evidence of actual impacts. Yet, as noted by Rudolf [12], it is important to compare changes in numbers of tourists before and after the construction of an OWF.

Biggar Economics [28] provides one interesting example of an attempt to measure changes in tourism numbers. They provide a time-series based study, using employment data for the accommodation and food services sectors, to estimate actual local tourism economy impacts of the construction stage of UK OWF developments. The study analysed indicators of the tourism industry in 11 comparable cases (e.g. Walney, Burbo Bank, Westermost Rough and Rampion). The study compared employment trends in the local OWF coastal employment areas with trends in the wider

regional economies, and concluded --- *"Overall, analysis of the 11 areas studied did not suggest any relationship between the construction of the offshore wind farms and a reduction in tourism, visitor spending or tourism-related employment"*. Indeed, most locations showed a better local employment growth than the wider region.

Studies of the impacts of OWFs in various EU states indicate that impacts may vary according to distance from the coast but, in general, there is little evidence of negative impacts. In the Netherlands for example, the EU Marine Spatial Planning (MSP) platform [24] explored the issue of potential OWFs off the Dutch coast (near Zandvoort and Scheveningen). Whilst the MSP acknowledges direct negative effects for sailing and recreational fisheries in the short term, these are likely to disappear once the OWFs are operational*. "On the visual effects of the OWFs, the plan mentions that research has been done on the experiences of tourists, the regional economic impact to the municipalities and the impact on tourism. The results of this research were only positive and gave no reason to object to the development".*

A number of US studies [17, 29, 30] focus on the significance of impact of distance of the OWF from the coast. A particularly interesting study is that of Block Island, Rhode Island [10, 31]. The study collected empirical data from this first US OWF, consisting of five turbines located three miles off coast, using a mix of methods – content analysis, media review, participant observation, interviews and focus groups. Overall findings reveal the diverse interests and perceptions of stakeholders, but little evidence that the OWF has adversely affected participation in tourism and recreation in the area and on the mainland, which is 16 nautical miles distant. Although many recreationalists and tourists acknowledge pros and cons about the OWF*, "… the wind farm's overall effect is relatively benign and, in some cases, positive".* Smythe et al. [32] demonstrate that, contrary to conventional wisdom on the impacts of distance previously referenced, in the case of the Block Island study some of the positive effects are because of the siting of the project close to the coast, with the project being an attractant to both land- and boat-based visitors. However, there are caveats: the wind farm is young, small and some effects may not have fully developed, hence the importance of monitoring. In addition, there may be various local factors in play, such as the curiosity factor of first of kind in USA, and perceived improved fishing around the OWF.

Our own primary research on the impacts of the recently operational Aberdeen OWF provides further perceptual findings. A survey approach of the local community used a snowball approach via initial contacts of the study team, and contacts from previous research (e.g. Aberdeen community benefits fund consultees). The short online survey involved questions on any perceived positive and/or negative impacts of the OWF on local tourism and recreation activities, on any associated infrastructure developments (e.g. boat trips) and any data sources. A review of social media (Facebook postings) in relation to local tourism and recreation impacts was also undertaken. Overall, the level of response to the survey was disappointingly low. There may be several reasons for this --- in particular the overlap with Covid lockdowns in 2021. In this context, it is likely that the responses were a low priority for those contacted. It may also be that almost no respondents saw the impacts studied as constituting major local issues for tourism and recreation. The survey of Aberdeen public contacts resulted in 24 responses, and the findings are summarised in Table 5.

Table 5 Summary of Aberdeen residents' responses to survey questions.

