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Maritime Alliance for fostering the European Blue Economy through a Marine Technology Skilling Strategy

Co-funded by the Erasmus+ Programme of the European Union

Identification of Priorities and Lines of Action

January 2020

About this Report

This document was developed within the framework of the **MATES project, Maritime Alliance for Fostering the European Blue Economy through a Marine Technology Skilling Strategy.** The objective of the project is to develop a skills strategy that addresses the main drivers of change to the maritime industry, in particular shipbuilding and offshore renewable energy. Both sectors are strongly linked and require new capacities to succeed in an increasingly digital, green and knowledge-driven economy.

Project duration: 2018 - 2021
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Document information	
Short description	Description of the proposed action lines, providing methodological terms of reference to set priorities and undertake strategic decisions.
Next steps	A web-based workshop will present the proposed action lines and apply the terms of reference to select priorities. The results of this prioritisation exercise are presented in the Baseline Strategy report (Deliverable 3.2), indicating how these Lines of Action will be addressed in the Pilot Experiences foreseen in Work Package 4.
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Glossary

This glossary does not provide official definitions, but explanations based on recognized information sources.

Term	Definition
21st Century skills	A blend of content knowledge, specific skills, expertise and literacies which modern/future professionals need to possess as well as students need to master to succeed in work and life. Also included in the terminology is "professional attitude".
3D printing	Group of technologies where a three-dimensional object is created through the superimposition of layers of material. It is expected to transform radically the industrial sector by reducing capital expenditures and demanding human resources. This will enable time to be saved from manufacturing processes, the use of more cost-efficient materials and it is expected to be exploited in the building of the infrastructure's components.
Artificial Intelligence	Activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment
Augmented Reality	An enhanced version of reality where live direct or indirect views of physical world environments are augmented with superimposed computer-generated images over a user´s view of the real-world, thus enhancing one´s current perception of reality.
Automation and advanced robotics	Automation refers to sophisticated automated systems, ideally with the additional capability for self-maintenance and repair, mostly requiring little or no human interaction to operate, apart from top-level guidance. Advanced robotics in maritime sectors refers to Unmanned systems (US), such as Autonomous Underwater Vehicles (AUVs), Remotely Operated Vehicles (ROVs), humanoid robots, etc. Control systems are key for the implementation of automation and advanced robotics in those sectors.
Behaviour change	Any modification in behaviour altering the way you act and react. The change may happen spontaneously and involuntarily without any intervention, or it may be systematic and prompted by conditioning.
Big Data	Field that treats ways to analyse, systematically extract information from, or otherwise deal with datasets that are too large or complex to be dealt with by traditional data-processing application software. In offshore renewables the adoption of Big Data technologies are required due to the huge numbers and variety of recorded data which are difficult to manage. Big Data technologies are used to support complex processes management and optimisation, and real-time decision-making
Blue Growth	European long-term strategy to support sustainable growth in the marine and maritime sectors as a whole. Seas and oceans are drivers for the European economy and have great potential for innovation and growth.

Capacity building	Long-term, continuing process, in which all stakeholders participate (ministries, local authorities, non-governmental organisations and water user groups, professional associations, academics and others). In 1991 it was defined as a) the creation of an enabling environment with appropriate policy and legal frameworks; (b) institutional development, including community participation (of women in particular); and (c) human resources development and strengthening of managerial systems.
Composite materials	Materials made from two or more constituent elements, each with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. At the shipbuilding industry, three elements are used to create composite materials: fibres, core materials and resins.
Delphi	The Delphi method is based on the principle that forecasts from a structured group of individuals are more accurate than those from unstructured groups. The experts answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymised summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments.
Delphi method	Forecasting process framework based on the results of multiple rounds of questionnaires sent to a panel of experts. Several rounds of questionnaires are sent out to the group of experts, and the anonymous responses are aggregated and shared with the group after each round.
Digital twin	Virtual replica of objects and processes that simulates the behaviour of their original twins. The objective is to analyse their effectiveness in certain cases to improve its efficiency.
Digitalisation	The use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business.
Drones	Unmanned aerial vehicles that perform work and inspection in dangerous and confined spaces (i.e. turbines, cargo holds etc.) thus not only eliminating the risks in specific tasks but also capable of making extensive and efficient inspections.
Energy storage	Set of methods and technologies used to store various forms of energy. The implementation of energy storage can provide further benefits to offshore renewables sector. It can ensure the development and improvement of grid integration, as well as the integration of offshore renewables in energy network infrastructures. Besides, it supports the sector´s growth by facilitating the wide installations of large-scale offshore facilities contributing to the reduction of their operational costs.
European Quality Assurance Reference Framework for Vocational Education and Training	The Framework is an instrument for improving the quality of VET systems. It provides a European-wide system to help Member States and stakeholders to document, develop, monitor, evaluate and improve the effectiveness of their VET provision and quality management practices. It can be applied at both system and VET provider levels adapted to the different national systems and used in accordance with national legislation and practice. It complements the work of the European Qualifications Framework (EQF) and the European Credit System for VET (ECVET).

