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Executive summary

This report presents the results of the socio-economic assessment (SEA) carried out for the NEMMO project. The SEA is a well-established method that has helped in understanding the potential positive and negative socio-economic impacts of the NEMMO project innovations.

For this study, the UNEP/SETAC guidelines for Social Life Cycle Assessment (LCA) and the Product Social Impact Assessment Framework presented in the Handbook for Product Social Impact Assessment (PSIA) have been followed. According to those well-established methodologies, which follow the standards ISO 14040 and ISO 14044 on environmental LCA, the following phases have been considered:

- (1) a goal and scope definition phase, in which the reasons for carrying out the study (goal) and the product system to be studied (scope) have been defined. In addition, at this stage, relevant actors have been identified and a materiality assessment has been conducted in order to determine the relevant social topics by means of questionnaires for the relevant stakeholder groups;
- (2) a hotspots identification phase by conducting questionnaires to the relevant stakeholders of the value chain (supply chain, manufacturing and installation). These questionnaires have been developed following the methodology proposed by the PSIA. Stakeholders' opinion has been fundamental to identify potential social impacts;
- (3) an impact assessment phase, in order to evaluate previous responses with the 5-point reference scale included in the PSIA. This has been complemented with an economic assessment of several indicators, with the aim at further analysing the economic implications of the NEMMO project; and
- (4) an interpretation phase, in which main outputs have been analysed to help understand the resulting socio-economic impacts related to the implementation of the NEMMO system.

The authors would like to thank the Morlais Anglesey Marine Energy Project for their collaboration in the project and in this report accepting to participate in meetings and answering the questionnaires on a voluntary basis.

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Abbreviations

CAPEX: Capital expenditure.

COPD: Chronic obstructive pulmonary disease.

EC: European Commission.

EOL: End-of-Life.

FTE: Full Time Equivalents.

FU: Functional Unit.

GVA: Gross Value Added.

HIE: Highland and islands enterprise.

IO: Input-Output.

ISO: International Organization for standarization.

LCA: Life cycle assessment.

LQ: Location Quotient.

MEW: Marine Energy Wales.

OPEX: Operating expenses.

ORE: Ocean Renewable Energy.

PDA: Project development area.

PSIA: Product Social Impacts Assessment.

SEA: Socio-economic assessment.

SHDB: Social Hotspot database.

S-LCA: Social Life cycle Assessment.

TEA: Techno-economic assessment.

1. Introduction

The socio-economic assessment (SEA) presented in this report aims at identifying and analysing possible socio-economic challenges and risks that may happen along the whole life cycle of the NEMMO project, highlighting its potential to create social benefits through enhanced employment opportunities, and increased employees and community engagement, as well as assessing possible future improvements.

With the objective of obtaining the greatest excellence, the recognised UNEP/SETAC guidelines for Social Life Cycle Assessment (LCA) (UNEP/SETAC, 2009) and the Handbook for Product Social Impacts Assessment (PRé Sustainability BV, 2018 and 2020) have been the basis for this SEA. These guidelines provide a consensus-based roadmap and a body of knowledge to help in the assessment of socio-economic impacts of products and technologies.

As established in the above-mentioned initiatives, stakeholders' opinion is fundamental, and, in this sense, questionnaires have been conducted to help understand associated social impacts related to the development of the NEMMO project. Analysing the socio-economic impacts that may occur during a project execution by following participatory processes, is the best way to understand all impacts related to involved stakeholders and their socio-cultural and economic surroundings.

To complement the SEA, several social indicators have been selected to assess them quantitatively. This way, further longer-term opportunities for the local economy related to the know-how generated in the tidal energy sector can be understood.

This deliverable aims at presenting the socio-economic impacts of the NEMMO project outcomes. The socio-economic assessment (SEA) has first collected the opinion of the relevant actors through questionnaires and interviews; second, assessed potential social impacts; and finally, identified social hotspots by applying the methodology established in the UNEP/SETAC guidelines for Social Life Cycle Assessment (LCA), as well as the Handbook for Product Social Impacts Assessment (PSIA).

Special focus has been placed on identifying longer-term positive socio-economic opportunities from the implementation of the NEMMO technologies. In this direction, an economic quantitative analysis of various preselected indicators has been also included.

This report sets out, in section 2, the methodological approach; in section 3, the goal and scope definition including the materiality assessment; in section 4, the inventory development, where the identified key social topics are presented; section 5 which contains 2 subsections, one on the impact assessment following the 5-point reference scale of the PSIA, and a second one, where an economic assessment for several preselected social indicators is presented. And to conclude, in sections 6 and 7, the interpretation of results and main conclusions are reported. In the Annexes, the questionnaires related to section 4, as well as the key information employed in the economic assessment and the conducted calculations are included.

2. Methodological approach

The SEA presented in this deliverable is based on the UNEP/SETAC guidelines for social LCA (UNEP/SETAC, 2009) and the PSIA for social impact assessments (PRé Sustainability BV, 2018 and 2020), which follow the LCA methodology aiming at evaluating the environmental performance along the whole life cycle of products and services. To ensure transparency when applying the LCA methodology, two standards were provided by the International Organization for Standardization (ISO):

- ✓ ISO 14040:2006 - Environmental management -- Life cycle assessment -- Principles and framework (ISO, 2006a).
- ✓ ISO 14044:2006 - Environmental management -- Life cycle assessment -- Requirements and guidelines (ISO, 2006b).

According to ISO standards, there are 4 different phases when conducting a LCA study:

1. The goal and scope definition phase: In this phase, the reasons for carrying out the study (goal) and the product system (scope) will be defined. For that, whether the results will be used for comparative reasons or not, the intended audience, systems boundaries (unit processes to be included in the system considering all life cycle stages), allocation procedures, impact categories, as well as, system assumptions will be determined.
2. The inventory analysis phase: This phase implies the data collection (at all life cycle stages) and determination of calculation procedures to quantify relevant inputs and outputs of a system.
3. The impact assessment phase: This phase aims at evaluating the environmental impacts considering the data collected during the inventory analysis phase.
4. The interpretation phase: In this phase, the results consistent with previously defined goal and scope are presented. The aim is to generate a set of conclusions, limitations of the study and recommendations to decision-makers.

Considering the phases established in the ISO standards and the relevant guidelines for social LCA; the subsequent methodology has been followed for the consecution of the SEA presented in this report:

1. **Goal & Scope definition** through which, 3 outputs have been delivered:
 - Description of system boundaries.
 - Identification of relevant stakeholders for the NEMMO project.
 - Materiality assessment for the selection of relevant topics for the different stakeholders of the value chain.
2. **Hotspots identification** for previously identified stakeholders by means of questionnaires developed based on the PSIA, considering the relevant topics identified in the materiality assessment and supported by the Social Hotspots Database (SHDB) Risk mapping tool (SHDB, 2022) for country and sector social risks identification.
3. **Impact assessment** to determine main socio-economic impacts for the project based on the 5-point reference scale methodology established in the PSIA (2020) (PRé Sustainability BV, 2020). In addition to this, an economic quantitative assessment has been carried out to further evaluate the economic implications of the NEMMO project, by means of an exhaustive evaluation of diverse selected indicators that have been identified for being of major relevance for the NEMMO project.
4. **Interpretation of results**, where a results compilation is presented based on the impact assessment conducted based on the PSIA, as well as the quantitative assessment of selected indicators.

3. Goal and scope definition of the study

The goal of this deliverable is to present the SEA of the NEMMO project innovations that are expected to contribute to a breakthrough in ocean tidal energy. This study considers potential socio-economic risks and benefits related to the whole life cycle, with some slight nuances. On the one hand, the design phase is generally omitted in LCA studies because of its scarce relevance, and this principle has been also followed for the social assessment presented in this report. However, the project design and planning often spans several years, thus generating a relatively significant impact in the economy. In this sense, the design phase has been considered in the economic assessment presented in section 5.2. On the other hand, regarding the end-of-life (EOL) stage, it has been not considered in this study. The reason is that, since the SEA presented in this report is based on questionnaires to relevant stakeholders. Since the assessed technology is so new and is not installed yet, there were no waste management companies that could provide an accurate picture of possible EOL scenarios of the NEMMO innovative tidal energy farm components.

The location of the different processes may affect the related potential social impacts for this study. Therefore it has been considered that the blade design and manufacturing is carried out in Spain, while the whole system mounting and operation is accomplished in the UK, affecting the local communities in those two areas.

To conclude, the main target audience of this report are the partners of the NEMMO project and the European Commission, as well as, different stakeholders promoting the development of tidal energy technologies that may be interested in understanding related socio-economic impacts.

3.1. System boundaries

System boundaries refer to the unit processes that have been included in the system. In the present study, the following stages have been considered:

1. **Devices' manufacturing:** A hydrodynamic system is required to interact with the tidal flow speed to extract energy from it, and a power take off system converts the energy extracted into electrical energy. A control system provides supervisory and closed-loop control. In addition to the production of these devices, which represent the most significant component of the total capital cost associated with tidal projects, auxiliary elements are also required for proper functioning, including foundations, mooring, cabling, electrical equipment, and onshore infrastructure.
2. **Installation and commissioning:** Once the manufacturing phases are completed, they need to be assembled onshore and installed offshore. Typical activities include port services, installation of electrical systems, installation of foundations and moorings, and finally device installation.
3. **Operations and maintenance:** Once the installation becomes operational, various on-going activities are required to facilitate this, including monitoring, planned and unplanned maintenance, insurance, and grid charges.

As previously commented, the design stage will be only considered in the economic assessment presented in section 5.2.

In the next figure, the system boundaries considered in the study are presented:

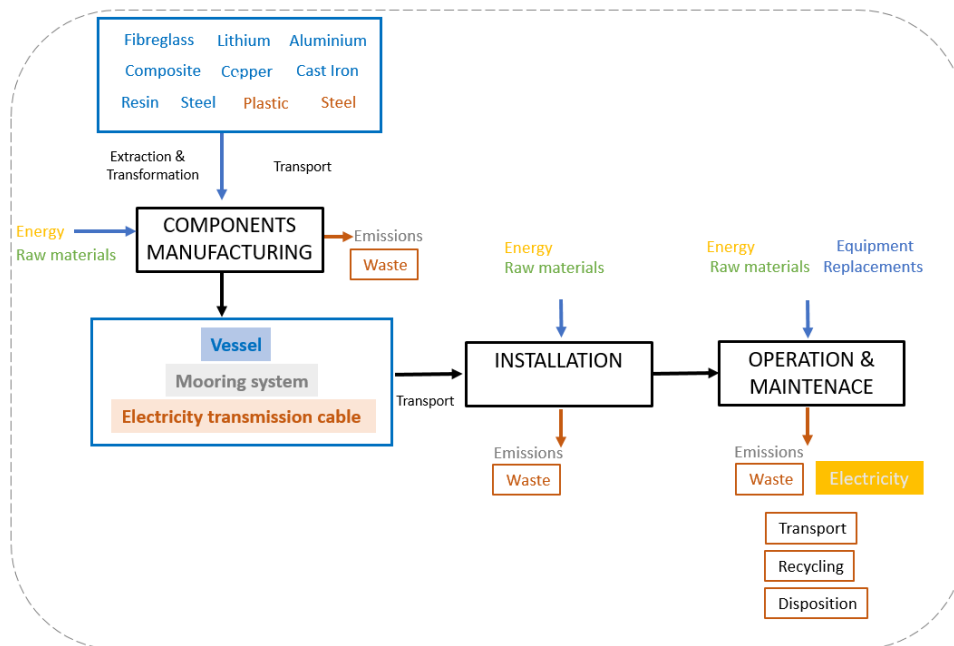


FIGURE 1. SYSTEM BOUNDARIES OF THE MAGALLANES TIDAL FARM FOR THE SOCIO-ECONOMIC ASSESSMENT

3.2. Stakeholders’ identification

In Figure 2, the relevant stakeholders for the NEMMO project are presented:

	Life cycle stages				
	Supply chain	Manufacturing and installation	Use	Maintenance	End of Life
Identified stakeholders	Workers of INPRE	Workers of Magallanes Renovables Local communities			Waste management companies

FIGURE 2. RELEVANT STAKEHOLDERS FOR THE NEMMO PROJECT

As already mentioned, waste management companies have not been included considering their current lack of experience regarding the management at the EOL of the different components originating from the decommissioning of the NEMMO project. Questionnaires results regarding those waste management companies may not be representative for this study and final results could be adversely affected.

3.3. Materiality assessment

The materiality assessment allows preselecting the relevant social topics to be analysed for different stakeholders. To achieve this, on the one hand, and in order to identify the social topics of relevance for workers, either of the supply chain or manufacturing companies, materiality questionnaires have been sent to the following stakeholders:

- ✓ Supply chain: INPRE (see Table 3).
- ✓ Manufacturing and installation: Magallanes Renovables (see Table 4).

On the other hand, and in order to identify the social topics of relevance for the local communities, the Morlais project has been analysed. The Morlais Project, is a Menter Mên project which aims at helping tackle climate change by supporting the use renewable energy to generate clean low carbon electricity, through the implementation of the necessary infrastructure for tidal renewable energy related companies, including Magallanes Renovables, manufacturer, and installer of the NEMMO project.

In Table 1, the relevant identified social topics for Morlais project are presented. This selection has been completed considering those topics with assessed moderate and major relevance from Morlais project’s Environmental Statement (Menter Mên, 2019). In addition, these have been further classified following the social topics established in PSIA (2020) (PRé Sustainability BV, 2020), last version of the PSIA where the topics included in the PSIA (2018) have been updated, including:

- ✓ Health and safety: The company works to prevent and mitigate adverse impacts or enhance positive impacts on the health and safety of the local community.
- ✓ Access to material and immaterial resources: The company works to improve community access to material and immaterial resources and infrastructure.
- ✓ Community engagement: The company engages with local community through open dialogue and responds to their concerns and foster trust and relationships.
- ✓ Skill development: The company creates new jobs and promotes new skills development.
- ✓ Contribution to economic development: The company contributes to the economic development of the community.

