Guidance on assessing the socio-economic impacts of offshore wind farms (OWFs)

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Executive Summary

Purpose and structure of the report: The Offshore Wind sector is a major, dynamic, and rapidly evolving renewable energy industry. 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. There has been much less ES content on the impacts on the human environment, and especially the impacts on local and regional coastal communities adjacent to the offshore projects. Such communities are often suffering greatly from the decline in traditional industries, such as shipbuilding, fishing and tourism. Human environmental impacts include a wide range of social and economic issues.

However, the lack of knowledge on the impacts of OWFs on human interests can greatly hamper case management. There is a need for adequate planning and assessment tools for the key stakeholders – developers, consultancies, governments (local, regional and national), development agencies and the general public—who are the audience for this report. The focus of this document, as structured below, is to provide an array of good practice guidance for stakeholders on the under-assessed socio-economic implications and opportunities emanating from the growth in this dynamic renewable OWF energy industry. In each of sections 2-5, there are short summaries of key guidance points, highlighted in yellow, underpinned by research findings and good practice examples, drawing on the findings in the six Technical Reports for this research programme.

Context: a dynamic OWF renewable energy industry: The UK is the global leader in offshore wind energy generation. At the end of 2018, the UK had 7.9GW in 38 operational OWFs, with almost 2,000 wind turbines, making the country the nation with the single largest operating capacity in the world (Crown Estate 2019). The most recent forecast is for this capacity to grow to 40GW by 2030, with up to £50bn infrastructure spend (Queen's Speech Dec 2019). Such growth provides important potential socio-economic opportunities for the UK, and for regions and local areas adjacent to the OWF sites, in terms of employment, supply chain and other socio-economic benefits. Yet there is a concern that as an industry, the UK offshore wind energy sector should take the delivering of UK content and UK economic success, at all levels, more seriously.

An overview of the procedures for planning and assessing the socio-economic impacts of major OWF projects: Socio-economic impacts are of growing importance in the planning and assessment of OWFs, especially in the UK. International drivers include IFC/World Bank Performance Standards (IFC 2012, World Bank 2017), IAIA Social Impact Assessment Guidelines (2015) and the amended EIA Directive (EC 2014). Major projects have special assessment procedures. For example, in England, OWFs greater than 50MW come under the 2008 Planning Act which identifies a subset of Nationally Significant Infrastructure Projects (NSIPs), with impacts examined by the Planning Inspectorate, National Infrastructure Division (PINs/NID). There is a growing recognition by practice of the importance of a social licence to operate from the community, and of local content. However, to date, from a review of UK OWF ESs, there has been a predominance of assessment of economic impacts, with much more limited consideration of the assessment of social impacts. There is also a concern that many of the economic benefits of major projects may leak out way beyond the local area.

A consideration of socio-economic impacts needs to clarify the type, duration, spatial extent and distribution of impacts. In other words, the analyst need to ask what to include, over what period, over what area, and for whom. A socio-economic impact assessment examines these questions through the various steps in the assessment process - baseline studies, scoping;

prediction and assessing impact significance; mitigation and enhancement of impacts; and monitoring. There is consideration of the steps separately for economic impacts and for social impacts in the main sections of this guidance report.

Impact assessment process -- some *economic* impact findings and recommendations: Economic impacts will normally include employment, Gross Value Added (GVA) and specific sector impacts, for each project stage, time-period and spatial level. There are Direct impacts (eg project employment), Indirect impacts (eg supply chain), and Induced impacts (eg retail expenditure of employees). For the project, it is important to establish, as fully and accurately as possible, the investment/expenditure and the associated human resources plans for the key stages of the project lifecycle—especially for the construction (CAPEX) and O&M stages (OPEX). The prediction and assessment of economic impacts of an OWF project on various spatial areas is an inexact, but important, exercise. Methods used, such as scenarios, should seek to reduce uncertainty associated especially with port location, supply chain and technology. Use may be made of a range of potential local and regional employment impact rules of thumb for total construction and for each O&M year, using a jobs per project MW size, and GVA £m per project MW size approach. These can provide broad orders of scale and ranges of potential economic impacts for the analyst.

For socio-economic impacts, and particularly for economic impacts, the focus in assessment is often more on enhancing beneficial impacts, rather than on mitigating adverse impacts. Key enhancement measures include supply chain websites, supply chain events, skills training programmes, and local recruitment targets. Use can be made of an Employment and Skills Plan, or equivalent, in a planning permission to support effective implementation of socio-economic undertakings (predominantly economic). Monitoring is invaluable in learning from practice. It allows the comparison of predictions with actual outcomes, provides guidance on actual impacts for future OWF planning, and facilitates an adaptive approach to project implementation. Monitoring of recent projects shows the economic value of onshore construction and especially the O&M stage for local areas, and the need to increase local and regional economic benefits from offshore construction.

Impact assessment process--some *social* impact findings and recommendations: Social impacts of OWFs include impacts on the demography, housing, other local services, and socio-cultural/quality of life of the host coastal area. Some social issues – such as attitudes to change in seascape, way of life and implications for marine environment-- are important but qualitative and more difficult to assess. Key tasks in assessing social impacts follow the main steps for EIA, particularly highlighting the importance of participatory approaches to engage communities. Social impacts should be covered whatever the distance from the coast of the OWF, for there is always onshore construction, the substantial offshore construction workforce may have onshore impacts (eg temporary housing), and there is the important O&M stage. Affected communities should be involved and engaged at the earliest stage possible, to achieve a ‘social licence to operate’. This will hopefully minimise negative social impacts and maximise local community benefits.

Prediction methodology for social impacts is largely descriptive and qualitative. While various methods can be employed (eg. scenarios), predicting impacts for social issues is not a precise science, and an element of assessor judgement, informed by stakeholder consultation, is necessary. Mitigation and enhancement measures are likely to focus on local area education and skills training initiatives. Monitoring of social impacts, including views on wellbeing/QoL, local services, community cohesion and landscape, plus wider views on renewable energy, is important, and use can be made of direct surveys of the affected communities, and from media coverage. Community Benefits Agreements (CBA) are becoming an established element in OWF practice and the report includes some good practice CBA lessons.

Glossary of Terms used in the Report

Acronym	Explanation
BEIS	Department for Business, Energy and Industrial Strategy
BIS	Department for Business, Industry, Innovation and Skills
BOWL	Beatrice Offshore Wind Farm Limited
CAPEX	Capital Expenditure
CBA	Community Benefits Agreement
CfD	Contract for Difference
D &ID	Direct and Indirect (economic impacts)
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DECEX	Decommissioning Expenditure
DEVEX	Development expenditure
ECCF	East Coast Community Fund
EIA	Environmental Impact Assessment
EOWDC	European Offshore Wind Deployment Centre
ES	Environmental Statement
ESIA	Economic and Social Impact assessment
EWEA	European Wind Energy Association
FTE	Full Time Equivalent (re jobs)
GVA	Gross Value Added
GW	Gigawatt
IAIA	International Association for Impact Assessment
IAU	Impacts Assessment Unit (Oxford Brookes University)
IO	Input-Output (models and tables)
LA	Local Authority
LEP	Local Economic Partnership
LCLO	Local Community Liaison Officer
MW	Megawatt
NEF	New Economics Foundation
NPS	National Policy Statement
N-RIF	National Renewables Infrastructure Fund Scotland
NSIP	Nationally Significant Infrastructure Projects
O&M	Operation and Maintenance stage of OWF project
ONS	Office of National Statistics
OPEX	Operational Stage Expenditure
ORE	Offshore Renewable Energy -- Catapult Centre
OWF	Offshore Wind Farm
OWGP	Offshore Wind Growth Partnership
OWIC	Offshore Wind Industry Council
OWPB	Offshore Wind Programme Board
PINS/NID	Planning Inspectorate/National Infrastructure Division
QoL	Quality of Life
SE	Scottish Enterprise
SIA	Social impact assessment
SEI	Socio-economic impact assessment
SIMP	Social Impact Management Plan
SOC	Standard Occupational Classification
SROI	Social Return on Investment
TOTEX	Total Expenditure

1. Introduction

1.1 Aims of the practice guide, and guide structure

The Offshore Wind sector is a major, dynamic, and rapidly evolving renewable energy industry. This is particularly so in Europe, and especially in the UK. There is also growing interest and development activity in this sector in many other parts of the world. In Europe, and again especially in the UK, the growth has been particularly rapid in the recent decade (from 2010 onwards), and the momentum into the new decade (from 2020 onwards) may be even greater.

Offshore Wind Farms (OWFs) are normally large projects, and increasingly very large projects, in terms of spatial spread and development expenditure. Such projects normally require specific planning and assessment procedures, in advance of any development consent. The Environmental Impact Assessment (EIA) process is designed to ' identify, predict, evaluate and mitigate the biophysical, social and other relevant effects of proposed development proposals prior to major decisions being taken and commitments made' (IAIA 2009).

For OWFs, the focus of much EIA activity, and the content of resulting Environmental Statements (ESs), has been on the biophysical impacts, including impacts on birds, marine mammals and fishing. There has been much less ES content on the impacts on the human environment, and especially the impacts on local and regional coastal communities adjacent to the offshore projects. Such communities are often suffering greatly from the decline in traditional industries, such as shipbuilding, fishing and tourism. Human environmental impacts include a wide range of social and economic issues. However, the lack of knowledge on the impacts of OWFs on human interests can greatly hamper case management. There is a need for adequate planning and assessment tools for the key stakeholders – developers, consultancies, governments (local, regional and national), development agencies and the general public—who are the audience for this report.

The focus of this document, as structured below, is to provide an array of good practice guidance for stakeholders on the under-assessed socio-economic implications and opportunities emanating from the growth in this dynamic renewable OWF energy industry. There are summaries of key guidance points embedded in sections 2-5, highlighted in yellow.

Section 2	Context: ***a dynamic OWF renewable energy industry***
Section 3	***An overview of the procedures for planning and assessing*** the socio-economic impacts of major OWF projects
Section 4	Impact Assessment Process – ***Economic*** *Impact Assessment Issues, Methodologies and Techniques*
Section 5	Impact Assessment Process – ***Social*** *Impact Assessment Issues, Methodologies and Techniques*
Section 6	Conclusions: ***overview o***f ***key findings, recommendations***, and spreading good practice
References	

1.2 Impacts on the human environment: socio-economic impacts definitions

Impacts on the human environment can be summarised as the "people effects" of development actions. They cover a wide range of social and economic impacts and the boundaries between these are fuzzy. Economic impacts can range from the macro-impacts on a nation's economy to the impact on construction workers' wage levels in a town adjacent to a project. Social impacts may include impacts on local demographics, livelihoods, housing, local services, and wellbeing and community cohesion. Table 1.1 provides an overview of some of the most current socio-economic issues associated with the development of major projects. Socio-economic impact assessment (SEI)/social impact assessment (SIA) focuses on the human dimension of environments. It seeks to identify the impacts of development actions on people, and who benefits and who loses; it can help to ensure that the needs and voices of diverse groups in a community are taken into account during project planning and decision-making.

Table 1.1: Types of socio-economic (Source: adapted from Glasson (2017a))

1. **Direct economic:**
   - employment, including employment cohort and safeguarding of existing employment;
   - unemployment and underemployment
   - characteristics of employment (e.g. skill group);
   - labour supply and training; and
   - other labour market effects, including wage levels and commuting patterns
2. **Indirect/induced/wider economic/expenditure:**
   - employees' retail expenditure (induced);
   - linked supply chain to main development (indirect);
   - labour market pressures;
   - wider multiplier effects;
   - effects on existing commercial activities (eg tourism; fisheries);
   - effects on development potential of area; and
   - GVA and GNP.
3. **Demographic:**
   - changes in population size; temporary and permanent;
   - changes in other population characteristics (e.g. family size, income levels, socio-economic groups); and
   - settlement patterns
4. **Housing:**
   - various housing tenure types;
   - public and private;
   - house prices and rent / accommodation costs;
   - homelessness and other housing problems; and
   - personal and property rights, displacement and resettlement
5. **Other local services:**
   - public and private sector;
   - educational services;
   - health services; social support;
   - others (e.g. police, fire, recreation, transport); and
   - local authority finances
6. **Socio-cultural:**
   - lifestyles/quality of life;
   - gender issues; family structure;
   - social problems (e.g. crime, ill-health, deprivation);
   - human rights;
   - community stress and conflict; integration, cohesion and alienation; and
   - community character or image
7. **Distributional effects:**
   - effects on specific groups in society (eg: by virtue of gender, age, religion, language, ethnicity and location); environmental justice

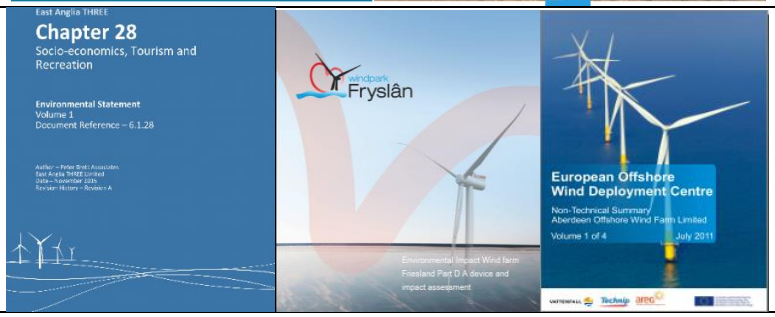
Some authors refer to social impact assessment rather than socio-economic impact assessment. Some see it as a separate field of study, a separate process (Esteves et al, 2012), often more associated with a developing world context. Others, including the approach taken here, see it as an integral part of environmental impact assessment (EIA), providing the essential "human elements" complement to the "bio-physical" focus of many ESs: 'from the perspective of the social impact agenda, this meant valuing people "as much as fish" …' (Bronfman, 1991). Our focus is on the wider definition of socio-economic impact assessment, within a holistic impact assessment process (be it called EIA, EA, IA, ESIA etc) that is of relevance to all stages of a project's lifecycle.

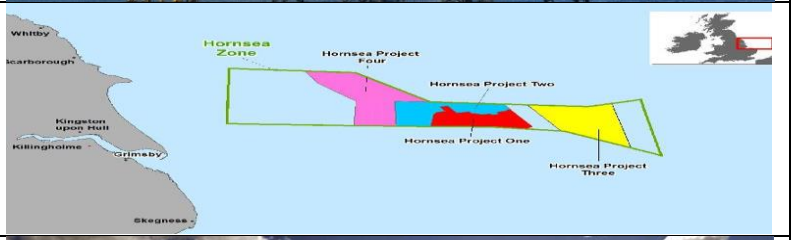
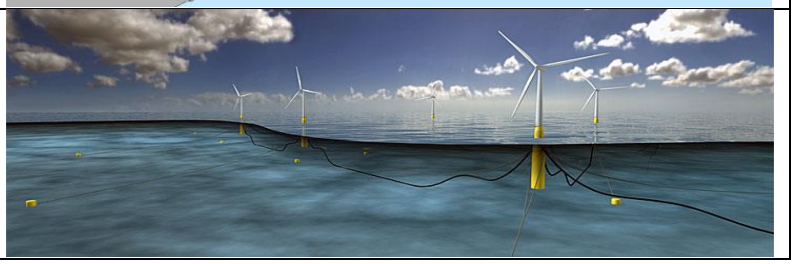
1.3 Underpinning research and documents

The research for this guide was part of a Vattenfall scientific research programme to understand the environmental impacts of offshore wind projects; the European Offshore Wind Deployment Centre (EOWDC) in Aberdeen funded and facilitated the research. Believed to be the largest research programme of its kind, the programme has funded in-depth scientific research and monitoring in a real-time environment on four biophysical impacts topics, plus this socio-economic impacts topic. A scientific panel, made up of specialists in the field, advised on the selection of research projects to receive funding; panel members included Vattenfall, Aberdeen Renewable Energy Group, Marine Scotland Science, Scottish Natural Heritage, the Scottish Environment Protection Agency, RSPB Scotland, the Joint Nature Conservation Committee, Whale and Dolphin Conservation, and The Crown Estate.

The socio-economic impacts project ran over a period from 2017-2020. A team from the Impact Assessment Unit (IAU) at Oxford Brookes University undertook the research. It involved a set of studies as illustrated in Figure 1.1.

Figure 1.1: Key elements in the socio-economic impacts of OWFs research programme

Key research element	**Illustrative example**
Examines the evolving literature (academic and practice) on the socio-economic impacts of major projects, and especially of OWFs	
Reviews the socio-economic content in recent OWF Environmental Statements (ES) for the UK (25) and other EU States (13)	

Main case study: monitors the impacts of the small 96 MW European Offshore Wind Deployment Centre (EOWDC) (**Aberdeen OWF**) over the project lifecycle. Became fully operational in 2018.	
Subsidiary case study: reviews the impacts of the lifecycle of the mid-size 588MW **Beatrice OWF** (Scotland – N. Sea). Will become fully operational in 2020.	
Subsidiary case study: reviews the impacts of the major 7GW (in total) **Hornsea offshore array** (England – N. Sea). 1.2 GW Hornsea 1 becomes fully operational in 2020. Hornsea 2-4 are in various stages of development, and planning.	
Minor case study: reviews the impacts of the recent **floating OWFs (Hywind and Kincardine**) off NE Scotland. Operational in 2019-2020.	

This guide has a set of underpinning study areas, as illustrated in Figure 1.1. Each has a substantial Technical Report (TR):

***TR1**.Literature Review on socio-economic impacts: of c100 academic and practice documents*
***TR2**.Environmental Statement (ES) socio-economic content review: 25 ESs from UK*
***TR3**.ES socio-economic content review: 13 ESs from other EU States*
***TR4**.Main Aberdeen OWF real time monitoring of the local socio-economic content over the planning /development, construction and operation and management stages, with minor comparative study of the NE Scotland floating offshore wind farm developments*
***TR5**. Subsidiary comparative case study of Beatrice OWF, NE Scotland*
***TR6**. Subsidiary comparative case study of the Hornsea OWF array (Hornsea projects 1-4), off Humberside, England*

2. Context: a dynamic OWF renewable energy industry

2.1 Rapid growth --- from onshore to offshore

Wind is a rapidly increasing energy sector. In Europe the wind energy sector increased from 2.5GW in 1995 to over 142GW of capacity in 2015 (EWEA, 2016). Over 80% of this capacity was in the form of onshore wind energy projects, but the offshore sector has been growing apace since 2000, especially in the North Sea (EC 2019). The UK is the global leader in offshore wind energy generation. In 2015 it had over 5GW in operation or under construction, and a further 14.3GW with consent and likely to move into construction by the early 2020s (Higgins and Foley 2014; RenewableUK 2015). At the end of 2018, the UK had 7.9GW in 38 operational OWFs, with almost 2,000 wind turbines, making the country the nation with the single largest operating capacity in the world (Crown Estate 2019). The forecast is for this capacity to grow to 30GW by 2030, with up to £40bn infrastructure spend (BVG 2016, Crown Estate 2019). Table 2.1 and Figure 2.1 show the dominance of the UK offshore energy sector in Europe, followed by Germany, Denmark, Belgium and the Netherlands.

Table 2.1: Number of wind farms, MW capacity and number of turbines connected at end of 2019, per country

Country	Number of Wind Farms Connected	Cumulative Capacity (MW)	Number of Turbines Connected	Net Capacity Connected in 2019	Number of Turbines Connected in 2019
UK	40	9,945	2,225	1,760	252
Germany	28	7,445	1,469	1,111	160
Denmark	14	1,703	559	374	45
Belgium	8	1,556	318	370	44
Netherlands	6	1,118	365	0	0
Sweden	5	192	80	0	0
Others	9	114	31	8	1
Total	110	22,072	5,047	3,623	502

Source: adapted from Wind Europe (2020)

Box 2.1 illustrates the growing significance of wind energy (onshore and offshore) in the total energy mix for the UK. Yet despite this international advantage, there is concern that the UK offshore wind sector has not sufficiently capitalised on its lead to secure UK economic advantage, in terms of UK investment and UK jobs (RenewableUK, 2015). It is difficult to be accurate on jobs associated with the UK offshore sector. In 2008 Bain & Co were estimating 5,000 jobs for both onshore and offshore, which could grow to 50,000+ by 2020 (75% offshore). BVG (2016) estimated already 13,000 UK jobs in the offshore sector by 2015. The infrastructure value of UK offshore projects was estimated at c£10bn (2015), and could increase by +£20bn (2020), and +£30bn (2025).