European Skills Competences and Occupations classification	European multilingual classification of Skills, Competences, Qualifications and Occupations. ESCO works as a dictionary, describing, identifying and classifying professional occupations, skills, and qualifications relevant for the EU labour market and education and training.
Exploitation of alternative fuels and renewable energy sources	Alternative fuels are all different substances which may be used as a replacement of conventional fossil fuels that serve today as the main power source for propulsion and power generation in shipping. The most relevant nowadays is the Liquefied Natural Gas (LNG) which have the widest applicability. In addition to this there are also other vessels using other sources for energy, like electrification which has attracted an increased interest with relevant projects being implemented.
Formal education	Education that is institutionalised, intentional and planned through public organisations and recognised private bodies, and in their totality constitute the formal education system of a country. Formal education programmes are thus recognised as such by the relevant national education or equivalent authorities.
Gender balance	This term refers to the equal participation and human resources for women and men in all areas of work, projects or programmes.
Governance	It is the establishment of policies and continuous monitoring of their proper implementation, by the members of the governing body of an organisation.
Green retrofitting	Any type of upgrade at an existing structure that is whole or partially occupied to improve energy and environmental performance. The most important change in current regulations affecting global shipping is expected to be addressing the maximum limit of sulphur contents in marine fuels which will drop from 3.50% to 0.5%.
Green technologies	This term refers to a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products.
Lines of Action	Lines of Action are those actions that have been identified through the work of the MATES Project that will address skills gaps in the shipbuilding and offshore renewable energy sectors
Marine renewable energy (MRE)	This term refers to wave and tidal energy in the UK. But it has generally a wider definition, being equally understood as Ocean Energy (ocean waves, tides, salinity, and ocean temperature differences) in which offshore wind is often not included.
Maritime technologies	Technologies for the safe use, exploitation, protection of, and intervention in the marine environment. In the MATES project there are two fields where maritime technologies are of great importance: Shipbuilding, a sector that is being updated by the use of alternative fuels and autonomous vessels, and Offshore Renewable Energies, which are now adopting more renewable energies to be used, such as solar energy or wave energy. Definition of Maritime technologies and specific use in the MATES project as Shipbuilding and ORE sectors
Massive Open Online Courses	Free online courses available for anyone to enrol. It provides an affordable and flexible way to learn new skills, advance careers and deliver quality educational experiences at scale.

Ocean literacy	The understanding of the ocean´s influence on you and your influence on the ocean.
Offshore Renewable Energy (ORE)	This term includes the offshore wind, wave and tidal energy, osmotic and OTEC (Ocean Thermal Energy Conversion). Generally used to design Offshore Wind energy - MATES uses this term to refer as well to Ocean Renewable energy, which includes four different energy segments: wave and tide, usually known as Marine Renewable Energy (MRE), plus osmotic and OTEC, and even offshore solar energy.
Paradigm	Example, pattern: an outstandingly clear or typical example or archetype
Paradigm shifters	Elements of fundamental changes in the basic concepts and experimental practices of a scientific discipline
Pilot Experiences	Planned actions to test the addressing of gaps in the skills of the workforces of the shipbuilding and the offshore renewable energy industry
Shipbuilding	Building of ships and floating structures, including pleasure and sporting boats, repair and maintenance of ships and boats, and manufacture of marine equipment and marine machinery.
Skills ecosystem	Clusters of high, intermediate or low-level competencies in a particular region or industry shaped by interlocking networks of firms, markets or institutions
Skills shortage	Refers to a useful understanding of what skills are in demand or may be in demand in the future for a particular job.
Smart grid & smart sensors	A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers via two-way digital communication. This system allows for monitoring, analysis, control and communication within the supply chain to help improve efficiency, reduce energy consumption and cost, and maximize the transparency and reliability of the energy supply chain. The smart grid was introduced with the aim of supports the optimisation of electricity generation, transmission and distribution by creating a highly interactive and responsive electricity grid that creates a balance between energy demand and supply. This technology is expected to increase stability, reliability and efficiency in offshore renewable energy operations.
Vessel automation, vessel autonomy and advanced robotics	This group of terms refers to the modernisation of the vessels based on the development and application of automated systems on ships. This kind of technology will be able to reduce the crew members needed to operate a ship, increase the amount of cargo transported at a lower cost and develop more sophisticated information systems based in sensors, cameras and radars.
VET Standards	This term refers to the key elements of lifelong learning systems equipping people with knowledge, know-how, skills and/or competences required in particular occupations or more broadly on the labour market. It responds to the needs of the economy but also provides learners with skills for personal development and active citizenship. VET contributes to enterprise performance, competitiveness, research and innovation and is central to employment and social policy.

Virtual Reality	Is a realistic simulation (yet completely virtual) of an environment that is created with a mixture of interactive hardware and software and presented to the user in such a way that the user suspends belief and accepts it as a real environment.
Vocational Education Training	Sometimes simply known as vocational training, it is the training in skills and teaching of knowledge related to a specific trade, occupation or vocation in which the student or employee wishes to participate. Vocational education may be undertaken at an educational institution, as part of secondary or tertiary education, or may be part of initial training during employment, for example as an apprentice, or as a combination of formal education and workplace learning.

Executive Summary

The aim of this report is to describe the reference framework utilized to set up the priorities and Lines of Action within the MATES project. This report sets out the methodology to be used in prioritizing these Lines of Action in order to finely tune the Pilot Experiences to be undertaken in the second half of the project. These Lines of Action, in the context of the MATES Project, are the key themes or areas on which the Pilot Actions will focus on within their fine-tuning and detailed planning and implementation.

This report includes a list of the Lines of Action identified during the first year of the Project, the prioritisation criteria for those Lines of Action and the instructions to undertake the online voting process which was carried out in order to prioritise those Lines of Action. This prioritisation system is defined so that those action lines, within which the most important training needs and skills gaps fit, will be addressed in the next stage of the MATES Project and will be included in the Marine Technology Skilling Strategy that will be the main output of the project.

The Lines of Action presented and prioritised within this report are based on the work done in WP1 and WP2 and presented in the D1.2 State of the Art Report and the D2.1 Baseline Report on Present Skills Gaps. This work done earlier in the project highlighted the current state of the Offshore Renewable Energy and Shipbuilding sectors and the skills gaps within. From this information, the key Lines of Action were drawn out. Upon completion of the Baseline Report (Sdoukopoulos, 2020), (the report on present skills gaps in the shipbuilding and offshore renewables value chains), the relevant data that were collected and analysed were used as a basis for prioritizing the Lines of Action that set the direction of the Pilot Actions to be undertaken at the next stage of the project.

The results of this prioritisation exercise will be presented in the Baseline Strategy (Deliverable 3.2) indicating how these Lines of Action will be addressed in a set of Pilot Experiences.

The MATES partnership, following a practical approach, aims to produce a comprehensive but also feasible and demonstrable skills strategy supporting further growth in the two sectors targeted and strengthening the global competitiveness of European industries. In order to achieve this, the best approach to make the strategy achievable is to focus on the priorities stemming from the gaps identified at an earlier stage of the project.

The main criteria for this prioritisation exercise were determined through the work done, to date, within the project; i.e. based on the stakeholder consultation and baseline data collection already carried out. These criteria have also considered the EQAVET quality criteria. The main objective of this report is to define the criteria and a relative weighting system that was used in the prioritisation exercise.