TABLE 1. RELEVANT SOCIAL TOPICS FOR LOCAL COMMUNITIES FROM MORLAIS PROJECT

Social topics (PSIA, 2020)	Selected impact topics (Morlais) (Menter Mên, 2019)		Type of impact	Relevance
				moderate (m) major (M)
Health and safety	Decarbonisation	Clean energy, balancing services, spin-off capacity	Beneficial	Operation (m) Repowering (m)
Access to material and immaterial resources	Level of commerce activity	Green cluster creation	Beneficial	Construction (m) Operation (m) Repowering (m)
	Energy security	More green electricity, local supply, diversity of supply	Beneficial	Operation (m) Repowering (m)
	Fisheries and shellfisheries	Obstruction of fisheries activities	Adverse	Construction (m) Operation (m) Repowering (m)
	Effects on shipping	Obstruction to navigate around	Adverse	Construction (M) Operation (m) Repowering (m)
	Cumulative effects	Effects upon other tidal, maritime energy, local projects	Beneficial	Construction (m) Operation (m) Repowering (m) Decommissioning (m)

	Recreational boating and angling	Water safety issues	Adverse	Construction (m) Operation (m) Repowering (m) Decommissioning (m)
Community engagement	Wellbeing of future generations	Green branding for locality	Beneficial	Operation (m)
Skill development	Job opportunities	Numbers	Beneficial	Construction (m)
		Types, quality, skills area	Beneficial	Construction (M) Operation (M) Repowering (M) Decommissioning (m)
	Training opportunities	New skills and competence needs	Beneficial	Construction (m)
	Provision of education and visitor facilities	Tertiary BsC, Eng, PhD	Beneficial	Operation (m)
	Additional local services	New technical skills, workboats, cranes, better sea knowledge	Beneficial	Construction (m)
Contribution to economic development	Social benefits	Decentralisation of economic growth	Beneficial	Construction (m)
	Economic impacts	Direct & secondary income	Beneficial	Construction (m) Decommissioning (m)
	Economic impacts	Accumulation of grant support	Beneficial	Construction (m)

In addition, previously identified topics have been further assessed to check their relevance in this moment in time for the NEMMO project (see Table 2). The aim has been analysing the references used at the moment of the assessment of the Morlais project and identifying the up-to-date references to see if the selected topics are still relevant at this point for the NEMMO project:

TABLE 2. DEEP ASSESSMENT OF RELEVANT SOCIAL TOPICS FOR LOCAL COMMUNITIES FROM MORLAIS PROJECT

Selected impact topics from Morlais project (Menter Môn, 2019)		Additional information extracted from Morlais project	Additional references used in Morlais project	Updated references for the NEMMO project
Decarbonisation	Clean energy, balancing services, spin-off capacity	Opportunities for decarbonisation and clean growth will only be fully realised within the operational and repowering stages.	The UK Energy Act 2013: Introduction of provisions to enable a statutory 2030 decarbonisation target range for the GB electricity sector	2030 reduction targets still in force. Therefore, this issue is considered to be relevant at this point in time for NEMMO project.
Level of commerce activity	Green cluster creation	The successful implementation of measures that increase the understanding of the project and establish a strong green cluster locally, will lead to major beneficial effects during the operation and repowering phases.	Importance of “clustering effect” according to Highland and Islands Enterprise (HIE) report (March 2019).	This issue is considered to be relevant at this point in time for NEMMO project.
Energy security	More green electricity, local supply, diversity of supply	The project will help to beneficially support a transition to a more decentralised and decarbonised energy model by showing how and where best tidal energy may be able to contribute effectively to local, regional and UK energy supply.	UK Industrial Strategy 2017: The pressures on the existing energy systems are likely to increase markedly, as the transition to a more decentralised and decarbonised energy model accelerates.	This issue is considered to be relevant at this point in time for NEMMO project. Considering the “Build Back Better, our plan for growth (2021)”: In clean energy, we will bring about a green industrial revolution, targeting investment in technologies like CCUS, hydrogen and offshore wind.
Fisheries and shellfisheries	Obstruction of fisheries activities	Menter Môn has committed to several techniques and engineering designs/modifications inherent as part of the	No extra reference.	This topic is not considered of relevance since mitigation measures are in place.

Selected impact topics from Morlais project (Menter Môn, 2019)		Additional information extracted from Morlais project	Additional references used in Morlais project	Updated references for the NEMMO project
		project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible.		
Effects on shipping	Obstruction to navigate around	Embedded mitigation measures are in place prior to construction.	No extra reference.	This topic is not considered of relevance since mitigation measures are in place.
Cumulative effects	Effects upon other tidal, maritime energy, local projects	Potential Cumulative Impacts Identified for Metocean Conditions and Coastal Processes. Example during construction: Changes in seabed level (morphology) due to deposition during foundation installation in the project.	No extra reference.	Based upon the geographical configuration of the Minesto Project Development Area (PDA), there is no possibility of changes in tidal flow interacting between projects, due to the alignment of flood and ebb flows off the coast of Anglesey. The predicted impacts of Minesto's Holyhead Deep project on coastal processes have been assessed as being not significant (Minesto, 2016), and this conclusion is considered equally valid for the NEMMO project.
Recreational boating and angling	Water safety issues	Final mitigation plans will be agreed prior to the construction.	No extra reference.	This topic is not considered of relevance since mitigation measures are in place.
Wellbeing of future generations	Green branding for locality	A marketing strategy will be developed for the project that should monitor the impact of the Morlais brand and wider green branding at local, regional, and national levels.	No extra reference.	This issue is considered to be relevant at this point in time for NEMMO project.
Employment	Numbers	The creation of jobs, particularly higher value technology-oriented jobs is a key driver for	Marine Energy Supply Chain Survey	This issue is considered to be relevant at this point in time for

Selected impact topics from Morlais project (Menter Môn, 2019)		Additional information extracted from Morlais project	Additional references used in Morlais project	Updated references for the NEMMO project
		regional economic development and a key reason why tidal energy has been supported at local, national, and international levels.	carried out by Sgurr Energy for the Scottish Government in 2009 (Sgurr Energy, 2009).	NEMMO project. See sections 5 and 6 for the quantitative assessment.
	Types, quality, skills area	The project will create a high number of jobs within the local economy, some of these will be highly skilled and will provide a very strong opportunity regionally and locally. Menter Môn will develop a supply chain portal that will advertise opportunities for the local contractors and workforce which will highlight the job availability across Wales, timely and in advance of the developments to encourage workforce to prepare.	No extra reference.	This issue is considered to be relevant at this point in time for NEMMO project.
Training opportunities	New skills and competence needs	Project construction will offer temporary employment opportunities both in terms of direct construction jobs and opportunities in the supply chain.	No extra reference.	This issue is considered to be relevant at this point in time for NEMMO project.
Provision of education and visitor facilities	Tertiary BsC, Eng, PhD	This impact is considered beneficial for all three regions being assessed (local, regional, and national), as there could also be benefits to other regional and national universities and training establishments.	No extra reference.	This issue is considered to be relevant at this point in time for NEMMO project.
Additional local services	New technical skills, workboats, cranes, better sea knowledge	Along with the developing capacity within the project organisation (Menter Môn), the Project will require, and will act as the catalyst for similar developing capacity within the local supply chain. Development of local supply chain will	No extra reference.	This issue is considered to be relevant at this point in time for NEMMO project

Selected impact topics from Morlais project (Menter Môn, 2019)	Additional information extracted from Morlais project	Additional references used in Morlais project	Updated references for the NEMMO project
		continue to progress and over time will provide additional, services, facilities, and knowledge.	
Social benefits	Decentralisation of economic growth	Tidal energy developments of the type represented by Morlais project, provide an opportunity for decentralised development and economic growth in such areas. Menter Môn identified that within Anglesey there are 12 Engineering and Fabrication companies several which have already and are at present undertaking work for tidal developers in the area. There are also nine marine services companies within the island three of which are already providing services to Minesto.	This potential (beneficial) impact was raised by many stakeholders through the consultation process in 2019.
Economic impacts	Direct & secondary income	Anglesey is expected to benefit in the region of £3.6 M (17MW) and £41.4 M (240MW) per annum during the construction and operation phases respectively. Marine Energy Wales (MEW) suggests: "Combining the investment into wave and tidal energy in Wales with publicly funded Welsh research projects brings the total investment to date in marine energy in Wales to £96.2 million".	MEW, 2019a
	Gross value added (GVA)	The report by MEW highlights that with a UK deployment of 100 MW per year from 2021/22, and a realistic share of a growing global market, the tidal stream industry could generate a net cumulative benefit to the UK by 2030 of £1.4 Bn, consisting of £1.6 Bn GVA from the domestic market and £1.1 Bn GVA from exports, offset by £1.3 Bn of revenue support.	MEW, 2019a
			This issue is considered to be relevant at this point in time for NEMMO project. See sections 5 and 6 for the quantitative assessment.
			This issue is considered to be relevant at this point in time for NEMMO project. See sections 5 and 6 for the quantitative assessment. GVA direct plus indirect effects for the 34.5 MW scenario is 80 M€. This means that for each MW installed, the generated added value is 2,33 M€. See sections 5 and 6 for the quantitative assessment.

Questionnaire for the materiality assessment for workers of the supply chain (INPRE):

Mailing date: 2022.05.12
 Response date: 2022.05.23

Responsible Partner: Tecnia
 Survey respondent: INPRE, S.L.

Instructions: In the following table you should give a score from 1 to 5 to each social topic to know your opinion and select the most significant ones to include in the S-LCA. It is important that based on your experience and your knowledge, you define which of these social topics could be relevant or not for the NEMMO project. Please, read the description of each social topic before giving us your perception of the risk.

<u>Score</u> (*)	1: No evidence	2: Low impact	3: Medium Impact	4: High Impact	5: Very High Impact
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TABLE 3. QUESTIONNAIRE FOR THE SOCIAL TOPICS SELECTION FOR WORKERS OF THE SUPPLY CHAIN

Stakeholder	Social Topic	Description	Score (*)
Workers (Supply chain)	Occupational health and safety	The extent to which the management of the company maintains or improves the safety and overall health status of the workers.	1
	Remuneration	The extent to which the management sufficiently compensates the workers. this social topic assesses the combination of wages a social benefit received by workers.	1
	Child Labour	The extent to which a company works toward eradicating child labour and pro-actively raising awareness of issues associated with child labour.	1
	Forced Labour	The extent to which a company works towards eradicating forced labour and pro-actively raising awareness of issues associated with forced labour.	1
	Discrimination	The extent to which a company is engaged in preventing discrimination and actively promoting non-discrimination at the workplace. Discrimination refers to any distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment.	1
	Freedom of association and collective bargaining	The extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties.	1
	Work-life balance	The extent to which a company enables workers to have choices over when, where and how they work and encourages healthy work-life balance.	1

Questionnaire for the materiality assessment for workers of the manufacturing and installation phase (Magallanes Renovables):

Mailing date: 2022.05.10
Response date: 2022.05.10

Responsible Partner: Tecnia
Survey respondent: Magallanes Renovables

Instructions: In the following table you should give a score from 1 to 5 to each social topic in order to know your opinion and select the most significant ones to include in the S-LCA. It is important that based on your experience and your knowledge, you define which of these social topics could be relevant or not for the NEMMO project. Please, read the description of each social topic before giving us your perception of the risk.

<u>Score (*)</u>	1: No evidence	2: Low impact	3: Medium Impact	4: High Impact	5: Very High Impact
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TABLE 4. QUESTIONNAIRE FOR THE SOCIAL TOPICS SELECTION FOR WORKERS OF THE MANUFACTURING AND INSTALLATION PHASE

Stakeholder	Social Topic	Description	Score (*)
Workers (Manufacturing and installation)	Occupational health and safety	The extent to which the management of the company maintains or improves the safety and overall health status of the workers.	5
	Remuneration	The extent to which the management sufficiently compensates the workers. this social topic assesses the combination of wages a social benefit received by workers.	4
	Child Labour	The extent to which a company works toward eradicating child labour and pro-actively raising awareness of issues associated with child labour.	1
	Forced Labour	The extent to which a company works towards eradicating forced labour and pro-actively raising awareness of issues associated with forced labour.	1
	Discrimination	The extent to which a company is engaged in preventing discrimination and actively promoting non-discrimination at the workplace. Discrimination refers to any distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment.	3
	Freedom of association and collective bargaining	The extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties.	4
	Work-life balance	The extent to which a company enables workers to have choices over when, where and how they work and encourages healthy work-life balance.	5

4. Hotspots identification

Following the materiality assessment, a final list of relevant social topics for both, local communities, and workers of the supply chain, manufacturing and installation stages has been defined. The selection of relevant social topics has been supported by means of the SHDB Risk mapping tool (see section 4.2) (SHDB, 2022), which helps visualising and communicating the social risks present in product supply chains by country and sector.

To conclude, based on the final list of social topics, questionnaires for the different stakeholders have been developed (see section 4.3) with the aim of identifying and evaluating key socio-economic issues associated to each stakeholder category. These questionnaires have been developed following the PSIA (2018), which provides a list of possible questions to include for each stakeholder, section that has not been included in the last version (2020).

4.1. Key social topics for relevant stakeholders

In the following table, the relevant social topics for local communities are listed, based on the assessment conducted to the Morlais project and presented in Table 1 and Table 2:

TABLE 5. RELEVANT SOCIAL TOPICS FOR LOCAL COMMUNITIES (BASED ON THE MORLAIS PROJECT)

Selected impact topics for local communities	
Decarbonisation	Clean energy, balancing services, spin-off capacity
Level of commerce activity	Green cluster creation
Energy security	More green electricity, local supply, diversity of supply
Wellbeing of future generations	Green branding for locality
Job opportunities	Numbers
	Types, quality, skills area
Training opportunities	New skills and competence needs
Provision of education and visitor facilities	Tertiary BsC, Eng, PhD
Additional local services	New technical skills, workboats, cranes, better sea knowledge
Social benefits	Decentralisation of economic growth
Economic impacts	Direct & secondary income
Economic impacts	Accumulation of grant support

In the following table, the selected social topics are listed, based on the materiality assessment results presented in Table 3 and Table 4 to INPRE (supply chain) and Magallanes (manufacturing and installation) respectively. It must be noted that the social topics of child labour and forced labour are not relevant for the NEMMO project, and therefore, they have not been considered in the elaboration of the questionnaires for workers of the supply chain and manufacturing and installation stages.

TABLE 6. RELEVANT SOCIAL TOPICS FOR WORKERS OF THE SUPPLY CHAIN AND MANUFACTURING AND INSTALLATION COMPANIES

Selected impact topics for workers of the supply chain (INPRE), and manufacturing and installation companies (Magallanes Renovables)	
Occupational health and safety	The extent to which the management of the company maintains or improves the safety and overall health status of the workers.
Remuneration	The extent to which the management sufficiently compensates the workers. this social topic assesses the combination of wages a social benefit received by workers.
Discrimination	The extent to which a company is engaged in preventing discrimination and actively promoting non-discrimination at the workplace. Discrimination refers to any distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment.
Freedom of association and collective bargaining	The extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties.
Work-life balance	The extent to which a company enables workers to have choices over when, where and how they work and encourages healthy work-life balance.

4.2. Social Hotspot Database (SHDB) Risk mapping tool

The SHDB Risk mapping tool has been used to support the selection of identified social topics for workers and local communities in the materiality assessment. The Risk mapping tool allows visualising the social risks present in products supply chains at country and sector level. Considering that NEMMO project main suppliers are INPRE, located in Spain, and the main manufacturing and installation company is Magallanes Renovables, located in the UK; the construction sector has been selected for both countries, and in the following table, the relevant topics with high or very high score are presented:

TABLE 7. SOCIAL TOPICS FOR WORKERS & LOCAL COMMUNITIES (UK & SPAIN) (SHDB RISK MAPPING TOOL)

Relevant social topics for workers in the UK	
<i>Occupational health & safety</i>	
Occupational toxics & hazards	There is a high occupational risk related to toxics & hazards, and very high risk in terms of cancer and Chronic obstructive pulmonary disease (COPD).
Occupational injuries & fatalities	No more information is provided.

<i>Labour rights and decent work</i>	
Freedom of association, collective bargaining, right to strike	There is a high risk regarding the lack of association and collective bargaining rights and collective bargain coverage.
Migrant labour	There is evidence of risk to migrant workers.
Relevant social topics for workers in Spain	
<i>Occupational health & safety</i>	
Occupational toxics & hazards	There is a high occupational risk related to toxics & hazards, and very high risk in terms of cancer and Chronic obstructive pulmonary disease (COPD).
Occupational injuries & fatalities	No more information is provided.
<i>Labour rights and decent work</i>	
Unemployment	There is a very high unemployment level.
Migrant labour	Very high risk in terms of workers' remittances and compensation paid per immigrant.
Relevant social topics for local communities in Spain	
Access to health care	High risk related to access to health care.

No relevant social topics are identified as critical for the local communities in the UK.

As can be observed, the social impact topics listed in Table 7 are also considered in the previous selection presented in Table 5 and Table 6. This serves as a confirmation of the socials topics that are relevant and therefore, considered in the elaboration of questionnaires for workers and the local communities (see section 4.3) based on the PSIA.

4.3. Questionnaires for the hotspots identification

For the elaboration of the questions, the PSIA edition 2018 has been considered. The PSIA 2018 provides useful guidelines and examples to properly define queries to subsequently conduct the impact assessment based on the 5-point reference scale. These guidelines have not been included in the PSIA edition 2020; however, the social topics have been updated in this last version, and therefore, these new social topics have been taken into consideration in the present study.