Box 2.1: Renewable electricity overtakes fossil fuels in UK

Renewable energy sources provided more electricity to UK homes and businesses than fossil fuels for the first time over the last quarter, according to new research. The renewables record was set in the third quarter of this year after its share of the electricity mix rose to 40%. .It is the first time that electricity from British windfarms, solar panels and renewable biomass plants has surpassed fossil fuels since the UK's first power plant fired up in 1882. A string of new offshore windfarms built this year helped nudge renewables past fossil fuels, which made up 39% of UK electricity, in a crucial tipping point in Britain's energy transition.

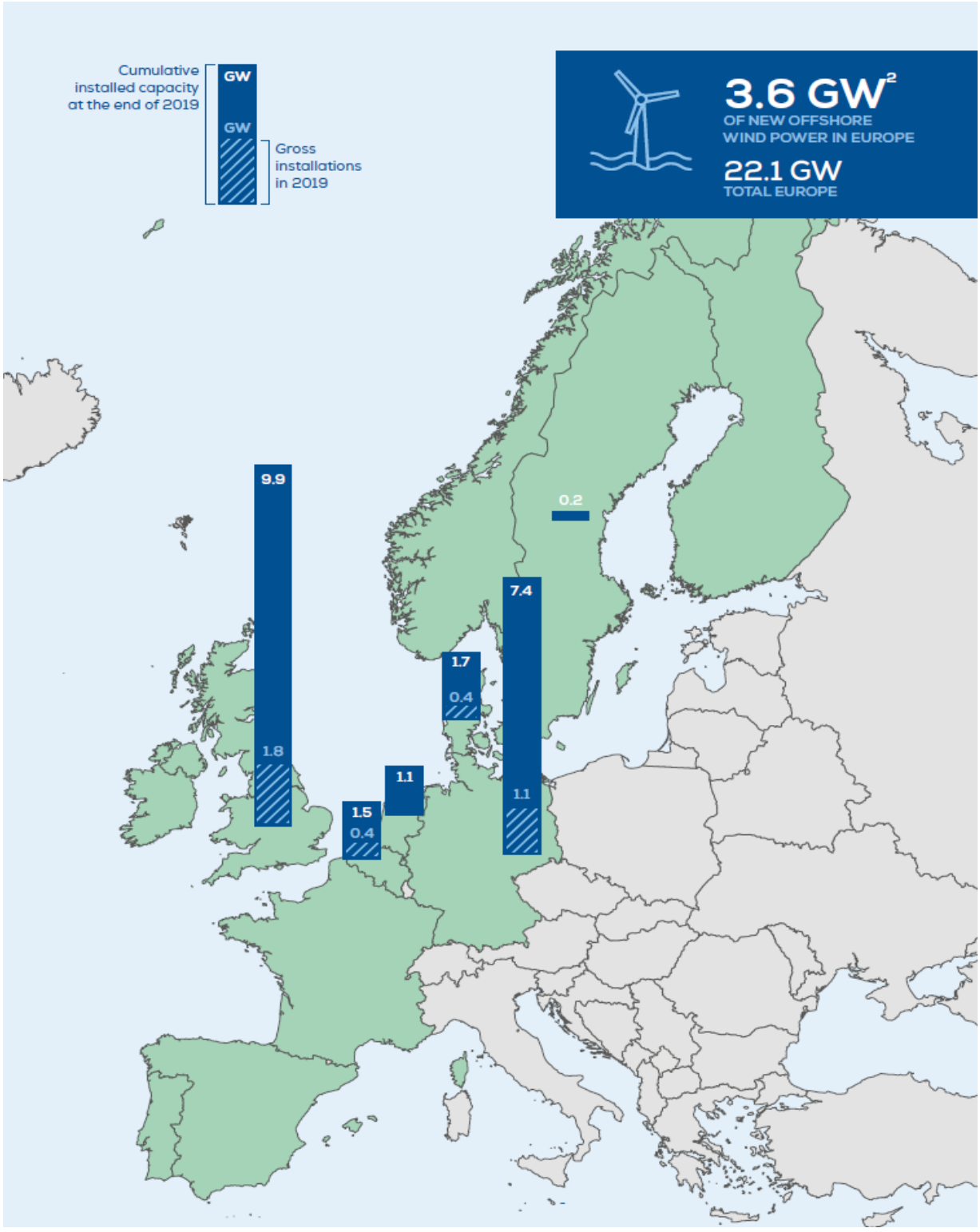
Wind power is the UK's strongest source of renewable energy and made up 20% of the UK's electricity following a series of major windfarm openings in recent years. Electricity from renewable biomass plants made up 12% of the energy system, while solar panels contributed 6%.The world's largest offshore windfarm, the Hornsea One project, began generating electricity off the Yorkshire coast in February 2019, reaching a peak capacity of 1,200MW in October. It followed the opening of the Beatrice windfarm off the northeast coast of Scotland over the summer. Together these schemes almost doubled the 2,100MW worth of offshore capacity that began powering homes in 2018.

Luke Clark, of Renewable UK, said the industry hopes to treble the size of its offshore wind sector by 2030 to generate more than a third of the UK's electricity. "The cost of new offshore wind projects, for example, has just fallen to an all-time low, making onshore and offshore wind our lowest-cost large scale power sources," Clark said. The next generation of offshore windfarms is expected to cost about £40 for every megawatt hour of electricity generated, less than the average market price for electricity on the wholesale energy markets.

Source: adapted from Guardian (14.10.2019)

The OWF industry is also a very technologically innovative industry, with rapid developments for example in the scale of turbine size, cabling and control systems. There has been a rapid fall in the unit cost of delivering UK offshore wind, as exemplified by the fall in the Contract for Difference (CfD) price for offshore wind projects in 2017 (BEIS 2019). By 2030 there could be up to 30GW UK capacity (BVG, 2016). Yet there is a concern that as an industry the UK offshore wind energy sector should take the delivering of UK content and UK economic success more seriously. At an offshore wind summit in Glasgow in early 2020, the Scottish Energy Minister, Paul Wheelhouse, commented, "*Scotland is the ideal location for offshore wind, but recent projects have not delivered the significant economic opportunities we want to see for Scottish businesses. The Scottish government has been calling for the offshore sector to do more by awarding contracts to our indigenous supply chain but recent disappointments suggest that more has to be done. I will use every lever at our disposal to ensure that our renewables supply chain benefits from the expansion of offshore wind in our waters, leading to the creation and retention of Scottish jobs*'' (Scottish Renewables Offshore Wind conference, 28 Jan 2020). Under new measures agreed between the Scottish Government and the Crown Estate Scotland, developers will have to agree on supply-chain commitments when applying for offshore wind leases.

Figure 2.1: Geographical distribution of cumulative and new (2019) MW capacity per country



Source: Wind Europe (2020)

2.2 UK Institutional support

In 2013 the then UK Department for Business, Industry, Innovation and Skills (BIS) produced a set of documents outlining the UK Offshore Wind Industrial Strategy, and providing an Overview of Support for the industry (BIS, 2013). The Strategy focused on industry and

government working together to…"build a competitive and innovative UK supply chain that delivers and sustains jobs, exports and economic benefits for the UK…" The strategy document identified two new delivery bodies to implement the strategy: The Offshore Wind Industry Council (OWIC) and the Offshore Wind Programme Board (OWPB). The bodies bring together representatives of government, developers and supply chain to provide leadership in the sector and to remove barriers to offshore wind in the UK, reduce costs and build a competitive UK-based industry. The Overview of Support document identifies four main topics: supply chain, innovation, finance and skills. Two examples of support initiatives are noted below:

- Offshore Renewable Energy (ORE) Catapult Centre is one of a number of Catapults established and overseen by the Technology Strategy Board. Catapults are technology and innovation centres bringing together the best of UK businesses, scientists and engineers to work side by side on R&D. The ORE Centre has a budget of £54m.
- The National Renewables Infrastructure Fund (N-RIF) Scotland is a £70m fund to support the development of port and near port locations for the use of the offshore wind industry. The aim is to stimulate private sector investment in a number of sites, thus helping to attract offshore wind supply companies to those sites.

Additional to the range of such initiatives is the vital support for wind farm finance through the Contract for Difference (CfD) system that aims to give the industry some certainty to invest by offering guaranteed price support. In 2018, there was also the launch of the new joint government-industry Offshore Wind Sector Deal to invest £250 million. This includes a new Offshore Wind Growth Partnership to develop the UK supply chain as global exports are set to increase fivefold to £2.6 billion by 2030, and a third of British electricity set to be produced by offshore wind power by 2030 (see Box 2.2).

Box 2.2 UK Government Sector Deal

Executive Summary

This Sector Deal builds on the UK's global leadership position in offshore wind and seeks to maximise the advantages for UK industry from the global shift to clean growth, consistent with the Clean Growth Grand Challenge. It will do this by:

1. Providing forward visibility of future Contracts for Difference rounds with support of up to £557m, with the next allocation round planned to open by May 2019, with subsequent auctions around two years thereafter.
2. The sector committing to increase UK content to 60 per cent by 2030, including increases in the capital expenditure phase.
3. Increasing the representation of women in the offshore wind workforce to at least a third by 2030.
4. Setting an ambition of increasing exports fivefold to £2.6bn by 2030.
5. The sector will invest up to £250m in building a stronger UK supply chain, establishing the Offshore Wind Growth Partnership (OWGP) to support productivity and increase competitiveness. With the largest installed offshore wind capacity in the world and the prices consumers pay for the energy the sector generates falling significantly (between the 2015 and 2017 Contracts for Difference auctions, support costs fell 50 per cent), a trend that is expected to continue.

Over the next decade, there will be a huge expansion of offshore wind around the world with some estimates envisaging a 17 per cent annual growth from 22GW to 154GW in total installed capacity by 2030. In the UK, this could see offshore wind contributing up to 30GW of generating capacity. The domestic opportunities are significant too. Building up to 30GW* of offshore wind by 2030 could account for over £40bn of infrastructure spending in the next decade.

* Now 40GW with £50bn of investment, following Queen's Speech to Parliament in December 2019.

Source: adapted from BEIS (2019)

Box 2.3: Guidance Summary - Context

- The UK is the global leader in offshore wind energy generation. At the end of 2018, it had 7.9GW in 38 operational OWFs, with almost 2,000 wind turbines, making the country the nation with the single largest operating capacity in the world (Crown Estate 2019).
- Rapid fall in unit cost – major fall in CFD: the next generation of OWFs is expected to cost about £40 for every MW generated.
- The government target is for this capacity to grow to 40GW by 2030, with up an infrastructure spend of up to £50bn.
- Such growth provides important potential socio-economic opportunities for the UK, and for regions and local areas adjacent to the OWF sites, in terms of employment, supply chain and other socio-economic benefits. However, it is also important to mitigate any potential adverse effects on local services and quality of life.
- Such impacts can be especially important for those UK coastal communities that are suffering greatly from the decline in traditional industries, such as shipbuilding, fishing and tourism.
- There is a concern that as an industry, the UK offshore wind energy sector should take the delivering of UK content and UK economic success, at all levels, more seriously.
- The lack of knowledge on the actual socio-economic impacts of OWFs on communities can greatly hamper case management. There is a need for adequate planning and assessment guidance for the stakeholders–developers, consultancies, governments (local, regional, national), development agencies and the public.

3. An overview of the procedures for planning and assessing the socio-economic impacts of major OWF projects

3.1 International context

Major OWFs require an Environmental Impact Assessment (EIA). Fifty years after the pioneering enactment of the National Environmental Policy Act in the USA, EIA is a universally recognised instrument for environmental management, and at least 180 countries have EIA systems. Many of the international funding institutions, such as the World Bank, also have established EIA procedures (World Bank 2017), which often include socio-economic dimensions.

The International Association for Impact Assessment (IAIA) Social Impact Assessment Guidance (IAIA 2015) promotes an increased focus in the assessment process upon enhancing the benefits of projects to impacted communities. Whilst the guidance recognises the need to ensure the effective mitigation of negative impacts, it also recognises the value in working with the project development team to deliver greater benefits to communities. This is seen as necessary for the project to earn its social licence to operate. The guidance states that enhancing benefits covers a range of issues. These include modifying project infrastructure to ensure it can also service local community needs, and providing social investment funding to support local social sustainable development and community visioning processes. It also involves providing a genuine commitment to maximize opportunities for local content (i.e. jobs for local people and local procurement) by removing barriers to entry to make it possible for local enterprises to supply goods and services, and giving training and support to local people.

Of particular significance in Europe is the latest amendment of the EU EIA Directive (2014/52/EU). There was a hope that the amended Directive would further grasp the socio-economic impact initiative, yet it still maintains a biophysical focus, with the socio-economic content limited to population, human health and cultural heritage. In Europe at least, socio-economic developer/consultancy good practice, as exemplified in this report, is likely to continue to outstrip legislative good practice for some time.

3.2 EU and UK EIA and NSIPs regimes

The UK EIA regime, and those of other EU Member States, sit within the context of the EU EIA Directive and Guidance. The main stages and steps in the EU EIA process are set out in Figure 3.1.

In England, major OWFS (greater than 50MW) come under the 2008 Planning Act which identifies a subset of Nationally Significant Infrastructure Projects (NSIPs), with impacts examined by the Planning Inspectorate, National Infrastructure Division (PINs/NID). NSIPs are projects that are considered by the Government to be so big and nationally important that permission to build them needs to be given at a national level by the responsible Secretary of State. Instead of applying to the local planning authority for planning permission, as for most EIA projects, the developer must apply to PINs for a Development Consent Order (DCO). Figure 3.2 sets out the main steps in the NSIP process. While the main examination process is quite short, at six months, the overall process is front-loaded, with much pre-application activity, including screening, scoping, consultation with stakeholders, and the production of a

preliminary environmental information document (PEI), prior to the production of a full ES and a DCO draft application. There is also a variation on the EIA regulations, covered in the Infrastructure Planning (EIA) Regulations 2017 (HMG 2017), specifically concerning the scoping of impacts for major projects, where the applicant has the opportunity to ask PINs/NID for a formal scoping opinion on the information to be included in the ES. Similar processes, with some variations, apply in the other countries of the UK.

Figure 3.1: EU Guidance on main stages and steps in the EIA process

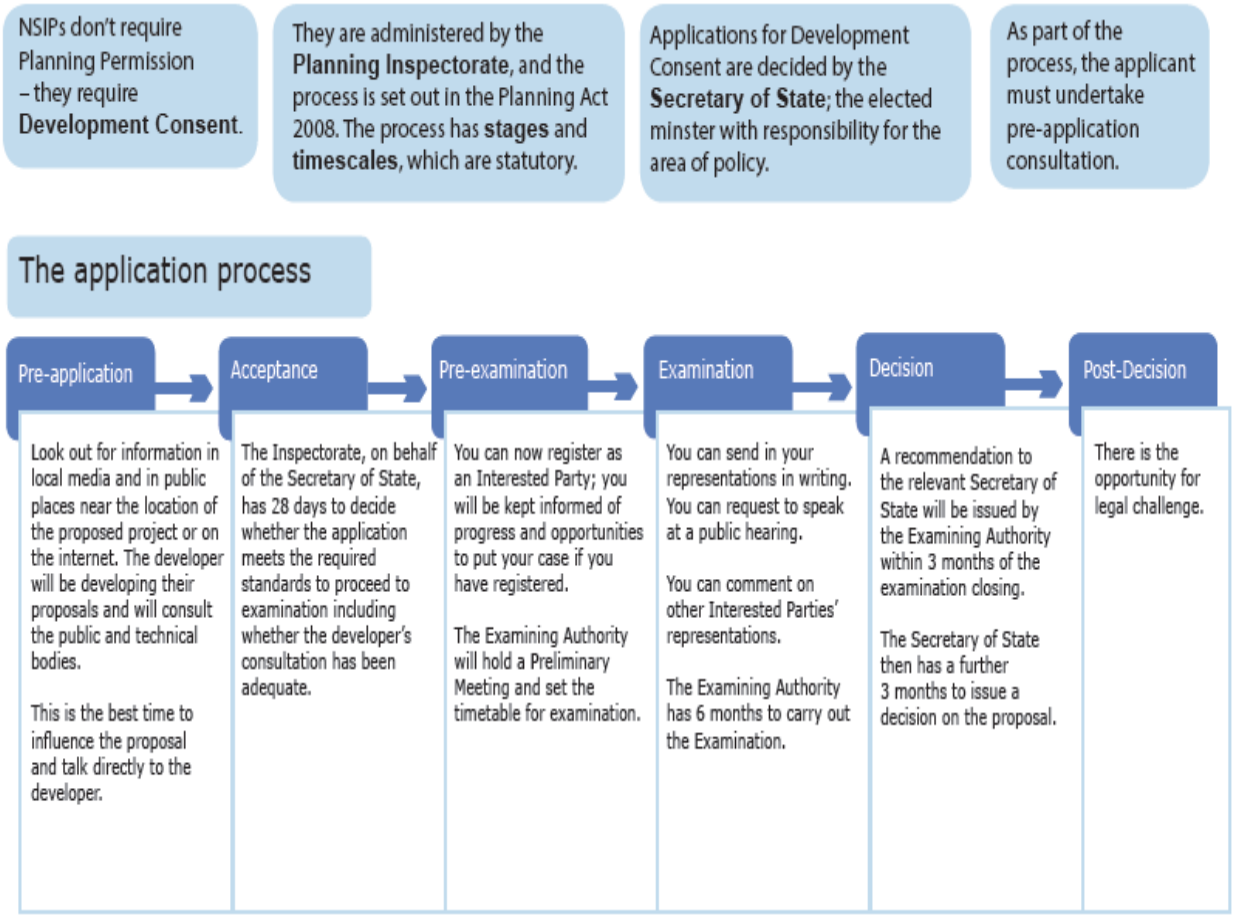
Screening (as appropriate)	The Competent Authority makes a decision about whether EIA is required. At the end of this stage, a Screening Decision must be issued and made public
Scoping (as appropriate)	The Directive provides that Developers may request a Scoping Opinion from the Competent Authority, which identifies the content and the extent of the assessment, and specifies the information to be included in the EIA Report.
EIA Report	The Developer, or the experts(s) on his/her behalf, carry out the assessment. The outputs of the assessment are presented in the EIA Report, which contains: *information regarding the project, the Baseline scenario, the likely significant effects of the project, the proposed Alternatives, the features and Measures to mitigate significant effects as well as a Non-Technical Summary and any additional information specified in Annex IV of the EIA Directive.*
Information and Consultation	The Competent Authority makes the EIA Report available to- authorities with environmental responsibilities, local and regional authorities, and to other interested parties and the public for review. They have the opportunity to comment on the project and its environmental effects.
Decision Making and Development Consent	The Competent Authority examines the EIA Report including the comments received during consultation and issues a Reasoned Conclusion on whether the project entails significant effects on the environment. This must be incorporated into the final Development Consent decision
Information on Development Consent	The public is informed about the Development Consent decision
Monitoring (as appropriate)	During the construction and operation phases of the project, the Developer must monitor the significant adverse effects on the environment identified as well as measures taken to mitigate them.

Source: adapted from EU (2017)

In Scotland, for example, there are separate EIA assessment and consent processes for the offshore and onshore elements of major OWF developments. For offshore projects greater than 50MW, applications for the offshore generation and transmission elements of the project are administered, under the Electricity Works (EIA) (Scotland) Regulations 2017, via the Energy Consents Unit of the Scottish Government, and by Marine Scotland for marine licence consent. The onshore elements (eg transmission lines and sub-stations) are consented under

the Town and Country Planning (Scotland) Act 2019 by the relevant local authority (ies). The steps in the EIA processes are in line with the EU Directive and guidance (as set out in Figure 3.1).

Figure 3.2: Main steps in the NSIP process – a stakeholder's' guide



Source: PINS (2017)

3.3 The importance of the socio-economic impacts of OWFs

The review of UK and other EU states ESs for OWFs undertaken for this research shows a much greater focus on biophysical impacts than socio-economic impacts). Key biophysical impacts include impacts on birds, marine mammals and on fish. However, all the 25 reviewed UK ESs for developments of over 50MW since 2010 include sections/chapters on socio-economic impacts and, in some cases, other sections/chapters on impacts on potentially impacted industries such as tourism, fishing and shipping. Some of these are very substantial and supported by important technical appendices. The socio-economic impact content in the more recent ESs is normally in the range of 50-100 pages, but precision is difficult, because of additional appendices, and extra sections sometimes required by examination bodies. Of course, length of coverage does not always equate with depth and quality of coverage (IAU, Socio-economic impact assessment in Environmental Statements (ESs) for UK Offshore Wind Farms (OWFs), 2020).