Survey question	Summary of responses

From your experience, has the presence of the OWF had any *negative impacts* on tourism activities (e.g. on visitor numbers/categories, activities?) in your authority area?	• *Most (20 responses) – no negative impacts.* • *Others -- I think they are nice to look out at sea; if anything it is an attraction; I enjoy watching the turbines; possibly a negligible effect on tourism.*
From your experience, has the presence of the OWF had any *positive impacts* on tourism activities (e.g. on visitor numbers/categories, activities?) in your authority area? If any, please describe.	• *Most (10 responses) – none noticed; no impacts.* • *Yes, people like to come to the beach and look out to sea at the wind turbines.* • *We enjoy looking at the wind farms from the beaches we go to. When they first appeared we took the kids to see them and one of our teenagers has just completed a ˜Girls in Energy" course at school where they made model wind turbines.* • *Harbour tours and stuff are better.* • *It looks good. It helps to tell quickly what direction the wind is at sea.* • *Positive renewable energy helps to shake the Oil and Gas industry label for the city. Symbol of energy transition in the eyes of people that is otherwise invisible.* • *Yes, I enjoy admiring the turbines emerging from the sea; to me it signifies man's ambitions. Although sometimes it appears too abstract view over the horizon, it is beautiful at the same time.* • *Yes. Having been in lockdown for a long time, removal of restrictions allows more viewing of the wind farm.* • *Yes, it is a clear symbol of the progress towards a fully renewables energy future.* • *It is positive to show visitors the windfarm.* • *They are certainly an attractive talking point and as a keen photographer, I know of many other photographers that have used them as a subject, or in the background.*
Have there been any initiatives taken to promote OWF associated tourism (e.g. such as information boards/viewpoints, leaflets for TIC, visitor centre, boat trips etc)? If so, please describe.	• *Most (17) – no; not that I know of; none to my knowledge.* • *The harbour boat trip tours to the windfarm have been positive.* • *Leaflets, involvement at the local school and presentations. Also interactive experiences at the local library, which was interesting.* • *Leaflets, local news + local energy centre.* • *Would be welcomed; visited Norfolk a few years back and they had a visitors' centre used by tourists and locals alike.*
From your experience, has the presence of the OWF had any negative impacts on local recreation activities	• *All (24) – none; none at all; not to my knowledge.*

in your authority area? If any, please describe.	
From your experience, has the presence of the OWF had any positive impacts on local recreation activities in your authority area? If any, please describe.	• *Most (14) – no; not to my knowledge; I do not think so.* • *Yes, something to look at on the horizon.* • *I am sure boat trips are more interesting as a result.* • *Yes, via the Vattenfall "Unlock our Future" fund.* • *An added site to visit potentially for old and young people. Becoming an attraction to marine life i.e. dolphins and seals.* • *Yes, it is giving more options for our local schools to talk about climate change. The younger generation have a greater opportunity to learn about the environment by the very presence of OWF.* • *I see the OWF regularly as I travel around the area and I feel very proud it is there.* • *I like seeing the turbines while I am out running/walking.* • *Yes - good to see tourism boat trips taking place.*
Are you aware of any proposed initiatives in relation to tourism or local recreation activities that you can provide us with information about? If so, please describe.	• *Most (16) – no; not aware of any; not yet; do not know.* • *New harbour with tourist potential for cruises, a marine visitor centre.* • *I know that Aberdeen City Council have recently been consulting on plans to develop the town centre, beachfront and links between the two.* • *The children in the community were very interested to learn about them and watch them being erected. Providing information to residents and especially the children is key to acceptance from some people who think they are unsightly.*
If you have any other comments in relation to tourism and recreation and OWF that we have not addressed in the above questions, please add them here.	• *Most (16) – no response; no; do not know; none.* • *Just to reiterate that a visitor centre would be welcome by many, and for school visits.* • *The dunes here at Blackdog are in a perilous condition from erosion and suffer contamination from an old rubbish dump, so attracting more people here to inform, educate and or view the OWF would certainly not help our local environment.* • *It would be appropriate if boat trips could be organised to get closer to the turbines to understand construction and mechanism of operation/generation of power.* • *I would definitely go on a boat trip to see the turbines up close if it was on offer.* • *I feel the wind farm is an addition but not really highlighted as a tourist attraction. It would be good to show interaction with wildlife, how it affects it and the likely creation of artificial reefs at the turbine towers.* • *As a resident near a windfarm, I think you get used to the new adjusted view.*

The responses of local residents are either neutral or positive, with very few negative comments. Positive comments cover several themes: visually attractive OWF; positive symbol of/local pride in renewable energy initiative; local/school educational links and potential; plus harbour/boat tours. A review of Facebook postings over the period reinforced many of the Aberdeen survey responses, with many likes and very few dislikes. For example, the posts of a community group close to the wind farm were largely positive with just a couple of posts concerned about the fog warning noise coming from the OWF.