In the Annex 1, the elaborated questionnaires for local communities and workers of the supply chain, manufacturing and installation stages are presented:

- ✓ Questionnaire in Table 12 for Menter Môn, owner of the Morlais Project as part of the local community. This questionnaire has been individually developed for Menter Môn considering the analysis conducted and presented in Table 1 and Table 2.
- ✓ Questionnaire in Table 13 is addressed to workers of the main supply chain company, INPRE.
- ✓ Questionnaire in Table 14 is addressed to workers of the main manufacturing and installation company, Magallanes Renovables.

5. Impact assessment

In the following section, the impact assessment of the SEA is presented, which has been organised in two different subsections:

- ✓ Section 5.1 presents the assessment results of the questionnaire's answers conducted following a 5-point reference scale included in the PSIA (2020).
- ✓ Section 5.2 presents an economic quantitative assessment carried out to further evaluate the economic implications of the NEMMO project, by means of an exhaustive evaluation of diverse selected indicators.

5.1. Impact assessment based on the PSIA (2020)

PSIA methodology uses a 5-point reference scale to evaluate each of the social impact category. The methodology is designed to consider both the positive and negative impacts of the technology. This method allows analysing company's behaviour, transforming the qualitative data obtained into a quantitative score for each of the social impact category. Table 11 shows the reference scale, from -2 to +2, where the general principles are:

- ✓ The score 0 means that the company neither has a detrimental nor contributing impact on the stakeholders.
- ✓ In case of a detrimental impact on the stakeholders, if there is evidence that the companies take action to address/improve the situation, the score is -1. When the companies do not take action to address and remediate the situation, the score is -2.
- ✓ If the company has implemented a management system to continuously improve the situation and it has resulted in certain tangible improvements, the score is +1. If the company is the best-in-class regarding the performance on this topic the score is +2.

TABLE 8. REFERENCE SCALE OF THE PSIA (2020)

5-point reference scale scores	
-2	Unacceptable situation
-1	Unacceptable situation with signs of improvement
0	Acceptable situation
+1	Beyond acceptable
+2	Ideal performance

Menter Mòn, owner of the Morlais Project, as local communities:

TABLE 9. ANALYSIS OF MENTER MÔN RESPONSES BASED ON THE PSIA 2020

Social Topic	Analysis of responses based on the PSIA (2020)
Health and safety	+1: All documentation pertaining to health and safety procedures are in accordance with the requirements. The project requires a great deal of environmental monitoring. No further management systems are in place that go beyond the law.
Access material and immaterial sources	+2: An Environmental Statement (ES) is in place as part of the Environmental Impact Assessment process, where socio-economic aspects and impacts derived from the project are assessed. As part of this, potential adverse impacts on the access to material and immaterial resources have been identified and mitigation measures designed.

Community engagement	+1: An email and phone number are provided to encourage the local community forward comments and proposals. Menter Môn is a social enterprise seeking to add value to the region's resources for the benefit of local inhabitants. The maximum score has not been given since no decisions have been incorporated based on the community.
Skill development	+2. The establishment of a community fund for holy island is on process. The aim is to train young people to facilitate their entrance into the industry. Morlais supports the recruitment of young people from the area and has set up the skills and employment portal to ensure solutions for identified skills gap.
Contribution to economic development	+2: the 85% of the workforce are locals. In addition, Morlais have established a supply chain working group to maximise jobs and work opportunities for local people and businesses. There is a community liaison group established within the Morlais Project through which local jobs, supply chain opportunities and details of current construction work are provided.



INPRE as the workers of the supply chain stage:

TABLE 10. ANALYSIS OF INPRE RESPONSES BASED ON THE PSIA 2020

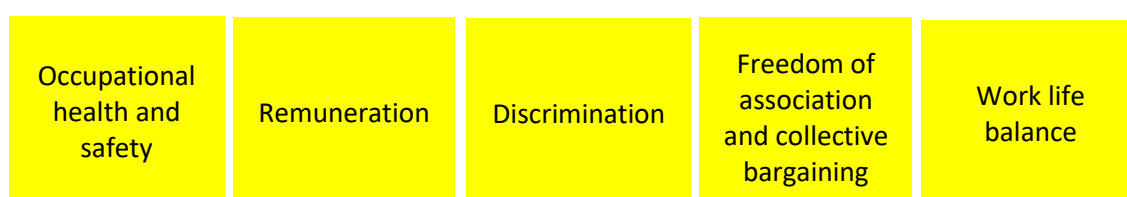
Social Topic	Analysis of responses based on the PSIA (2020)
Occupational Health and safety	+1: There is a free private insurance available for workers and mechanism exit to address possible incidents; however, no evidence is presented.
Remuneration	+1: Most salaries are higher than the minimum, and a bonus based on the individual performance is in place.
Discrimination	+1: They act according to the law in terms of discrimination policy, and an equality plan against gender discrimination is in place.
Freedom of association and collective bargaining	+1: The freedom of association and collective bargaining is feasible. Interesting outcomes are considered in management decision; however, no evidence is presented.
Work life balance	0: They act according to the law.



Magallanes Renovables as the workers of the manufacturing and installation stage:

TABLE 11. ANALYSIS OF MAGALLANES RESPONSES BASED ON THE PSIA 2020

Social Topic	Analysis of responses based on the PSIA (2020)
Occupational Health and safety	0: They act according to the law. In addition, mechanism exit to address possible incidents; however, no evidence is presented.
Remuneration	0: Workers have a higher than a minimum salary and overtime is compensated, but no evidence is presented.
Discrimination	0: They act according to the law.
Freedom of association and collective bargaining	0: No collective representation is needed since it is a company with less than 50 employees.
Work life balance	0: They act according to the law.



5.2. Economic Assessment

In order to further understand the economic implications of the NEMMO project, the following indicators have been selected from Table 1 and Table 2. These indicators have been chosen due to their relevance for the economy and therefore, for the society in the selected areas:

- ✓ **Employment:** Refers to the number of jobs that are created by the deployment of the tidal park. This is expressed as Full Time Equivalents (FTE), a measure that converts full- and part-time jobs into a common currency (where one PT job is equivalent to half a FT job) and, for temporary construction impacts, as person years of employment.
- ✓ **Gross economic output:** Refers to the overall impact in monetary terms upon an industry or the overall economy linked to the deployment of the tidal project. This can be differentiated between direct output (the expenditures required to build and deploy the tidal farm) and indirect output (the further spending affecting industry's suppliers).
- ✓ **Gross value added (GVA):** GVA is the commonly accepted measure of wealth creation for an economy. It is what is left of gross output once bought in goods and services have been paid for. This residual output is then available for distribution as profits, wages and salaries and capital investment costs.
- ✓ **Income:** Refers to the compensation of employees and it indicates the change in compensation due to the deployment of the tidal park.

These indicators have been computed according to framework presented in Figure 3:

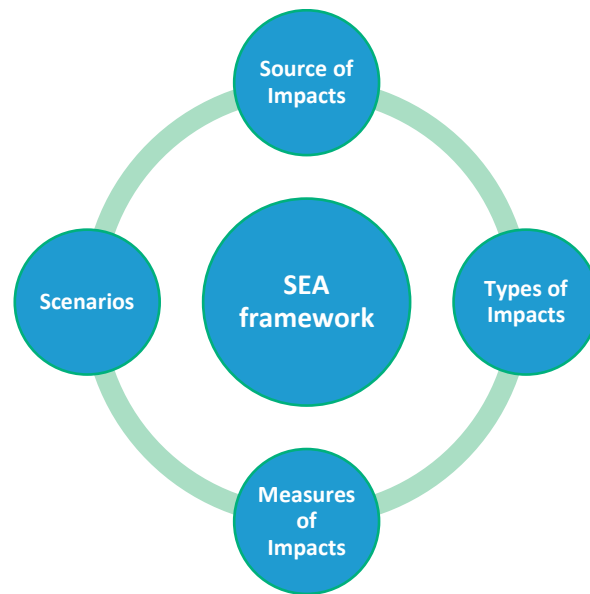


FIGURE 3: MAIN ELEMENTS OF THE ECONOMIC ASSESSMENT FRAMEWORK

Further information on the main elements of the economic assessment framework is presented below:

- ✓ Source of impact: Socio-economic impacts were differentiated according to the deployment phases of a tidal park, including project design and planning. Specifically, economic impacts have been estimated for the capital investment incurred in designing, testing, developing, and constructing the installation and the operational expenditure incurred in operating and maintaining it. Hence, other longer-term opportunities for the local economy related to the know-how generated in the tidal energy sector and the possibility to export this expertise to wider energy markets, have been considered outside the scope of this quantitative assessment.
- ✓ Type of impacts: The estimated socio-economic impacts include, on the one hand, direct impacts, which capture the economic activity that is supported directly through the construction, operation, and maintenance of the installation (e.g., staff directly employed on the development and all first-tier supply chain expenditure relating to the construction of the installation); and, on the other hand, indirect impacts, which make reference to the impacts of the additional output generated by companies in the supply chain supporting the first-tier suppliers. The additional economic activity in these companies is passed down through their supply chains and generates additional, indirect benefits for many other companies.

Other induced impacts, who may capture the knock-on benefits that the new employment and salaries can have in the economy, e.g., the salaries earned by those employed in additional jobs spent on goods and service elsewhere in the economy, were excluded from the analysis¹.

- ✓ Measures of impacts: these are the selected quantitative indicators used to inform on the socio-economic impacts (see definition above).
- ✓ Scenarios: In line with D6.2 (LCA) and D6.3 (techno-economic assessment (TEA)), this study considers two scenarios:

¹ The exclusion from the SEA of induced impacts was due to 1) the lack of multipliers for induced effects from UK IO tables, and 2) the scarce intrinsic reliability of these multipliers.

- 34.5 MW tidal farm consisting of 23 platforms with a rated power of 1.5 MW.
- 100 MW tidal farm consisting of 30 platforms with a rated power of 3.3 MW.

Besides the installed capacity, scenarios were also developed considering the potential development sites. In this regard, this study is aligned with the LCA (D6.2) and the TEA (D6.3), thus considering Scotland (Fall of Warness tidal site) and Wales (Morlais tidal site) as the local economies benefitting from the tidal project.

Furthermore, the UK economy has been also considered to (1) provide complementary average estimates for comparative purposes and (2) better simulate the distribution of socio-economic impacts between local and global economies. Depending on the specialization of local economies, it is likely that various economic activities (and therefore impacts) are carried out by companies outside the local region, thus only marginally contributing to the local economy.

5.2.1. Methodological approach

This study has been structured as follow:

1. **Mapping the marine renewables supply chain:** Review and classification of the different types of economic activities involved during the life cycle of the tidal plant, from the development and gaining planning consents, to tidal device manufacturing, installation, and operations & maintenance and, finally, the decommissioning phase. The review and classification of economic activities is based on the description provided in D6.1 (system modelling), D6.2 (LCA) and D6.3 (TEA). In addition, previous SEA reports conducted for similar tidal projects in UK (Morlais Project, 2019; REGENERIS, 2013) were also reviewed to integrate this mapping analysis. The reader can refer to Annex 2 for the result of this task and have an overview of the economic activities linked to the life cycle stages of a tidal project.
2. **Linking economic activities to SIC codes:** Based on the previously identified economic activities, similar economic activities available in the Standard Industrial Classifications (SIC) (2007) have been identified and selected. This made it possible to 1) link tidal park economic activities to socio-economic statistics of Wales, Scotland, and UK, and hence, understand in which sector the local economies are more or less specialised (see next steps), and 2) exploit the Input-Output tables for Wales, Scotland, and the United Kingdom and estimate the socio-economic impacts of the tidal project (see 4th step).
3. **Analysing existing capacity in local economies:** Based on the SIC economic activities relevant to tidal projects, we reviewed capacity, in terms of specialisation and employment, for Scotland, Wales, and UK, setting out:
 - ✓ Location Quotients (LQs) in each identified economic activity for Wales and Scotland. A LQ of 1,0 in any industrial activity means that the region and the nation are equally specialized in that activity, while a LQ higher than 1 means that the region has a higher concentration than the nation. Industries with a high LQ (>1,2) are important because imply that a region is very specialised in an industry, and, hence, is more likely to bring money into the region.
 - ✓ Employment in each identified economic activity. When considering an industry's LQ, it is also important to consider the underlying number of jobs as the final social economic impacts will also be proportional to the magnitude of the sectoral or economic activity. In this line, a high LQ coupled with a high number of jobs will produce the biggest socio-economic impacts in an economy (EMSI BURNING GLASS, 2020). By contrary, an economic activity with a high LQ will have a limited effect on the economy – in absolute terms - if the number of jobs is low.

The reader can refer to the Annex 3 for a complete overview of LQs and number of jobs for Wales and Scotland by SIC activities.

4. **Estimating economic impacts:** In the final part of the analysis, the Input-Output (IO) tables for Wales, Scotland, and UK to estimate the potential socio-economic impacts resulting from the implementation scenarios of the tidal projects have been used. IO tables can be used to understand the consequences for an economy due to changes in final use for a particular industry. By using the relationship between changes in demand and the resulting economic activity, IO tables provide estimates on how new expenditures will impact economic development aspects such as employment, GVA or income. In this context, the multiplier and effect indicators were used and applied to tidal economic activities based on the matching done in step 2. The reader can refer to Annex 3 for the definition of multipliers and effect indicators, including an overview of multipliers employed, and the underlying SIC economic activities.

5.2.2. Limitations of the study

First, it is difficult to judge when the 34.5 MW and, above all, the 100MW capacity may come forward, as there are several sources of uncertainty. First, implicit in these scenarios is the need for the capital and operational costs to have fallen sharply to ensure that the roll-out of these much higher levels of capacity is economically and financially viable. Further, there is a relative lack of evidence on capital and operational costs associated with the development and operation of large-scale tidal energy projects since no large-scale projects have been developed at commercial scale to date. In this context, this study takes advantage of the results of the TEA carried out in D6.3, which is based on the experience matured by Magallanes with the ATIR pilot.

Second, coupled with the uncertainty on baseline costs, it is not known in advance the extent to which the industry will be able to reduce its cost of energy over time and capacity through learning, economies of scale and innovation. The TEA (D6.3) considered a conservative cost reduction pathway, which can provide a useful indication of potential cost reductions. Namely, the learning rates used in D6.3 are 7% for capital expenditure (CAPEX) elements and 5% for operating expenses (OPEX) elements. Therefore, the impacts estimated in this study also relies on these learning rates.

Another source of uncertainty concerns the ability of the local industry (in this case Wales or Scotland) to benefit from the opportunities generated by the tidal project. This depends on a range of factors, including the procurement approach pursued by developers, the current capabilities of the regional supply side, its ability to form strategic alliances to bid for large packages of work, and so on. In this context, in addition to presenting the socio-economic impacts for each economy independently, we also present the results in which a hypothetical distribution of impacts between the local and global economy was modelled based on the LQs.

To conclude, the study makes use of statistical (SIC) and IO tables. The use of these data it is subject to several caveats. On the one hand, the analysis is based on historical data, which may not reflect current situation or future trends. As an example, in the future, there may be new inward or domestic investment to meet the needs of the sectors that are poorly represented in terms of LQs. In addition, while the LQs indicate regional specialisation in particular sectors and a presence of skills relevant to the tidal renewable industry, it does not imply that these sectors have the capacity or willingness to grow or diversify into this type of business. On the other hand, regarding the IO tables, it should be borne in mind that while the UK and Scotland count with updated IO tables (2021), the only IO table available for Wales dates to 2007. Although multipliers are not expected to vary much over time, unless a systemic change occurs, the results for Wales may suffer from greater uncertainty. In addition, Wales IO table only consider output multipliers, hence excluding relevant aspects such as employment, GCA and income generation. For these reasons, socioeconomic impacts for the Welsh scenarios are not included in the results section, but only provided in the Annex 4: Complete results.