The socio-economics impacts coverage from a limited review of 13 non-UK ESs, mainly for Denmark, Netherlands, Belgium, was present but was thinner than for the UK; the key

economic topics considered were tourism (onshore and offshore), commercial fishing, shipping, and traffic (IAU, Socio-economic impact assessment in Environmental Statements (ESs) for Other EU States' Offshore Wind Farms (OWFs), 2020).

Socio-economic impacts have been covered in UK *onshore* wind farms proposals for some time. These include especially employment and supply chain impacts and various community benefits schemes. They also focus on local concerns about issues such as visual, noise and construction traffic impacts. In contrast, one perspective on *offshore* wind farms is that they are 'out of sight, out of mind' and as such SEI are less important. However, the impacts of OWFs do come ashore in many ways – visual if near coast, and via sub-station connections, and via a range of employment and supply chain impacts and opportunities. Offshore wind farms are increasingly much larger than onshore developments, with subsequently much larger impacts, or potential for much larger impacts, both biophysical and socio-economic.

As noted in section 3.1, there is an increasing focus on the social licence to operate for major projects. Whilst interested parties use this term loosely, it is nevertheless gaining ground as a responsible way for developers to operate, through seeking and obtaining the broad acceptance of relevant communities to conduct their construction and operational activities (Boutilier 2017). The social acceptance of a project by a local community is particularly important, involving issues of trust and fairness and a process of community engagement. Associated quite often with the social licence, and equity issues, is the issue of local content, and a concern that many of the benefits of major projects leak out way beyond the local area. This is a particular concern for OWF projects in the UK. RenewableUK (2015, 2019) has raised concern that the UK offshore wind sector has not sufficiently capitalised on its lead to secure local content, in terms of UK investment and UK jobs.

OWFs involve by definition offshore locations, some are near coastal others are much further off coast. Many coastal locations, for example on the North Sea coast of the UK, are suffering from the decline in traditional coastal located industries, such as shipbuilding, tourism and fishing. Towns and cities such as Hartlepool, Hull, Grimsby, Great Yarmouth and Lowestoft, have suffered from some of the worst unemployment rates, especially youth unemployment, and major issues of deprivation, in the country. Many have been designated as Development Areas/Assisted Areas at some stage over the last 50 years. **OWF developments potentially offer major opportunities for much better times for coastal communities, if those opportunities are grasped.**

A consideration of socio-economic impacts needs to clarify the type, duration, spatial extent and distribution of impacts. In other words, the analyst need to ask: what to include, over what period; over what area, and impacting whom? In socio-economic impact assessment, these questions are considered through the various *steps in the assessment process*, as noted in Figure 3.1. These can be summarised as:

- baseline studies: understanding the socio-economic characteristics of the project
- baseline studies: understanding the local socio-economic environment baseline
- scoping: clarifying the key socio-economic issues
- impact prediction
- assessing impact significance
- mitigation and enhancement of impacts
- monitoring of impacts, and associated measures

The various steps are now discussed separately for economic impacts (s4) and for social impacts (s5). These constitute the main sections of this guidance report.

Box 3.1: Guidance Summary – Overview of Planning and Assessment Procedures

- Major OWFs require Environmental Impact Assessments (EIA) and the production of an Environmental Statement (ES), which involves a distinct set of procedures.
- Socio-economic impacts are of growing importance in the planning and assessment of OWFs, especially in the UK. International drivers include IFC/World Bank Performance Standards (2012); IAIA Social Impact Assessment Guidelines (2015); and amended EIA Directive.
- Major projects have special assessment procedures. For example, in England, OWFs greater than 50MW come under the 2008 Planning Act which identifies a subset of Nationally Significant Infrastructure Projects (NSIPs), with impacts examined by the Planning Inspectorate, National Infrastructure Division (PINs/NID). The developer must apply to PINs for a Development Consent Order (DCO). Similar processes, with some variations, apply in the other countries of the UK; in Scotland, for example, there are separate EIA assessment and consent processes for the offshore and onshore elements of major OWF developments.
- There is growing recognition of the socio-economic impacts associated with various stages in, and elements of, the OWF lifecycle – including development/pre-construction, offshore construction, onshore construction, operation and maintenance (O&M), and decommissioning.
- To date, from a review of OWF ESs, there has been a predominance of assessment of economic impacts, with varying considerations and ambivalent trends in the assessment of social impacts.
- OWF developments can potentially make important contributions to employment and general wellbeing in often currently deprived coastal communities.
- There is a growing recognition of the importance of a social licence to operate from the community. The social acceptance of a project by a local community involves issues of trust and fairness and a process of community engagement.
- Associated quite often with the social licence, and equity issues, is that of local content. There is a concern that many of the benefits of major projects may leak out way beyond the local area. Local content is important, but to date there has been an industry emphasis on impact at the national level.

4. Impact assessment process – *economic: impact assessment issues, methodologies and techniques*

4.1 Understanding the OWF lifecycle for socio-economic impacts

Socio-economic impacts are the outcome of the interaction between the characteristics of the project and those of the "host" environment. Baseline information is needed on both sets of characteristics. For the project what is important is the investment/expenditure and the associated human resources plans for the key stages of the project lifecycle—especially for the construction and Operation and Management (O&M) stages. Investment for infrastructure projects may be particularly large in the construction stage (CAPEX); but ongoing operational expenditure (OPEX) over many years may also be of considerable local and regional economic significance. Construction stage capital investment may involve a hierarchy of main (tier1) contractors, tier2 sub-contractors and tier 3 sub-sub-contractors, which can present considerable difficulties for the analyst. Understanding may also be complicated by rapidly changing technology in new and innovative areas. For example, work on major offshore wind farms has seen a rapid increase in the size of wind turbines, from 3MW to potentially 12MW in just a few years. As such, there may be a need to allow for some uncertainty in analysis.

Each developer and their consultants for their various ES submissions undertake valuable work on the key characteristics of the OWF lifecycle. Key OWF developers in the UK and EU (2020) include Orsted (previously Dong), Vattenfall, SSE, EDF Renewables, EON, Innogy and Equinor (previously Statoil). Major OWF consultancies, involved particularly in producing the ESs, include ERM, RPS, Royal Haskoning, AECOM and others. Socio-economic assessment may be sub-contracted to specialist consultancies such as Regeneris, Arcus, LUC and SQW. Further valuable work that seeks to provide an overview of the key characteristics of the industry more widely are provided by bodies such as the Crown Estates, and consultants such as BVG Associates. Drawing on these sources, such as *Guide to an Offshore Wind Farm* (BVG associates, 2019), and other sources noted in the References, a number of life cycle stages and project components can be identified for the socio-economic assessment, as set out in Table 4.1.

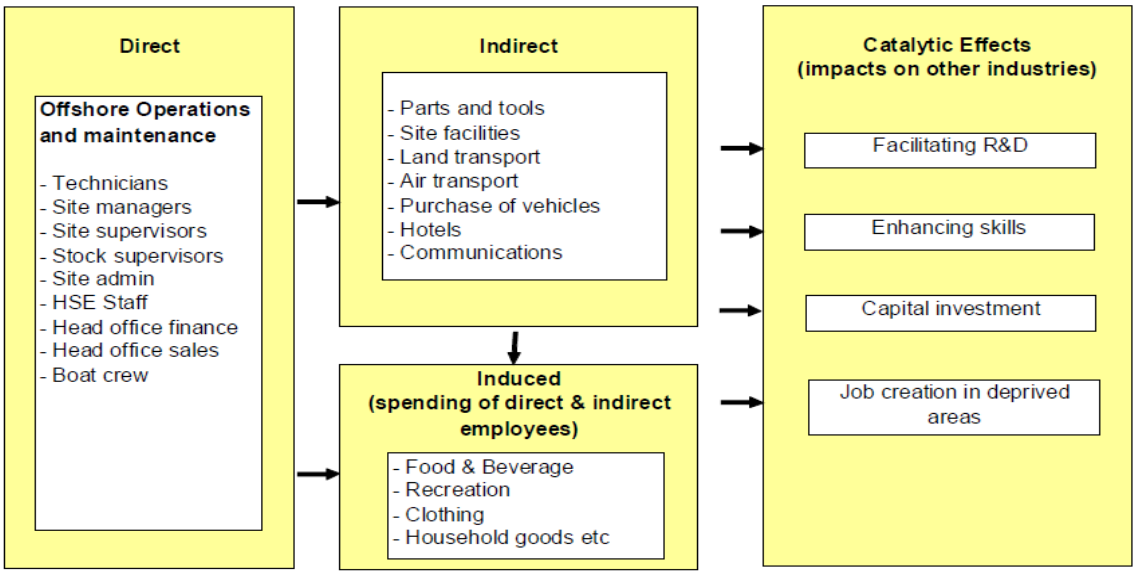
Table 4.1: OWF lifecycle stages for SEI

Main stages	*Key activities*	*Costs involved for a 1GW OWF (BVG 2019, and IAU estimates)*
DEVEX (development expenditure)	The **development** stage includes the early, pre-construction, planning, assessment and consenting activities; plus ongoing management services.	Estimated at c£120m (with c£50m for assessment and consenting). About £8m for the EIA/ES, of which c £350,000 for the socio-economic impact assessment. May be up to 5 years in the planning and development.
CAPEX (capital expenditure)	The main **construction** activity, which includes offshore and onshore activities. The major **offshore activities** include: turbine elements (tower, blades, nacelle, and rotor) and balance of plant (cabling, foundations and offshore substations); **onshore activities** include onshore substation and grid	Roughly estimated at c£2-3bn for a 1GW OWF. May be c3years in the construction stage. Major area for cost efficiencies (IAU estimate from recent cases)

	connections. Installation and commissioning activities.	
OPEX (operational expenditure)	The operation and management **(O&M)** stage involves training, logistics, transfer vessels, monitoring, maintenance and servicing.	Estimated at c£75mpa. O&M lifecycle is typically 20-25 years.
DECEX (decommissioning expenditure)	Involves the removal, making safe and possible recycling of offshore and onshore infrastructure. An alternative, depending on the stage of technology at the time, may be repowering of the OWF.	Estimated at c£300m. Further environmental surveys and management plans are required for decom activity, under the Energy Act (2004).
TOTEX (total expenditure)		IAU roughly estimated at c£4bn (undiscounted) over full project life cycle

The components involved in each stage can be disaggregated in much more detail (see BVG 2019). Figure 4.1 below provides a more dated, but very useful outline of the various direct, indirect and induced components of OWF O&M employment, noting also some wider catalytic effects on other industries.

Figure 4.1: The various components of Offshore Wind Farms' O&M employment



Source: Oxford Economics (2010)

There is concern about the leakage of much of the project expenditure, especially the large element of CAPEX, outside the UK (BVG 2015). Over the lifecycle of a typical project, BVG estimated DEVEX to be about 1.5 % spend, CAPEX 53% and OPEX 43.5%. However, the 2017 report on *Offshore Wind UK Content* by RenewableUK for the Offshore Wind Programme Board does show an increase in UK content across all stages of the lifecycle. This may partly reflect some significant investments made by companies such as MHI Vestas, with its' Isle of Wight blade production facility for the new 8MW turbines, and Siemens' Greenport development on Humberside, which opened its blade factory in December 2016. Table 4.2

shows the estimate of UK content by RenewableUK (2017), using aggregated data from those contracts over £10m submitted anonymously to the industry body by wind farm developers, including projects coming into Final Investment Decisions (FID) between 2010 and 2015. However, these estimates do not show the economic impacts at the local and regional levels, which are the levels of particular interest to host communities and local authorities/agencies.

Table 4.2: Range and average UK content in TOTEX, DEVEX, CAPEX and OPEX

	Lower	Upper	Weighted average 2017	2015	Change against baseline
DEVEX	27%	92%	**73%**	**57%**	**+16%**
CAPEX	22%	38%	**29%**	**18%**	**+11%**
OPEX	52%	89%	**75%**	**73%**	**+2%**
TOTEX	44%	53%	**48%**	**43%**	**+5%**

Source: RenewableUK (2017)

4.2 Understanding the local and regional host socio-economic baseline environment– economic

4.2.1 What is local?

The 'local' in local content can mean several things covering a range of spatial scales. In terms of maximizing national content, as largely referred to in Table 4.2, local is the UK. However, for example, if considering wind farms in Scotland, there would also be a concern to identify what percentage of economic benefit is staying within Scotland. But neither definition would be local for the host community. This would be much more specific, but again could range from daily commuting distance for the construction stage (sub-region wide) to much more local for the O&M scale, with workers much more likely to reside near the onshore/port facilities for a long term job. Some studies unfortunately avoid specification altogether. Where it is included there is some focus on adjacent coastal local areas, although there is some variation in approach, as illustrated in Box 4.1:

Box 4.1 Examples of local and regional definitions from some recent UK ESs.

-- *Beatrice: s*tudy area includes local authorities that border Moray Firth: Moray, Highlands and Aberdeenshire;
-- *Aberdeen*: uses Inner Area (Aberdeen City and Shire), and Outer Area (Scotland);
--*Triton Knoll*: uses local (part of Lincolnshire), regional (E. Midlands) and UK levels of analysis;
-- *Inch Cape: uses* economic study area (60mi catchment) including four labour market catchment areas;
-- *Navitus:* 60 minutes' drive time catchment; but only 10km coastal belt for tourism impacts of offshore development;
-- *Dogger Bank Teesside:* NE region, and local Tees Valley Boroughs, UK—plus onshore cable corridor; and
-- *East Anglia 3:* which uses alternative regional spatial areas, around port location alternatives.

There is merit in differentiating between local area (eg 60 minutes local commuting catchment area) and wider regional context for the construction stage, and in using a narrower local authority area definition of local for the O&M stage.

4.2.2 What are the main economic dimensions for baseline studies?

The economic impact dimensions of the host environment are set out particularly in points 1 and 2 of Table 1.1. There is usually a functional relationship between impacts. For example, direct economic impacts will usually have a range of indirect (supply chain) and induced (worker expenditure) impacts. Table 4.3 provides an example from the major Humberside Hornsea 2 OWF host location of a set of baseline local economic indicators, and in this case, of indicators of a deprived and problematic local economy which has suffered from the decline of traditional heavy industries.

Table 4.3: Example of baseline economic indicators: Humberside (2013)

Economic Indicator	***Local spatial scale***			
	UK comparator	*Humberside local impact study area:*	*-in which Hull*	*-and NE Lincolnshire (including Grimsby)*
% working age population in work	71	69	63	69
% unemployment of economically active population	8	10	15	12
% population with no qualifications	10	11	16	11
% with elementary occupations (SOC)	17	23	25	28
total GVA pc (£)	21,700	15,500	18,100	18,200
employment density (jobs per 1000 working age residents)	703	599	570	655

Source: adapted from Smartwind (2015) Hornsea Offshore Wind Farm ES Vol 3—Onshore, Chapter 11 Socio-economics

In addition, an economic baseline should assess the local industrial structure, for example using Location Quotient analysis to identify areas of strength and weakness. Industries that may be impacted by the OWF, such as tourism and fishing, should be included as appropriate. All should be set in the context of relevant economic policy objectives for local, sub/regional (eg Local Economic Partnerships) and national government/agency bodies (see chapter 8, Glasson and Marshall 2007).

4.3 Scoping key economic impacts

A Scoping Report should draw on the understanding of the characteristics of the project and the host area baseline (s4.1 and 4.2) to identify the likely most significant impacts. The socio-economic content of UK OWF ESs to date has very much focused on economic impacts, of the order of five pages of economic content to one of social. This may reflect the more quantitative and measurable nature of economic impacts. The relative coverage of social impacts appears even less in some of the most recent ESs, many of which are for projects that are a long distance offshore, and several social impacts (e.g on accommodation and health) may be scoped out of the assessment from the beginning. However, as discussed in s5 of this report, this can underplay important social impacts. Table 4.4 presents an interesting example of a scoping document.

Key economic impact areas, as reflected in the review of UK ESs, are employment, skills and training, and supply chain and GVA (Gross Value Added) impacts. There is also coverage of some related sector impacts, especially on tourism and fishing for offshore works, and on agriculture for the onshore cable route. Some ESs have included separate chapters on such sector studies. Except where the likely impacts on such sectors are likely to be of major

significance, there is merit in including such studies in one socio-economic impacts section/chapter to provide an accessible and integrated socio-economic impact assessment.

ESs should, and do clearly recognise the variations in socio-economic impacts over the OWF life cycle. Most include both the construction and the operation and management (O&M) stages, and increasingly ESs are including the decommissioning stage. By far the most attention is for the construction stage, and primarily offshore construction. Some studies make clear distinctions between the onshore and offshore activities, but for many this is not clear, and the focus is primarily on the offshore activities. This is unfortunate as the onshore can have important local and regional socio-economic impacts, as can the O&M stage. Even within stages, it may be necessary to identify phases, for example peak construction employment, to highlight the extremes of impacts that might flow from a project.

The question of who is impacted is often the least well-covered aspect in scoping, but is vitally important. The distributional impacts of developments do not fall evenly on communities; there are usually winners and losers. Distributional effects can be analysed by reference to geographical areas and/or to groups involved (eg local and non-local, socio-economic groups, and age groups). This may raise important issues of environmental justice.

ES scoping should show an awareness of the statutory guidelines for the assessment of the relevant economic and social issues. This is especially the case with regard to English ESs and guidance in Energy National Policy Statements (NPSs), including NPS EN-1 (DECC 2011) (see Box 4.2), although this guidance is thin on economic impacts and an update is well overdue.

Box 4.2: NPS guidance on scoping socio-economic impacts

The UK National Policy Statement for Energy (HMG 2010) specifies a particular set of socio economic impacts. Para 5.12.3 of EN-1 identifies the following considerations as relevant socio-economic impacts:

- 'the creation of jobs and training opportunities;
- the provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;
- the effects on tourism;
- the impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure. This could change the local population dynamics and could alter the demand for services and facilities in the settlements nearest the construction work (including community facilities and physical infrastructure such as energy, water, transport and waste). There could also be effects on social cohesion depending on how populations and service provision change as a result of the development, and;
- cumulative effects-if development consent were to be granted for a number of projects within a region and these were developed in a similar timeframe, there could be some short term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects within the region.'

Source: DECC (2011)

Table 4.4: Anticipated coverage of socio-economic impacts in the Hornsea 4 Scoping Report

Valued socio-economic aspects	Typical issues	Comment onshore	Comment offshore
Health and wellbeing	Could H4 affect individual and community/population health group cohesion?	No likely significant effects. While there will be a large construction workforce, much of it will be drawn from local and regional resources and no single community will be exposed to large scale temporary immigration of workers.	Not applicable
	Could H4 affect community safety?	Will be addressed in the Traffic and Transport assessment. Other community safety factors (such as fencing and security of working areas) will be addressed in a CoCP.	Will be addressed in Shipping and Navigation, to the extent applicable.
	Could H4 affect family cohesion?	No likely significant effects, not relevant to H4	
	Could H4 affect cultural maintenance?	No likely significant effects, not relevant to H4	
Sustainable natural resource harvesting	Could H4 affect hunting and gathering activities (noting that this mainly applies in traditional economies onshore) but offshore does apply to commercial fisheries?	No likely significant effects, not relevant to H4	Will be addressed under Commercial Fisheries.
	Could H4 affect the recreational and traditional economy (eg. through interrupting access to land and sea)?	Will be addressed under 'Land Use and Agriculture', together with landowner and land user consultations.	Will be addressed under Commercial Fisheries, and Other Marine Users.
	Could H4 affect the value of alternative land uses (eg. tourism vs fishing vs industry)?	Not applicable to H4 as alternative land or sea uses will be compensated	
Protected heritage and cultural resources	Could H4 affect the aesthetic, cultural, archaeological and/or spiritual value of places?	Will be addressed under Cultural Heritage	Will be addressed under Marine Archaeology
	Could H4 affect the maintenance of traditional language, education, laws and traditions?	No likely significant effects, not relevant to H4	
Equitable business and employment opportunities	Could H4 affect local, regional and national business competitiveness?	Relevant given Humber region context and supply chain.	
	Could H4 provide employment opportunities for local, regional and national residents?	Relevant given Humber region context and supply chain.	
	Could H4 facilitate training and career development for local and regional residents?	Relevant given Humber region context and supply chain.	
	Avoidance of boom and bust cycles (via economic diversification)?	No likely significant effects, not relevant to H4	
Population sustainability	Could H4 cause or exacerbate in- and out- migration effects?	No likely significant effects. While there will be a large construction workforce, much of it will be drawn from local and regional resources and no single community will be exposed to large scale temporary immigration of workers.	
	Could H4 cause changes in the social and cultural make-up of affected communities?	No likely significant effects, not relevant to H4	

Adequate services and infrastructure	Could H4 lead to pressure on social services, such as health care, education and justice?	No likely significant effects. While there will be a large construction workforce, much of it will be drawn from local and regional resources and no single community social service will be exposed to large scale demand from workers.
	Could H4 cause or exacerbate housing pressures eg. Affordability, availability and appropriateness?	No likely significant effects. While there will be a large construction workforce, much of it will be drawn from local and regional resources and demand for temporary accommodation by those hired from outside the region will be distributed over a relatively wide area and unlikely to compete with others (eg. domestic or tourism) for availability.