Lines of action

This report sets out the details of the Lines of Action that were developed using the data collected as part of the Baseline Report of the MATES Project.

Below are the Lines of Action for the Shipbuilding (SB) sector that have been developed as part of this methodology.

1. Training, reskilling/ upskilling workforce in the use of **digital and data driven technologies (big data, Internet of Things, cloud computing, 3D printing, artificial intelligence**)
2. Training, reskilling/ upskilling workforce in the use of automation and robotics as **well as in the human –robot interactions** (automation/autonomous ships, mechatronics, augmented reality)
3. Training, reskilling/ upskilling workforce in the use technologies for **minimising environmental impact in shipbuild**ing (sustainable practices, reduction of polluting emissions, construction materials and antifouling systems)
4. Optimizing the processes of **decontamination and recycling of decommissioned vessels**.
5. Promoting a better matching of trainings to current needs in **technical disciplines (electrical systems, beam welding and various other techniques like gas metal arc welding, gas tungsten arc welding and oxyacetylene welding, fitting and cutting)**
6. Progressive introduction and increasing relevance of **21st century skills** within the training offer ("Soft skills" e.g. creative thinking and innovation, critical thinking and problem solving, communication and collaboration, knowledge management and transfer, flexibility and adaptability, initiative and self-direction, productivity and accountability).
7. Increase the **attractiveness of maritime careers** for graduates and early-career skilled workers promoting Ocean Literacy
8. Enhancing visibility and promoting the **role of women in the shipbuilding sector**
9. **Skills ecosystems**: meeting points for the most relevant stakeholders from Industry, academia and research.
10. Training, reskilling/ upskilling workforce in **health and safety**, adapted to new processes, materials and tasks.

Below are the Lines of Action for the Offshore Renewable Energy (ORE) sector that have been developed as part of this methodology.

1. Training, reskilling/ upskilling workforce in the use of **new digital technologies (artificial intelligence, mechatronics, 3D printing, Internet of things, cloud computing, big data**).
2. Training, reskilling/ upskilling workforce in order to increase technical knowledge on **Energy storage**
3. Develop **synergies among sectors with significant similarities** in their needs to promote skills transferability between them (e.g. Oil and gas, offshore wind energy, ocean energy)
4. Opportunities for **skills diversification from parallel sectors** e.g. Fisheries, aquaculture, and marine operations. Particular skills in ROVs, health and safety, marine operations.
5. **Multi-disciplinary skills outside of specialisation**. E.g. Ecologists should also have skills in technological development, business/ financial aspect of ORE
6. Increasing the **levels of experience and specialisation gained by temporary employment**
7. Specialisation and experience in **offshore economics** related to market, financial and investment analysis, such as Levelized Cost of Energy (LCOE) reduction, subsidy framework, etc.

8. Need for **specialisation and expertise in skills that are not yet standardized** and are still under development e.g. Decommissioning
9. Research and development of **legislation, guidelines and policies** associated with offshore renewable energies
10. Promoting/ enhancing **21st Century skills**: adapted to the different needs of 'blue collar' and "white collar" roles: teamwork, communication, analytical skills. (Also referred to as soft skills, and including capacities such as creative thinking and innovation, critical thinking and problem solving, communication and collaboration, knowledge management and transfer, flexibility and adaptability, initiative and self-direction, productivity and accountability).
11. Enhancing **Ocean Literacy** in offshore renewable energy to increase attractiveness of maritime careers for graduates and early-career skilled workers
12. Promoting **STEM women in ORE**

Each of these Lines of Action was scored according to a set of criteria in order to assess their importance in relation to the skills gaps within the current and future workforces for the SB and ORE sectors.
These criteria include:

- Sector relevance
- Geographical relevance
- Political support
- Urgency
- Cost
- Impact on employability
- Attractiveness

Using these criteria, a score was applied to each Line of Action in order to prioritize the list of Lines of Action in relation to the SB and ORE sectors. This was done at an online workshop for which all Thematic Experts within the MATES Partnership and Network were invited to attend and to vote on each criterion for each Line of Action. At this workshop, the Lines of Action were explained in full, in the context of the overall goals of the MATES Project.

Introduction

Purpose of this report

The aim of this report is to describe the reference framework utilized to set up the priorities and Lines of Action within the MATES project. Therefore, it includes a list of the Lines of Action identified during the first year of the Project, the prioritisation criteria for those Lines of Action and the instructions to undertake the online voting process.

Objectives

The objectives of this work are to:

1. Prioritise Lines of Action needed and select those to be addressed by the project.
2. Establish a prioritisation system (including priority criteria and terms of reference to apply them) and classify all training needs obtained in the different scenarios of the foresight.
3. Define the actions needed to address the top priorities.
4. Cross-link priority Lines of Action and Pilot Experiences to identify how best to maximise their strategic alignment and impact. Provide feedback for the Pilot Experiences' comprehensive planning, execution and assessment.

Numbers 1 & 2 will be achieved within this report. Numbers 3 & 4 will be achieved when the voting process has been carried out on an online workshop and the final report (Baseline Strategy) has been completed.

Specific objectives of this report are:
1 – Define the Lines of Action proposed within the project to address the main skills gaps detected in MATES target sectors: Shipbuilding and Offshore Renewable Energy.
2 – Define the criteria to prioritize the identified Lines of Action.
3 – Define the methodology for consultation with MATES Experts and conduct online voting on prioritisation of Lines of Action based on criteria.

Expected impact

The task of this Work Package (WP3) is to select the most important training needs and skills gaps to be addressed in the Shipbuilding and Offshore Renewable Energy sectors. A prioritisation system has been defined so that those actions lines, within which the most important training needs and skills gaps fit, will be addressed in the next stage of the MATES Project and will be included in the Marine Technology Skilling Strategy that will be the main output of the project.

Methodology for Identification of Priorities and Lines of Action

Upon completion of the Baseline Report (Sdoukopoulos, 2020), (the report on present skills gaps in the shipbuilding and offshore renewables value chains), the relevant data that were collected and analysed were used as a basis for prioritizing the Lines of Action. These Lines of Action will ultimately set the direction of the Pilot Actions to be undertaken at the next stage of the project.