6. Results & Interpretation

6.1. Interpretation of the impact assessment based on the PSIA (2020)

Analysing the result obtained in the impact assessment, it can be assumed that the NEMMO project, has embarked on the path of the social responsibility.

On the one hand, considering the responses from the relevant workers, all policy requirements regarding occupational health and safety, remuneration, discrimination, freedom of association and collective bargaining and working hours are met in both, INPRE and Magallanes Renovables.

Regarding occupational health and safety, it can be said that both companies provide a healthy and secure work environment contributing to a continuous and active training to the workers in terms of safety issues related with their work. Additionally, mechanisms are in place in case of incidents occur.

In terms of remuneration, all the workers are paid at least the minimum wage, as well as additional social benefits such as retirements and private health insurances are in place. With regard to non-discrimination actions in the workplace, both enforce the law, and in the case of INPRE, an equality plan against gender discrimination is available.

Both companies support the freedom of association and collective bargaining and in terms of work-life balance, both the supply chain company and the manufacturing and installation company do not exceed the work hours set by law, being the overtime work in Spain limited to a maximum 8 working hours per day. In case overtime is required under specific circumstances, this is economically rewarded.

Neither INPRE nor Magallanes Renovables could present evidence for their responses. In this sense, the results of the impact assessment are not as good as expected, since the maximum score (+2) can only be provided to those responses accompanied with related evidence.

It must be noted that under no circumstances, the execution of the project poses social risks to the stakeholders of the NEMMO supply chain, manufacturing, and installation stages, therefore, the focus will be on enhancing those aspects in which there is room for improvement.

On the other hand, considering the responses from Menter Môn, it can be ensured that through Morlais project, Menter Môn has a clear focus to promote the local community empowerment driving the social transformation in the area.

First, all documentation pertaining to health and safety procedures are in accordance with statutory requirements. In addition, and since the project requires a great deal of environmental monitoring, first-hand environmental risk assessments are undertaken.

Regarding the access to material and immaterial resources, these have been identified and mitigation measures have been designed, to ensure a minimal impact when these arise.

With regard to the intentional interactions with communities, Morlais increases the visibility and understanding of issues and empowers local communities to communicate the issues that affect their lives. For that, Morlais has an inbox on the website, where residents and local businesses can submit questions and complaints. Additionally, a Community Liaison Group has also been set up with the aim of benefiting local communities and consultation processes are available with local communities.

In terms of skill development, the purpose of Morlais is to establish a community fund for the area, with the purpose of training young people to facilitate their entrance into the industry. Interactions with educational institutions are also conducted to ensure that the skills requirements of the industry are reflected in training provisions.

To conclude, Morlais is leading the contribution to economic development in the area, by hiring local people and establishing a supply chain and skills and employment working group and portal in order to maximise jobs and work opportunities for local people and businesses and identify and provide solutions for any skills gap presented by the work opportunities.

6.2. Interpretation of the economic assessment

This section presents the results of the study described in section 5.2. Firstly, a qualitative analysis of the supply chain capacity of the Welsh and Scottish economies is presented based on the comparison between the main economic activities leading the deployment of the tidal park and, on the other hand, the respective specialisation of Wales and Scotland in such activities. Second, the economic impacts, including job creation, GVA and income changes, are estimated based on the IO tables. Given the limited availability of IO tables for Wales², results for a general UK scenario, which applies UK IO tables, and an *ad-hoc* regionalised scenario for Scotland where we distinguish between potential impacts occurring locally, -i.e., in Scotland, and those occurring outside the focal economy, i.e., at UK level, are presented.

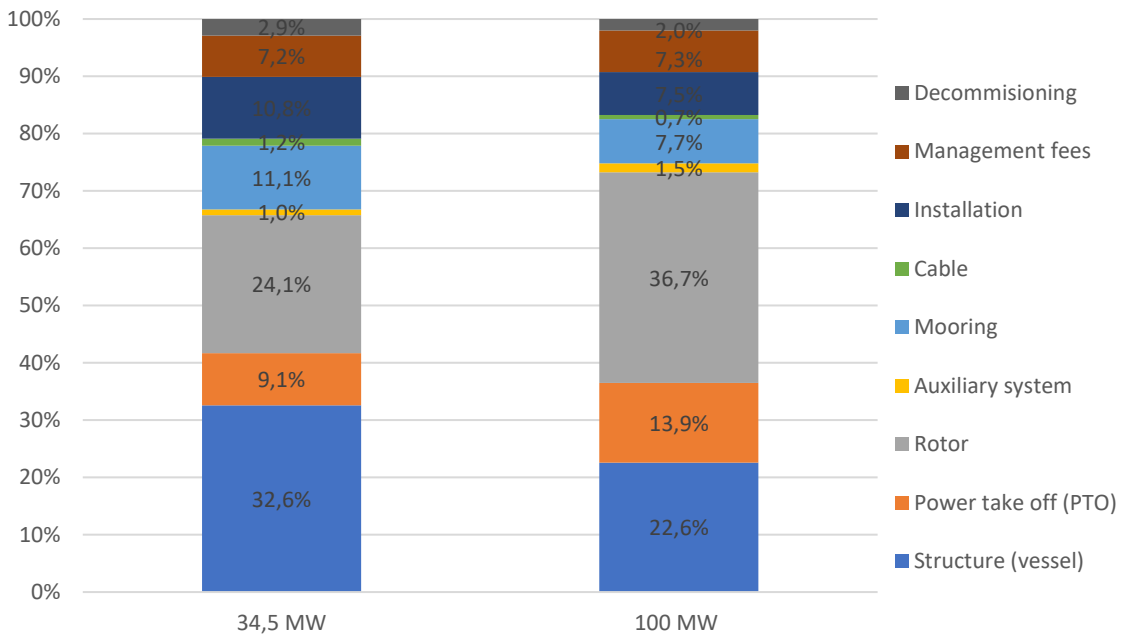
6.2.1. The driving economic activities of NEMMO tidal park & the supply chain capacity of the Welsh and Scottish economies

Figure 4 shows the main components of CAPEX for the NEMMO tidal park scenarios. These are based on the results of the TEA conducted in T6.3. Considering the 34.5 MW scenario, the largest economic activity in terms of economic impact, or investment, is the construction of the floating platform, which alone accounts for about 33% of the total CAPEX. This is followed by the production of rotor components (25%) and the production of moorings and electrical cable systems, each of which represents 11% of the CAPEX. Similar results are provided for the 100MW scenario.

Note that in the 100 MW scenario, due to the higher rated power of the tidal turbines (from 1.5 to 3.3 MWh) the cost of turbine components (i.e., rotor, power take off, and auxiliary systems) is higher compared to the 34.5 MW scenario. Conversely, since the platform structure remains the same between the two scenarios, its cost remains unchanged between the two scenarios. Therefore, the CAPEX share of the turbine components is higher in the 100 MW scenario.

² Wales IO data back to 2007 and only accounts for output multipliers. Socioeconomic impacts for Wales are provided in Annex 4.

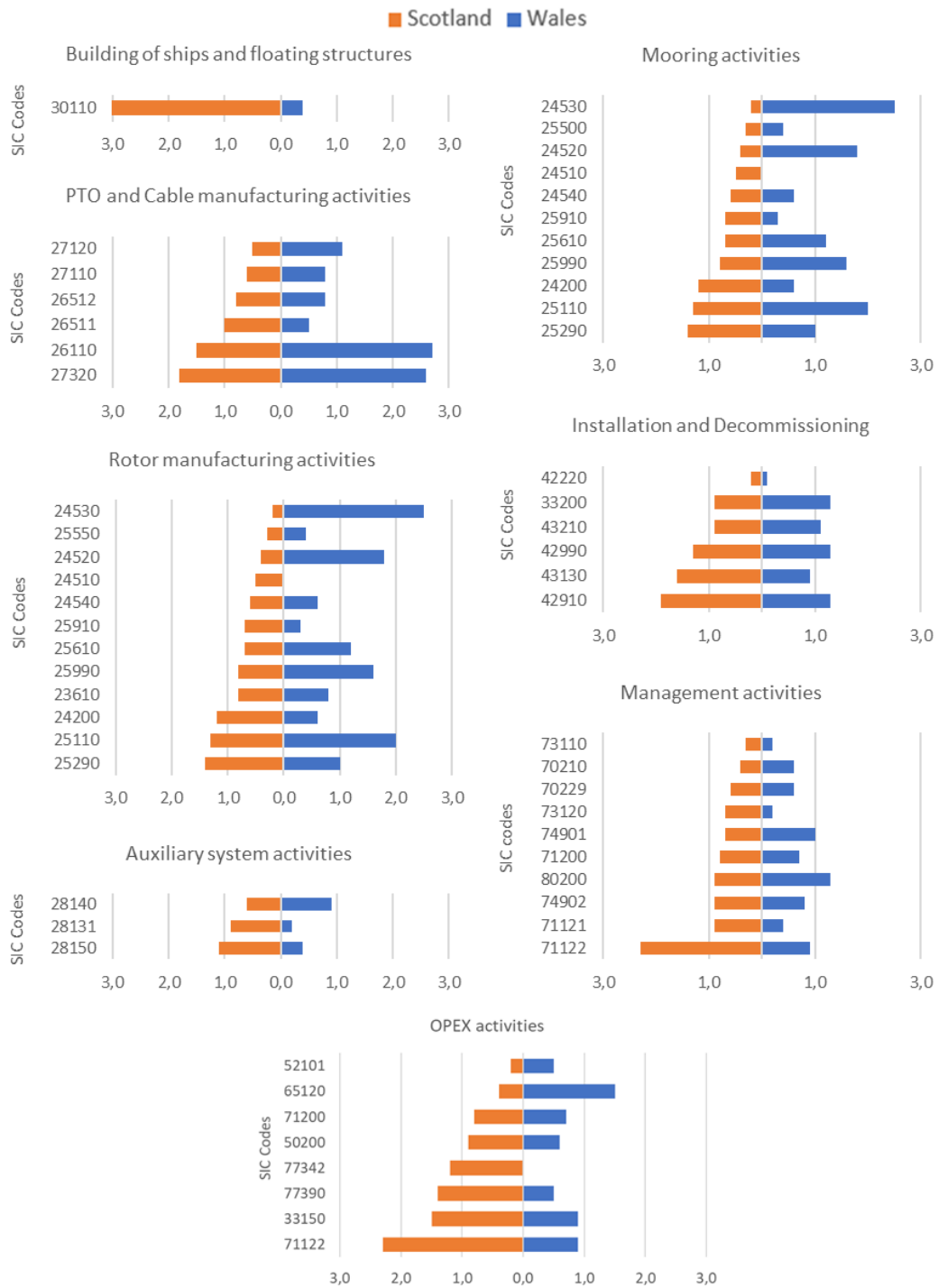
FIGURE 4: CAPEX BREAKDOWN OF NEMMO TIDAL PARK



Concerning the supply chain capacity of Scotland and Wales, according to the respective sectoral specialisation (Figure 5), different patterns can be observed between the two regions and across the several economic activities. First, Scotland seems very well positioned to lead all the industrial activities linked to the manufacturing of the floating platform. As the LQ for “building of ships and floating structures” suggests, the Scottish specialisation in these activities is three times the national average. This indicates that the Scottish region would be able to cater for most of these activities, thus generating a significant local socio-economic impact. By contrary, the very low LQ of Wales (0,4) suggests the limited capacity of the region to satisfy this market demand. In this case, the relative socio-economic impacts would occur, above all, beyond the local Welsh economy.

On the other hand, the Welsh region seems much more specialized in those activities related to the electrical and electronics industry. Among these activities stand out the LQ in “production of electronic components”, which is 2,7, and in “manufacture of other electronic and electric wires and cables”, which is 2,6. UK’s LQs in the same activities are 1,5 and 1,8, respectively. For the other activities in the electricity and electronics sectors, there are no obvious significant advantages for the Scottish or Welsh economies, as the LQs are quite similar to each other and closer to the UK average. Consequently, we can expect the production of power take-offs and the (cable) electricity system to produce significant local socio-economic impacts, especially in the case of the Welsh economy – Scotland is somehow less specialized than Wales in this industry, hence a greater share of these activities will be outsourced outside the local economy.

FIGURE 5: SECTORAL SPECIALISATION FOR SCOTLAND AND WALES BY SIC ACTIVITIES



Note that the description of SIC activities is provided in Annex 3.

The rotor component represents the second biggest driver (after the platform) of the CAPEX (25%). Under this element several economic activities can be grouped, mostly related with metal/metal structure, concrete and non-metal products and production. These, for instance, are casting of iron, steel, light metals and other non-ferrous metals, manufacture of metal structures and/or concrete products for construction purposes and treatment and coating of metals (the reader can refer to Annex 2 and Annex 3 for an extensive description).

Similar to what observed for the electrical and electronic industry, we can also observe an opposite pattern in the metal and concrete manufacturing industry between Wales and Scotland. Wales region seems more specialised than Scotland in most of underlying economic activities. Note for example “casting of light metals”: 2,5 vs 0,2, “manufacture of metal structures and parts of structures”: 2,0 vs 1,3 and “casting of steel”: 1,8 vs 0,4. Overall, Wales can be said to specialize in these activities in line with the UK average, while Scotland remains below the national average. Therefore, the local economic impact related to the production of rotor components will be mostly limited in the Scottish region, while more significant in the case of the Welsh scenario. It should also be noted that the economic activity “manufacturing of metal structures and parts of structures” is one of the sectors with the highest number of workers (4 thousand in Wales and 51 thousand in UK). In this line, investment in this sector would represent one of main catalyst for boosting both local economies.

Results similar to the rotor components also apply to economic activities related to the mooring system. Indeed, the mooring system mostly concerns the manufacturing of steel anchors, to be inserted into seabed, and the chain catenary legs connecting the tidal devices. Therefore, only activities related to metal/metal structure production are considered in this case. The average LQs for Wales and Scotland are 1,09 and 0,74, respectively.

The last significant CAPEX component is the installation phase, which accounts up to 11,10% of the total CAPEX (8% in the 100 MWh scenario). Installation phase includes economic activities such as “installation of industrial machinery and equipment”, “electrical installation”, “sea and coastal freight water transport”, and “operation of warehousing and storage facilities for water transport activities”. On average, Wales and Scotland specialize in these activities as well as the national economy, so that economic impacts are expected to be equally distributed between the local and national economy. If any, it should be highlighted 1) the above-average specialisation of Wales in the “installation of industrial machinery and equipment”, which is 1,3, and 2) the number of jobs in “sea and coastal freight transport” in Wales (132 thousand employees), which is the highest number among the identified economic activities for this region. Therefore, despite the relatively low LQ (0,6), Wales could particularly benefit from investments in this sector as they would achieve a high share of employment. Equal results apply to the decommissioning phase as this implies the same typology of economic activities.

Finally, management and commissioning activities represent a limited share of the overall CAPEX (7%) and their reach also appears to be limited in the local economies of Wales and Scotland, as these regions are far from the national average of specialisation in management activities – see e.g. LQ for “management consultancy activities (other than financial management)” which is 0,6 for both Wales and Scotland). However, it should be noted that, in UK, management and consulting represent the largest sector (in terms of employment) among those identified as relevant in this study (418 thousand employees). Therefore, investments in this sector would have a significant impact on the national economy through e.g., job creation and income generation.

For what concerns the OPEX components, we can distinguish two main groups of activities:

- ✓ Operation and maintenance.
- ✓ Insurance and fixed expense.