Source: adapted from Orsted (2018) Hornsea Project 4—EIA Scoping Report

Box 4.3: Guidance Summary—Understanding the OWF project, local community and scoping key economic issues

- For the project, it is important to establish, as fully and accurately as possible, the investment/expenditure and the associated human resources plans for the key *stages* of the project lifecycle—especially for construction (CAPEX) and O&M (OPEX) stages.
- CAPEX includes both offshore and onshore construction, estimated in total at c£2-3bn for a 1GW OWF. By far the major investment is offshore, but onshore works can be significant locally.
- OPEX includes training, logistics, transfer vessels, monitoring, maintenance and servicing. Expenditure is significant over a 20-25 year lifecycle, estimated in total at c£1.5bn for a 1GW OWF.
- Estimates of UK share of OWF expenditure (2017) are CAPEX (c 30%) and OPEX (c 75%). However, these estimates do not show the economic impacts at the local and regional levels, which are the levels of particular interest to host communities and local authorities/agencies.
- Economic impacts will normally include employment, GVA and specific sector impacts (eg tourism, fishing), for each project stage, time-period and spatial level.
- There are Direct impacts (eg project employment), Indirect impacts (eg supply chain), and Induced impacts (eg retail expenditure of employees).
- What is the local impact area? There is merit in differentiating between local area (eg 60 minutes local commuting catchment area) and wider regional context for the construction stage, and in using a narrower local authority area definition of local for the O&M stage.
- The economic impact dimensions of the host environment include employment and unemployment, skills and education, GVA per capita, industrial sectors.
- A Scoping Report should draw on understanding of the characteristics of the project and host area baseline to identify the likely most significant impacts.
- Scoping good practice should: recognise variations in impact issues over the project lifecycle, address distributional impacts (potential winners and losers), and show awareness of statutory guidelines (eg. English National Policy Statement for Energy (HMG 2010) para 5.12.3 of EN-1specifies a set of economic impacts to be considered --- eg workforce lifecycle, jobs and training, effects on tourism).

4.4 Predicting and assessing significant economic impacts

4.4.1 Predicting and assessing – opening the black box

Prediction and assessment of the likely socio-economic impacts of a major project on various spatial areas is an inexact exercise. It involves the identification of potential change in indicators for issues set out in the Scoping Report. Methodologies may use simple extrapolative and comparative measures drawing on trends in relevant data, informed by examples of actual impacts from similar projects, or use may also be made of a range of economic impact models, such as multipliers and input–output (IO) models. Predictions then provide the basis for the assessment of the relative significance of impacts to inform decision makers whether they may be considered acceptable.

4.4.2 Key structuring elements – importance of multipliers

The key building blocks for predicting the main employment and GVA elements of OWF projects are set out in Table 4.5. The importance of the amount of OWF related employment for a local area is clear, although there are dimensions other than quantity, including permanency or otherwise, and job quality. The OWF related GVA element requires more clarification. GVA is an economic productivity metric that measures the contribution of a company, producer, or in this case a development, to an economy or region. It provides a monetary value for the amount of goods and services that have been produced in an area, minus the cost of all inputs directly attributable to that production. It is calculated by applying a GVA-output ratio to project expenditure.

As illustrated in Figure 4.1 direct economic impacts on employment and GVA can have wider multiplier effects. These secondary economic impacts include two main categories: indirect impacts and induced impacts. Indirect impacts result from the developer/main contractors requiring supplies ranging from components from local engineering firms to provisions for the canteen. Induced impacts result from the extra expenditure flowing into an area from the retail activities of, often well-paid, employees working on project main contracts and sub-contracts. Overall, the net effect may be considerably larger than the original direct injection into the areas under study. Such wider impacts are usually seen as beneficial, but they may also bring some costs, including inflationary impacts on various local markets, including housing and of course the labour market itself -- with the possible displacement of workers to the project at the expense of existing local businesses. A 2017 study (Noonan and Smart, ORE Catapult) estimated the OWF GVA multiplier at 1.7

Table 4.5: Key elements in economic predictions for OWF developments

Project stage	***Employment metric***	***GVA metric***
Development/pre-construction	For each project stage:	For each project stage:
Construction offshore –peak		
Construction offshore –total	-- direct employment -- indirect employment -- induced employment All in FTE person years	-- direct GVA -- indirect GVA -- induced GVA
Construction onshore --peak		
Construction onshore –total		
O&M – annual		
O&M -- total		

Decommissioning – total		

4.4.3 Managing uncertainty

The Rumsfeld position appears common in some OWF ES predictions: "--- as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know.*"* Whilst this may be a little harsh on OWF developers, they and their consultants have often argued some unknowns in their socio-economic predictions.

The first unknown relates to port location and most studies do tend towards imprecision on this issue, arguing that it will depend on the specification and sourcing of key construction elements (turbines, blades etc). Some projects (eg Dogger Bank Creyke Beck) argue that the port location issue negates any detailed economic analysis at all. Some ESs are a bit more specific on port location, narrowing it down to a few relatively adjacent ports (e.g. Walney potential use of Barrow, Heysham, Belfast and Liverpool; Hornsea 3 modelled Humber and East Anglia based alternatives). However, as particular ports become used for actual construction/ laydown and O&M hubs for live projects, the port locations for subsequent projects (often next in a sequence at a broad location) should hopefully become easier for the developer to identify in the ES. *A second unknown* relates to the supply chain capacity of local, regional and national areas. *A third known unknown* relates to the rapidly evolving OWF technology. As noted already12MW turbines are in the offing, as are more technology-based approaches to O&M (eg use of drones for inspection), and the use of floating OWFs, all of which may have implications for the design, location and socio-economic impacts of OWFs.

For EIA exercises, the assumptions underlying predictions should be clearly stated. The probability of and confidence in predictions should be addressed; EU and UK EIA legislation and guidance now requires "the probability of impact" to be considered. Ranges may be attached to predictions within which the analyst is n% confident that the actual outcome will lie. Sensitivity analysis can be used to assess the consistency of relationships between variables. An uncertainty report can bring together and clearly disclose sources of uncertainty, and monitoring of the actual project impacts may facilitate a more adaptive management response.

4.4.4 Use and misuse of scenarios

The scenario approach is currently the most popular way of allowing for uncertainty in relation to the issues outlined in s4.4.3. In some cases, there is also use of a 'Rochdale-envelope' worst-case scenario approach (PINS 2018). The scenarios normally have three levels – low/medium/high – for local/regional/UK employment and supply chain content. However, there are many interesting variations to the nature of the low/medium /high scenarios, as illustrated below, with considerable variation in interpretation (Box 4.4).

In many cases, there is also a very wide range in economic predictions across the scenarios, making life very difficult for decision makers and host authorities. For example, for the Beatrice project, total local area job years predictions varied from 400-1800 for the construction stage, and from 3200-6000 for the total O&M stage, for low and high scenarios. For Hornsea 3, construction employment pa estimates for the Humber local area ranged from 120 (low

scenario) to 2140 (medium scenario) to 4060 (high scenario). What is a sensible way forward? With more OWF activity, and with more identification of ports etc, it should be easier for developers to specify the more likely scenario, to narrow the ranges, and to specify probabilities. Whilst there will be impact variations relating especially to the particular nature of projects and the economic capacities of local economies, there may be a shift towards medium scenarios at least for onshore construction, and to high impact scenarios for the O&M stage. For offshore construction, medium scenarios are probably more likely for regional and national than for local area impacts.

Box 4.4: Some examples of high, medium and low economic impact scenarios in recent UK OWF ESs

-- *Triton Knoll:* with high impact scenario assuming 70-100% UK sourcing; medium 50% of high and low 10% of medium;

-- *East Anglia 3:* with high assuming 55% UK sourcing; medium 35% and low 20% (latter considered worst case scenario);

-- *Hornsea 1:* low impact where local ports are not used, medium impact where a local port is used and 50% of supply chain opportunities related to the construction will be locally sourced;

--*Inch Cape:* base impact scenario has a moderate supply chain capacity and whole life expenditure of 12% impacting on the economic study area, 9% for the rest of Scotland and a further 17% for the rest of the UK; with the high impact scenario, the predictions are 33% local, 14% rest of Scotland and 25% rest of UK; and

-- *Navitus:* low (not local port), medium (local port for construction and O&M), and high (as for med + some local fabrication)

4.4.5 Prediction methodologies –simple, complex and hybrid

As noted in s4.4.1, prediction methodologies may use simple extrapolative and comparative measures drawing on trends in relevant data, informed by examples of actual impacts from similar OWF projects, or use may be made of a range of economic impact models, such as multipliers and input–output (IO) models. As for major projects more generally, so for OWFs there has been a growing interest and practice in modelling the wider economic impacts – both expenditure and employment. Over time there has also been increasing use of guidance from sources such as HM Treasury's *Green Book* (2018), Scottish Enterprise (SE) *Additionality and Economic Impact Assessment Guidance Note* (2008), and NPS Energy projects guidance (DECC 2011).

A modelling trend, and one which has evolved in the OWF sector over the last decade, has been the development of an Input-Output (I-O) approach, particularly advanced by some UK consultancies. An I-O table is a balancing matrix of financial transactions between industries and sectors, which can be used to provide a detailed and disaggregated guide to the wider economic impacts resulting from changes in one industry or sector. However, the key to effective I-O analysis is the currency and level of disaggregation of the underpinning I-O tables. Unless an up-to-date I-O table exists for the host area under study, the start-up costs are likely to be too great for most socio-economic impact studies, and there is a need to adapt from the use of national and regional I-O tables. For the UK these include UK-wide (ONS, 2019) and Scotland-wide (Scottish Government, 2016) tables. These tables categorize industry sectors using Standard Industry Classification (SIC) codes. For a relatively new sector, such as an OWF, there may not be adequate and appropriate codes, resulting in some generalization that may distort results. The use of higher/national scale data and multipliers can also over-generalize impacts, missing out the particular nuances of local economic bases.

Notwithstanding such limitations, there has been some interesting I-O work undertaken for OWFs, for research on local content in the sector at large (e.g. see Oxford Economic work on the impacts of the O&M stage, for Vestas—Oxford Economics 2010), and on some of the larger OWF projects. These studies show the significance not only of direct impacts, but also of the indirect and induced impacts, which are estimated to be together of the order of 75-80% of the direct impacts, although with variations between scales and project stages.

In addition to the I-O approach, and partly as a response to the I-O approach, a number of more hybrid and 'bottom-up' approaches have been developed. I-O approaches can seem complex and opaque to many interested parties, and less grounded in the actual details of the project and the host economy. Three alternative approaches, which seek to be more transparent and locally based, are set out in Table 4.6.

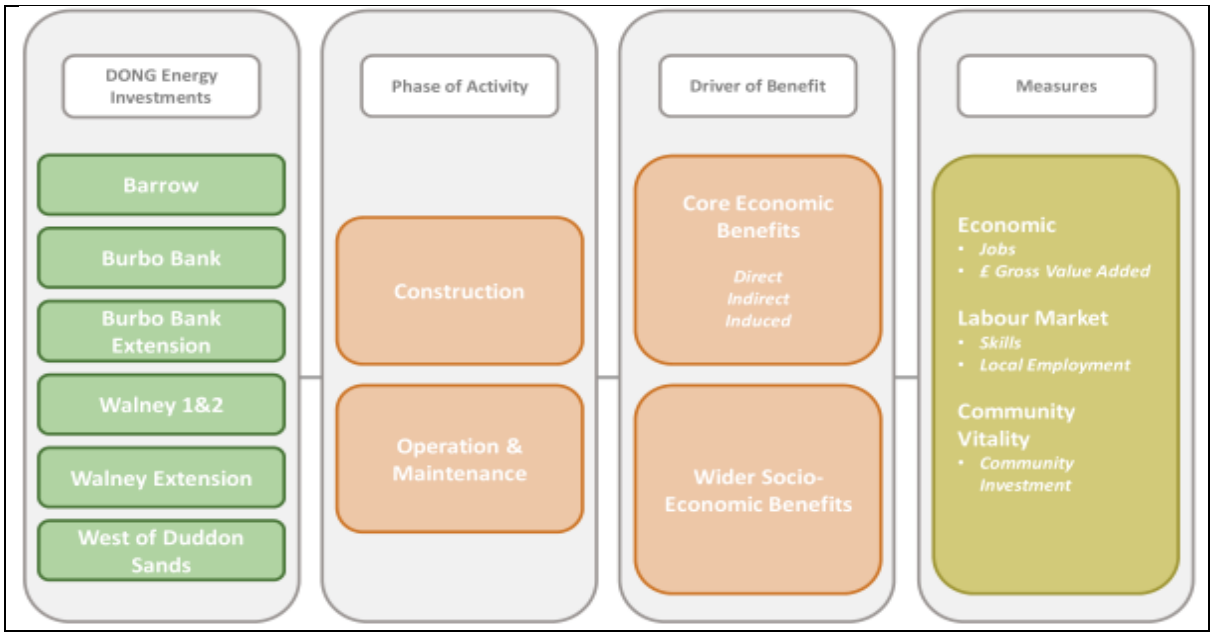
Table 4.6: Some alternative 'more hybrid' modelling approaches

Approach	***Key elements***
Oxford Brookes Impact Assessment Unit (IAU) approach, as used for other energy projects (e.g. EDF HPC (2011), and onshore wind farms)	• bottom up approach, for example for local employment prediction • disaggregating the employment demands of the project over the lifecycle of the project, into specific skill categories • detailing the employment characteristics of the host local area (e.g. wider commuting zone for construction) • use of monitoring data from comparative projects; gravity model analysis of likely local area skills supply and key stakeholder consultation, to produce set of predicted local employment impacts by skill group • application of limited sensitivity analysis (e.g. + /- 10% range) • application of generic secondary impacts multipliers
BVG Associates/UHI (2017)	• local content impact methodology, which seeks to be *" more robust and transparent to the industry lay-reader than existing economic analyses*" • captures local value added from the project investment, via collation of project data on employee earnings, self-employed profit and use of buildings, plant and equipment (direct and indirect impacts) • application of specific sector knowledge and data • application of induced expenditure multipliers • division of aggregate local value added by average annual wage plus other non-wage costs of employment, to arrive at estimate of FTE employment form the local value added
Regeneris/Dong approach as applied to Irish Sea and Humber cases (Regeneris, 2015, 2016)	• for Irish Sea study • desk based research and analysis of socio-economic impacts of Dong's investments in E. Irish Sea • analysis of contracts data and discussions with Dong's delivery team to understand project costs and likely geography of supply chain • development of robust socio-economic model to capture and quantify expected impacts for construction and O&M project stages • discussion with local stakeholders (e.g. LAs, trade bodies, local industries) to understand wider effects of wind farm developments in key areas (e.g. Cumbria) Fig 4.2 summarises the assessment framework that underpins this analysis.

Is there a normative alternative approach? The Norfolk Vanguard OWF ES (Vattenfall 2018) raises some scepticism about the value of income and expenditure forecasting. Here, more emphasis is placed on a normative approach, seeking to maximise the local economic benefits via development of a vigorous supply chain ecology in the local and regional business

environments. That is, the focus is on managing the level of local economic impacts through working with local businesses as fully as possible.

Figure 4.2: Dong/Regeneris hybrid model – Irish Sea example



Source: Regeneris Consulting (2015)

4.4.6 Importance of local content, and reducing leakage

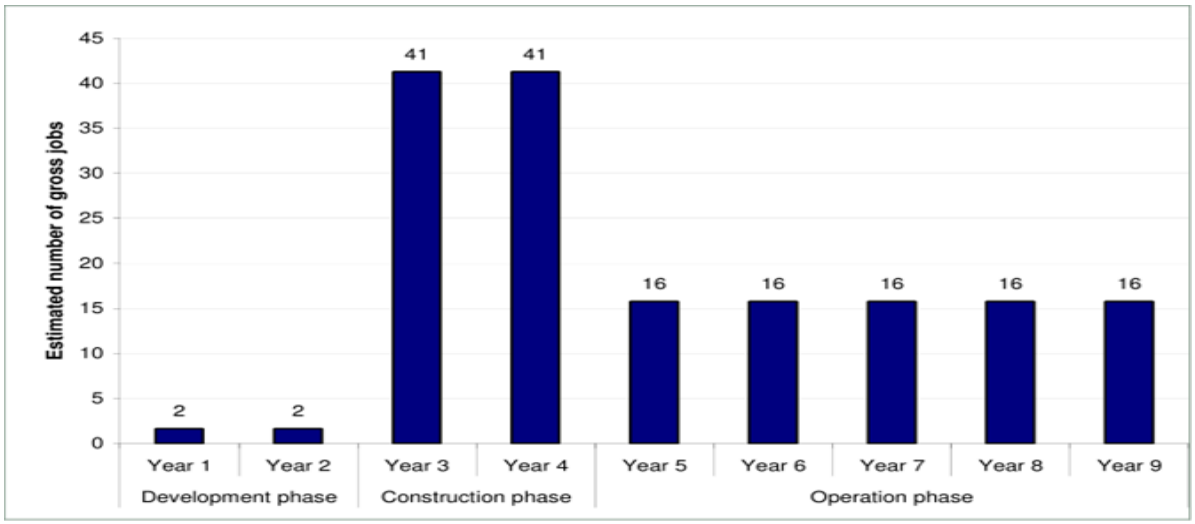
Much of the economic benefit of OWF developments, especially from the major construction stage (offshore) leaks out of local and regional areas. However, there is still benefit to communities. A study by Hattam et al (2015) for the Crown Estate, using a capital stocks approach showed, under human capital, positive impacts for example on employment (direct, indirect and induced), and on skills and wages. 'Although not unequivocal, the impacts on financial, manufactured and human capital are primarily positive.'

The importance of local content is set out in a more geographically specific context in a report by SQW (2011) --- *Phase 2 Socio-Economic Report, Argyll Renewable Communities.* SQW note the increased focus on the local socio-economic effects of renewable energy developments, and that local employment opportunities are more likely in the O&M stage, and can be influenced by a proactive approach by both developers and communities. They estimate one local O&M job for every 2-3 turbines as an approximate guide. They also note that whilst much of the offshore work will be outsourced from local area, there is more local potential with the onshore work (e.g. sub-station connections; local port improvements). The impacts of multiple OWF developments can be cumulative, and can be a catalyst for port development and other supply chain activities (e.g. set down areas, assembly and, in some cases, fabrication facilities). In terms of potential negative impacts of building OWFs on tourism, fishing and the local housing markets, SQW conclude that the evidence is mixed and inconclusive.

In one of the few studies of the actual local content impacts of an OWF project, SQW (2005), using a supply chain analysis, provide some estimates of local jobs in the East of England

region for the relatively small scale (60 MW) Scroby Sands project. Figure 4.3 shows that whilst there are a higher number of local jobs for a couple of construction years, it is the O&M jobs which generate the largest number of local jobs over the lifetime of the project. The SQW study also estimated a total spend of £80m (construction plus first five years of operation), of which about £40m was sourced from UK companies, and £13m from the East of England region. By project stage, the region had c 20% of the development stage, 10% of the construction stage and 75% of the operational stage.

Figure 4.3: Estimated local jobs in stage years of the Scroby Sands development



Source: SQW Analysis of Scroby Sands supply chain analysis (2005) in SQW (2011); DTI (2005)

In another ex-post supply chain study, a UK contents analysis of the Robin Rigg project in the Solway (EON 2011) provides a more disaggregated breakdown for this project that straddles the England-Scotland border. Again, as displayed in Table 4.7, the tendency for the O&M expenditure to be more heavily weighted to the local area is highlighted. It also highlights the importance of the O&M base, which in this case is located in Workington in Cumbria. Some findings documented in a more recent study by BVG Associates for Scottish Power on their onshore wind farms in SW Scotland also reinforce the local significance of the O&M stage for wind power (BVG, 2017). These indicate 25% of OPEX expenditure in the local area (SW Scotland) and 67% in Scotland, compared to only 2% (local) and 25% (Scotland) for CAPEX.