Within the Baseline Report a critical review and analysis of the existing needs for education, training and skills in the sectors of shipbuilding and offshore renewables in

Europe was conducted to address current shortages and gaps in relevant skills and qualifications. This critical review and analysis incorporated a desktop literature study and the work of the State of the Art report (Fidalgo *et al.*, 2019) and a series of workshops that were undertaken in the first year of the MATES Project[1]. See Figure 1 below for a graphical summary of the methodology.

As was prescribed at MATES' proposal stage, a wide variety of themes covering the interests of all relevant stakeholder groups has been identified. The main output of this exercise was the identification of several skills and training gaps and challenges that may be addressed in order to improve the situation under which the strategy design has been accomplished. Those gaps and challenges found, were expected due to the variety of disciplines, sectors involved, range of VET segments, different countries and sea basins addressed within the project.

The MATES partnership, following a practical approach, aims to produce a comprehensive but also feasible and demonstrable skills strategy supporting further growth in the two sectors targeted and strengthening the global competitiveness of European industries. In order to achieve this, the best approach to make the strategy achievable is to focus on the priorities stemming from the gaps identified at an earlier stage of the project.

The main criteria for this prioritisation exercise was determined through the work done, to date, within the project, i.e. based on the stakeholder consultation and baseline data collection already carried out. These criteria have also considered the EQAVET quality criteria. The main objective of this report is to define the criteria and a relative weighting system that will be used in the prioritisation exercise. All experts who have signed up as members of at least one of the Thematic Expert Groups were given the chance to vote for each criterion at an online workshop that was organized for facilitating the process. More specifically, the aim of the online workshop was to identify the priority list of training and skills needs. The output of the workshop was then used to define the scope of the Project Pilot Experiences.

The Lines of Action that have been drawn up through the work done to date were presented against the criteria to be voted upon. A table describing the **Lines of Action** with the following structure is presented below:

- Reference No.
- Title
- Challenge (referring to relevant needs and gaps from those identified)
- Scope and possible instruments (it must include at least one of the following types of action: mobility, training, curriculum development, design of training materials)
- Expected Impact (The impact that would be measurable if a Pilot Action were implemented)
- Relevant indicators (How the impact could be measured)
- Actors (who will implement the Pilot Action and who will benefit from it).

[1] Deliverables 1.3, Mobilisation Workshops and 2.1 and 2.2 Baseline validation workshops and final validation worshop https://www.projectmates.eu/results/deliverables/

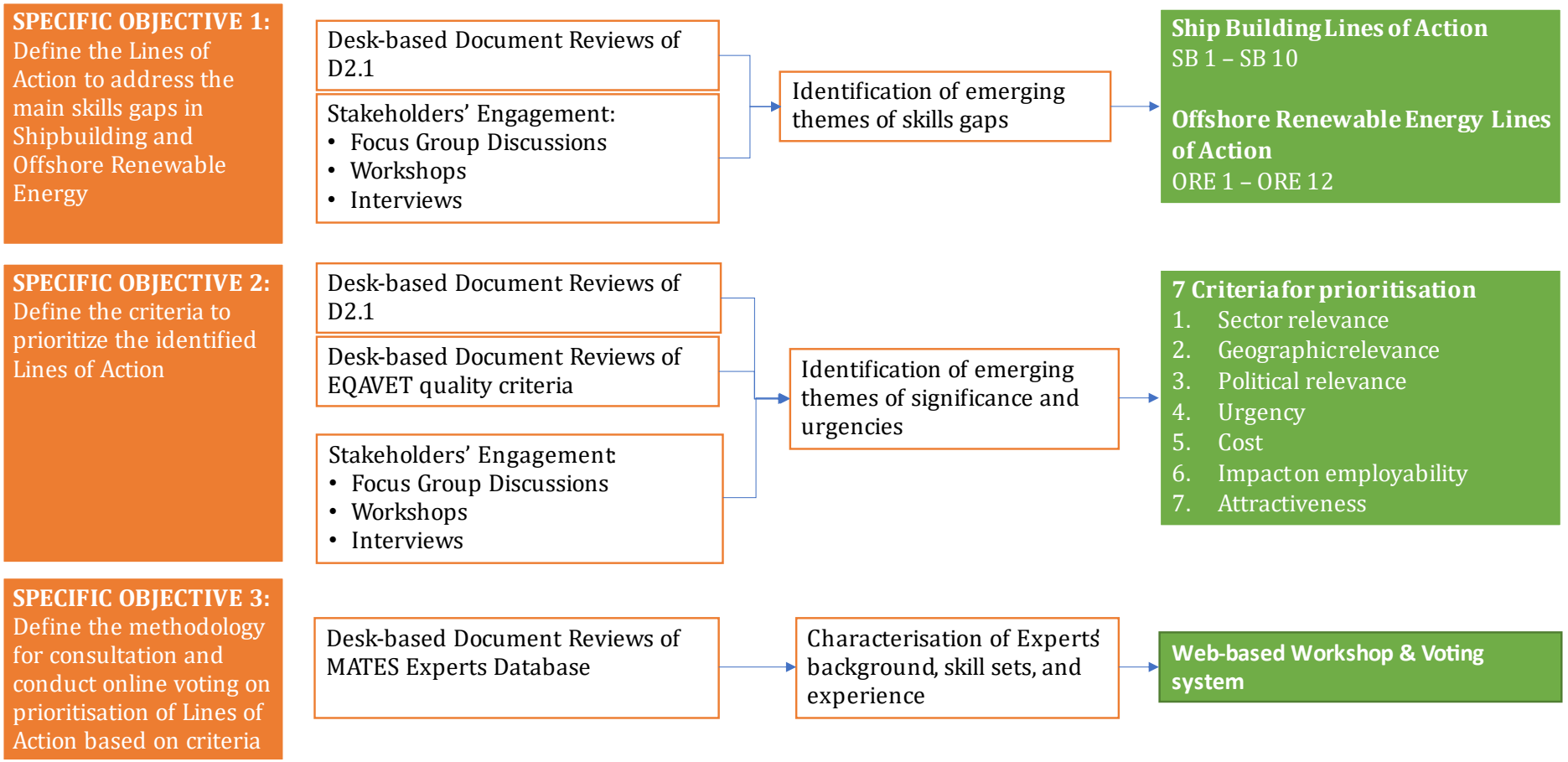


Figure 1 Summary of the methodology undertaken to meet the three objectives of this activity.