5. Mitigation and Enhancement Measures

Whilst impact predictions in ESs, and the limited evidence from practice, are on balance largely benign and of low significance, there is some focus on mitigating potential negative impacts, and enhancing potential local tourism and recreation benefits. About two thirds of UK OWF ESs had some coverage of mitigation and/or enhancement measures in relation to predicted tourism and/or recreation impacts. Mitigation measures related largely to the possible onshore construction impacts on tourism and recreation. The measures included temporary redirection of Public Rights of Way (PRoWs); timing of construction out of tourism season; communication on construction times with caravan parks; careful planning of cable routes to avoid key recreation and tourism sites; landscaping to make onshore substation discreet; and some impact monitoring requirements. In terms of enhancement measures, to date there are only a few examples of visitor centres associated with OWFs. Four identified are Sheringham Shoal, Lincolnshire, Scroby Sands and Rampion. Scroby Sands is a particularly successful example (Box 1), but not all such visitor centre ventures survive. There is evidence of pre-existing boat tours incorporating OWFs into their routes for the Aberdeen, Scroby Sands, Thanet and Rampion OWFs. Overall, it would appear that the tourism ventures that do survive provide a service paid for by the public (e.g. boat tour) or, are financially supported/owned by the OWF operator (e.g. visitor centre).

Box 1 Summary of Scroby Sands Visitor Centre.

Scroby Sands is one of the UK's first commercial OWF, located 2.5 km off the coast of Great Yarmouth on the East coast of England. It has 30 × 2.5 MW turbines, and is quite a small OWF development. The permanent Scroby Sands OWF Information Centre opened in 2004, and had a major refurbishment in 2011. E.ON Climate and Renewables UK own it. E.ON is also the developer, owner and operator of the OWF. The company provided the initial finance for the facilities; it also covers the staff running costs. The Centre is open May to October, and entrance is free. The Centre is near the Great Yarmouth Tourist Information Centre, fair and piers, making it an attractive location for tourists.

The Centre includes an exhibition area providing general information about renewable energy, plus specific information about Scroby Sands. There is also an interactive educational area. Children from local and regional schools can visit, experience and learn about energy outside the classroom. It is also possible to view the OWF through binoculars. The illustration in this box shows viewing through a window of the E.ON Visitor Centre. The programme supports the school geography and science curriculum [27].

Every year people, of all ages, from all over the world, visit the Centre. With over 35,000 visitors a year, it is probably the busiest of such centres in the UK [23].

"Over the years the building has gone through a number of redesigns and this new look is part of our commitment in supporting the local community. We hope it offers the chance for visitors and local people alike to come and learn about offshore wind and the positive impact it has had on the area of Great Yarmouth," Peter Lawson, Scroby Sands Site Manager at E.ON, said following 2018 refurbishment.

"While walking along the prom we came across this visitor centre and we were amazed at the wealth of information from the staff. We were also lucky on the day we visited as they were doing checks on the windfarm. A member of staff told us to use the binoculars and look at the first wind turbine and what we saw was amazing as a member of the team was abseiling down one of the blades doing a check. It showed you how large these things are" (Trip Adviser 2019).

Source: E.ON Scroby Sands Wind Farm Visitor Centre.

As noted in the study by Regeneris [7], onshore wind has the potential to be a tourist attraction in its own right, given the right conditions. Dinnie/ClimateXchange [33] note also that wind farms and renewables could play an important role in eco-tourism, seeking to maximise environmental performance and minimise impact on the local environment. However, Rudolf et al. [34] add the cautionary note that whilst currently some OWFs may be tourism attractants by virtue of their novel and innovative technology, the novelty may wear off with a rapidly growing OWF industry.