An early Danish monitoring study of the impact of the Horns Rev OWF (Ladenburg et al 2005) calculated the employment effects associated with the establishment and running of wind farms using I-O model data (see s4.5 re I-O studies). The calculations showed that the establishment of an OWF with 80x 2 MW turbines created around 2,000 person years of domestic employment over the construction period. A *tentative estimate* indicated that up to one quarter of this would be at the local level. Operation and maintenance over the 20-year lifetime of the park was estimated to create an additional 1,700 person years of employment; *it was expected* that three quarters of this would be at the local level. Summary actual vs predicted economic impacts for the case studies used in this research are set out in s4.6.

Table 4.7: Summary of findings from Robin Rigg OWF on local content

	Cost (£m)	UK	Scotland	North West	Cumbria	Dumfries and Galloway
Construction Total	£381	32%	8%	4%	1.4%	0.2%
Project Management	£19	100%	5%	6%	4%	3%
Turbine Supply	£141	-	-	-	-	-
Balance of Plant	£84	31%	-	16%	4%	-
Installation & Commissioning	£137	56%	21%	2%	1.1%	0.2%
O&M Costs (Annual)	£9.4	86%	6%	39%	34%	4%
Fixed Costs and Overheads	£4.2	78%	3%	7%	5%	2%
Turbine Maintenance	£3.2	87%	-	75%	71%	-
Marine Operations	£1.1	100%	9%	50%	50%	-
Environmental Services	£0.5	100%	83%	16%	1%	83%
Balance of Plant	£0.4	100%	-	59%	15%	-

Source: EON (2011)

4.4.7 Some prediction 'rules of thumb'

Employment

From the review of UK ESs, the prediction of potential employment associated with OWFs can vary widely between impact scenarios. In addition, for some ESs it is not clear whether the figures used are for the whole project life cycle or just for a key stage (normally construction). If for construction, is the figure for peak employment or again for total FTEs? There are also frustrating issues of which spatial level is being used, and for which scenario? One increasing area of consistency is the practice of using a Direct plus Indirect and Induced approach to employment impacts, although there is considerable variation in the size of multipliers used. However, notwithstanding these problems, which do limit the utility of findings, it is possible to identify a range of predicted potential local and regional employment impacts for total construction and for each O&M year, using a *jobs per project MW size approach* (Box 4.5). Although O&M employment numbers may be low, especially compared with the construction stage, the various O&M activities are in most cases much more accessible to local people; they also have a 20-25 year life.

Box 4.5: Some OWF ES employment prediction 'rules of thumb'—jobs per project MW size

- These figures include Direct plus Indirect and Induced employment.
- *For total Construction FTEs*, the forecast jobs per MW range from c 0.2 (local area /low impact scenario), to c 0.5 (local area /medium impact scenario) to c 1.5 (regional area /medium impact scenario).
- *For O&M the annual FTE per MW* over the 20-25 year life of the project is much less, and may be of the order of 0.15-0.2 per MW for a regional area /medium impact scenario, although some forecasts appear to be (unrealistically?) much lower than this. The 0.15 to 0.2 is somewhat lower than the O&M estimates by Oxford Economics of 0.19 Direct plus 0.16 Indirect per MW (Oxford Economics/Vestas 2010), although the Oxford Economics estimate is probably for a wider than regional scale.

- Whilst there is some commonality in the use of the Direct plus Indirect & Induced employment approach, there is *considerable variation in the multiplier ratios* used (i.e. D: Sum of ID+INDU). These vary from 1:0.3 to 1:1.5, with the mean being around 1:1, although we should expect some variations reflecting the variations in the potential of the various OWF host coastal local and regional economies to provide supply chain support.

Wider economic impact/GVA

Many ESs seek to calculate the *GVA of the project*, normally for the construction stage, but sometimes also for O&M and decommissioning. However, comparisons are complicated in many cases by a lack of clarification as to spatial level and the length of time used in the analysis. A few examples of the calculated scale of total construction stage GVA are set out in Box 4.6, plus some prediction 'rules of thumb'. They illustrate the wide range in impacts between scenarios.

Box 4.6: Some OWF ES wider economic impact /GVA predictions and 'rules of thumb' (GVA m per MW)

- *Construction stage examples*; construction life is on average about two years:

-- 580 MW Beatrice project: low (lc) and high case (hc) scenarios, from £17m D+9m ID (lc) to £63m D + £35m ID (hc) for local study area;
-- 750 MW Walney Extension: £49m D + £15m ID for regional GVA;
-- 1200 MW E. Anglia 3: GVA £68 m (lc) to £218m (hc) for offshore construction; £19m for onshore:
-- 450 MW Neart na Gaoithe: £20 m D + £10m ID (lc) and £260 m D + £140m ID (hc)

- GVA levels are lower per annum for the *O&M stage*, but the longer life of this stage (c 20-25 years) increases their local significance.

-- 580 MW Beatrice project: high and low case scenarios, from £137 D+ £63m ID (lc)to £245m +£133m (hc) for local study area over project lifetime, giving c £10-20m pa;
-- 750 MW Walney Extension: £11m D +£3m ID for regional GVA (assumed pa?);
-- 1200 MW E. Anglia 3: GVA of c £14m (pa) for 25 years; and
-- 450 MW Neart na Gaoithe: £8m D + £4m ID (lc) and £9m D + £5m ID (hc) pa for local area

- On average, these examples suggest a local/regional GVA per MW of from c £ 0.1-0.5 m for the total construction stage, and c £ 0.04m pa for the O&M stage (the latter averaging about £15-20 m pa for the total project for medium size projects; and up to £50m for large projects). It is likely that there will be less difference between the low case and high case scenarios for the O&M stage, as there is likely to be more opportunity for local sourcing of the goods and services involved.

4.4.8 Assessing significance

Unlike many physical impacts (such as noise and air pollution), there are no recognised local socio-economic standards against which the predicted impacts of a project can be assessed. Whilst we may agree that a fall in unemployment is positive compared with, for example, an increase in crime, there are no absolute standards. Views on the nature of local benefits from a project may vary greatly between local stakeholders; they may be sometimes political; they may sometimes be arbitrary. However it may at times be possible to identify potential *threshold changes* in the socio-economic profile of an area; for example, impacts which threaten to swamp the local labour market, or conversely employment opportunities which threaten to leak almost entirely from the host area. Table 4.8 provides an OWF example of an approach

to defining sensitivity. A high-sensitive receptor will show evidence of severe socio-economic challenges, underperformance and vulnerability (e.g. reflected in high unemployment), and may be identified as a high-ranking local authority policy priority. In contrast, a low –sensitive receptor will show good performance, capacity to handle change and will not be a policy priority.

From the reviews of OWF ESs, almost all provide some significance assessment of the potential employment and GVA impacts. All construction employment and GVA impacts are assessed as positive, but perhaps somewhat surprisingly, very few ESs assess them as of major significance, with medium or minor seen as more, equally, likely to be the level of significance assessment (local and regional?). For O&M employment and GVA, assessment is in almost all cases assessed as minor positive, but with a few medium significance assessments for some larger projects. In addition, some ESs note that OWF development can boost local/regional confidence providing a very positive impact on the development potential of an area (see s4.6 for such examples from the research case studies).

Table 4.8: Definition of terms relating to the sensitivity of socio-economic receptors

Sensitivity	*Definition*
Negligible	The receptor is not identified as a policy priority (because of economic potential and/or need). There is evidence of good overall performance and no particular weaknesses or challenges for the receptor in the impact area.
Low	The receptor is not identified as a policy priority (because of economic potential and/or need). There is evidence that the receptor is resilient and no particular weaknesses or challenges for the receptor in the impact area.
Medium	The receptor is not identified as a policy priority (because of economic potential and/or need). There is evidence of considerable socio-economic challenge or underperformance and vulnerability for the receptor in the impact area.
High	The receptor is identified as a policy priority (because of economic potential and/or need). There is evidence of major socio-economic challenges or underperformance and vulnerability for the receptor in the impact area.
Very High	The receptor is identified as a policy priority (because of economic potential and/or need). There is evidence of severe socio-economic challenges or underperformance and vulnerability for the receptor in the impact area.

Source: RPS Hornsea 2 ES (2013)

Several of the ESs reviewed also include discussion of the *potential impact of the project on other economic sectors, especially on tourism and fishing.* For the construction stage, the ESs assess the impacts on tourism as negative, and of minor and in some cases of medium significance. Analyses tend to draw on previous studies of the impacts on tourism of both onshore and offshore wind farms; these tend to show little impact on tourists' destination decisions (eg Scottish Power Renewables 2019). There are fewer mentions of the negative impact on fishing from the construction stage; where mentioned they are usually seen as minor negative, although major in one major North Sea fishing area. There are also a few minor negative mentions of the impact of onshore cable laying on local agricultural activities. The findings are similar for the O&M stage, although there is occasional mention of the potential tourism value of OWFs.

Box 4.7: Guidance Summary – Predicting Economic Impacts and Assessing Significance

- Prediction and assessment of economic impacts of an OWF project on various spatial areas is an inexact, but important, exercise. It involves the identification of potential change in indicators for issues set out in the Scoping Report.
- Indicators include, in particular, employment and GVA for each project stage, with estimation of direct, indirect and induced impacts. The overall multiplier impact may be of the order of 1.75 x simple direct impact.
- Uncertainty of impacts is a key issue, with host community/authority requirements for more certainty of impacts sometimes being at odds with developer requirements for flexibility in nature of development and sourcing of components. Uncertainty, usually relates to port location, supply chain and technology.
- If an Input-Output or other form of modelling is used, relevant calculations and assumptions need explanation.
- Where the methodology uses scenarios, keep the number of scenarios to an absolute minimum; clearly set out the logic, assumptions and probability underpinning each scenario; and specify a most likely scenario. An uncertainty report can bring together and disclose sources of uncertainty.
- With more clusters of OWF developments, it should be possible for developers to narrow down the range of scenarios, with a likely shift to medium scenarios for onshore construction, and high scenario for O&M. For offshore construction, a medium scenario is more likely for regional and national than local area.
- Guidance and overall impact assessment methodology should specify key guidance documents used on socio-economic impacts (e.g. English Energy NPS guidance, Crown Estate, Treasury Green Guide; industry guidance eg BVG etc).
- Use may be made of a range of potential local and regional employment impact rules of thumb for total construction and for each O&M year, using a jobs per project MW size, and GVA £m per project MW size approach. These can provide broad orders of scale and ranges of potential economic impacts for the analyst.
- For example, for total construction FTEs, forecast jobs per MW range from c 0.2 (local area /low impact scenario), to c 0.5 (local area /medium impact scenario) to c 1.5 (regional area /medium impact scenario). For O&M the annual FTE per MW over the 20-25 year life of the project is much less, and may be of the order of 0.15-0.2 per MW for a regional area /medium impact scenario.
- Levels of significance (simple scale, and either positive or negative) should be attached to all assessments. Assessment can make use of a sensitivity matrix. The assessment of construction employment and GVA impacts is usually positive, and of medium/minor significance, and for O&M employment and GVA, minor positive, but with medium significance assessment for larger projects.

4.5 Mitigation and enhancement

4.5.1 Enhancement focus

For socio-economic impacts, and particularly for economic impacts, the focus in assessment is often more on enhancing beneficial impacts, rather than on mitigating adverse impacts. However there may be some instances of potential adverse impacts requiring some mitigation measures (for example, concentrated 24 hours offshore construction working to minimize impact on fishing; and, in extremis, Navitus OWF project cancelled for potential tourism/visual and landscape impacts on a World Heritage Site). Increasingly, enhancement measures are being packaged in some form of plan. This might be a specific Employment and Supply Chain

Plan, included as a Requirement in the project DCO (see Box 4.8).The Hornsea example involves the developer working together with the LEP, local authorities, education and training agencies, and business organisations, to support a whole range of education and training, and supply chain initiatives for the Humberside area.

Some of the evolving economic impacts enhancement measures are set out in Table 4.9. Such measures seek to increase local economic capacity to respond positively to opportunities, and to shift GVA and local employment impacts more towards the medium case scenarios for the construction stage and high case for O&M. The related issue of Community Benefits Agreements is discussed in later sections of this report. When positive enhancement measures are put in place, it is important that they do not become diluted and that they are implemented as intended. This is an important role for monitoring systems discussed in s4.6.

Box 4.8: *Example of an Employment and Skills Plan – Hornsea 2 DCO Requirement 17*

Employment and skills plan— Requirement 17

(1) No part of the authorized development may be commenced until an employment and skills plan based on the outline employment and skills plan has been submitted to and approved by North Lincolnshire Council in consultation with North East Lincolnshire Council, East Lindsey District Council and the Humber Local Enterprise Partnership.

(2) The plan must include:

(a) proposals for the provision of information to the Humber Local Enterprise Partnership on the employment and supply chain opportunities associated with the construction, operation and maintenance of the authorised development including details of the core qualifications and skillsets required to access those opportunities;

(b) proposals for local advertising of employment and supply chain opportunities during the construction of the authorised development; and

(c) proposals for the undertaker to provide outreach employment presentations during the period of construction of the authorised development at appropriate times and locations; and (d) proposals for local advertising of employment and supply chain opportunities during the operation of the authorised development.

(3) The approved employment and skills plan must be implemented and maintained during the construction and operation of the authorised development.

(4) In this Requirement, "Humber Local Enterprise Partnership" means the local enterprise partnership established in June 2011 with the objective of promoting and developing the natural economic area surrounding the Humber estuary.

Source: PINS (2015)

Table 4.9: Examples of evolving types of economic impact enhancement measures

Type of measure	Key elements, and examples
Supply chain websites	Developer websites provide vehicles for local firms to check out supply chain opportunities and to register their interest.
Supply chain events	Developers provide open events setting out the project supply-chain opportunities, well in advance of the project start, for interested suppliers.
Skills training programmes	This involves working with local education and training providers to help in the provision of appropriate training to equip local people with appropriate skills to work on the project. Provision of apprenticeships.
Local recruitment targets	In addition to overall local recruitment targets, there may also be specific targets for employment from disadvantaged groups.

4.5.2 Scaling and hub potential

The impacts of multiple OWF developments can be cumulative, and can be a catalyst for port development and other supply chain activities (e.g. set down areas, assembly and, in some cases, fabrication facilities).This can lead to an area developing a hub status for OWF development, delivering major economic enhancement opportunities. See Box 4.7 for the case of Humberside. Durning and Broderick (2019) provide a valuable set of specific guidelines for cumulative impact assessment for OWFs.

4.6 Monitoring, auditing and adaptive management and assessment

4.6.1 A vital step in the OWF assessment and management process

Monitoring is invaluable in learning from practice. It allows the comparison of predictions with actual outcomes, and provides guidance on actual impacts for future OWF planning (Box 4.9). It facilitates an adaptive approach to project implementation; it can aid fine-tuning of the project when some of the intended outcomes are not being fully achieved. Key indicators for monitoring direct economic impacts include, for example: levels and types of employment on the project, by local and non-local sources and by previous employment status; the output of training programmes and take-up by the project; distribution of contracts and sub-contracts; and workforce expenditure. Some information can be provided by the developer and tier 1 contractors; other information may benefit from some specific surveys (e.g. of the economic activities of the project employees). The provision and specification of the nature of monitoring information by the developer and main contractors should be specified in permissions and built into contracts as requirements.

Box 4.9: The benefits of monitoring

Monitoring	Monitoring for conformance with standards
	Monitoring for compliance with conditions
Auditing	Evaluation of actual against predicted impacts
Management	Management for better project implementation
	Management for future consents and licences
Communication	Improved stakeholder communication on actual impacts of project and their management

Unfortunately, monitoring has been a particularly weak link in impact assessment and was not mandatory for EIA in the UK, nor in many other EU Member States, until required from 2017, under EU Directive (2014/52/EU). To date, for OWFs, other than Scroby Sands and Robin Rigg early OWFs (s 3.4.6), there has been little work on monitoring socio-economic impacts. Major developers and their consultants tend to draw on their own previous ES studies in the area, but there is little monitoring evidence. For many ESs, there has been little or no mention of the monitoring of socio-economic impacts, but this is changing, as illustrated by the following ES content:

--- *Neart Na Gaoithe*: Recommended that economic benefits are monitored for the local area and across Scotland through the keeping of records on supplies and the contracts for them, showing the source location. The data will be analysed periodically to highlight economic benefit to the study area.

---*Norfolk Vanguard:* ES recognised that monitoring is an important element in the management and verification of the actual project impacts. The requirement for and appropriate design and scope of monitoring will be agreed with the appropriate stakeholders and included within the final CoCP and the Construction Method Statement (CMS) commitments prior to construction works commencing.

Some more detailed examples of approaches to the monitoring and auditing of the socio-economic impacts of OWFS are now set out in s4.6.2.

4.6.2 Some OWF examples: predictions and actual impacts

Box 4.10 a-c draws on the findings from research on the three current OWF case studies: Aberdeen, Beatrice and the Hornsea array. For each there was a comparison of ES predictions with actual economic impacts – measured in a variety of ways. The studies highlight a number of outcomes, including the importance of economic impacts, some differences between predictions and actuals, the importance of multiplier impacts, high local leakage from offshore construction activity, but significant local and regional benefits from onshore construction, and especially from the 20-25 year O&M stage. The projects also show variations across scale, with Humberside now reaping the benefits of hub status as the base for a pipeline of large OWF projects. They also display some innovative monitoring practices.