Presentation of Lines of Action

The following two tables list the Lines of Action that have been drawn from the work carried out in the Mates Project to date. These are the themes within which skills gaps have been identified and discussed within the stakeholder engagement and baseline data collection work. These two tables are split into to the two sectors that MATES is focusing on: Shipbuilding and Offshore Renewable Energy. The details of these Lines of Action as they are currently understood are presented in the proceeding columns. This information has been collated from the reports produced to date. The details of this table were presented at the online workshop for discussion and validation.

Shipbuilding

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
SB 1	**Training, reskilling/ upskilling** workforce in the use of **digital and data driven technologies** (big data, Internet of Things, cloud computing, 3D printing, artificial intelligence)	A conversion of the existing fleet is expected to adopt new technologies that will be implemented in innovative equipment and more technologically advanced vessel designs. Thus, the shipbuilding industry will soon need professionals with new capabilities and	Curriculum development Design of training materials (contents and delivery) Training methodologies New training formats and training spaces (including non-formal formats as contests or mobility)	Efficient resource utilisation Increased precision Cost effective projects Potentially enhanced international competitiveness of involved stakeholders, regaining of sectors former importance in Europe	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery	Companies Academic Centres: VET, Higher level education

[2] Should comprise at least one of each of the following types of action: mobility, training, curriculum development, design of training materials

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		skills in the digital domain.		Increase of productivity Facilitate the mobility of employees between different positions and sectors.	No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	
SB 2	**Training, reskilling/ upskilling** workforce in the use of **automation and robotics as well as in the human –robot interactions** (automation/autonomous ships, mechatronics, augmented reality)	The application of automated systems on ships is sought to significantly reduce the crews and ultimately allow to develop autonomous vessels. Robots and drones are being progressively introduced in the production and post-production phases, to automate part of the production phase	Curriculum development Design of training materials (contents and delivery) Training methodologies New training formats and training spaces (including non-formal formats as contests or mobility)	Efficient resource utilisation Increased precision Cost effective projects Improved safety and security at work Extensive and efficient inspection in difficult to reach or inaccessible places	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		such as welding, cutting and lifting activities as well as to perform work and inspection in dangerous and confined spaces, etc. Their use is expected to improve costs, efficiency and safety in operations.	Extensive and efficient inspection in confined spaces		No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	
SB 3	**Training, reskilling/ upskilling** workforce in the use technologies for minimising environmental impact in shipbuilding (sustainable practices, reduction of polluting emissions, construction materials and antifouling systems)	There is an increased pressure to reduce the environmental impact of the shipbuilding industry and maritime transport. Ideally, a 40% reduction in shipping CO_2 emissions, as well as other harmful environmental substances,	Development of training materials (contents and delivery) Training methodologies New training formats and training spaces (including non-formal formats as contests or mobility)	Reduced environmental impacts of the shipbuilding industry and the maritime transport.	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		including air pollutants, water pollution, waste and noise, it is expected by 2050 (alternative fuels, renewable energy, lighter construction materials, etc.)			purposes of training delivery No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	
SB 4	Optimizing the processes of **decontamination and recycling of decommissioned vessels.**	There is an important number of decommissioned vessels that are transferred to countries in Southeast Asia to be dismantled in the absence of environmental controls and security for workers. Optimisation of the processes to recycle decommissioned	Design of training materials (contents and delivery) Training methodologies New training formats and training spaces (including non-formal formats as contests or mobility)	Reduced environmental impacts of the shipbuilding industry. It will facilitate the development of a greener European dismantling sector	No. of projects within the sector that are undertaken using the new methods No. of Innovative training delivery and organisation (New business models for trainings explored) No of innovative content developed and used	Companies Academic Centres: VET, Higher level Education Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		vessels would contribute to implement the Circular Economy principle of **"closing the loop" of product lifecycles.**			No. of enterprises targeted/reached No. of Education institutions targeted/reached No. of trainees targeted/reached	
SB 5	Promoting a **better matching of trainings to current needs in technical disciplines** (electrical systems, beam welding and various other techniques like gas metal arc welding, gas tungsten arc welding and oxyacetylene welding, fitting and cutting)	Vocational education graduates most of the times are not enough specialised. In order to accomplish most technical disciplines, it is required to develop different programs, and complete them with practical training. There is a need for mechanisms to facilitate the completion of such	Mentoring/supervisory support structure to technical team Trainers training Design of training materials (contents and delivery; modular trainings that could be complemented, mechanisms to ease on-the job training can also be a solution besides the creation of ad hoc training offer).	Increased coordinated effort in addressing sector's challenges Increased efficiency of on-the-job trainings (OJT) Introduce new knowledge to the trainer's curricula.	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		training programmes[3]			No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	
SB 6	**Progressive introduction and increasing relevance of 21st century skills within the training offer** ("Soft skills" e.g. creative thinking and innovation, critical thinking and problem solving, communication and collaboration, knowledge management and transfer, flexibility and adaptability, initiative and self-direction, productivity and accountability).	In a fast-changing environment, 21st century skills become critical for interpreting the global development drivers in a practical way and for implementing the best available technology and knowledge. As transversal capacities, they will	New methodologies, training formats and training spaces (including non-formal training spaces) Mentoring/supervisory support structure to technical team Team building activities and	Increased coordinated effort in addressing sector's challenges Facilitate the knowledge transfer and mobility of employees between different position and different blue growth sectors	No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery No. of Companies targeted/reached	Companies Academic Centres: VET, Higher level education Trade Unions

[3] For example in Germany it is common to undertake a so called Duales Studium, (Dual Study) which combines vocational training and university study. Attendees have to complete the syllabuses of study and vocational training, this way of education is highly accepted by the industry, this way of education is also perceived as very fruitful but very demanding for the student.