A study by the German Offshore Wind Energy Foundation [35] noted some of the negative and positive aspects of tourism and OWFs but focused in particular on best practice in promoting or protecting tourism as part of OWF development. The study noted the importance of early engagement with the tourism industry to find benefits for the sector. Tourism can provide a niche market for an area to stand out in the competitive tourism market. There can be a multitude of potential attractions. However, this requires significant commitment in terms of personnel, finance,

networking and partnerships. Such an approach appears to have created tangible benefit in Denmark [36] where visitors can now take "wind safaris" of nearshore windfarms.

In the EU, an Interreg-supported report on a Danish case study [37] examined the local potential of OWF related tourism, distinguishing two types of tourist groups: those seeing OWFs as a reason for visiting the area, and those already in the area who would like to know more about the coastal OWFs. The study suggested a possible hierarchy of enhancement initiatives ranging from just providing basic information to the local tourist office about the OWFs, and to local recreationalists (eg anglers and sailors) in terms of access, to production of OWF guides, energy tours, to the biggest initiative of establishing a visitor centre. However, a particular issue highlighted was the communication/information gap between the OWF developer and local agencies. "*The Energy Tours are challenged by the fact that the product owners themselves do not give sufficiently high priority to providing information about their systems and trial facilities. The undertakings that operate the sites, including the offshore wind farms, do not feel responsible for serving as guides for ordinary or business tourists. They are primarily interested in running their business. This creates a missing link between the knowledge and expertise possessed by the undertakings and the dissemination of this information to ordinary and business tourists."*

An important EU/South Baltic 2016 report [27], with a focus on '*Bringing together tourism and offshore wind energy'* – examines how various aspects of offshore wind energy can help to attract new and greater numbers of tourists to the South Baltic area. Some key points and promotional examples for these OWFs, which are mostly close to shore, include:

- Importance of engagement strategy to get locals on board early;
- use of communication technology/websites;
- encourage green tourism;
- provide boat tours; also maybe sightseeing flights in some locations (more distant OWFs);
- open OWF site to local recreational sailors to sail within (very popular);
- provide permanent 'World of Wind' exhibition centre (importance of location);
- use of harbour boat based exhibition centre; and
- link with other activities (e.g nature tourism; also industrial tourism–with linked visits to wind farm manufacturers; also potential linking onshore and offshore wind farm tours in some locations).

The European MSP approach reinforces the importance of early engagement, and strongly advocates using MSP to minimise conflicts between key stakeholders and maximise benefits from OWF developments. This involves an eight-step solutions approach [24]. A key step is the creation of a Tourism Impact Statement (TIS) by the developer on the likely impacts of the development on the local tourist industry. TISs also set out the methods to minimise any costs on local tourism and maximise any benefits (e.g. access arrangements). The statements include information such as the number of tourists travelling, views from tourist accommodation, the scale of tourism impact and the outdoor activity in the area of development, and should be part of the EIA and/or Strategic Environmental Assessment (SEA) process.

6. The 'Hidden Potential' of Community Benefits Schemes

There has been a significant growth in the use of community benefits initiatives in the recent development of UK OWFs, reflecting some shift in the power relationships between stakeholders,

from developers and towards local communities. Some of these have implications for local tourism and recreation. *"Developers provide community benefits normally voluntarily, and additionally, outside of the planning and licensing process for major projects. They are not mitigation measures to manage adverse project impacts, nor are they enhancement measures for increasing positive project impacts, for example for local employment and supply chain benefits - important though those measures are. As such, they are not material considerations in the project decision-making process [38]. Developers provide community benefits to communities associated with a development, increasingly in the form of a monetary annual payment, often referred to as a community benefits fund. The community can access this fund for a wide range of local community socio-economic and environmental initiatives"* [39]. Two thirds of UK operational or under construction OWF projects since 2010 have established annual community benefits funding [39]. In its report, *Offshore Wind Operational Report*, the Crown Estate [40], which manages the seabed for England, Wales and Northern Ireland, noted, "…*community benefits schemes are now well established and an integral part of offshore wind energy development-signifying the positive relationships being built between operators and the local communities within which they operate".* The Crown Estate estimated the annual value of the benefits spending at c£3 m in 2018 and increasing.