Operation and Maintenance includes economic activities such as “repair and maintenance of ships and boats”, “Sea and coastal freight water transport” or “renting and leasing of freight water transport equipment”. In this case, Scotland has a very specialised economy in these activities, with LQs in line with or above to national average: the most important economic activities are “Engineering related scientific and technical consulting activities” LQ is 2,3 and “repair and maintenance of ships and boats” LQ is 1,5. In contrast, the Welsh economy appears to be less specialised, with the average LQ of operation and maintenance activities equals to

0,68. Consequently, the socioeconomic impacts of operation and maintenance would be expected to be mostly local in the Scottish scenario, while rather global (national level) for the Welsh scenario.

Finally, Wales LQ for insurance is equal to 1,5, which is above the Scotland LQ for the same economic activity, which is 0,4. As a result, Wales seems best positioned to take advantage from investments in this sector compared to the Scottish counterpart. However, it should be remembered that the amount of fixed expenses and insurance activities remain rather marginal compared to the activities presented above.

6.2.2. Economic impacts: UK scenario

Figure 6 and Figure 7 present the results for the selected economic indicators for the general UK scenarios. In this context, multipliers from the UK IO tables³ have been used and linked to the main economic activities characterising the development of the tidal park. In particular, Figure 6 provides the impacts related to CAPEX, while Figure 7 present those related to the OPEX. An important difference to keep in mind when comparing the broader socioeconomic impacts of CAPEX and OPEX is that the impacts of CAPEX will be limited to the tidal park development, therefore limited in time. Otherwise, OPEX is expressed as annual expense and extend over time according to the useful life of the tide park (20-25 years). In this sense, a job related to OPEX is a job that would last 20-25 years.

CAPEX – wider economic impacts

Considering the 34.5 MW scenario, it is estimated that a direct capital investment of 105 M€ would generate an indirect economic impact equal to 71 M€. This would increase to more than 120 M€ in the case of 100 MW installed capacity (and a direct investment of 190 M€). The relatively high – expected – indirect effects are due to the high multipliers of UK, which, on average are equal to 1,7. This means that every euro invested in the tidal power plant development has a total multiplier effect on the UK economy about 1,7 times the direct amount spent in developing the tidal project itself. Thus, for every euro spent directly on e.g., device manufacturing, installation, management, and commissioning, about 0,7 euros additional are spent elsewhere on items directly related to the power project. The economic activities having the greatest “leverage effect” are the “building of ships and floating structures” (multiplier 1,82), and those related to construction and installation (multipliers above 2,00). It is also interesting to note that UK IO tables present multipliers regularly higher than the Scotland and Wales IO tables, which are rather closer to 1,35. Therefore, the socio-economic impacts for the UK may be overestimated compared to the results for Scotland and Wales.

If the output effects by the installed capacity are normalised, it can be observed how the economies of scale increase the financial efficiency of the tidal projects. Indeed, the cost savings associated with the upscaling from 34,5 to 100 MW would also reduce the indirect output effects from 2,06 to 1,24 M€ per MW. While from a corporate perspective a higher level of financial efficiency will obviously help the commercial viability of the project, from a pure societal perspective lower spending will also reduce the relative magnitude of socioeconomic impacts.

Employment impacts have been assessed in 950 FTE jobs (34.5M) and 1765 FTE jobs (100MW)⁴. These translate into 28 and 18 FTE per MW respectively, indicating that the higher efficiency achieved through economies of scale and learning effects would avoid roughly 10 employees

³ <https://www.gov.scot/publications/input-output-latest/>

⁴ To note that as employment multipliers were not available from UK IO tables, the Scotland multipliers have been used in this case.

per MW at large scale deployments. These estimates are in line with other studies (perhaps on the conservative side), which estimated 19 direct and indirect jobs per MW for tidal project development (Dalton et al., 2016).

Going forward, GVA direct plus indirect effects for the 34.5 and 100 MW scenarios are 80 and 142 M€, respectively. This means that for each MW installed, the generated added value is 2,33 M€ (34.5 MW) and 1,43 M€ (100 MW). To conclude, the increase in compensation (income) for the 34,5 and 100 MW scenarios has been evaluated in 52 M€, or 1,51 M€ per MW installed, and 92 M€, or 0,93 M€ per MW installed, respectively.

OPEX – wider economic impacts

According to the TEA (D6.3), OPEX direct impact was estimated in 4,7 M€/year and 6 M€/year for the 34,5 and 100 MW scenarios, respectively. These direct impacts would produce indirect impacts equal to 3,5 M€/year and 4,7M€/year. In this case the multipliers used are in the range of 1,77, for those activities related with repairing and operation, and 1,80 for those activities related with insurance services, leasing renting etc. Normalising by the installed capacity, OPEX would generate indirect impacts of 0.11 M€/year per MW in the case of a 34.5 MW tidal plant, while as indicated by the 100 MW scenario, large-scale deployments would reduce this impact to 0.05 M€/year per MW.

The number of jobs created for the management of the tidal park would be 34 and 44 employees respectively for the 34.5 and 100 MW scenarios. This is in line with similar studies which estimate the number of operation and maintenance jobs for an installed capacity of 60 MW in 25 FTEs / year (REGENERIS, 2013). Although this number of jobs is significantly less than the jobs created for the construction of the tidal park, it should be remembered that the jobs related to the operation of the tidal park should last at least 20-25 years, unlike those related to the CAPEX which would last a few years (e.g., 4-5 years).

Finally, operation and maintenance expenditure would generate GVA direct plus indirect effects for the 34.5 and 100 MW scenarios equal to 3,75 and 4,83 M€/year, respectively. This means that for each MW installed, the generated added value is 0,11 M€/year (34.5 MW) and 0,05/year M€ (100 MW). To conclude, the increase in compensation (income) for the 34,5 and 100 MW scenarios has been evaluated in 1,97 M€/year, or 0,06 M€/year per MW installed, and 2,53 M€/year, or 0,03 M€/year per MW installed, respectively.

FIGURE 6: SOCIOECONOMIC IMPACTS BY CAPEX FOR THE UK SCENARIOS (34,5 & 100 MW)

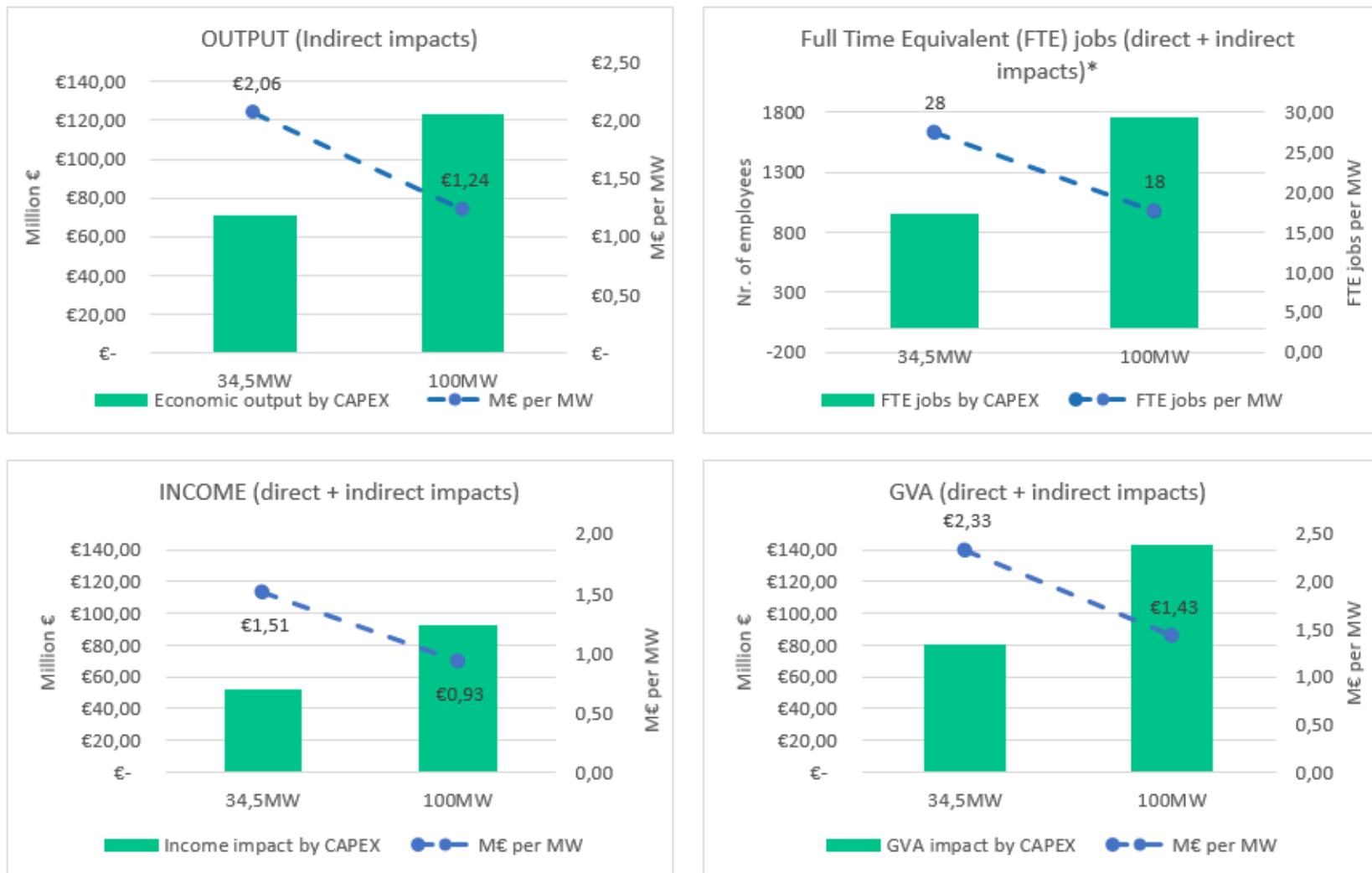
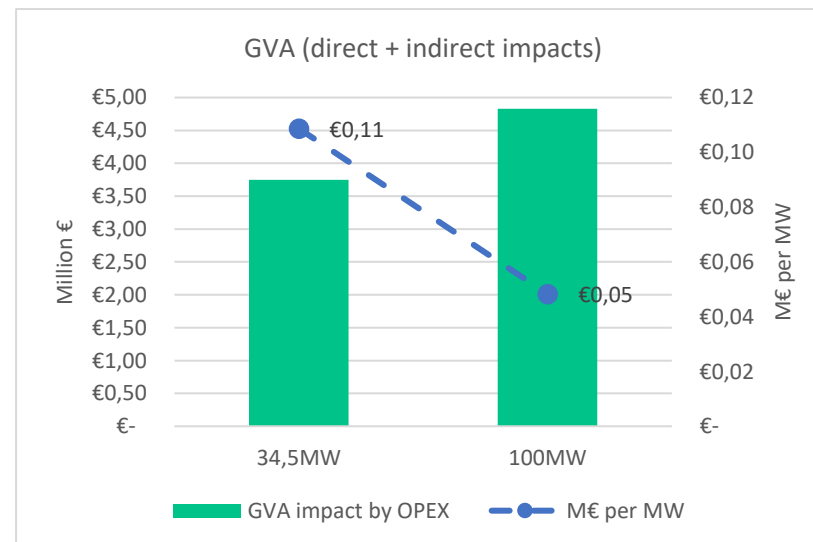
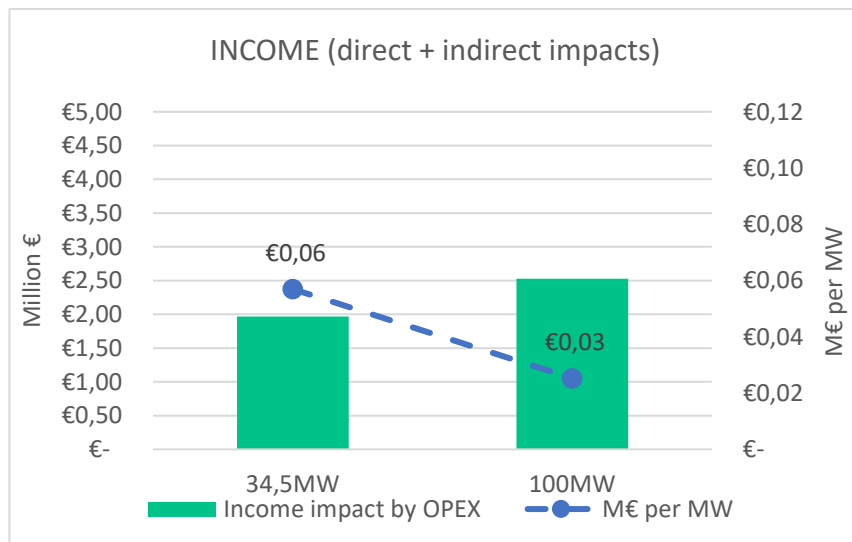
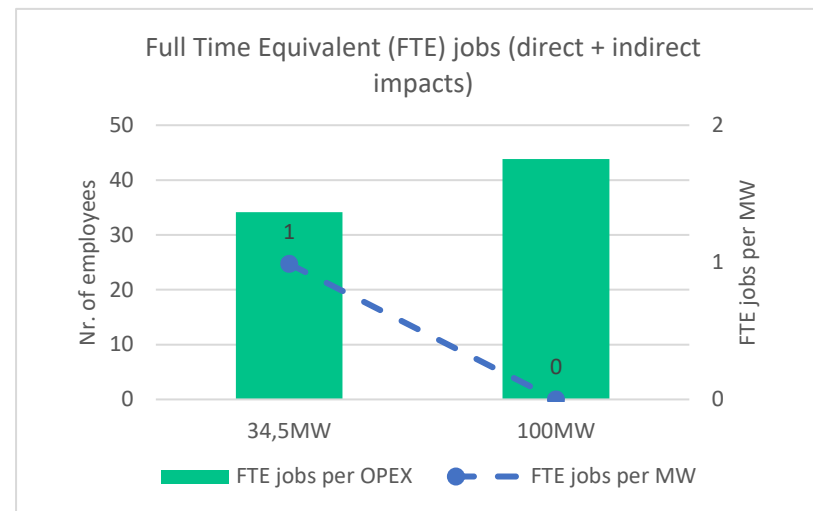
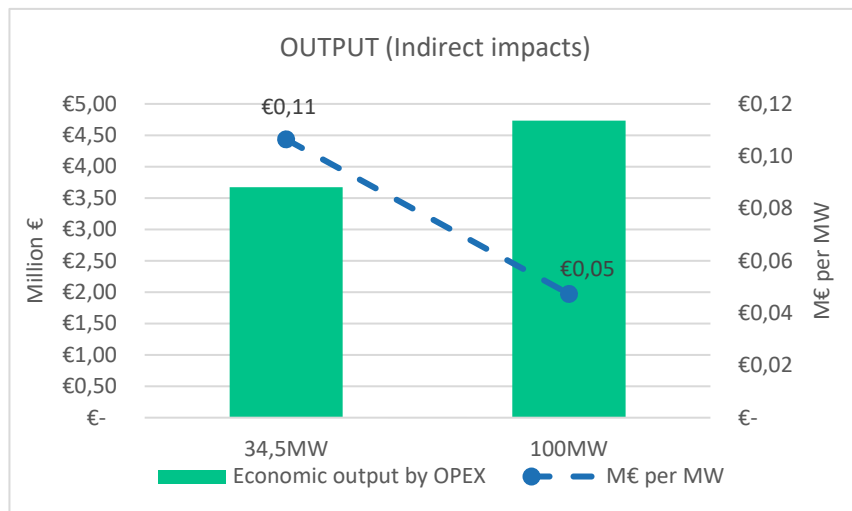


FIGURE 7: SOCIOECONOMIC IMPACTS BY OPEX FOR THE UK SCENARIOS (34,5 & 100 MW)



6.2.3. Economic impacts: Scotland scenario

This section presents an ad-hoc scenario considering the development of a 34.5 MW tidal park at Fall of Warness (Scotland) and distinguishes between local economic impacts, i.e., those occurring and benefitting Scottish economy, and global impacts, i.e., those occurring outside the focal region or, in other words, at UK level.