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		facilitate mobility and adaptation to change.	mobility programs (workshops to bridge the gaps in communication and mutual understand of the work areas) Curriculum development		No. of education institutions targeted/reached No. of trainees targeted/reached	
SB 7	**Increase attractiveness of maritime careers** for graduates and early-career skilled workers promoting Ocean Literacy	There is a risk of losing knowledge and experience due to the **aging of the staff:** over 45 years in average for most EU Countries**.** In parallel, there is a **decreasing interest** in the industrial maritime sectors by young people; in some cases, due to a **lack of knowledge** about the possibilities it can offer, and in others for the association with a	Communicating marine science and technology in public domain. (Promoting the understanding of the Ocean's influence on us and our influence on the ocean) Implementing internal procedures within the companies to safeguard the maritime environment.	Increased level of Ocean Literacy in European society and also in maritime technologies sectors workforce at all levels. More visibility for the professional opportunities in the maritime industry. More young people and specialists from other sectors as well as more women attracted to the maritime careers.	No. of publications No. of interested individuals' public organisations targeted/reached No. of Companies targeted/reached No. of education institutions targeted/reached	Companies Academic Centres: VET, Higher level education Communication media

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		negative image, related to the obsolescence and the danger of these activities, and the instability associated with recent crisis.				
SB 8	**Enhancing visibility and promoting the role of women in the shipbuilding sector**	It is highly complex to find aggregated data at European level on women's participation in the shipbuilding industry. Women are underrepresented, both in the trainings concerning maritime industrial sectors, and as workforce. There are still barriers to their normal integration.	Development of study/analysis on women roles in the maritime industry Recommendations for the creation of data series of the workforce indicating gender. Mobility Mentoring/supervisory support structure to technical team Communicating the role of women in the	Updated information on the role of women in shipbuilding, with details of their specific activity within the sector. Organisational culture more inclusive, reducing barriers for women integration.	No. of publications No. of recommendations No. Gaps/Barriers to women normal integration have been identified/reported No. Appropriate and realistic solutions to gaps/barriers into women normal integration have been devised No. of interested individuals, public	Research Centres Academic Centres: VET, Higher level education Government agencies/regulators Companies Trade Unions

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
			maritime industry in public domain		organisations targeted/reached No. of Companies targeted/reached No. of education institutions targeted/reached	
SB 9	**Skills ecosystems**: meeting points for the most relevant stakeholders from Industry, academia and research.	Skills needs are constantly evolving, and the pace of change is accelerating	Recommendations for the creation of connexions among relevant stakeholders beyond the project	Contribution to updated and sustainable data on skills needs	No. of interested public organisations (research, Administration) targeted/reached No. of Companies targeted/reached No. of education institutions targeted/reached	Companies Academic Centres: VET, Higher level education Government agencies/regulators Research Centres Trade Unions
SB 10	**Training, reskilling/ upskilling** workforce in health and safety, adapted to new processes, materials and tasks.	The implementation of new processes will generate new risks at work that will need to be prevented. Those	Mentoring/supervisory support structure to technical team Trainers training	Diminishing of the hazard at work.	No. of Innovative training delivery and organisation (New business models for trainings explored)	Companies Academic Centres: VET, Higher level Education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[2]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		will include risks related with the human-robot interactions, the data driven industry and related tasks, as well as the use of new materials and processes.	Design of training materials (contents and delivery; modular trainings that could be complemented, mechanisms to ease on-the job training can also be a solution besides the creation of *ad hoc* training offer). Mobility		No of innovative content developed and used No. of enterprises targeted/reached No. of Education institutions targeted/reached No. of trainees targeted/reached	Government agencies/regulators Trade Unions

Offshore Renewable Energy

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
ORE 1	**Training, reskilling/ upskilling** workforce in the use of new digital technologies (artificial intelligence, mechatronics, 3D printing, Internet of things, cloud computing, big data).	The mentioned Digital Technologies are gaining an essential contribution throughout the lifecycle of ORE projects, from the planning to the operation and maintenance of the offshore devices. This is expected to have an increased impact in the future, and the workforce should be prepared for this.	Curriculum development/update Design of training materials (contents and delivery) Training methodologies New training formats (including non-formal formats as contests or mobility)	Efficient resource utilisation Increased precision of training schemes to meet industry requirements Cost effective projects Increased number of appropriately qualified workforce in new technologies available in the sector potentially enhanced international competitiveness of involved stakeholders	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	Companies Academic Centres: VET, Higher level education

[4] Should comprise at least one of each of the following types of action: mobility, training, curriculum development, design of training materials