Box 4.10 a-c. Summary of actual vs predicted economic impacts for three case studies

Case study project	***Some key findings***
a. Aberdeen: **-- 96MW** **-- 11 turbines** **-- £280m project** -- operational 2019 -- 2km offshore --demonstration project	• IAU studies for the Vattenfall EOWDC research programme involved detailed examination of actual contract expenditure and employment data for all stages of the project lifecycle, including a workforce survey for the main onshore construction project (although this was not possible for the offshore construction project). • Development/pre-construction: many of the contracts are with local firms and several others are with other Scottish firms in Glasgow, Edinburgh and in other centres. Taken together, they bring an important share of the £3m initial expenditure into Aberdeen, Aberdeenshire and Scotland at large. • Onshore construction involved the sub-station at Blackdog and the cable connection to the grid at Dyce. The local Aberdeen/Aberdeenshire content was substantial, with for example, c30% of contract/sub-contract expenditure and c60% of the workforce for the sub-station work; for the rest of Scotland the figures were c15% and c30%. • For offshore construction, the local and Scotland contract expendituresare very small proportions of the large total, estimated at c1% and c2% of this major expenditure element. Only a very small % of the peak construction workforce of 500 were local or other Scotland. • The contract value of the O&M stage, largely using locally-based companies, may be of the order of at least £3m pa. A high proportion of O&M staff are local. • The above stage estimates are of direct impacts. In all cases there will be substantial multiplier increases from indirect and induced expenditure. For example, for the locally important O&M stage, with long-term contracts, there may be higher indirect and induced multiplier impacts, increasing for example total job impacts to c40-50pa, giving a significant 800-1000 FTE over the 20 year life of the project. • Actuals vs ES predicted economic impacts indicate an underestimate of the local and Scotland value, especially of the O&M stage, but also of onshore construction, but an overestimate of the local and Scotland value of the major offshore construction stage. However, disaggregation of the main tier 1 contractors contracts may raise somewhat the local and Scotland values of the offshore impacts).

b. Beatrice

-- 588MW
-- 84 turbines
-- £2.6 bn project
-- fully operational in 2020
-- 13km off Caithness
-- reduced in size down from original 1GW

- The project has some good practice on socio-economic impact monitoring. For example, there is an attempt to monitor the actual economic impacts using an Input-Output model, and to estimate the wider impacts of the Community Benefits Fund using a Social Return on Investment model (see s5.6.2 for the Community Benefits Fund).
- The 2017 Beatrice I-O model applies to the initial development expenditure and construction capital stages of the project. The starting point of the model is the expenditure, broken down by geographical spend, and by type of spend or by supplier name where possible, up to the end of construction in 2018. A brief summary of the methodology, including its strengths and limitations, is included in BOWL (2017). For Scotland-wide impact, the estimate is £570m of investment (c22% of total), £530m of GVA and about 5800 years of full-time employment.
- A further Beatrice I-O study (Bigger Economics 2019), also includes actual estimates for the O&M stage. The OPEX employment estimate for Scotland is 370 jobs per annum, with discounted operational expenditure (at 3.5%pa) (GVA) in Scotland over the 25 years of £540m
- Unfortunately, the estimates from the model do not distinguish between local impact and Scotland–wide impact. There are also the caveats associated with I-O models noted in s 4.4.5.
- Comparison with the ES predictions is complicated by the subsequent 40% reduction in the size of the windfarm. For Scotland as a whole the low case ES employment prediction for development/construction of the initially much larger wind farm is 5800 person years –the same as predicted in the I-O model for the construction of the much smaller project.
- For O&M, the ES predictions of c £430-660m for Scotland O&M GVA should also be reduced pro-rata (40%) to allow (very crudely) for the smaller actual project. Whatever the assumptions, the 2019 GVA actual estimate is higher than the earlier predictions. Similarly, for O&M employment, the comparisons are 370 jobs in Scotland against predictions of 350 total (UK+) for a 1000 MW project. All this again highlights the real economic significance of the O&M stage in the project lifecycle.
- Policy initiatives to enhance positive impacts, with an apparent shift well away from the low case, appear to be favourable to Scotland (and the local Study Area?).
- In terms of local impact, the Wick area is likely to be a major beneficiary during the O&M stage, with an estimated harbour investment of £10m, and about 90 O&M jobs (SSE Vimeo, July 2017), from offshore technicians to onshore office administrators.

c. Hornsea array

-- up to 7GW with 4 Hornsea Projects
-- Hornsea 1 fully operational in 2020
-- H1 is c1.2 GW
-- H1 has 174 turbines
-- all Hornsea projects are well offshore at 80-120 km

- The Hornsea array is part of a major pipeline of OWFs off the Yorkshire and Humberside coast, which shows that the impacts of multiple OWF developments can be cumulative, and can be a catalyst for port development and other supply chain activities (e.g. set down areas, assembly and, in some cases, fabrication facilities).
- For the construction stage, if the local medium impacts scenarios from all of the Hornsea ESs were to be fulfilled, the average number of local Humberside (LEP area) construction jobs over the period to 2025 could be likely 2000-2500pa.
- From our research, a detailed disaggregation of construction contracts shows that the UK does appear to have about 50% of Hornsea One contracts, although this provides no indication of their cumulative value.The UK appears to have a substantial involvement in cabling, and a very substantial consultancy role, with about 75% of the consultancy contracts. It is difficult to identify local Humberside contracts, but they are likely to be no more than about 10-15% of the total number, and in value likely to be much less.
- What is undeniable is that the pipeline of projects has led to confidence in inward investing in the supply chain, including for example:
  -- Siemens £310m investment in a new wind turbine blade facility in Hull which, as well ascreating an expected 1100 new direct jobs, will create further supply chain opportunities.
  -- Approval of the Able Marine Energy Park on the Humber, a bespoke £450m port facility for the renewable energy sector, particularly offshore wind
- In combination, the OWF developments and linked onshore investments all enhance the identification of the Humber as a major OWF hub. This has

supported/ and been supported by major enhanced skills provision in an area with previously a shortage of higher level skills than nationally.

- If the local medium impacts scenarios from all of the ESs were to be fulfilled, the average number of local O&M jobs for the Humberside (LEP area) would be at least 1000 O&M jobs for the next 20-25 years. Dong/Orsted has also invested £200m in the establishment of a major OWF O&M servicing base in Grimsby Docks which became operational in Spring 2018, creating at least a further 200 jobs.

RenewableUK (2015) has noticed the monitoring issue: "*As an industry we have a positive story to tell about engineering process and innovation, de-carbonisation and cost reduction. We need to speak up more loudly to demonstrate that as an industry we also take delivering UK content and UK economic success seriously. Which is why the Offshore Wind Industry Council (OWIC) has agreed to begin monitoring and reporting on UK content. Working on behalf of the Offshore Wind Programme Board (OWPB) for OWIC, we will conduct an annual survey of offshore wind developers, and publish findings, to show how industry is progressing….Our target, agreed with Government, is to deliver 50% of UK content".* BVG Associates (2015) has developed a reporting process for monitoring local content of UK OWFs, for supplier and sub-supplier contracts over £10m. This is a very useful initiative, but it is limited by the use of UK as the "local" in local content. There is need for a much more spatially disaggregated approach.

In the Netherlands -- a government department (Rijkswaterstaat) coordinates the monitoring of the expected impacts, in order to learn for future EIAs (adaptive management). See also: *Environmental impacts of offshore wind farms in the Belgian part of the North Sea: Learning from the past to optimise future monitoring programmes,* Degraer et al *(2013)'.* In the UK, there has been some strategic level 'monitoring' from a Dong/Orsted 2015 overview study.

Box 4.11 Guidance Summary – Mitigation, Enhancement and Monitoring

- For socio-economic impacts, and particularly for economic impacts, the focus in assessment is often more on enhancing beneficial impacts, rather than on mitigating adverse impacts. Key enhancement measures include supply chain websites, supply chain events, skills training programmes, and local recruitment targets.
- The good practice inclusion in development permissions of an Employment and Skills Plan, or equivalent, to support effective implementation of socio-economic undertakings (predominantly economic) is strongly recommended
- The impacts of multiple OWF developments can be cumulative and a catalyst for port development and other supply chain activities (e.g. set down areas, assembly and fabrication facilities).This can lead to an area developing a hub status for OWF development, delivering major economic enhancement opportunities.
- Monitoring is invaluable in learning from practice. It allows the comparison of predictions with actual outcomes, provides guidance on actual impacts for future OWF planning, and facilitates an adaptive approach to project implementation.
- The nature of economic impacts monitoring information required from the developer and main contractors should be specified in permissions and built into contracts as requirements
- Key indicators for monitoring direct economic impacts include, for example: levels and types of employment on the project, by local and non-local sources and by previous employment status; the output of training programmes and take-up by the project; distribution of contracts and sub-contracts; and workforce expenditure.
- Monitoring studies can highlight some key economic impact issues for developers and local areas, including differences between ES predictions and actual impacts, the

importance of multiplier impacts, high local leakage from offshore construction activity, but significant local and regional benefits from onshore construction, and especially from the 20-25 year O&M stage.

- BVG Associates (2015) has developed a reporting process for monitoring local content of UK OWFs, for supplier and sub-supplier contracts over £10m. This is a very useful initiative, but limited by the use of UK as the "local" in local content. There is need for a much more spatially disaggregated approach to monitoring.

5. Impact assessment process–*social impact assessment issues, methodologies and techniques*

5.1 Social impacts and their assessment

The *key steps in the impact assessment methodology*, as set out in Figure 3.2 are covered here in s5, as in s4, but with particular reference to social impacts and their characteristics. As noted in s4.1 socio-economic impacts are the outcome of the interaction between the characteristics of the project and those of the "host" environment. Baseline information is needed on both sets of characteristics. Table 1.1 sets out the potential range of social impacts of OWFs, including impacts on the demography, housing, other local services, and socio-cultural/quality of life of the host coastal area. There are also distributional issues, the impacts on particular groups in society, which may raise questions of environmental justice.

Assessing social impacts present *some methodological challenges*, a key issue being to capture social and cultural values, and to predict the potential impact of a project on these issues that are harder to quantify. Given the specificity of offshore contexts, it has been suggested (Wiersma, 2016) that in analysing attitudes towards OWF, it is important to move away from the factors relevant for onshore developments, and explore the uniquely marine characteristics of OWF and the importance of 'the sea' as an influence on local residents' identity. This may involve ethnographic work and other qualitative methods to explore people's experiential and symbolic connections with the sea, for example through the concept of marine citizenship (McKinley and Fletcher, 2012). Gee and Burkhard (2010) use the concept of cultural ecosystem services to explore the relationship with coastal communities and OWFs; these services include 'non-material benefits which people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences' (MA 2005). For example, people coming to the sea wanting to enjoy an un-degraded coastal setting, may feel an emotional loss of the open horizon and feel in some way a sense of being limited.

Arce-Gomez et al (2015) point out that the focus on quantifiable aspects of SIA risks overlooking the 'softer' social impacts, such as potential adverse impacts on local culture, which are harder to measure. Qualitative and participatory approaches are essential, but also challenging. However, inadequate assessment of social issues may lead to negative attitudes from the public in terms of frustration and opposition to a project. This could subsequently mean higher costs for the developer and potentially delays for the local planning authority. It is therefore in the interests of all stakeholders to provide a comprehensive assessment of social impacts for a project (Larsen et al 2015). Vanclay (2012) summarises some key tasks (Box 5.1), highlighting the importance of participatory approaches to engage communities.

Box 5.1: Key tasks of Social Impact Assessment (SIA)

- **Creating participatory processes and a deliberative space** to facilitate community discussions about desired futures, the acceptability of likely negative impacts and proposed benefits, and community input into the SIA process, so that they can come to a negotiated agreement with a proponent, preferably on the basis of the emerging legal principle of 'free, prior and informed consent' (FPIC);
- **Gaining a good understanding of the communities and stakeholders** likely to be affected by the policy, program, plan or project (i.e. profiling) including a thorough stakeholder analysis to understand the differing needs and interests of the various sections of those communities;
- **Identifying the needs and aspirations of the various communities**;
- **Scoping the key social issues** (the significant negative impacts as well as the opportunities for creating benefits);
- **Identifying key indicators and collecting baseline data**;
- **Forecasting the social changes** that may result from the policy, program, plan or project and the impacts these are likely to have on different groups of people;
- **Establishing the significance of the predicted changes**, and determining how the various affected groups and communities will likely respond to them;
- **Identifying ways of mitigating potential negative impacts and maximising positive opportunities;**
- **Developing a monitoring plan** to track implementation, variations from mitigation actions, and unanticipated social changes, especially negative impacts;
- **Facilitating an agreement-making process between the communities and the proponent** ensuring that FPIC principles are observed and that human rights are respected, which leads to the **drafting of an Impact and Benefit Agreement (IBA);**
- **Assisting the proponent in the drafting of a Social Impact Management Plan** (SIMP) that operationalizes all benefits, mitigation measures, monitoring arrangements and governance arrangements that were agreed to in the IBA, as well as plans for dealing with any ongoing unanticipated issues as they arise;
- **Putting processes in place to enable proponents, regulatory authorities and civil society stakeholders to implement arrangements implied in the SIMP and IBA** and to develop their own corresponding management action plans, establish respective roles and responsibilities throughout the implementation of action plans, and maintain an ongoing role in monitoring.

Source: Vanclay (2012: 150-151), adapted from Vanclay and Esteves (2011).

5.2 Understanding the community: profiles, and attitudes to OWFs

A discussion of what is local is covered at s4.2.1. There may be a *community of place* impacted by the OWF, and this can be specific for example to a location hosting the sub-station, and to coastal communities with a view of the development. However, there may also be a much wider *community of interest,* including for example people with an interest in renewable energy. Understanding the potentially impacted community can be gained from a stakeholder profile analysis, informed especially by local authorities, developers and relevant other agencies. Parish/ local community councils, or other community leaders, may be important for the very local impacts of developments such as the onshore components of the project. Baseline data tends to focus on local demography, education, housing and local services.

Identified stakeholder groups can have various attitudes to OWFs that may influence their response to proposed developments. On the one hand, there may be general support for what is clearly regarded as a clean and renewable energy source. On the other hand there may be concern about the implications for the seascape, the marine environment and for marine industries/activities – especially fishing and coastal recreation. Uncertainty around location and scale, visual appearance, the onshore land requirements and the potential need for

exclusion zones can all feed into negative public perceptions. Table 5.1 provides an example of the range of views from a German research study (Gee and Burkhard, 2010).

However, imagined impacts may be worse than actual impacts. Uncertainties (and subsequent fears) can be addressed through early community engagement processes. In a study of public acceptability of three offshore renewal energy projects in Guernsey, including a wind energy development, Wiersma (2016) found that adopting an 'upstream' approach, engaging with local residents at an early stage in the project, in particular using visual, place-based methodologies, can contribute to more acceptable energy development practices in the future.

Table 5.1: Arguments fielded against and in support of OWFs

Argument	Percentage out of all arguments fielded
Arguments primarily raised against OWFs	
• Aesthetic qualities of landscape	21.8
• Nature conservation	5.1
• Emotional arguments	7.6
• Shipping safety	3.6
• Other arguments	8.0
Doubts raised (qualified support)	
• Feasibility/technology/financing	4.4
• Economic viability	4.6
• Others	6.2
Arguments primarily raised in support of OWFs	
• Renewable/clean form of energy generation	23.3
• Creates employment in the region	5.2
• Counteracts climate change	0.2

Source: Adapted from Gee and Burkhard (2010)

5.3 Scoping

The 'scoping in' of social impact issues in the reviewed ESs is very limited (IAU, The Socio-economic impacts in Environmental Statements of UK Offshore Wind Farms, 2020). A few refer to potential impacts on community vitality and viability from construction stage changes in demand for local housing, accommodation and services. However, overall there appears to be a general assumption that social impacts are not important for OWF developments, especially those a long way offshore, and many can be scoped out altogether. See for example the scoping out of most social impact issues from the otherwise innovative summary socio-economic scoping table for Hornsea 4 (Table 4.4).

However, social impacts should be covered whatever the distance from the coast of the OWF, for there is always onshore construction, the substantial offshore construction workforce may have onshore impacts (eg temporary housing), and there is the important O&M stage. As noted in 5.2, likely issues will normally include demographic, housing, local services, and wellbeing/QoL impacts. As for the economic impacts, these should be for each project stage, time-period and spatial level, and should include both offshore and onshore impacts. However, social impacts are likely to be more qualitative than the economic impacts. Any visual perception studies, for near coast locations, should also be included here.

A study on the impacts of OWF on well-being, commissioned by the Crown Estate (Hattam et al, 2015) indicates that on balance, at the regional/national level, the offshore wind industry has a largely positive impact on well-being, although the picture is complex. Examples of impacts detailed in the study, selected here as they relate to specifically social impacts of OWF, are provided in Table 5.2. These indicate some additional social impacts to be considered in assessing impacts of OWFs, for example related to health.

The issue of 'community cohesion' receives little coverage in ESs and in the OWF literature. A rare study on the topic by Langbroek and Vanclay (2012) of a Dutch OWF found that the host area had strongly held views about the perceived negative social impacts including a reduction in the aesthetic quality of the land- and sea-scape, and impacts on community identification, place attachment and cohesion. While the positive economic benefits such as employment opportunities were recognised, it was estimated that these would benefit temporary construction workers from elsewhere. Furthermore, this influx of workers was also thought to have potential negative impacts due to the particular social characteristics of the traditional fishing village, with its conservative religious community. There were fears of a loss of community cohesion due to the presence of construction workers, including a fear of crime among residents, which could generate feelings of hostility and resentment. The impacts on mental and physical well-being are also explored in this study, including residents' feelings of frustration and anger at the lack of consultation. The study concluded that the process was characterised by poor community engagement processes and a lack of consideration of community.

Table 5.2: Capital Stocks Analysis -- some human/social impacts of OWF

Capital Stock	Summary and direction of change
Human capital (e.g. skills and education)	**Positive impact:** • Creation of direct jobs in construction, operation and maintenance of offshore wind turbines, as well as indirect jobs in supply chain. • Induced employment effects. **Impact unclear:** • Mental health impacts related to offshore wind are uncertain but could be influenced by falling house prices [negative], transient work force [negative] and buying energy from green sources [positive].
Social capital (e.g. social networks)	**Mixed impact:** • Generally strong support for OWF, motivated by beliefs about environmental impact, job creation and local economic growth. • Opposition exists, motivated by concerns over profitability, decreases in property values and impacts on wildlife. • Community funds can have positive impacts, but some view such funds as bribes. **Impact unclear:** • Evidence is anecdotal and suggests tourism continues to exist alongside the offshore wind industry with some new recreation opportunities (e.g. boat trips to OWFs). • Effects on the view and the restorative nature of environment could affect engagement with the coastal environments and ultimately health. **Positive impact:** • Formation of opposition and supporter groups builds relationships and social capital within communities.

Source: adapted from Hattam et al (2015)

Box 5.1: Guidance Summary – Social Impacts, Community, and Scoping Issues

- Social impacts of OWFs include impacts on the demography, housing, other local services, and socio-cultural/quality of life of the host coastal area. There are also distributional issues, the impacts on particular groups in society, which may raise questions of environmental justice.
- Some social issues -- as attitudes to change in seascape, way of life and implications for marine environment-- are important but qualitative and more difficult to assess.
- Key tasks in assessing social impacts follow the main steps for EIA, particularly highlighting the importance of participatory approaches to engage communities.
- Local community includes a community of place impacted by the OWF (eg. a location hosting the sub-station, and coastal communities with view of development). There is also a wider community of interest, including for example people with an interest in renewable energy, tourism visitors to a coastal area.
- A stakeholder profile analysis, informed by local authorities and developers can help to understand the nature of impacted communities. Parish/ local community councils may be important for local perceptions of the onshore components of the project. More quantitative baseline data tends to focus on local demography, education, housing and local services.
- Social impacts should be covered whatever the distance from the coast of the OWF, for there is always onshore construction, the substantial offshore construction workforce may have onshore impacts (eg temporary housing), and there is the important O&M stage.
- As for economic impacts, social impacts should be for each OWF project stage, time-period and spatial level, and should include both offshore and onshore impacts. However, social impacts are likely to be more qualitative than the economic impacts. Any visual perception studies, for near coast locations, should also be included here.

5.4 The importance of early and continuing community engagement

5.4.1 Approaches to engagement and community liaison

A key recommendation (of the study referred to in s5.3) is that affected communities should be involved and engaged at the earliest stage possible, to achieve a 'social licence to operate'. In this way, outcomes can be discussed and negotiated that will hopefully minimise the negative social impacts, including on community cohesion, and maximise local community benefits. Approaches to achieving such engagement can include:

- developer to employ a Local Community Liaison Officer (LCLO) or equivalent;
- participation of LCLO, and other developer and LA staff as appropriate, in community workshops and /or focus groups for the initial development stage to together scope potential key issues;
- ongoing regular engagement with the community by LCLO, and others as appropriate, throughout the construction and into early O&M stages of the project to monitor actual impacts and manage any adjustments to mitigate negative impacts, and enhance positive impacts;
- in all project stages to fully utilise engagement opportunities provided by existing community groups (eg parochial/community councils), and their meetings programmes;

- developer to provide some funding support for engagement activities in development and construction stages, and a Community Benefits Agreement for the duration of the O&M stage (see s5.5);
- undertake surveys of community views of perceived development impacts at key stages in the project lifecycle, including focus on key impacted groups (eg. specific settlements close to onshore works; wider community of interest; specific potentially impacted industries, such as fishing and tourism);
- monitor the media coverage of views on project impacts; and
- produce regular publicly available monitoring reports on the project and its local and regional impacts

Our survey of ES activity reveals some engagement practice, ranging from the sparse to the quite innovative. The UK Norfolk Vanguard OWF project, for example, had considerable consultation work with local community/local stakeholders. The project has employed a Local Liaison Officer and a Skills and Education Champion based in Norfolk, as well as procured support from a Norwich based Public Engagement agency. The project has continued to deepen and broaden engagement with organisations that support and represent the interests of people and businesses local to landfall, onshore cable route, onshore project substation and National Grid substation, and in the region. Another example of good practice is provided by the Aberdeen project (See Box 5.2)

Box 5.2: Community Engagement for the Aberdeen EOWDF project

Engagement strategy

Since the FID in July 2016, Vattenfall implemented a proactive, two way community engagement strategy, involving an extensive engagement with local residents and key local stakeholders, providing briefings and attending meetings and events to inform and consult on the construction of the project. On a monthly basis, project representatives, in particular the project's Local Community Liaison Officer, attended the Belhelvie Community Council meeting, and met with the chair of the Blackdog Residents Association to provide an update on the project and get their input on current developments. The project also made use of local community magazines, community newsletters, drop-in sessions and the Vattenfall website as a medium to communicate with local residents and stakeholders.

Raising awareness of the OWF renewable industry

A key component of the engagement strategy has been educating and raising awareness of the renewable industry and the technology and innovations associated with the Aberdeen project. This involved working collaboratively with the Aberdeen Science Centre to facilitate education outreach sessions, workshops and events to deliver relevant information in an interactive, accessible and engaging way. In addition to being involved in a series of STEM events and project presentations throughout Scotland. The EOWDC also supported established community events such as Techfest, the May festival, Energetica Festival and Wild About Aden Community Day. Wood RecyclAbility provides another example. Based in Pitmedden Aberdeenshire it offers adults with a wide range of abilities the chance to experience a real workplace setting. Vattenfall collaborated with them to make a human height wooden turbine for Vattenfall community events. They also made the mini-turbines used for Vattenfall monthly HSSE awards. Another engagement event, included the 2018 Aberdeen Library Exhibition, which provided an opportunity to assess the wider community views on both.