The reasons for considering this ad-hoc scenario are threefold: First, according to the TEA (D6.3) the Fall of Warness is the site having the best financial performance thanks to the significantly higher speed of tidal current compared to the Morlais area in Wales. Second, the 34,5 MW scenario is the most realistic option as it relies on current technological developments. In particular, the 34,5 scenario is based on 23 tidal platforms with 1,5MW rated power each, which is the actual rated power of Magallanes tidal platform. The 100 MW scenario assumes an increase in rated power up to 3.3 MW, which for the time being is not technically feasible. Third, to model Scotland impacts it is required the respective regional IO table. Hence, the lack of a comprehensive and updated IO table for Wales prevented the modelling of local impacts for this region.

Distinguishing local impacts from global ones allows to understand the degree to which a large project such as a tidal park benefits the local area or, conversely, has a limited impact on local development. In turn, making sure that tidal park projects support local development is the key to securing the support of civil society and, ultimately, ensuring a smooth project development. To differentiate between local and global socioeconomic impacts, we took advantage of the LQs, which, as said above, are indicators measuring the specialisation of a region in an economic activity compared to the national (UK) average. If a region is highly specialized in a sector, then it is likely to be able to satisfy an additional demand for services in that sector. If, on the other hand, a region does not specialize in one sector, then it is more likely that these services will be outsourced, i.e., supplied from the other regions (in this case proxied as "UK economy"). Therefore, depending on the Scottish economic specialisation we distributed the CAPEX and OPEX direct expenditures between Scotland and UK economy as follow:

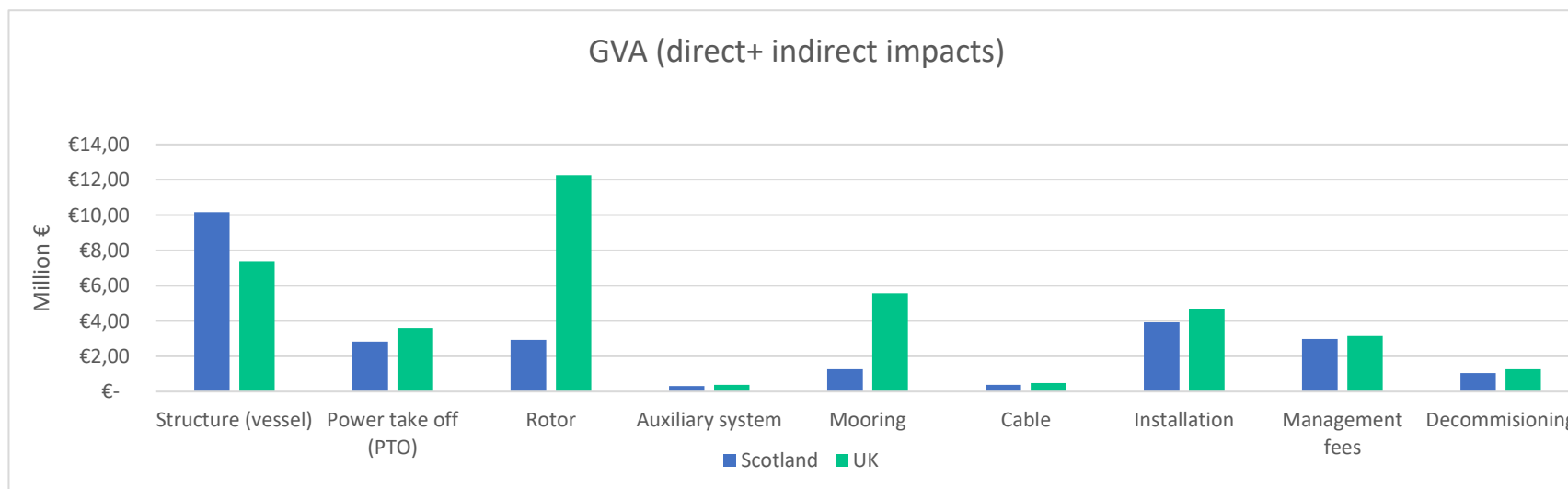
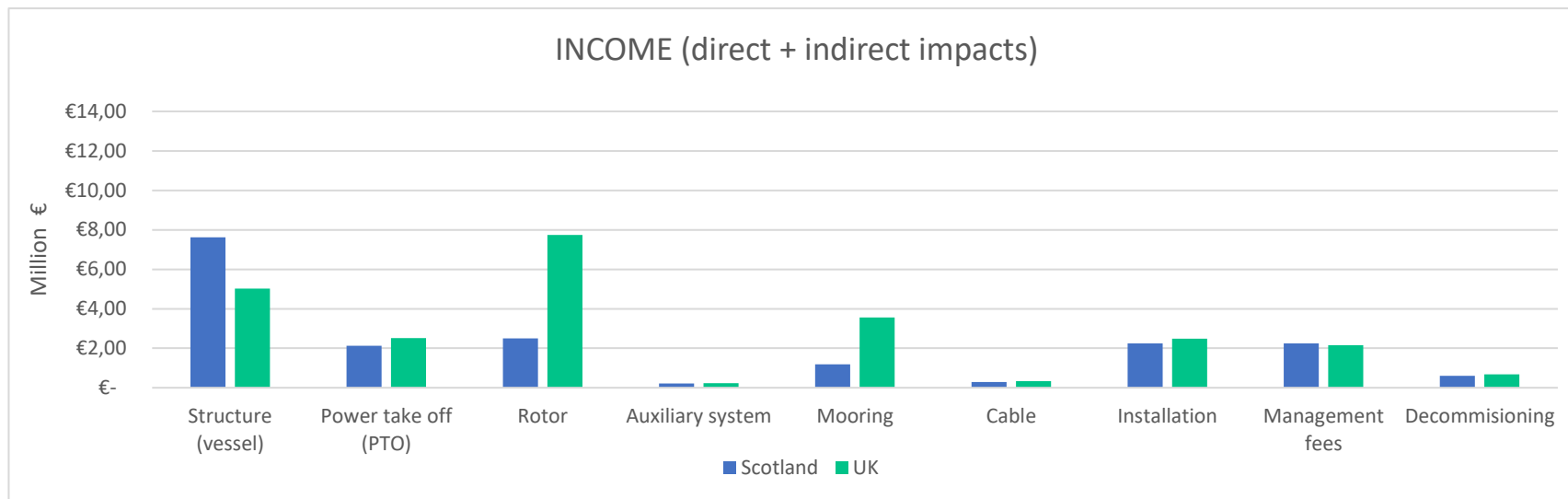
- ✓ if Scotland LQ >1,20, then Scotland will benefit 75% of the total direct expenditure.
- ✓ if $0,80 < \text{Scotland LQ} < 1,20$, then Scotland will benefit 50% of the total direct expenditure.
- ✓ if Scotland LQ < 0,80, then Scotland will benefit 25% of the total direct expenditure.

Once direct spending has been split between Scotland and the UK proportionally to the specialisation of the two economies, respective multipliers have been applied to Scotland and UK direct expenditure shares to calculate socioeconomic impacts.

Figure 8 shows the results for the Scotland scenario. In terms of gross economic output, a direct contribution to the Scottish economy of a total of 72 M€ is expected and a slightly higher contribution, 87 M€, to the UK economy in general. The economic activities that would benefit Scotland most are certainly those linked to the construction of ships and floating structures. These would have a local impact in Scotland twice as large as the national impact (38 vs 15 M€). On the other hand, economic activities relating to the rotor equipment manufacturing would create larger impacts in the UK economy than the Scottish economy. This is because of the relative lower specialisation that Scotland has in activities related to concrete products for construction purpose and metal/metal structure production (see LQs above Figure 5). Similar findings apply to the mooring system. Also in this case, Scotland does not seem very specialised in the underlying economic activities, consequently fewer local impacts are expected linked to this CAPEX component. Rather balanced distributions are expected for the other CAPEX items, as in these case Scotland presents LQs close to 1, i.e., the national average.

FIGURE 8: SOCIOECONOMIC IMPACTS BY CAPEX – SCOTLAND-UK, 34.5 MW





In terms of FTE jobs, it is estimated that 451 FTE jobs are created locally, while 491 FTE jobs would be generated at UK level. Again, the main driver for job creation in Scotland would be the sector of construction of ships and floating structures, which would generate 188 FTE jobs, followed by construction and installation sector, 63 FTE jobs, and the activities related to rotor manufacturing, 56 FTE jobs. It should be noted that, despite Scotland's low specialization in activities related to the production of rotors, the high size of this CAPEX element makes it an important factor for the local economy. In addition to local jobs, the economic impact of rotor manufacturing is expected to create as much as 170 FTE jobs at UK level. This is the most important CAPEX driver of socioeconomic impacts at UK level, followed by the activities linked to mooring system elements manufacturing (78 FTE jobs) and building of ships and floating structures (62 FTE jobs).

7. Conclusions

The SEA presented in this report, which aims at identifying and analysing possible socio-economic challenges and risks that may happen along the life cycle of the NEMMO project, has been conducted based on the UNEP/SETAC guidelines for Social-LCA and the Handbook for PSIA, that follow the principles of the ISO standards for LCA (ISO 14040:2006 and ISO 14044:2006). The use of well-established and robust methodologies and procedures has led to a comprehensive analysis that has enabled understanding positive and negative social impacts related to the NEMMO project.

In this report, the stakeholders' engagement has been fundamental. Understanding the perspectives of the stakeholders, has helped identifying critical issues and better understanding NEMMO project key benefits and risks. In this direction, questionnaires for the materiality assessment for the selection of relevant topics for the different stakeholders of the value chain, as well as questionnaires based on the PSIA to better understand the potential social risks that may be happening in the project, have been conducted.

Results of this analysis reveals the responsibility and commitment of the NEMMO project with the society, not only complying with the current legislation, but striving for a continuous improvement through the establishment of initiatives that promote the working and living standards of society.

In addition, the quantitative assessment of some selected indicators, i.e., the job creation, the gross economic output and GVA, as well as the income changes, for both the Welsh (Morlais tidal site) and Scottish (Fall or Warness tidal site) economies, has serve as a basis to further evaluate the economic implications of the NEMMO project.

Results of the quantitative assessment show interesting findings regarding the different components of the NEMMO system. Concerning the supply chain capacity, the development of a tidal park may benefit either Scotland or Wales but with very different patterns according to the respective sectoral specialisation. Scotland seems well positioned to lead the industrial activities linked to the manufacturing of the floating platform, thus generating significant local socio-economic impacts in this sector. The Welsh region seems more specialized in those activities related to the electrical and electronics industry.

Considering the 34.5 MW scenario, it is estimated that a direct capital investment of 105 M€ would generate an indirect economic impact equal to 71 M€. This would increase to more than 120 M€ in the case of 100 MW installed capacity (and a direct investment of 190 M€). This means that every euro invested in the tidal power plant development has a total multiplier effect on the UK economy about 1,7 times the direct amount spent in developing the tidal project itself. Thus, for every euro spent directly on e.g., device manufacturing, installation, management, and commissioning, about 0,7 euros additional are spent elsewhere on items directly related to the power project. The economic activities having the greatest "leverage effect" are the "building of ships and floating structures" (multiplier 1,82), and those related to construction and installation (multipliers above 2,00).

Employment impacts have been assessed in 950 FTE jobs (34.5M) and 1765 FTE jobs (100MW). These translate into 28 and 18 FTE per MW respectively, indicating that the higher efficiency achieved through economies of scale and learning effects would avoid roughly 10 employees per MW at large scale deployments. GVA for the 34.5 and 100 MW scenarios have been estimated in 80 and 142 M€, respectively. This means that for each MW installed, the generated added value is 2,33 M€ (34.5 MW) and 1,43 M€ (100 MW). To conclude, the increase in compensation (income) for the 34,5 and 100 MW scenarios has been evaluated in 52 M€, or 1,51 M€ per MW installed, and 92 M€, or 0,93 M€ per MW installed, respectively.

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Annexes

Annex 1: Questionnaires to relevant stakeholders of the NEMMO project

Questionnaire for Menter Môn (owner of the Morlais Project) as part of the local community:

TABLE 12. QUESTIONNAIRE FOR MENTER MÔN (OWNER OF THE MORLAIS PROJECT) AS PART OF THE LOCAL COMMUNITY

Social Topic	Description	Question	Answer			Evidence / more information
			Yes	No	Uncertain	
Health and safety	The extent to which the company or facility (i.e., Menter Môn through Morlais project) works to prevent and mitigate adverse impacts or enhance positive impacts on the health and safety of the local community.	Have you ever had incidents due to damage, adverse impacts, or risks to the local community? If yes, do you think you have acted on the matter? How?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	H&S partner through whom all qualifications required by staff and directors have been passed. All documentation pertaining to health and safety procedures has been completed and is compliant. Processes described in our documentation our pursuit regularly in accordance with statutory requirements.
		Does your company have a basic Environmental Health and Safety (EHS) system or follow a system or mechanism to enforce the local laws on local community health and safety? (e.g., safety of operations, project related land use changes and associated risks, etc.)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The project requires a great deal of environmental monitoring. As a result, individuals undertaking research must visit dangerous locations. At all times activities on land and sea our subject too full environmental risk assessments prior to undertaking.
		Has your company a management system in place (e.g., ISO 14001, EMAS) or any other form of verification to ensure effective and proactive action to improve community health and safety?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

		Do you think that health and safety is a key priority to your company? If yes, please provide some information to verify this.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Yes. Having just completed a £34 million capital construction project with minimal health and safety events there is confidence that processes indicate the degree of seriousness. This will not change health and safety is embedded in the company culture
Access to material and immaterial sources	The extent to which the company or facility (i.e., Menter Môn through Morlais project) works to prevent and mitigate adverse impacts on local communities or to restore and improve community access to material and immaterial resources.	Have you ever had any incidents or adverse impacts or risks to the community's access to resources (e.g., water, soil, electricity, internet, transport, cultural heritage...) related to the company's activities? If yes, have you developed a corrective action plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Does the company monitor risk or adverse impacts on access to material and immaterial resources? (If yes, please provide some extra information)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Morlais Project has followed a consenting process, for which an Environmental Statement (ES) has been prepared as part of the Environmental Impact Assessment process. In this ES, aspects related to socio-economic aspects and impacts derived from the project have been assessed. As part of this, potential adverse impacts on the access to material and immaterial resources have been identified (e.g., fisheries and shellfisheries, effects on shipping and recreational boating and angling) and mitigation measures designed, to ensure a minimal impact when these arise. Upon building and operation of the project, these aspects will need to be monitored. In relation to this, a specific section on navigation has been created on the website.
		Do you think that your company raises awareness on local community about their access to resources and avoiding risks on this? (If yes, how?) And do you improve local capacity building? (e.g., facilitating information,	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All this information is provided in the Morlais Project website.

		technology, water supply, infrastructure, tools...)				
Community engagement	The extent to which the company or facility (i.e., Menter Môn through Morlais project) engages with community stakeholders through ongoing open dialogue and responds to their concerns and inquiries fairly and promptly, to continuously foster greater trust and relationship with the local community. Particular attention needs to be paid to engaging representatives of vulnerable groups such as youth and women.	Do you ever have received complaints from some local community organization? If yes, please specify which ones and how you dealt with them.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	There is an inbox on the website. Local residents and local businesses can submit questions and complaints. The nature of the complaints orientates around current activity. During road construction works complaints were of a business disruption nature. In this direction, it was established a continuously updated part of the website to inform the local community of upcoming works in their vicinity, other complaints centered upon an impact on business revenue caused by roadworks. So far, no serious problems have arisen. During the early stages of the project pre planning there were questions raised by RSPB on the effects of the project on bird life. They work closely with RSPB to seek to ensure but no harm is done to bird life in the area and have contracted RSPB to undertake monitoring work.
		Has your company got a communication channel with the local communities enforcing the policy to inform and consult the local community? If yes, which one?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Menter Môn through Morlais project has set up a website in which information of the project is constantly updated with newsletters being sent out on a monthly basis, information on the proposals, consenting, consultation and other related information about the project, to ensure that the local community is consulted on. An email and phone number is provided in the website to encourage the local community forward their comments and proposals. Additionally, a Community Liaison Group has also been set up.
		Is there any direct involvement in community initiatives and/or through financial support of community projects (e.g., Morlais Project, Earth Day activities, Community liaison groups, etc.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	An example of the direct involvement in community initiatives is Morlais, which is a Menter Môn project which aims to benefit local communities, the economy and help tackle climate change by using renewable energy to generate clean low carbon electricity. Menter Môn is a social enterprise seeking to add value to the region's resources for the benefit of local inhabitants.