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
					by for instance qualitative and quantitative assessment of job postings	
ORE 2	**Training, reskilling/ upskilling** workforce in order to increase technical knowledge on Energy storage	Energy Storage will be a very important element of the ORE sector and will increase the efficiency of the sector. Therefore, it is important that the skills required to incorporate energy storage methodologies and technologies into the ORE sector are present in the ORE workforce	Curriculum development/update Design of training materials (contents and delivery) Training methodologies New training formats (including non-formal formats as contests or mobility)	Efficient resource utilisation Increased precision of training schemes to meet industry requirements Cost effective projects Increased amount of appropriately qualified workforce in energy storage methods applicable in the sector potentially enhanced international competitiveness of stakeholders	No. of projects within the sector that are undertaken using the new methods No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery No. of Companies targeted/reached No. of education institutions targeted/reached	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
					No. of trainees targeted/reached	
ORE 3	**Develop synergies among sectors** with significant similarities in their needs to promote skills transferability between them (e.g. Oil and gas, offshore wind energy, ocean energy)	The oil and gas sector has important similarities with ORE, especially in the procedures of installation, construction, operation and maintenance. But there are barriers to the mobility of staff as well as to knowledge transfer and dissemination from one sector to the other: i.e. the lack of recognition for the oil and gas certificates to work offshore by the ORE industry.	Recommendations for the recognition of qualifications from oil and gas sectors Curriculum development/update Design of training materials (contents and delivery) Training methodologies New training formats (including non-formal formats as contests or mobility) Communication about ORE sector in public domain and similar sectors' communities	Redundancy minimised Vacant positions filled Cost effective projects Improved execution of projects' works Offshore energy sectoral lessons learnt through shared job positions	No. and types of available mobility schemes No. of employment places/ job opportunities increased by the synergies developed No. of certifications targeted for recognition in ORE sector No. Gaps/Barriers in official recognition pathways have been identified/reported No. Appropriate and realistic solutions to gaps/barriers in official recognition pathways have been devised	Companies Academic Centres: VET, Higher level education Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
ORE 4	Opportunities for **skills diversification** from parallel sectors e.g. Fisheries, aquaculture, and marine operations. Particular skills in ROVs, health and safety, marine operations.	Parallel sectors have important similarities with ORE, especially in the use of ROVs and in marine operations and health and safety of working at sea. But there are barriers to the mobility of staff from one sector to the other: i.e. the lack of knowledge and awareness of workers in these sectors about the ORE sector requirements.	Recommendations for the recognition of qualifications from parallel sectors Curriculum development/update Design of training materials (contents and delivery) Training methodologies New training formats (including non-formal formats as contests or mobility) Communication about ORE sector in public domain and parallel sectors' communities as industrial stakeholders may	Cross sectoral lessons learnt through shared job positions Redundancy minimised Vacant positions filled Cost effective projects Improved execution of projects' work	No. and types of available mobility schemes No. of employment places/ job opportunities increased by the synergies developed No. of certifications targeted for recognition in ORE sector No. Gaps/Barriers in official recognition pathways have been identified/reported No. Appropriate and realistic solutions to gaps/barriers in official recognition pathways have been devised	Companies Academic Centres: VET, Higher level education Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
			require immediate ability to work in commercial projects upon commencement of the job placement, governmentally supported training schemes might be helpful to assist the transfer from one to the other sector]			
ORE 5	**Multi-disciplinary** skills outside of specialisation. E.g. Ecologists should also have skills in technological development, business/ financial aspect of ORE	In business, there is a requirement for members of the workforce to understand elements outside of their specialisation in order to maximize the commercial success of the sector. This has been flagged particularly in relation to those without business/ financial expertise requiring this expertise in order to	Mentoring/supervisory support structure to technical team Trainers training Design of training materials (contents and delivery; modular trainings that could be complemented, mechanisms to ease on-the job training can also be a solution besides the creation of ad hoc training offer).	Cross sectoral lessons learnt within the sector Redundancy minimised Vacant positions filled Improved execution of projects' work Cost effective projects	No. and types of integrated work available No. and types of collaborative initiatives available	Companies Academic Centres: VET, Higher level education Trade Unions Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		maximize the opportunity for commercial success across all facets of a commercial ORE project.				
ORE 6	Increasing the levels of **experience and specialisation** gained by temporary employment	Short term contracts lead to temporary employment and hence low levels of specialisation and experience. This is a challenge in the ORE sector	Curriculum development Design of training materials (contents and delivery) Training methodologies Review of HR hiring and staff retention mechanisms Review of funding sustainability	Skills loss minimised Dedicated workforce retained Increased number of experts and specialist available in the sector Improved execution of projects' work	No. of barriers to staff retention mechanisms identified/reported No. of appropriate and realistic solutions to gaps/barriers to staff retention have been devised	Companies Academic Centres: VET, Higher level education Trade Unions Government agencies/regulators
ORE 7	Specialisation and experience in **offshore economics** related to market, financial and investment analysis, such as Levelized Cost of Energy (LCOE) reduction, subsidy framework, etc.	As an emerging sector, there is a greater requirement for expertise and experience in offshore economics in order to ensure	Curriculum development/update Design of training materials (contents and delivery)	Increased experience and specialty in project finance / investment Increased coordinated effort in	No. of innovative content developed and used for the purposes of training delivery No. of Companies	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		the success of ORE developments on a commercial scale.	Training methodologies	addressing sector's challenges Increased number of experts and specialists available in the sector	targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached No. of skills that are not yet standardized identified. No. of innovative content developed and used for the purposes of training delivery No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
ORE 8	Need for specialisation and expertise in **skills that are not yet standardized** and are still under development e.g. Decommissioning	ORE, as an emerging sector needs to develop standardized protocols. Skills will be required in these aspects of the industry as it develops, and standards are required.	Curriculum development/update Design of training materials (contents and delivery) Training methodologies	Increased confidence in undertaking high-risk and challenging projects Increased coordinated effort in addressing sector's challenges	Amount of MATES Project experts available in the sector No. of types of innovative methods employed in new, under development facets of ORE value chain	Companies Academic Centres: VET, Higher level education Government (Marine Scotland Science, EMEC and their similar in other countries)
ORE 9	Research and development of **legislation, guidelines and policies** associated with offshore renewable energies	Due to the developing nature of this sector, legislation, guidelines and policies will be required as the sector grows in order to support its development appropriately and ensure its sustainability (both commercially and environmentally)	Curriculum development/update Design of training materials (contents and delivery) Training methodologies	Increased coordinated effort in addressing sector's challenges Increased support to the sector's further development	No. of research outputs No. of publications Ability for policy driven success of the sector	Companies Academic Centres: VET, Higher level education Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
ORE 10	**Promote/ enhance 21st Century skills: adapted to the different needs of 'blue collar' and "white collar" roles:** teamwork, communication, analytical skills. (Also referred to as soft skills, and including capacities such as creative thinking and innovation, critical thinking and problem solving, communication and collaboration, knowledge management and transfer, flexibility and adaptability, initiative and self-direction, productivity and accountability).	In a fast-changing environment, 21st century skills become critical for interpreting the global development drivers in a practical way and for implementing the best available technology and knowledge. As transversal capacities, they will facilitate mobility and adaptation to change. This has been specifically noted in relation to 'white collar' roles	New methodologies, training formats and training spaces (including non-formal training spaces) Mentoring/supervisory support structure to technical team Development of team building activities and mobility programs	Increased coordinated effort in addressing sector's challenges	No. of innovative training delivery and organisation (New business models for trainings explored) No. of innovative content developed and used for the purposes of training delivery No. of Companies targeted/reached No. of education institutions targeted/reached No. of trainees targeted/reached	Companies Academic Centres: VET, Higher level education
ORE 11	Enhance **Ocean Literacy** in offshore renewable energy to **increase attractiveness of maritime careers** for graduates and early-career skilled workers	As an emerging sector, there is a gap in the public's general knowledge of the industry. Increasing this general knowledge of the technology,	Didactic information in knowledge exchange platforms Training. Educational Mobility	Increased level of Ocean Literacy in European society and also in maritime technologies sectors workforce at all levels.	Amount of MATES Project experts available in the sector No. of research outputs	Companies Academic Centres: VET, Higher level education