Our research on community benefits found that approximately half of all UK OWFs since 2000 have included such initiatives to varying degrees for tourism and recreation initiatives. Many of the other half are at too early a stage of development to have such initiatives. Table 6 provides some detailed examples.

Table 6 Some detailed examples of community benefits approaches and possibilities.

OWF	Tourism and recreation community benefits initiatives – project examples
Beatrice	The Beatrice Partnership Fund (BPF) includes provision for a category of support for tourism, culture heritage and the arts. Two examples of such projects include: • £40,000 awarded in March 2017 to Covesea Lighthouse Community Company, providing a quality educational and heritage experience attracting 4,500 visitors each year. • £29,918 awarded to Garbh Allt Community Initiative to purchase four crofting townships near Helmsdale and develop tourist opportunities on the land.
Hornsea and Race Bank	Allocations under the Orsted Grantscape community benefits scheme include: • £14,451 to King's Lynn Boat Trust for restoration/re-launch of 1900 fishing boat Baden Powell • £38,618 to Withernsea Pier and Promenade Association Ltd for pier viewing platform • £17,000 to Anderby Parish Council for Anderby Creek disabled beach access improvements • £12,200 to We'll Meet Again Museum, Avro Lancaster virtual reality experience • £5,000 to Grimsby in Bloom, garden café

Burbo Bank Extension	• £10,935 to Wirral MBC, for New Brighton's Mermaid Trail • £20,000 to Wildlife Trust for Lancashire, Manchester and N. Merseyside • £5,000 to Friends of Hilbre Island, Interpretation Plan • £18,338 to Docklands Trail, Collingwood, Liverpool Docks • £15, 376 to All Afloat, Sailability Rhyl Marine Lake • £11,475 to Bootle Gateway Collective, Making N. Park Community Garden Disability Friendly
Gwynt-y-Mor (GyM)	The North Wales GyM project provides an excellent example of Community Benefits funding for local area tourism and recreation projects, via the main Community Fund (£19 m over the lifetime of the project), and a specific GyM OWF Tourism Fund of £690,000 delivered during the construction of the project. The Community Fund has supported well over 60 tourism and recreation projects to date, with over £600,000 of grants. The Tourism Fund has, for example: • helped to make major improvements to the Victorian pier at Llandudno so cruise liners can once again dock in the town; • contributed to the re-development of Rhyl Harbour; and • provided £170,000 for the Green Links project to promote walking and cycling opportunities, nature reserves and other attractions between Llandudno and Prestatyn.

The studies in Table 6 give some indication of the scope of projects, and the level of funding going into these recreation and tourism initiatives. This is a previously hidden and unreported dimension to the impacts of OWFs on local recreation and tourism. It also indicates that local recreation projects are probably at least as significant as tourism projects, although there are many overlaps between projects in terms of local and visitor beneficiaries, with for example, renovation of piers, provision of coastal trails and festivals.

The initial funding into these community benefits projects can generate significant additional/multiplier effects for the communities. The Beatrice OWF project has undertaken a wider analysis of the potential impact of its community benefits funds using a Social Return on Investment (SROI) approach applied to the first round of grant funding from the Beatrice Partnership Fund (BPF) in 2017. "*SROI is a methodology that lets you understand the wider value from investing money. It considers the social, economic and environmental impacts of an investment. Critically, all impacts are valued in monetary terms, enabling a direct comparison between impacts and investment. The approach considers the value created for all stakeholders impacted by an investment, not only the intended beneficiaries"* [41, 42] Crucial to the approach is the interrogation of stakeholder grant applications to identify anticipated impacts of potential successful applications and the valuation of these impacts over the lifetime of the successful projects. For the first round of the BPF, an estimate was that for every £1 spent by the fund, there would be £3.21 generated in wider value.