		Is there also a mechanism to “collaborate” with the local community? Please explain which one.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a consultation process set up with local communities (source: https://www.morlaisenergy.com/consultation/)
		Has your company ever incorporated some decision based on the community if such decisions have serious implications for the community?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Skill development	The extent to which the company (i.e., Menter Môn through Morlais project) contributes to skill development for the community at large. Skill development for the community at large creates a more resilient and healthy community, and potentially creates a resource for companies that look for new staff when needed.	Do you invest in a public private partnership or other activities that significantly increase the training capacity and quality in the region for most members of the local community?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Menter Môn is a not-for-profit social enterprise that delivers projects and services across Northwest Wales. It has a Board of Directors who give their time on a voluntary basis to provide the company with strategic support. The company does not receive any core funding and must either apply for funding or compete for work. In doing so, funding from various sources, both public and private, are key for the long-term sustainability of the company: European funding has been an important source of income for Menter Môn, however other public sources and competition for work on a commercial basis are also important sources. Source: https://www.mentermon.com/en/cwestiynau-ac-atebion/ The intention is to establish a community fund for holy island. One of the facilities set in this fund is for the purpose of training young people to facilitate their entrance into the industry. They also work closely with the local further education establishment in order to ensure that's the skills requirements of the industry are reflected in training provisions.
		Does your company establish programmes to support apprenticeships, internships, and education initiative to equip (young) people to workplace skills?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Morlais Project has set up a (a) community liason group to discuss issues related to the project development, including local jobs, supply chain opportunities and navigational routes; and (b) skills and employment portal in order to

		And training programmes within the local community? (If there are internship in workforce, please specify the %)				identify and provide solutions for any skills gap presented by the work opportunities from the Morlais Project.
		Do you think that there is a qualified local staff to develop work at your company?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Recruitment over the past 12 months indicates that young people from the local are available to take jobs at the company. Of the 15 staff working on the Model S project 12 live locally and have been raised in the area. It is more difficult to be certain about the engineering technology and marine skills that will be necessary during the operational of the project.
		Do you think that there is a skill-gap between the future needs of the company and the skill levels of local community members? (Please, argue your answer) If yes, do you take any actions about it? Please, specify.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The marine renewable energy sector is quite a new and growing field with great potential for skills development but also very specialized ones that would require further specialization. In doing so, Morlais has set up the skills and employment portal, as explained before, to ensure solutions for identified skills gap.
Contribution to economic development	The extent to which the company or facility (i.e., Menter Môn through Morlais project) contributes to the economic development of the local community. (Economic development is understood as the cultivation of activities that create a net gain of money into the community).	Which % of your workers are from the surrounding area/villages? (E.g., workers living in a radius of 40 km from the enterprise)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	85%. According to the information on the website, Morlais Project is formed by 16 team members, % of which live in the surroundings. Menter Môn has two offices, one in Llangefni (Anglesey) and Porthmadog, both of which within 40 miles distance from Holy Island, where the project will be located. Menter Môn, through Morlais project, has a clear focus to contribute to local communities, as clearly established on the website: Through Morlais, Menter Môn aims to secure maximum benefit for the economy of Anglesey and wider north Wales region. The project will involve developing the zone to accommodate marine technology developers as well as servicing their requirements – this means opportunities for businesses and service providers (source: https://www.morlaisenergy.com/supply-chain/).

		When are you hiring new employees do you take into consideration if the person lives in the same area, or do you not give importance to it?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Yes, following the principles and information listed in the point above.
		Do you have a public commitment to grow local employment? (If yes, please provide some evidence)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The company is a social enterprise Additionally, Morlais have established a supply chain and skills and employment working group and portal in order to maximise jobs and work opportunities for local people and businesses and identify and provide solutions for any skills gap presented by the work opportunities from the Morlais Project, respectively.
		Do you prefer to use local suppliers or external ones? (Please, give reasons and evidence)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Morlais have established a supply chain working group to maximise jobs and work opportunities for local people and businesses through the project (source: https://www.morlaisenergy.com/portal/supply-chain/)
		Do you have a policy that prioritizes buying goods and services from local suppliers? (If yes, please provide some evidence)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a community liaison group established within the Morlais Project through which local jobs, supply chain opportunities and details of current construction work are provided.

Questionnaire for workers of the supply chain (INPRE):

TABLE 13. QUESTIONNAIRE FOR WORKERS OF THE SUPPLY CHAIN (INPRE)

Social Topic	Description	Question	Answer			Evidence / more information
			Yes	No	Uncertain	
Occupational Health and safety	<p>The extent to which the management maintains or improves the safety and overall health status of the workers.</p> <p>The term health, in relation to work, indicates not merely the absence of disease or infirmity, but also includes the physical and mental elements affecting health, which are directly related to safety and hygiene at work.</p> <p>This social topic assesses both the rate of incidents and the status of prevention measures and management practices.</p>	<p>Has the company any policy/strategy on workers' health and safety to meet requirements set by local laws and international standards? <i>(Spanish Law 31/1995 on Risk Prevention Labor)</i></p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<p>Has the company a policy/strategy on workers' health and safety beyond the requirements set by law (e.g., PDCA)?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a free private insurance available for all workers
		<p>If incidents occur, is there any mechanism to act?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Remuneration	<p>The extent to which the management compensate the workers. This social topic assesses the combination of wages and social benefits received by workers.</p>	<p>Do worker's payments meet standards set by law? Or they are higher than the minimum? <i>(Minimum salary in Spain: 1050€/month)</i></p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	- In all cases standards are of course met. In most cases (more than 90%) are higher. On average, women salaries are higher than men Bonus based on individual performance are included in salaries
		<p>Are there implemented social benefits like retirements, health insurances?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Private Health insurance at companies cost
		<p>Do working hours exceed the legal limit? <i>(Maximum working hours in Spain: 8h/day)</i></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not as a standard but they are compensated
		<p>Is overtime compensated?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Discrimination	The extent to which a company is engaged in preventing discrimination and pro-actively promoting nondiscrimination at the workplace. Discrimination refers to any distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment.	Has the company a non-discrimination policy?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Is there any strategy that goes beyond the law? <i>(Spanish law 15/2022 on comprehensive for equal treatment and non-discrimination)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Equality plan against gender discrimination signed on the 18 th November 2022
		If incidents occur, are there any corrective actions implemented?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Freedom of association and collective bargaining	The extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties. They should be able to do this freely, without interference by other parties or the state, and should not be discriminated against as a result of union membership. The right to organise includes the right of workers to strike and the rights of organisations to draw up constitutions and rules, to freely elect representatives, to organise activities without restriction and to formulate programmes.	Has the company a policy that allows freedom of association and collective bargaining? <i>(Art. 37 of the Spanish Constitution guarantees the right to collective bargaining between the representatives of the workers and employers, as well as the binding force of the agreements)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Does the company have a collective representation of organised workers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		How many workers do their exercise as worker representative? How many hours?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3 workers
		Is there evidence that the company has taken disciplinary actions again workers organizing themselves collectively?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		The company or facility recognises the collective representation of organised workers in negotiations. and the company or facility engage in a dialogue with the collective representation of workers and incorporates their views into management decisions.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Work-life balance	The extent to which a company enables workers to have choices over when, where and how they work and encourages healthy work-life balance.	Normal working hours are promoted, facilitating flexibility?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	In a certain range, office workers are allowed to start and finish their workday in order to facilitate/match their family needs
		Strategies are in place to promote a work-life balance?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Questionnaire for workers of the manufacturing and installation stages (Magallanes Renovables):

TABLE 14. QUESTIONNAIRE FOR WORKERS OF THE MANUFACTURING AND INSTALLATION STAGES (MAGALLANES RENOVABLES)

Social Topic	Description	Question	Answer			Evidence / more information
			Yes	No	Uncertain	
Occupational Health and safety	<p>The extent to which the management maintains or improves the safety and overall health status of the workers. The term health, in relation to work, indicates not merely the absence of disease or infirmity, but also includes the physical and mental elements affecting health, which are directly related to safety and hygiene at work. This social topic assesses both the rate of incidents and the status of prevention measures and management practices.</p>	<p>Has the company any policy/strategy on workers' health and safety to meet requirements set by local laws and international standards? <i>(Law 31/1995 on Occupational Risk Prevention)</i></p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Being a company with less than 50 workers, it is not mandatory to have this document public repository.
		<p>Has the company a policy/strategy on workers' health and safety beyond the requirements set by law (e.g., PDCA)?</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<p>If incidents occur, is there any mechanism to act?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Being a company with less than 50 workers, it is not mandatory to have this document public repository.
Remuneration	<p>The extent to which the management compensate the workers. This social topic assesses the combination of wages and social benefits received by workers.</p>	<p>Do worker's payments meet standards set by law? Or are they higher than the minimum? <i>(Minimum salary in the UK: 1929,2€/month)</i></p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Higher than the minimum. No evidences have been provided.
		<p>Are there implemented social benefits like retirement or health insurances?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<p>Do working hours exceed the legal limit? <i>(Maximum working hours in the UK: 8h/day)</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<p>Is overtime compensated?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Discrimination	<p>The extent to which a company is engaged in preventing discrimination and pro-actively promoting nondiscrimination at</p>	<p>Has the company a non-discrimination policy?</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Being a company with less than 50 workers, it is not mandatory to have this document public repository.

	the workplace. Discrimination refers to any distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment.	Is there any strategy that goes beyond the law? <i>(The Equality Act 2010)</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		If incidents occur, are there any corrective actions implemented?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Freedom of association and collective bargaining	The extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties. They should be able to do this freely, without interference by other parties or the state, and should not be discriminated against as a result of union membership. The right to organise includes the right of workers to strike and the rights of organisations to draw up constitutions and rules, to freely elect representatives, to organise activities without restriction and to formulate programmes.	Has the company a policy that allows freedom of association and collective bargaining? <i>(Art. 11 of the Human Rights Act: Everyone has the right to freedom of peaceful assembly and to freedom of association with others, including the right to form and to join trade unions for the protection of his interests)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Being a company with less than 50 workers, it is not mandatory to have this document public repository.
		Does the company have a collective representation of organised workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	We have less than 50 employees. We don't need it.
		How many workers do their exercise as worker representative? How many hours?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
		Is there evidence that the company has taken disciplinary actions again workers organizing themselves collectively?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		The company or facility recognises the collective representation of organised workers in negotiations. and the company or facility engage in a dialogue with the collective representation of workers and incorporates their views into management decisions.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Work-life balance	The extent to which a company enables workers to have choices over when, where and how they work and encourages healthy work-life balance.	Normal working hours are promoted, facilitating flexibility?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Strategies are in place to promote a work-life balance?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Annex 2: List of economic activities to be considered in each phase

This table is used as information support to the social and economic assessments, and it is based on other reports presented (D6.2 and D6.3):

TABLE 15. LIST OF ECONOMIC ACTIVITIES TO BE CONSIDERED IN EACH PHASE

Overall lifecycle phase	Specific phase	Indicative list of activities
Project design, planning and management	Design and feasibility	Development of device arrangements; routing of sub-sea array cables; engineering design of balance of plant (mechanical, electrical, structural); marine logistics studies; financial analysis.
	Physical surveys	Coastal process surveys: potential subsea cable routes and landfall sites for cables. Seabed surveys: geophysical surveys – depth, sediment cover; geotechnical surveys – sampling from boreholes, characterising soil conditions to determine load bearing capacity. Survey results then used in the design of subsea components e.g., foundations and moorings.
	Environmental Survey	Fish, marine mammal, bird and onshore surveys (at the location of onshore equipment and cable laying routes). Some tasks undertaken alongside physical surveys; others carried out using simple vessels.
	Meteorological and resource monitoring	Sensors are deployed at an early stage to monitor meteorological conditions. Data is used to inform project design by understanding mechanical loads that equipment will experience.
	Applications and consents	Environmental Impact Assessment (EIA) statement, application for and negotiation of electrical grid connection conditions including modelling of device and array power quality output, stakeholder engagement, PR etc.
Devices' manufacturing	Platform manufacturing (or vessel adaptation) and tuning of the platform to operate	Manufacturing of the steel structure, mechanical installation and shaft alignment, transport and assembly at port, painting, and manufacturing of equipment. Installation of HMI, control system, PLC, sensors, dynamometers, meteorology. Launching at port with cranes Electrical installation of the PTO components Variable pitch installation Bilge and ballast system Cooling and ventilation system Fire extinguish system
	Power take off (PTO) Manufacturing	Manufacturing of gearbox, electrical Generator, converter, transformer, brake system
	Rotor manufacturing	Manufacturing of Variable Pitch system, blades, main shaft, bearings and oil tank.
	Auxiliary system manufacturing	Manufacturing of hydraulic system, genset, fire extinguishing system, cells and fuel tank.
	Mooring manufacturing	Manufacturing of Multipoint mooring systems with steel anchors inserted into seabed; chain catenary legs
Electrical system manufacturing	Manufacturing of array cables to connect strings of devices to an offshore substation. Then higher voltage cables to connect substation to onshore grid connection point. Manufacturing of connectors and transformers.	

Installation	Installation devices	Port services as final assembly take place at quayside due to risks and costs of doing this offshore. Installation of Electrical systems, on- and offshore substations and cabling required. Installation of foundations and moorings; Installation of marine energy device
O&M	Operations and Maintenance	Monitoring condition and performance of devices and balance of plant. Planning and management of maintenance activities. Managing and monitoring ongoing environmental impact of project. Preventive maintenance major refurb often needed after 3-5 years. Corrective maintenance: due to failure of equipment. Insurance and fixed expense (renting, business rates, grid charges, site energy rent).
End-of-Life	Removal, decommissioning and disposal of devices.	Platforms electrical unhook, uninstallation of the platform and towing for delivery to the tugboat, removal of the mooring and electrical system. Disposal and waste management.

Annex 3: Economic assessment calculations

Input-Output analysis differentiates between Type I and Type II multipliers. Type I multipliers account for the direct and indirect impacts based on how goods and services are supplied within a region, while type II multipliers also account for induced impacts. If there is an increase in final use for a particular industry output, we can assume that there will be an increase in the output of that industry, as producers react to meet the increased use; this is the direct effect. As these producers increase their output, there will also be an increase in use on their suppliers and so on down the supply chain; this is the indirect effect. As a result of the direct and indirect effects the level of household income throughout the economy will increase as a result of increased employment. A proportion of this increased income will be re-spent on final products, this is the induced effect. Considering that 1) the induced impacts are characterised by greater uncertainty and 2) type II multipliers are only available for Scotland IO tables, in this study only type I multipliers have been used.