Surveying community views

There have been a number of surveys of community views, of the local impacted Blackdog and Belhelvie communities and the wider Aberdeen/ Aberdeenshire communities of interest. The 2018 Aberdeen Library Exhibition provided an opportunity to assess the wider community views on both renewable energy, and on the specific impacts of the Aberdeen project. The various surveys provided perspectives on changing issues over the project lifecycle.

Associated community funding support

About £100,000 in funding has been provided to July 2019 for a variety of local causes including the Aberdeen Science Centre, Aberdeen Football Club, Belhelvie Girl Guides, Aberdeen and Grampian Chamber of Commerce, Robert Gordon University and various other local groups. Local funding initiatives are particularly important, and included for example :

- *The Blackdog Residents Association* requested financial support to improve the access and drainage in their community park. The Residents Association raised £500 which Vattenfall supplemented by donating a further £2000 to enable them to apply for a landfill tax funding amount of £25,000. The residents are in the process of applying for £25,000 towards the community park renovations. In addition to this Vattenfall donated £500 towards co- hosting a summer community-day event with the Blackdog Residents.
- *Donation to Belhelvie Girl Guide Donation:* the project donated £800 and £1000 for the 1st Belhelvie Girl Guides support with the delivery of Vattenfall newsletters to Blackdog and Balmedie
- To *Belhelvie Banter*, for quarterly project features in this community magazine (c£1000))
- *Supporting Balmedie and Belhelvie Library*
- *Supporting Blackdog Gala*
- *Supporting the community element of the OWF inauguration event*

5.4.2 Tracking the potentially influential role of the media

The media can be an interesting monitor, and influencer, of public opinion about a project, and should be part of the socio-economic work. Media of course has widened greatly from the days of just the local newspaper. Monitoring of media still involves the local and regional printed press, but also their online reports, the wider social media (eg YouTube videos, Tweets), plus public consultation records and reports (eg formally lodged planning objections to a development). A contents analysis approach of such media can be used to gain an overview of the weight of perceptions about both positive and negative impact issues, over the project lifecycle, and these can be displayed graphically. Again, the Aberdeen project provides an interesting case study (Figure 5.1 and 5.2).Renewable energy was a common positive theme throughout; economic considerations grew in significance into the O&M stage, as did the perceived benefit to the Aberdeen City Region. The O&M stage was seen as more locally positive than the construction stage. Negative themes declined in significance through the project lifecycle. The issue in relation to the adjacent Trump golf course dominated the pre-approval public consultation stage; site issues were most significant in construction; all themes were minor in O&M, with visual impact of this near coast OWF the most significant, but minor, negative concern.

Figure 5.1: Summary of positive and negative dominant themes in media coverage across project timeline of the Aberdeen OWF project (Source: Technical Report 4)

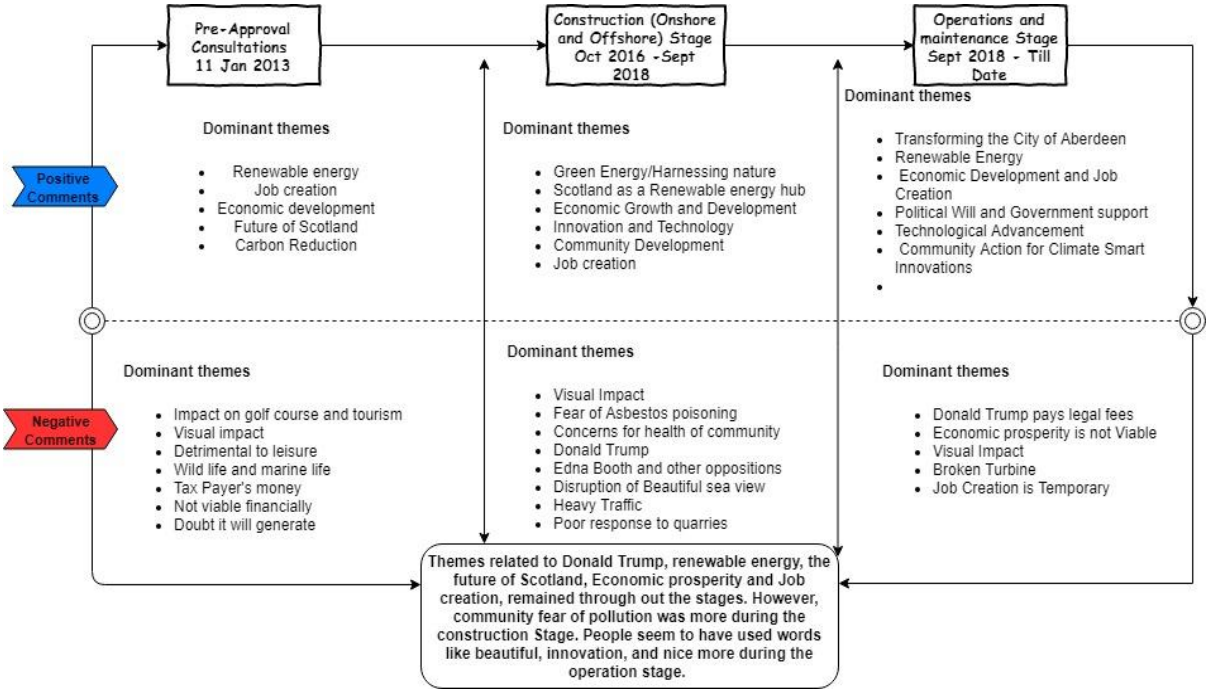
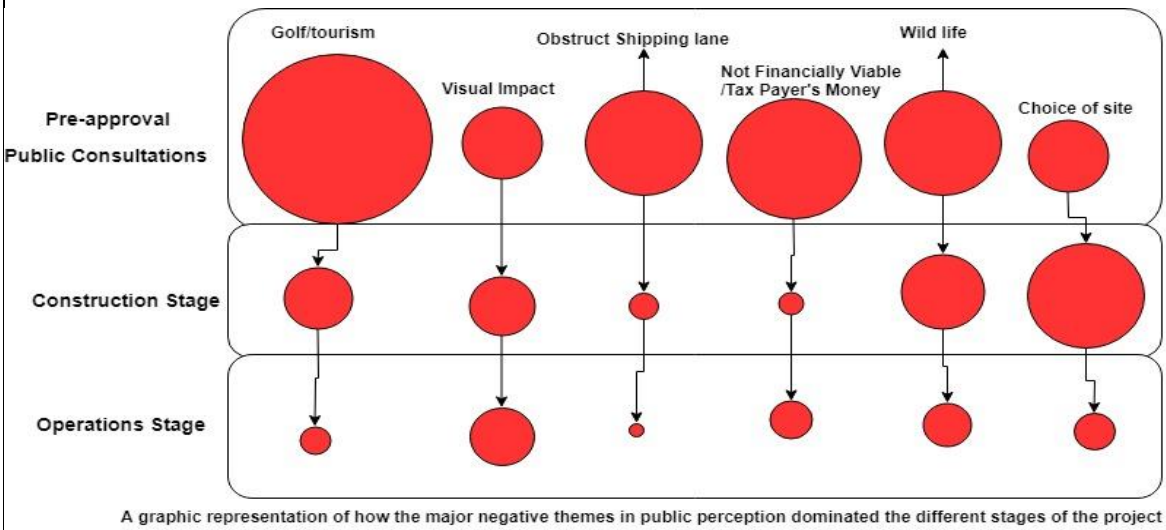


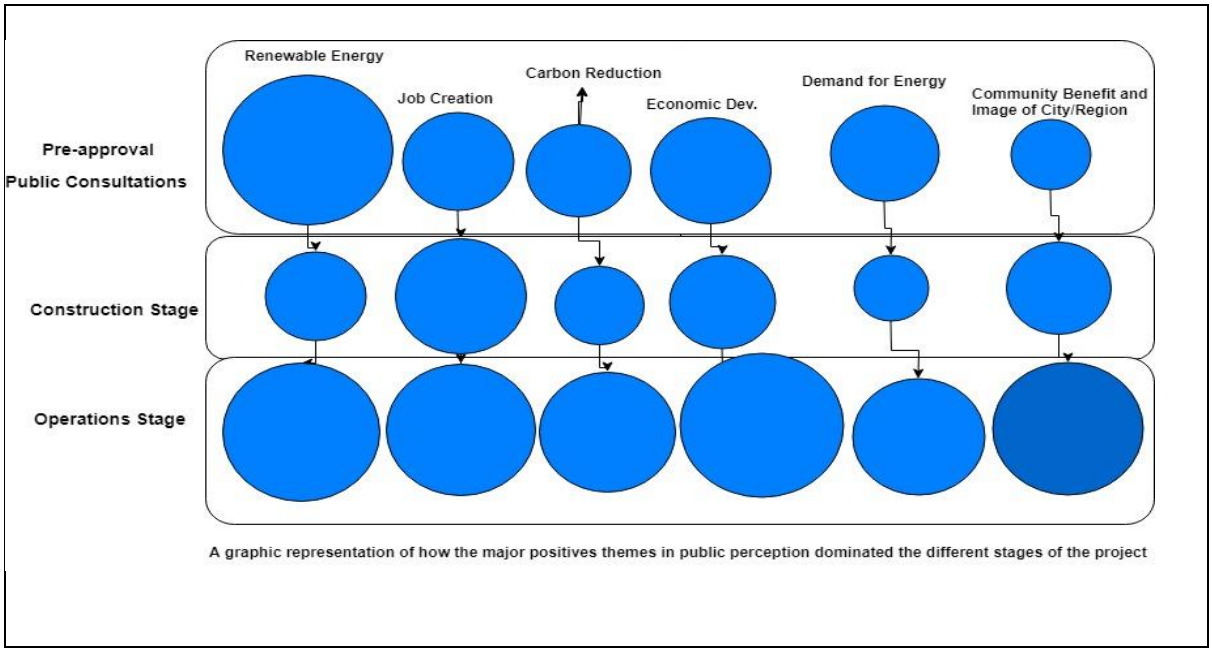
Figure 5.2 (a&b): Tracking the changing media perceptions over the Aberdeen OWF project timeline (Source: Technical Report 4)

(a)Showing the spread and degree of dominance of **negative themes** across all stages of the project(shape sizes indicate the frequency of mention of the issues identified).



A graphic representation of how the major negative themes in public perception dominated the different stages of the project

(b) Showing the spread and degree of dominance of **positive themes** across all stages of the project (shape sizes indicate the frequency of mention of the issues identified).



A graphic representation of how the major positives themes in public perception dominated the different stages of the project

Box 5.3: Guidance Summary – Community Engagement

Key recommendation -- affected communities should be involved and engaged at the earliest stage possible, to achieve a 'social licence to operate'. This will hopefully minimise negative social impacts and maximise local community benefits.

Eight– part plan for developer to achieve such engagement can include:

- *Appoint a Local Community Liaison Officer (LCLO) or equivalent;*
- *Participate early in community workshops / focus groups to scope potential key issues;*
- *Engage regularly with the community throughout project stages;*
- *Utilise engagement opportunities provided by community groups (eg parochial/community councils);*
- *Fund support for engagement activities in development and construction stages, and a Community Benefits Agreement (CBA) for O&M stage ;*
- *Survey community views of development impacts at key stages in the project lifecycle, including focus on key impacted groups (eg. specific settlements close to onshore works; wider community of interest; specific potentially impacted industries, such as fishing and tourism);*
- *Monitor media coverage of views on project impacts; and*
- *Produce regular publicly available monitoring reports on project and its local and regional impacts.*

5.5 Prediction and assessment

Prediction methodology for social impacts is largely descriptive and qualitative; there is a predominant use of professional judgement and comparative studies. However, some techniques are available (ICGP 2003), including the comparative model, straight-line trend projections, population multiplier methods, scenarios, and calculation of 'futures forgone'. On

the participatory side, Interactive Community Forums (ICFs) are a useful tool to capture the communities' perspective on potential social impacts (Arce-Gomez et al, 2015). There is also the Capital Stocks Analysis approach, as noted in Table 5.2. While various methods can be employed, predicting impacts for social issues is not a precise science, and an element of assessor judgement, informed by stakeholder consultation, is necessary.

Many social impacts are seen as deriving indirectly from the economic and environmental impacts. These include the education and training initiatives, and especially the Community Benefits initiatives, both covered in the following s5.6. Employment, and a reduction in unemployment, have important knock-on social and welfare benefits for communities, especially in left-behind coastal communities that are facing many socio-economic challenges.

The ESs examined in the research assessed the social impact significance of OWFs of the construction stage as minor and negative. However, some studies also identified potential positive impacts, including enhanced training opportunities and demographic shifts, with the attraction of more young people into the host area. For the O&M stage there was even less coverage of social issues, other than some limited mention of continuing visual impacts (negative/minor) and upskilling opportunities (positive/minor).

5.6 Mitigation and enhancement – including community benefits initiatives

5.6.1 Education and training initiatives

Following the results of the social impact assessment, it may be appropriate to propose *mitigation and enhancement methods* in order to reduce some of the anticipated negative impacts and enhance some of the positive impacts. In contrast to economic impacts, where the focus is almost wholly on enhancement, for social impacts there may be more of a mix of mitigation and enhancement. For example to lessen population impacts, it might be possible to recruit the workforce from within commuting distance. A key factor in enhancing local recruitment is the provision of appropriate education and skills training. To alleviate accommodation pressures, the developer could provide additional housing, particularly in the construction phase. Box 5.4 provides an example of some OWF - related education and skills enhancement measures for the Humberside area of the UK.

Box 5.4: Some OWF - related education and skills enhancement measures for Humberside

In combination, the OWF developments and linked onshore investments all enhance the identification of the Humber as a major OWF hub. This has supported/ and been supported by major enhanced skills provision in an area with previously a shortage of higher level skills than nationally. These for example include:

- University of Hull provision of new Masters programme in renewable energy.
- Hull College provision of a Digital and Green Energy Centre to provide relevant qualifications and support local businesses looking to grow into the renewable energy sector.
- An £11m investment in the University Technical College (UTC) in Scunthorpe specialising in engineering and renewable energy.
- Support in the LEP Regional Growth Fund for 380 local apprenticeships in priority sectors, including renewable energy.

All such OWF developments have contributed to a raising of confidence and aspiration in both the public and private sectors on Humberside, with one reflection being Hull's success in winning the competition to be UK City of Culture 2017.

5.6.2 Community benefits initiatives during the O&M stage

In mitigation, the developer could also fund local community projects that are offered in partial compensation for the adverse impacts of the OWF development. These can be informal compensation offers, or more formalised *Community Benefit Agreements (CBAs),* which are offered to the community in recognition of their participation in projects that are 'in the national interest', rather than specifically compensating for local impacts. For example, onshore wind farm projects in Scotland currently pay £5000 per MW of power produced pa, index-linked, to communities affected by onshore. CBAs relate to the 20-25 years O&M stage of projects.

In contrast to onshore wind, the consideration of community benefits from OWF projects is relatively new and has been managed more flexibly, reflecting the developing nature of this new industry (Glasson, 2017b). Some, predominantly near-shore English wind farms (eg North Hoyle and Rhyl Flats off the north Wales coast) have followed the pattern of the onshore wind farms, with benefits pro rata to MW size. But in many cases, and for some of the latest large North Sea distant offshore wind farms, the benefits packages have to date proved to be more ad hoc and pro rata much smaller than for onshore projects. A report by the University of Edinburgh on community benefits from offshore renewables (Rudolf et al 2014), recommended the avoidance of restrictive guidance for the relatively new, developing and risky by nature offshore renewables industry. However, the Scottish Government has been at the forefront in considering the distribution of the benefits from offshore renewables beyond the delivery of supply chain benefits, and has developed *Good Practice Principles for Community Benefits from Offshore Renewable Energy Developments* (Scottish Government, 2014).

Issues of equity, fairness and distribution are involved in the key CBA questions of which areas should benefit, what should be the size of available funding, what are eligible projects, and who should manage the CBA scheme? Rudolph et al (2017) consider community benefits in the context of debates on 'energy justice' for offshore renewables. They suggest that justice can be understood in a number of ways, with implications for procedural justice (decision-making processes), distributive justice (fair and equitable outcomes) and recognitional justice (who is represented or excluded, and how underrepresented groups can be integrated into the process) (Aitken et al, 2016; Jenkins et al, 2016). They note that there is limited experience of applying community benefits to OWF, partly due to the challenges of defining the relevant community, as well as the distance between the project and any beneficiaries, and the way in which impact is perceived. They conclude, "community benefit schemes need to be tailored to particular contexts, taking into account local circumstances" (Local Energy Scotland, 2015). In a study of a hypothetical future offshore wind farm in Exmouth, UK using three scenarios, Walker et al (2014) show that the proposed provision of community benefits is linked to stronger local support for OWF, compared to scenarios not mentioning community benefits. The authors link this outcome to residents' perceptions of procedural justice related to collective rather than individual outcomes. They suggest that emphasising the community benefits, rather than benefits to individuals, will garner greater support for offshore wind developments in the future.

Box 5.5 provides examples of evolving approaches to CBAs for OWFs for our three OWF case studies of Aberdeen, Beatrice and Hornsea. They show considerable variations in content, in relation to the eligible spatial area, the size of funding per MW, the eligible projects and management approaches. Whilst schemes should be tailored to local contexts, as noted above, there are some good practice lessons, and issues to be resolved. Good practice lessons include:

- open consultative approach with local community, involving survey work, to establish local preferences for the nature of the key elements of the CBA;
- two–tier geographical distribution, with Inner and Outer areas, and guaranteed share of funding for Inner Area communities;
- good use of decision making boards, with local representation, and independent external management; and
- the use of a wider Social Return on Investment (SROI) approach, to comprehensively assess the impacts of CBA projects

Some issues/ remedies include:

- some early application teething problems reinforce the importance of operable criteria and support to potential applicants to manage the application process, and to fully utilise the available funds;
- very wide variations in level of funding per MW pa, suggesting case for perhaps a basic level per MW pa, to be increased according to local circumstances; and
- over focus on narrow environmental sustainability criteria in some cases, and on community criteria in others, perhaps making the case for more mixed community and environmental focus

Box 5.5: Examples of recent approaches to Community Benefits Agreements schemes for UK OWFs

(a) Aberdeen *-96 MW*	• **Origins**: the Aberdeen OWF Community Benefits Fund (2019), known as the *Unlock our Future Fund,* built on pioneering Scottish work, as well as on other UK and international examples. Edinburgh University provided guidance in a report for the project (Haggett, 2018). Two key points included: -- as a small project, the Aberdeen project fund will be less than for other recent UK projects and expectations need to be managed; and, -- as noted in the Scottish Government Good Practice guidance, the limiting features of the fund (by geography, topic and beneficiaries) "*should be driven by the local community, who should play an active role in determining how funds are spent"* • **Consultation**: the LCLO for the OWF project followed up the guidance with a three month consultation period, involving discussions with local stakeholders, and an online survey of the local community on various options and priorities for the Aberdeen CBF. In terms of the geographical focus of beneficiaries, there was a clear preference for the whole of Aberdeenshire and Aberdeen City to benefit from the fund, although with sizeable smaller groups favouring the wards closest to the site. • **Key elements of the CBA are**: -- *Size of Fund:*£150,000 pa over 20 years; £3m in total (ie: c£1500 per MW pa) -- *Geography*: for whole of Aberdeen City and Shire, but with 10% (ie £15,000) pa ringfenced for Blackdog -- *Structure*: two levels of application—small projects, and large projects -- *Eligible projects focus*: community facilities that are fit for the future and environmentally sustainable; lasting legacy and of wide community benefit -- *Management:*community champions panel advised on management structure and decision makingPanel.The application process is independently managed by grant-making charity Foundation Scotland. • **Performance to date**:First applications were invited from early 2019 and the 11 first round allocations reflect clearly the high level environmental sustainability and community criteria. The next application round will open in January 2020. At the time of this report (Autumn 2019) it appears that there have been no applications from the Blackdog community; this may be due to the current lack of a residents' association and /or the perceived complexity of the application process. Hopefully, this will soon be resolved.