In the EU, community benefits delivered by OWF developers/companies follow the legislation (where present) of the country in which the OWF is being built and is coming ashore. Benefits schemes vary, including benefit funds and/or community share participation in the project, and whether they are mandatory or voluntary. Voluntary schemes, as found in England, Scotland, the Netherlands (and the USA), are to date largely flexible according to the circumstances of particular

projects. Mandatory schemes, as found in Denmark and Germany, are more rigid and predictable. Both types of schemes have a variety of stakeholder objectives, including being a good neighbour, sharing rewards, supporting community engagement, providing compensation and delivering fair reparations. For example, the major OWF developer Orsted distributes benefits funds grants under its Grantscape scheme on a voluntary basis in the UK, but in Denmark, community ownership of an OWF has been key, and there have been more mandatory schemes. Legislation varies across the EU, and continues to evolve. This can affect the nature of community benefits, size/location/distribution, which in turn can affect the extent to which local tourism and recreation activities receive support. Some EU state approaches are set out in Table 7.

Table 7 Some examples of some EU State Community Benefits schemes.

EU country	Community Benefits scheme (s)
Denmark	Denmark has experimented with, changing several times, its approach to community benefits. • The Green Scheme seeks to enhance local scenic and recreational values. The Danish Promotion of Renewable Energy Act (2008) introduced a green scheme for the financing of projects that enhance the scenery and recreational opportunities in municipalities. Under the scheme, Energinet.dk pays DKK 0.004 (0.04 pence sterling) per kWh for the first 22,000 full-load hours, for wind turbine projects connected to the grid since 2008. According to the Danish Energy Agency, this could work out at DK 200,000 (£21,325) per turbine depending on their size. Money goes to the given municipality, with the amount depending on the number and size of turbines connected to the grid in that municipality. The green scheme may part or fully finance development works for enhancing scenic or recreational values in the municipality and support municipal cultural and information activities aimed at promoting acceptance of the use of renewable energy sources. However, this legislation has changed four times (twice in 2020), since 2008 when it was introduced. • Any citizen, 18 or over, living within 4.5 km of new wind turbines has the option to buy shares in local turbine projects. Priority is for those living closest. The shares on offer must equate to at least 20% of the cost of the turbines. Shareholders share the costs, revenues, risk and influence on equal terms with the developer. The scheme ended in June 2020, primarily due to a lack of uptake of buying shares, and the increasing size of developments.

France	• The public domain concession agreement defines the fees that the concessionaire has to pay to the government for setting up a wind farm on the maritime public domain. For OWFs, these fees have two components: a fixed part, related to the facility's ground surface, and a variable part based on revenue drawn from the wind farm. Under the conditions set out in Decree n° 2008-851 of August 26, 2008, half of the proceeds of this tax go to the municipalities from which the wind farm is visible, and the other half goes to the Departmental Council (Conseil Général) which places it in a local fund for fishing and sailing.
EU	• To ensure that community energy continues to thrive, the EU's Green Deal has established a goal of "active consumer participation, individually or through citizen energy communities, in all markets, either by generating, consuming, sharing or selling electricity." To this end, the EU says that residents and community energy co-ops should have equal access to the same incentives, financial supports and advanced technologies as corporations.

Sources*:* Northern Ireland Assembly [43]; ClimateXchange [44]; EU [45].

7. Discussion and Conclusions

Table 8 provides a brief summary of key findings and some recommendations for stakeholders. There is a fuller discussion in the following text.

Table 8 A brief summary of some key findings and recommendations.