The following multipliers have been used:

- ✓ The output multipliers for an industry is expressed as the ratio of direct and indirect output changes to the direct output change due to a unit increase in final use.
- ✓ The employment effects estimate the number of direct plus indirect employment change due to a unit increase in final use. In other words, given the change in output for the industry the employment effect can be used to calculate the change in FTE employment for the economy as a whole.
- ✓ The income effects (i.e., wages and salaries or compensation of employees) estimates the direct plus indirect income changes due to a unit increase in final use. In other words, given the change in output for the industry the income effect can be used to calculate the change in compensation for the economy as a whole.
- ✓ The GVA effect multiplier estimates the direct and indirect GVA changes to the direct output change, due to a unit increase in final use. In other words, given the change in output for the industry the GVA effect can be used to calculate the change in GVA for the economy as a whole.

Table 16 presents the multipliers applied for Scotland, Wales and the UK economy across the several groups of economic activities leading the CAPEX and OPEX components, while Table 17 details the specific economic activities, according to the SIC classification, within each group, along with respective location quotients.

TABLE 16: MULTIPLIERS

Groups of economic activities	OUTPUT multipliers			Jobs effects multipliers			Income effects multipliers			GVA effects multipliers		
	Wales	Scotland	UK	Wales	Scotland	UK	Wales	Scotland	UK	Wales	Scotland	UK
Group 1: Building of ships and floating structures	1,46	1,5	1,82	na	7,4	na	na	0,3	0,59	na	0,4	0,87
Group 2: Activities related to electrical and electronic industries	1,30	1,30	1,60	na	9,70	na	na	0,45	0,53	na	0,60	0,76
Group 3: Activities related to concrete products for construction purpose and metal/metal structure production	1,37	1,33	1,53	na	9,04	na	na	0,40	0,41	na	0,47	0,65
Group 4: Manufacture of machinery	1,28	1,30	1,64	na	7,60	na	na	0,40	0,44	na	0,40	0,62
Group 5: Activities related to metal/metal structure production	1,37	1,31	1,51	na	9,04	na	na	0,41	0,41	na	0,44	0,64
Group 6: Sectors related to construction and installation	1,43	1,47	2,00	na	11,98	na	na	0,40	0,43	na	0,70	0,82
Group 7: Insurance, professional and administrative activities	1,23	1,23	1,68	na	15,40	na	na	0,48	0,53	na	0,81	0,87
Group 8: Operation and maintenance	1,26	1,29	1,65	na	11,49	na	na	0,44	0,52	na	0,74	0,85
Group 9: Fixed expenses and insurance	1,23	1,30	1,80	na	4,80	na	na	0,20	0,30	na	0,50	0,77

TABLE 17. ECONOMIC ACTIVITIES LINKED TO THE SIC CODES AND THE LQs OF WALES AND SCOTLAND

SIC code	Industry	LQ		Employment 1000 employees	
		Wales	Scotl.	Wales	UK
Group 1 Building of ships and floating structures					
30110	Building of ships and floating structures	0,4	3,1	0,38	24,60
Group 2 Activities focused on electrical and electronic industries					
26110	Manufacture of electronic components	2,7	1,5	1,90	13,70
26511	Manufacture of electronic instruments and appliances for measuring, testing, and navigation, except industrial process control equipment	0,5	1	0,87	42,00
26512	Manufacture of electronic industrial process control equipment	0,8	0,8	0,17	4,40
27110	Manufacture of electric motors, generators and transformers	0,8	0,6	0,53	10,80
27120	Manufacture of electricity distribution and control apparatus	1,1	0,5	0,99	14,80
27320	Manufacture of other electronic and electric wires and cables	2,6	1,8	1,02	7,50
Group 3 Activities related to concrete products for construction purpose and metal/metal structure production					
23610	Manufacture of concrete products for construction purposes	0,8	0,8	0,55	15,10
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,6	1,2	0,22	7,40
24510	Casting of iron	0	0,5	<0,1	2,90
24520	Casting of steel	1,8	0,4	0,24	1,50
24530	Casting of light metals	2,5	0,2	0,57	4,70
24540	Casting of other non-ferrous metals	0,6	0,6	<0,1	1,90
25110	Manufacture of metal structures and parts of structures	2	1,3	4,57	51,10
25290	Manufacture of other tanks, reservoirs and containers of metal	1	1,4	0,21	4,10
25550	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0,4	0,3	0,34	15,70
25610	Treatment and coating of metals	1,2	0,7	1,08	21,20
25910	Manufacture of steel drums and similar containers	0,3	0,7	<0,1	1,00
25990	Manufacture of other fabricated metal products	1,6	0,8	2,03	30,00
Group 4 Manufacture of machinery					
28131	Manufacture of pumps	0,2	0,9	<0,1	9,30
28140	Manufacture of other taps and valves	0,9	0,6	0,39	7,80
28150	Manufacture of bearings, gears, gearing and driving elements	0,4	1,1	0,16	7,40
Group 5 Activities related to metal/metal structure production					
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,6	1,2	0,22	7,40
24510	Casting of iron	0	0,5	<0,1	2,90
24520	Casting of steel	1,8	0,4	0,24	1,50
24530	Casting of light metals	2,5	0,2	0,57	4,70
24540	Casting of other non-ferrous metals	0,6	0,6	<0,1	1,90
25110	Manufacture of metal structures and parts of structures	2	1,3	4,57	51,10
25290	Manufacture of other tanks, reservoirs and containers of metal	1	1,4	0,21	4,10
25550	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0,4	0,3	0,34	15,70
25610	Treatment and coating of metals	1,2	0,7	1,08	21,20
25910	Manufacture of steel drums and similar containers	0,3	0,7	<0,1	1,00

25990	Manufacture of other fabricated metal products nec	1,6	0,8	2,03	30,00
Group 6 Sectors related to construction and installation					
33200	Installation of industrial machinery and equipment	1,3	0,9	0,91	*
42220	Construction of utility projects for electricity and telecommunications	0,1	0,2	<0,1	15,00
42910	Construction of water projects	1,3	1,9	<0,1	2,60
42990	Construction of other civil engineering projects nec	1,3	1,3	6,55	128,40
43130	Test drilling and boring	0,9	1,6	<0,1	1,60
43210	Electrical installation	1,1	0,9	9,22	215,20
Group 7 Insurance, professional and administrative activities					
70210	Public relations and communication activities	0,6	0,4	0,39	23,80
70229	Management consultancy activities (other than financial management)	0,6	0,6	7,52	418,50
73110	Advertising agencies	0,2	0,3	0,72	88,80
73120	Media representation	0,2	0,7	0,11	16,50
71121	Engineering design activities for industrial process and production	0,4	0,9	0,79	67,90
71122	Engineering related scientific and technical consulting activities	0,9	2,3	2,39	82,90
71200	Technical testing and analysis	0,7	0,8	1,43	48,50
74901	Environmental consulting activities	1	0,7	0,23	13,70
74902	Quantity surveying activities	0,8	0,9	0,56	17,00
80200	Security systems service activities	1,3	0,9	0,48	15,20
Group 8 Operation, maintenance, fixed expenses and insurance (annual)					
33150	Repair and maintenance of ships and boats	0,9	1,5	0,27	7,90
50200	Sea and coastal freight water transport	0,6	0,9	132,00	3,80
52101	Operation of warehousing and storage facilities for water transport activities of division 50	0,5	0,2	<0,1	1,50
65120	Non-life insurance	1,5	0,4	4,56	67,10
71122	Engineering related scientific and technical consulting activities	0,9	2,3	2,392	82,9
71200	Technical testing and analysis	0,7	0,8	1,427	48,5
77342	Renting and leasing of freight water transport equipment	n/a	1,2	n/a	0,4
77390	Renting and leasing of other machinery, equipment and tangible goods	0,5	1,4	0,688	39,1

SIC code	Industry	LQ		Employment 1000 employees	
		Wales	Scotl.	Wales	UK
Group 1 Building of ships and floating structures					
30110	Building of ships and floating structures	0,4	3,1	0,38	24,60
Group 2 Activities focused on electrical and electronic industries					
26110	Manufacture of electronic components	2,7	1,5	1,90	13,70
26511	Manufacture of electronic instruments and appliances for measuring, testing, and navigation, except industrial process control equipment	0,5	1	0,87	42,00
26512	Manufacture of electronic industrial process control equipment	0,8	0,8	0,17	4,40
27110	Manufacture of electric motors, generators and transformers	0,8	0,6	0,53	10,80
27120	Manufacture of electricity distribution and control apparatus	1,1	0,5	0,99	14,80

27320	Manufacture of other electronic and electric wires and cables	2,6	1,8	1,02	7,50
Group 3 Activities related to concrete products for construction purpose and metal/metal structure production					
23610	Manufacture of concrete products for construction purposes	0,8	0,8	0,55	15,10
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,6	1,2	0,22	7,40
24510	Casting of iron	0	0,5	<0,1	2,90
24520	Casting of steel	1,8	0,4	0,24	1,50
24530	Casting of light metals	2,5	0,2	0,57	4,70
24540	Casting of other non-ferrous metals	0,6	0,6	<0,1	1,90
25110	Manufacture of metal structures and parts of structures	2	1,3	4,57	51,10
25290	Manufacture of other tanks, reservoirs and containers of metal	1	1,4	0,21	4,10
25550	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0,4	0,3	0,34	15,70
25610	Treatment and coating of metals	1,2	0,7	1,08	21,20
25910	Manufacture of steel drums and similar containers	0,3	0,7	<0,1	1,00
25990	Manufacture of other fabricated metal products nec	1,6	0,8	2,03	30,00
Group 4 Manufacture of machinery					
28131	Manufacture of pumps	0,2	0,9	<0,1	9,30
28140	Manufacture of other taps and valves	0,9	0,6	0,39	7,80
28150	Manufacture of bearings, gears, gearing and driving elements	0,4	1,1	0,16	7,40
Group 5 Activities related to metal/metal structure production					
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,6	1,2	0,22	7,40
24510	Casting of iron	0	0,5	<0,1	2,90
24520	Casting of steel	1,8	0,4	0,24	1,50
24530	Casting of light metals	2,5	0,2	0,57	4,70
24540	Casting of other non-ferrous metals	0,6	0,6	<0,1	1,90
25110	Manufacture of metal structures and parts of structures	2	1,3	4,57	51,10
25290	Manufacture of other tanks, reservoirs and containers of metal	1	1,4	0,21	4,10
25500	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0,4	0,3	0,34	15,70
25610	Treatment and coating of metals	1,2	0,7	1,08	21,20
25910	Manufacture of steel drums and similar containers	0,3	0,7	<0,1	1,00
25990	Manufacture of other fabricated metal products nec	1,6	0,8	2,03	30,00
Group 6 Sectors related to construction and installation					
33200	Installation of industrial machinery and equipment	1,3	0,9	0,91	*
42220	Construction of utility projects for electricity and telecommunications	0,1	0,2	<0,1	15,00
42910	Construction of water projects	1,3	1,9	<0,1	2,60
42990	Construction of other civil engineering projects nec	1,3	1,3	6,55	128,40
43130	Test drilling and boring	0,9	1,6	<0,1	1,60
43210	Electrical installation	1,1	0,9	9,22	215,20
Group 7 Insurance, professional and administrative activities					
70210	Public relations and communication activities	0,6	0,4	0,39	23,80
70229	Management consultancy activities (other than financial management)	0,6	0,6	7,52	418,50
73110	Advertising agencies	0,2	0,3	0,72	88,80

73120	Media representation	0,2	0,7	0,11	16,50
71121	Engineering design activities for industrial process and production	0,4	0,9	0,79	67,90
71122	Engineering related scientific and technical consulting activities	0,9	2,3	2,39	82,90
71200	Technical testing and analysis	0,7	0,8	1,43	48,50
74901	Environmental consulting activities	1	0,7	0,23	13,70
74902	Quantity surveying activities	0,8	0,9	0,56	17,00
80200	Security systems service activities	1,3	0,9	0,48	15,20
Group 8 Operation, maintenance, fixed expenses and insurance (annual)					
33150	Repair and maintenance of ships and boats	0,9	1,5	0,27	7,90
50200	Sea and coastal freight water transport	0,6	0,9	132,00	3,80
52101	Operation of warehousing and storage facilities for water transport activities of division 50	0,5	0,2	<0,1	1,50
65120	Non-life insurance	1,5	0,4	4,56	67,10
71122	Engineering related scientific and technical consulting activities	0,9	2,3	2,392	82,9

Annex 4: Complete results of the economic assessment

OUTPUT (million euro)						
CAPEX Activities	34,5MW			100MW		
	Wales	Scotland	UK	Wales	Scotland	UK
Device manufacturing	32,63 €	32,20 €	53,94 €	60,33 €	58,13 €	98,31 €
Installation	4,82 €	5,23 €	11,15 €	6,13 €	6,65 €	14,18 €
Management and commissioning	1,72 €	1,73 €	5,06 €	3,18 €	3,19 €	9,35 €
End-of-Life	1,30 €	1,41 €	3,01 €	1,65 €	1,79 €	3,83 €
Economic output by CAPEX	40,47 €	40,56 €	73,16 €	71,29 €	69,76 €	125,68 €
M€ per MW	1,17 €	1,18 €	2,12 €	0,71 €	0,70 €	1,26 €

EMPLOYMENT (number of FTE jobs)						
CAPEX Activities	34,5MW			100MW		
	Wales	Scotland	UK	Wales	Scotland	UK
Device manufacturing	na	694	na	na	1379	na
Installation	na	134	na	na	171	na
Management and commissioning	na	90	na	na	166	na
End-of-Life	na	36	na	na	46	na
FTE jobs by CAPEX		954			1761	
FTE jobs per MW		28			18	

INCOME (effect) (million euro)						
CAPEX Activities	34,5MW			100MW		
	Wales	Scotland	UK	Wales	Scotland	UK
Device manufacturing	na	30,17 €	41,33 €	na	60,72 €	76,56 €
Installation	na	4,48 €	4,80 €	na	5,70 €	6,10 €
Management and commissioning	na	4,49 €	4,31 €	na	8,30 €	7,97 €
End-of-Life	na	1,21 €	1,29 €	na	1,54 €	1,65 €
Income impact by CAPEX		40,35 €	51,73 €		76,25 €	92,28 €
M€ per MW		1,17 €	1,50 €		2,21 €	0,92 €

GVA (effect) (million euro)						
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CAPEX Activities	34,5MW			100MW		
	Wales	Scotland	UK	Wales	Scotland	UK
Device manufacturing	na	37,43 €	62,27 €	na	75,06 €	116,12 €
Installation	na	7,84 €	9,23 €	na	9,97 €	11,74 €
Management and commissioning	na	5,98 €	6,32 €	na	11,07 €	11,69 €
End-of-Life	na	2,12 €	2,49 €	na	2,69 €	3,17 €
GVA impact by CAPEX		53,38 €	80,31 €		98,79 €	142,72 €
M€ per MW		1,55 €	2,33 €		0,99 €	1,43 €

	OPEX activities					
	34,5MW			100MW		
	Wales	Scotland	UK	Wales	Scotland	UK
OUTPUT (M€)	1,17 €	1,37 €	3,28 €	1,51 €	1,76 €	4,23 €
M€ per MW	0,03 €	0,04 €	0,10 €	0,02 €	0,02 €	0,04 €
EMPLOYMENT (nr. FTE jobs)	na	40	na	na	51	na
FTE jobs per MW	na	1	na	na	0,51	na
INCOME (M€)	na	1,73 €	2,13 €	na	2,22 €	2,74 €
M€ per MW	na	0,05 €	0,06 €	na	0,02 €	0,03 €
GVA (M€)	na	3,14 €	3,88 €	na	4,04 €	5,00 €
M€ per MW	na	0,09 €	0,11 €	na	0,04 €	0,05 €