(b) Beatrice -- 588MW	• **Origins and consultation:** The Beatrice Offshore Windfarm Limited (BOWL) development board, following consultation with a number of stakeholders including Highland and Moray councils, agreed The Beatrice Community Benefits Fund. It was developed using the Scottish Government's 'Good Practice Principles'. It was established in 2016. • **Key elements are**: -- *Size of Fund:* £300,000 pa over 20 years; £6m in total (ie: c£500 per MW pa) -- *Geography*: split between Highland (£4m) and Moray (£2m), and equally between a Beatrice Partnership Fund (BPF) and a Local Fund for each area (ie £1m BPF and £1m Local Fund for Moray).In contrast to the Partnership Funds, the Local Funds exist to support the community organisations closest to the wind farm to achieve their aims; only groups from the immediate local area to the development are eligible to apply -- *Structure*: two levels of application—small projects, and large projects -- *Eligible projects focus*: to be eligible for funding, projects must achieve one or more of the following priority themes--creating opportunities; empowering communities; and building sustainable places -- *Management:* Decisions on the allocation of Partnership Funds are made by an Independent Panel chaired by a member of the Scottish Council for Development and Industry (SCDI) • **Performance to date**: For the Highlands region, c45% of the Year 1 available funds were allocated, in a mix of revenue and capital projects, mainly for empowering communities, such as the renovation of an old school house as a community hub. For the Moray region, almost all the available Year 1 funds were allocated largely as capital, and mainly for sustainable places, including the Scottish Dolphin Centre. There has been some concern by local councillors about a perceived low level of funding for such a major project. The BOWL project has undertaken a wider analysis of the potential impact of the community benefits funds using a Social Return on Investment (SROI) approach for the projects in the first round of grant funding from the BPF in 2017. *SROI is a methodology that lets you understand the wider value as a result of investing money. It considers the social, economic and environmental impacts of an investment* (BOWL, 2017b). The project used a guidance document on the application of the SROI approach to Beatrice, produced by the New Economics Foundation (NEF, 2017).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 BOWL BPF, it was estimated that for every £1 spent by the fund, there would be £3.21 generated in wider value. On this basis the £6m fund would create almost £20m of social value when fully distributed.
(c) Hornsea *H1 1.2GW; and Race Bank 580MW*	• **Origins:** the East Coast Community Fund is set up to ensure that local people benefit initially from the operation of two of DONG's offshore wind farms – the 580MW Race Bank and the 1.2GW Hornsea Project One, with the two projects currently under construction. There was public consultation on which areas should benefit from the fund. • **Key elements are:** -- the Fund will distribute around £465,000 a year to help a wide range of local community and environmental initiatives for each of the next 20 years; £75,000 of the Fund each year is reserved for a "Skills Fund"; £9.3m in total (c£300 per MW pa) -- geographical areas include coastal communities in Yorkshire, Lincolnshire and North Norfolk Coast from the ECCF, in a coastal strip from Wells-next-the-Sea to the south, and Flamborough Head to the north -- grants from £1000 to £50,000 are available for: community buildings and facilities (eg: Improvement to village halls, community centres etc);community activities and services (eg: projects addressing health and wellbeing, community cohesion etc);environmental and public open space projects (eg: for parks, nature reserves, community growing schemes); and sports, recreation and play (eg: playgrounds, sports equipment etc) -- the Fund is managed by UK community fund administrator GrantScape, on behalf of DONG Energy • **Performance to date:** the ECCF was launched for applications in early 2017. Eligible organisations include voluntary and community groups, charities, parish and town councils, local authorities (working with community organisations, and social enterprises. There have now been five rounds of applications and allocations (ie: two rounds pa). The table below shows the fund allocations in the most recent round 5. Allocations to community services and buildings are dominant.

Organisation	Project	Funding
Long Sutton Bowls Club	Replace old equipment	£1400
Kings Lynn Winter night Shelter	Kings Lynn winter night shelter	£10,000
Boston Sea Cadets	New champ engine	£4,500
Keelby Sports Association	Improvement to sports ground	£2,880
Favour Foundation Ltd	Grimsby, Oasis Garden Buddy Scheme	£18,400
Anderby Parish Council	Disabled beach access improvement	£17,000
Zion Methodist Church, Boston	Maintenance	£2,000
Wrangle Parish Council, Boston	Toilet block refurbishment	£5,000
Withernsea Pie/ Promenade Assoc. Ltd	Pier Viewing Gallery	£38, 600
St John and St Stephen, NE Lincs	Soup Kitchen	£9,900
SASH	Resettlement of homeless young people Coast	£17,200
Citizens Advice Lindsey	Coastal Advice in Skegness and Mablethorpe	£35,000
Somercotes Stars Ltd	Technology for Pre School and After School Club	£3,500
Community Learning in Partnership	Mablethorpe Multi-Use Skills Unit	£29,600

5.7 Monitoring, auditing and adaptive management and assessment

The important role of monitoring and auditing is discussed in 4.6.1. Our review of ESs shows little evidence of monitoring and auditing of the social impacts of OWFs, partly reflecting the low priority given to such impacts and the challenge of monitoring these often more qualitative perceptual issues. However, such monitoring is important, and the survey approaches, and media tracking, over the project lifecycle, as set out in s5.4, illustrate possible approaches.

Box 5.6: Guidance Summary--Prediction, Mitigation, Enhancement and Monitoring

Prediction methodology for social impacts is largely descriptive and qualitative; there is a predominant use of professional judgement and comparative studies. While various methods can be employed (eg. scenarios), predicting impacts for social issues is not a precise science, and an element of assessor judgement, informed by stakeholder consultation, is necessary.

A Capital Stocks Analysis approach, as noted in Table 5.2, distinguishes between impacts on human capital (eg skills and education), which are often positive, and social capital (eg. social networks, community coherence), which are more mixed.

Mitigation and enhancement measures are likely to include education and skills training initiatives and, in some cases housing and local services (for example to alleviate accommodation pressures, the developer might provide housing assistance, particularly in the construction phase).

Monitoring of social impacts, including views on wellbeing/QoL, local services, community cohesion, and landscape, plus wider views on renewable energy, is important. Community views can be gained from direct surveys, and from media coverage. The survey approaches, and media tracking, over the project lifecycle, as set out in s5.4, illustrate possible approaches.

Box 5.7: Guidance Summary—Community Benefits Agreements

Community Benefits Agreements (CBA) are becoming an established element in OWF practice. Whilst they are voluntary measures provided outside the planning and licensing processes noted in s3 of this report, 'being a good neighbour' has become standard practice for operators.

Good practice CBA lessons include:

- open consultative approach with local community, involving survey work, to establish preferences for the nature of the CBA;
- two–tier geographical distribution, with Inner and Outer areas, and guaranteed share of funding for Inner Area communities;
- good use of decision making boards, with local representation, and independent external management; and
- the use of a wider Social Return on Investment (SROI) approach, to comprehensively assess CBA impacts.

Some CBA issues/ remedies include:

- importance of operable criteria and support to potential applicants to manage the application process, and to fully utilise available funds;
- very wide variations in level of funding per MW pa, suggesting case for perhaps a basic level per MW pa, to be increased according to local circumstances; and
- over focus on narrow environmental sustainability criteria in some cases, and on community criteria in others, perhaps making case for more mixed community and environmental focus

6. Conclusions: key findings, recommendations, and spreading good practice

6.1 Key research findings *(in a nutshell)*

Section 6.1 provides a brief summary only of the key research findings. See the underpinning studies illustrated in Figure 1.1 for more in-depth research findings. Each of those underpinning studies has a Technical Report output.

6.1.1 Overview—general socio-economic impacts

- Wind is a rapidly increasing energy sector. In Europe the wind energy sector increased from 2.5GW in 1995 to over 142GW of capacity in 2015 (EWEA, 2016). The UK is the European leader, and a global leader, in offshore wind energy generation. BVG (2016) estimated already 13,000 UK jobs in the offshore sector by 2015. The infrastructure value of UK offshore projects was estimated at c£10bn (2015), and could increase by +£ 20bn (2020), and +£30bn (2025). It is a major growth industry.
- Major OWFs require Environmental Impact Assessment (EIA) and the production of an Environmental Statement (ES), which involves a distinct set of procedures. Socio-economic impacts are of growing importance in the planning and assessment of OWFs, especially in the UK.
- Key OWF developers in the UK and EU include Orsted (previously Dong), Vattenfall, SSE, EDF Renewables, EON, Innogy and Equinor (previously Statoil). Major OWF consultancies, involved particularly in producing the ESs, include ERM, RPS, Royal

Haskoning, AECOM and others. Socio-economic assessment may be sub-contracted to specialist consultancies such as Regeneris, Arcus, LUC and SQW.

- There is growing recognition of the socio-economic impacts associated with various stages in, and elements of, the OWF lifecycle – including development/pre-construction, offshore construction, onshore construction, the under-estimated O&M stage, and decommissioning.
- There is a predominance of assessment of the economic impacts, with varying considerations and ambivalent trends in the assessment of social impacts.
- OWF developments can make important contributions to employment and general wellbeing in often currently deprived coastal communities.
- Local content is important, and there is a growing recognition of the importance of 'a social licence to operate' from the community. However, to date there has been an industry emphasis on 'national level'
- Issue of scale, both large OWF projects, and especially a programme of OWFs, can make important socio-economic contributions in improving and sustaining the supply chain and enhancing key infrastructure - especially ports. For some areas there is potential for hub status with multiple projects, and associated supply chain activities, including fabrication and assembly facilities, and O&M bases.
- Some countries (eg Netherlands and Belgium) use a strategic overview, with decisions over whether impacts are acceptable pre-determined at an earlier strategic level when the windfarm 'zone' was set. There are also different policy frameworks in Denmark between nearshore and offshore OWFs.
- Assessment methods tend to be quantitative for economic impacts, and qualitative for the social impacts. Innovative methods are being developed.
- Uncertainty of impacts is still an issue, with host community/authority requirements for more certainty of impacts sometimes being at odds with developer requirements for flexibility in nature of development and sourcing of components.
- OWF is a technologically dynamic industry, and this has assessment implications – for example regarding turbine scale, drone checks for O&M, floating OWFs etc. Floating windfarms may have more flexibility in fabrication location than conventional OWFs, with the possibility of generating little construction stage socio-economic impacts in their final destination location.
- Coverage of cumulative impacts is partial with some limited recognition of the need to mitigate potential pressures on local labour demand, but more on the potential enhancement opportunities for delivering significant wider local/regional economic benefits in combination with other local OWFs.
- To date, there has been little monitoring and auditing of the socio-economic impacts of OWFs, thus making it difficult to assess actual versus predicted impacts. Monitoring and auditing can also be complicated by the changing nature of projects (eg MW size) during development and construction.

6.1.2 Economic Impacts

- Economic impacts have predominance in OWF socio-economic assessment to the order of roughly 5:1 in content.
- The focus is normally quite narrow, on employment and GVA impacts, and on impacts on other coastal industries and activities, including fishing, shipping and coastal recreation.
- There is also a focus on assessing the importance of offshore construction, although there is growing recognition of the economic impact of onshore construction, and especially now on the impacts of the O&M stage of the lifecycle.

- Prediction methodologies range from simple extrapolative and comparative measures to a range of economic impact models, such as multipliers and input–output (IO) approaches. As for major projects more generally, so for OWFs there has been a growing interest and practice in modelling the wider economic impacts – both expenditure and employment.
- Predictions normally build in the indirect and induced expenditure and employment impacts of the original direct impacts.
- For economic impacts, the focus in assessment is often more on enhancing beneficial impacts, rather than on mitigating adverse impacts. This can involve education and skills training programmes, built in as requirements in the decision-making process, and encouragement of local supply chain opportunities.
- Whilst much of the economic benefit of OWF developments, especially from the major construction stage (offshore), currently leaks out of local and regional areas, there is still benefit to communities, and overall, with appropriate enhancement measures, economic impacts of OWFs can be substantial for a host area.

6.1.3 Social Impacts

- Social impacts of OWFs, to date, where they have been included, focus on some of local demography, housing, other local services, and occasionally on wellbeing/quality of life of the host coastal area. There are also distributional issues, the impacts on particular groups in society, which may raise questions of environmental justice.
- The social acceptance of a project by a local community is particularly important, involving issues of trust and fairness and a process of community engagement.
- Imagined impacts may be worse than actual impacts. There can be a habituation effect with objections softening over a relatively short period.
- Prediction methodology for social impacts is largely descriptive and qualitative; there is a predominant use of professional judgement and comparative studies.
- Overall, research indicates that on balance, at the regional/national level, the offshore wind industry may have a largely positive impact on well-being, although the picture is complex. However, the issue of 'community cohesion' receives little coverage in ESs and in the OWF literature
- The use of Community Benefit Agreements (CBAs), offered to the community in recognition of their participation in projects that are 'in the national interest', rather than specifically compensating for local impacts, is gaining ground. However, unlike CBAs for onshore wind, practice for OWFs is still quite variable, although developing.

6.2 Practice guidance: some recommendations for future OWF projects *(briefly)*

6.2.1 *Overview—general socio-economic impact assessment*

- Socio-economic impacts of OWF developments are important**,** however distant from the coast is the project, and should receive due consideration in the EIA, ES and in subsequent monitoring and adaptive EIA through the project lifecycle.
- For the ES output, where possible use should be made of an integrated chapter approach, which includes both socio-economic impacts (employment, economic development, housing, local services etc), and key economic sectors (especially tourism and fishing). The chapter should also bring together impacts of both onshore infrastructure (e.g. sub-stations and cable corridor) and offshore infrastructure (turbine cluster, cable array etc).

- Include consideration of all the impacts noted above for the key stages of the project lifecycle (i.e. development/pre-construction, on- and off-shore construction, O&M, and decommissioning). Construction impacts should be for both peak construction year, and for the total construction period. O&M impacts should be for the normally envisaged annual impact over the 20-25 year O&M life.
- Include consideration of all the impacts noted above for the key spatial impact levels: local, regional and nation-wide. Clearly define the spatial levels. There is merit in differentiating between local area (eg 60 minutes local commuting catchment area) and wider regional context for the construction stage, and in using a narrower local authority area definition of local for the O&M stage
- Every effort should be made to narrow down the main port options, and the relative probability of using any alternatives should be set out.
- Levels of significance (simple scale, and either positive or negative) should be attached to all assessments. Whilst baseline context setting is important, it should be targeted, and should not swamp out the impact assessment.

6.2.2 Economic impacts assessment

- For the project, it is important to establish, as fully and accurately as possible, the investment/expenditure and the associated human resources plans for the key stages of the project lifecycle—especially for the construction (CAPEX) and O&M stages (OPEX).
- Economic impacts will normally include employment, GVA and specific sector impacts, for each project stage, time-period and spatial level, as discussed above.
- The assumptions underlying predictions should be clearly stated. The probability of and confidence in predictions should be addressed; EU and UK EIA legislation and guidance now requires 'the probability of impact' to be considered. Ranges may be attached to predictions within which the analyst is n% confident that the actual outcome will lie.
- Offshore and onshore impacts may be calculated separately, but should be combined to produce total impacts. Sector studies should be included here.
- Impact predictions for employment and GVA should include clearly identifiable Direct, Indirect and Induced impacts.
- Guidance and overall impact assessment methodology should specify key guidance documents used on socio-economic impacts (e.g. English Energy NPS guidance, Crown Estate, Treasury Green Guide; industry guidance eg BVG etc) and in the impact assessment refer to coverage of the guidance.
- If an Input-Output or other form of modelling is used, relevant calculations and assumptions need explanation.
- Where the methodology uses scenarios, keep the number of scenarios to an absolute minimum; clearly set out the logic, assumptions and probability underpinning each scenario; and specify a most likely scenario.
- Use may be made of a range of potential local and regional employment impact rules of thumb for total construction and for each O&M year, using a jobs per project MW size, and GVA £m per project MW size approach. These can provide broad orders of scale, and ranges of potential economic impacts for the analyst.
- Assessment of significance of economic impacts can make use of a sensitivity matrix. All construction employment and GVA impacts are usually assessed as positive, and usually of medium/minor significance. For O&M employment and GVA, assessment is likely to be assessed as minor positive, but with a few medium significance assessments for some larger projects.

- The good practice inclusion in development permissions of an Employment and Skills Plan, or equivalent, to support effective implementation of socio-economic undertakings (predominantly economic) is strongly recommended.
- Key indicators for monitoring direct economic impacts include, for example: levels and types of employment on the project, by local and non-local sources and by previous employment status; the output of training programmes and take-up by the project; distribution of contracts and sub-contracts; and workforce expenditure. Some information can be provided by the developer and tier 1 contractors; other information may benefit from some specific surveys (e.g. of the economic activities of the project employees).The provision and specification of the nature of monitoring information by the developer and main contractors should be specified in permissions and built into contracts as requirements.
- If OWFs are to deliver on their potential to provide high quality jobs, often in some of the most deprived coastal communities of the UK, it is important that the delivery of local content is strongly supported. As an example, see the Scottish Government initiative (2020) noted in s2.1 of this guidance.

6.2.3 Social impacts assessment

- Social impacts should be covered whatever the distance from the coast of the OWF. They will normally include demographic, housing, local services, and wellbeing/QoL impacts.
- As for the economic impacts, these should be for each project stage, time-period and spatial level, and should include both offshore and onshore impacts.
- However, *social impacts are likely to be more qualitative than the economic impacts*. Any visual perception studies, for near coast locations, should be included here.
- A recognition of early and continuing community engagement is important as a way to engage with a local community, and to promote the 'social licence to operate.'
- The use of a Local Community Liaison Officer is recommended as a way of engaging with the host community (ies) from initial consultation on the proposal, through construction and into the O&M stage.
- Surveys of community views of perceived development impacts at key stages in the project lifecycle can be very helpful, including focus on key impacted groups (eg. specific settlements close to onshore works; wider community of interest; specific potentially impacted industries, such as fishing and tourism).
- Mitigation and enhancement measures are likely to include education and skills training initiatives and, in some cases housing and local services (for example to alleviate accommodation pressures, the developer might provide housing assistance, particularly in the construction phase).
- Community Benefits Agreements (CBAs) should be initiated at an early stage of the project, and should be developed in consultation with the community, again possibly with a survey of community views on the preferred nature of the CBA (especially spatial scope). Consider use of Social Return on Investment approach to assess wider impacts of CBA activity.
- Monitoring of social impacts, including views on wellbeing/QoL, local services, community cohesion, and landscape, plus wider views on renewable energy, can be gained from direct surveys, and from media coverage.

6.2.4 Wider and ongoing socio-economic impacts assessment

- Cumulative impact assessment is important, and should be included. The potential combination of scenarios involved can complicate assessment; the use of tiered assessment is away forward here. For example, for the Norfolk Vanguard (Vattenfall, 2018)

the highest priority is given to a consideration of tier 1 projects that are likely to be under construction in the same time envelope as the project under consideration. With more decisions on port locations, with their associated OWF- support infrastructure (construction fabrication and assembly facilities, and O&M supply hubs), it may become more possible to narrow down the range of scenarios.

- Monitoring and auditing of socio-economic impacts in both construction and O&M stages is crucial to check on the predictions made, on the implementation of mitigation and enhancement undertakings associated with the permission to build, and to learn for future projects. Because of the overlapping impacts of multiple projects in some areas (eg in the North Sea), there may be merit in a periodic strategic level multi-developer/ possibly government approach to such monitoring.

6.3 Testing recommendations, dissemination and continuous learning

Subject to discussion and agreement with the EOWDC research programme Steering Group, and also to time and resources, some of the following types of further activities are proposed:

- Specific feedback discussions with a Working Group of OWF industry stakeholders, including major OWF developers, consultants, academics and various government agencies, to test the guidance.
- Wider professional dissemination, including conference presentations to relevant renewable energy/major project events – such as those of National Infrastructure Planning Association (NIPA), and the various renewable energy groups (eg All Energy conference).
- Academic dissemination via journal publications (eg EIA Review, Impact Assessment and Project Appraisal) and academic conference presentations (eg International Association for Impact Assessment Annual conference, UK Planning Research conference).
- Building the guidance on better integrating socio-economic impact assessment into, as a minimum, future Vattenfall projects, and hopefully also into the OWF projects of other developers. Such assessment should also include structured monitoring exercises, leading to publicly available socio-economic (and other) data over the project lifecycle.
- Because of the overlapping impacts of multiple projects in some areas (eg in the North Sea), explore the possibility of periodic strategic level (i) single developer multi-projects approach, and (ii) multi-developer/ possibly government approach to monitoring for the impacts of OWFs in areas off the UK North Sea coast.

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