Some key findings
• whilst impacts on tourism and recreation are important considerations in OWF planning/development, they are generally assessed as minor/negligible, relatively benign and in some cases positive • indeed near coast OWFs can be a tourism attractant partly by virtue of their innovative nature, although the innovative attraction may decline as OWFs become more common • most OWF projects include tourism/recreation mitigation and enhancement measures, but not all enhancement measures, such as visitor centres, survive • OWF community benefits funds are becoming of increasing importance for tourism initiatives, especially in the UK, yet to date they have received little coverage in the literature and case studies • there are data limitations on research on tourism/recreation impacts, including for example research gaps on variations in impacts between OWF construction and O&M stages
Some recommendations for stakeholders
• early engagement and planning between stakeholder groups is important to both mitigate negative impacts on tourism/recreation and enhance potential positive impacts, possibly using Marine Spatial Planning and Tourist Impact Statements • OWF-led tourism/recreation enhancement measures require significant long term commitment between the OWF developer and local authorities/agencies to survive;

- the use of community benefits tourism/recreation initiatives would benefit from a much higher profile from stakeholders
- monitoring of changing tourism and recreation impacts over time is vital for better managing impacts and improving predictions

The various elements of the research show similar findings. In terms of the *balance of impacts*, the initial findings from the literature indicated that the overall impact of offshore wind farms on tourism appears relatively benign, and in some cases positive. The findings from the literature on the impact on tourism and recreation of distance of OWFs from the coast is mixed, although research generally finds that stakeholder concerns about visual impact of OWFs decrease as distance from the shore increases. As OWFs become larger and more distant, the perception by visitors, negative and positive, may decline. The ES research reinforces the findings on the balance of impacts. UK ESs largely predict no impact or minor/negligible impact concerning both tourism and recreation, although there are a few examples of predicted positive impacts. Where there is coverage of tourism and recreation in EU States' ESs, findings are similar to those in the UK; that is on balance largely benign and of low significance. However, it is important to note that to date most EU OWF developments have been in northern Europe; it is possible that impacts and perceptions will differ in more Mediterranean-facing countries.

Evidence from practice is limited. In some cases, OWFs may be a tourism attractant by virtue of their modern, innovative and novelty factors, and have a positive impact on tourism. OWF-led tourism can provide a niche market for an area to stand out in the competitive tourism market. However, with more of such developments, the novelty factor may wear off. There are very few examples of actual hard evidence of the impacts of OWFs on tourism and recreation (e.g. measured for example by relative changes in number of visitors and tourism employment) but Biggar Economics [28] provides a useful study. Our Aberdeen case study provides an example of either neutral or positive perceptions from the local community, with very few negative comments. The positive comments cover several themes: visually attractive OWF; positive symbol of/local pride in renewable energy initiative; local/school educational links and potential; plus harbour/boat tours.

The focus of literature studies is on the perceived impacts of operational OWFs on tourism, with much less on the construction stage, recreation impacts and hard evidence of actual impacts. The majority of ESs separate impacts by project stage and onshore and/or offshore impacts are considered; there is little variation in the nature of predicted impacts by stage. There is little evidence of separation of local recreation and tourism impacts, and indeed of distinguishing of impacts by stakeholder groups. Assessment in UK ESs is largely desk based with research utilizing baseline data, pre-existing research studies relating to perceived impacts on tourism, and consulting with local partners. Surprisingly, given the increasing incidence of the use of community benefits funds especially in relation to UK OWF projects, there is very little mention of the impacts of such funds on local recreational activities, both in the literature and from our case studies.

About two thirds of the reviewed UK ESs had some coverage of mitigation and/or enhancement measures in relation to predicted tourism and/or recreation impacts. Most UK *mitigation* measures related to the possible onshore construction impacts on tourism and recreation, including for example: temporary redirection of PRoWs; careful planning of cable routes to avoid key recreation and tourism sites; landscaping of onshore substations; and some impact monitoring requirements. For UK project *enhancement* measures, there are several examples in practice of attempts to use

initiatives to promote the virtues of OWFs, although hard evidence on their effectiveness is limited. There are a few examples of visitor centres associated with OWFs, and evidence of some pre-existing boat tours incorporating offshore wind farms into their routes. Not all ventures survive; overall, it appears that those that do, provide a service paid for by the public (e.g. boat tour) or are financially supported or owned by the OWF operator (e.g. visitor centre). There are some examples of measures linking with other tourism attractions (e.g. museums) and a few examples of monitoring of tourism provisions. The review of EU ESs indicates some limited provision of enhancement and mitigation measures. There are some good examples, as covered in the EU/South Baltic 2016 report [27], with a focus on '*Bringing together tourism and offshore wind energy',* which emphasises various protection and promotion measures. These include engagement strategies to get locals on board at an early stage, green tourism, boat tours and links with other activities (e.g including nature tourism, and industrial tourism–with linked visits to OWF supply chain locations). However, initiatives may have a short life if not economically viable.

The research indicated a number of gaps in research. For example, there is little research/evidence on the differences, if any, between impacts of OWF projects on tourism and recreation activities and on variations in tourism impacts between the construction and O&M stages of the OWF project life. Further, there is little work on social impacts, including the differential impacts of OWFs on the various key tourism and recreation user and provider stakeholder groups (including for example different tourist categories, such as day/overnight, age, socio-demographic background). There appears to be little research on the effectiveness of tourism and recreation impact mitigation and enhancement measures. The link between a specific OWF and local impacts may not be clear. Whilst there are smaller (MW) windfarms nearer the coast, these are now rarely solo ventures as additional phases or extensions tend to be in the pipeline, and there may be larger OWFs further out at sea. Much tourism impact information in ESs is dated and does not draw on monitoring of actual project impacts. The coverage of monitoring of tourism and recreation impacts in the ESs reviewed is thin.

The research has a number of implications for stakeholders, including especially OWF developers, host coastal local authorities and agencies, local community groups, and tourism and recreation businesses. Early engagement and planning to both mitigate negative impacts on tourism and enhance potential positive impacts is important, and can be part of a planning and assessment approach, possibly via Marine Spatial Planning. An important element of an MSP is a Tourist Impact Statement (TIS) by the developer on the likely impacts of the development on the local tourist industry. TISs also set out the methods to minimise any costs on local tourism and maximise any benefits (e.g. access arrangements). Tools that provide a quantification of the vital visual impact can also be of value both for developers and for government agencies; see for example Gonzalez-Rodriguez [46]. It is important to identify key tourism and recreation user and provider stakeholder groups, who may have differing and sometimes conflicting perceived and actual impacts of OWF developments.

Whilst OWF-led tourism initiatives (e.g visitor centres, boat trips) can provide niches for an area to stand out in the competitive tourism market, this requires significant long term commitment in terms of personnel, finance, networking and partnerships, especially between the OWF developer and local authorities/agencies. It is important to be aware of the potential changing attraction dynamics of OWFs. Visitor perceptions of the impacts of OWFs, both generally and for particular locations, may change overtime with perhaps the waning of the innovative attraction of OWFs.

There may be potential for enhancement initiatives which link OWF promotions with other activities, including for example nature based tourism and supply chain businesses. Community benefit schemes, now associated with many UK OWFs, provide the potential to support local tourism and especially recreation facilities, with a focus on sustainability initiatives and often on particular local social groups. Overall, they may be at least as significant for local communities as any direct enhancement measures associated with the OWF (e.g. visitor centres and boat tours). Yet to date they appear largely hidden from public and other stakeholder perceptions in terms of their role in tourism and recreation impacts, and would benefit from a much higher profile from developers and local authorities/agencies. Finally, the monitoring of changing tourism and recreation impacts over time, and their auditing against predictions, is vital for better managing impacts and for improving predictions for future projects.

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Author Contributions

Prof. Glasson: research design, investigation, formal analysis, working notes, writing original draft article and redrafts. **Dr. Durning**: survey designs, research ethics, review of draft. **Ms**. **Welch**: investigation, formal analysis, working notes and surveys implementation.

Competing Interests

The authors have declared that no competing interests exist.

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