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
		environmental impact, carbon saving potential, etc. will ultimately increase the attractiveness of entering the workforce of the sector. This would also raise the priority level of support for the sector in the public domain.	Curriculum development/update Design of training materials Communicating marine science and technology in public domain. (Promoting the understanding of the Ocean's influence on us and our influence on the ocean)	More visibility for the professional opportunities in the maritime industry. More young people and specialists from other sectors attracted to the maritime careers.	No. of publications No. of interested individuals and public organisations targeted/ reached	Communication media
ORE12	Promoting **STEM women** in ORE	It has been noted that there are relatively low levels of equal gender representation in the STEM aspects of the ORE Sector.	Development of study/analysis on women roles in the maritime industry Recommendations for the creation of data series of the workforce indicating gender. Mobility	Increased numbers of women working within the ORE sector Updated information on the role of women in ORE, with details of their specific activity within the sector.	No. of women newly recruited in the sector No. of publications No. of recommendations No. Gaps/Barriers to women normal integration have been identified/reported	Companies Research Centres Academic Centres: VET, Higher level education Government agencies/regulators

Reference No.	Title	Challenge referring to relevant needs and gaps from those identified	Scope and possible instruments[4]	Expected Impact	Relevant indicators	Actors/ Stakeholders
			Mentoring/supervisory support structure to technical team Communicating the role of women in the maritime industry in public domain		No. Appropriate and realistic solutions to gaps/barriers into women normal integration have been devised No. of interested individuals, public organisations targeted/reached No. of Companies targeted/reached No. of education institutions targeted/reached	

Criteria for Prioritisation

The following seven criteria were used in voting on the prioritisation of the Lines of Action discussed above:

1. Sector relevance
2. Geographic relevance
3. Political relevance
4. Urgency
5. Cost
6. Impact on employability
7. Attractiveness

Sector Relevance

Sector relevance describes how relevant the 'Line of Action' is to the sector (i.e. Shipbuilding or Offshore Renewable Energy).

Lines of Action were assessed by measuring their current individual and/or cumulative relevance to each sector or their predicted relevance in the future.

This question was asked as follows: 'How relevant is this Line of Action to the Shipbuilding/ Offshore Renewable Energy sector' with possible answers 'very relevant', 'relevant', 'not relevant', and 'I don't know'.

Geographic relevance

It was equally important to consider the geographic relevance of each 'Line of Action'. As stated in WP2 Baseline Discussion Document;

"As far as the development of a consistent set of skills is concerned… regional characteristics should be considered, meaning that each geographical region has special skills requirements determined by cultural features and the sectors' growth in this area. For example, Spain has limited experience in offshore renewables sector leading to different skills gaps in contrary to the rest of the European countries. As a result, the identification of methods and criteria for skills requirements and assessment should take into consideration the special characteristics of each region."

Geographic relevance criterion is the degree to which a Line of Action in a certain geographical context matches a sector's implicit or explicit need, and the extent to which the Line of Action further supports the decision-making or problem solving process of addressing the identified gap(s) and challenge(s).

Geographic relevance was assessed by looking at the relevance of each action to European Sea Basins, which are designated Marine Regions under the Directive 2008/56/EC:

- Baltic Sea
- North Sea
- Mediterranean Sea
- Black Sea
- Atlantic Ocean
- Arctic Ocean
- Adriatic and Ionian Sea
- Outer Regions

Within each Line of Action, workshop participants were asked to nominate the two most relevant sea basins that the Line of Action is relevant to in their opinion.

Political support

In order to efficiently and effectively address skills gaps in the Shipbuilding and Offshore Renewable Energy sectors, political relevance of the identified 'Lines of Action' was considered.

The political support criterion is the level of how a multidimensional construct encompassing actions of political leaders and institutions (specific support) as well as adherence to basic regime principles (diffuse support) provide a conducive environment for a Line of Action in each sector. The scope of political support that is relevant to MATES is the European political support. This criterion is therefore the level of support that is present currently in relation to the Line of Action from the perspective of EU political leaders, institutions.

Further qualitative information on other scopes of political support (e.g. local, national) was collected during the qualitative discussion session at the Workshop. The political support for certain current or predicted future skills gaps will have an influence on how and when they can be resolved.

Quantitative data on this criterion was collected by asking workshop attendees to vote on each Line of Action under this criterion answering, "What is the level of political support of this Line of Action", with 'high', 'medium', 'low', 'fluctuating', or 'zero'.

Urgency

The urgency criterion refers to how fast and swift actions are needed to be undertaken in order to address a Line of Action

The urgency of the 'Lines of Action' is important in the prioritisation, because the skills gaps that are most urgent and that have the most prominent negative effects on the sectors should be addressed first in order to maximise the success and longevity of these industries.

For each Line of Action, the question was asked as follows: "how urgently should this Line of Action be addressed?" with possible answers: 'Very urgently', 'urgently', 'not urgently', 'I don't know'.

Cost

The cost criterion is understood as the sum of money / total investment required to address a Line of Action

It is important to consider cost in the prioritisation of 'Lines of Action' as there is a limited budget available to address the identified skills gaps and test the 'Pilot Actions'.

The question which was asked as follows:

- What is the scale of cost implication in addressing this Line of Action? With possible answers 'Low', 'Medium', 'High'
- Please rank in ascending order the Lines of Action according to their cost implications

Impact on employability

The impact on employability criterion refers to how a Line of Action creates a difference in the process that influences an individual's chances of a job and steps in the internal and external labour market.

The overall impact on employability is very important to consider in the prioritisation of' Lines of Action'. Whether addressing current or future skills gaps, the MATES Project aims to achieve the maximum impact on employability while maximising the competitiveness of the Shipbuilding and Offshore Renewable Energy sectors through analysis and addressing of skills gaps.

For example, if the people completing the targeted training / educational programs had the skills described in this Line of Action, what would the overall impact on their employability be?

Attractiveness

The attractiveness criterion is the measure of how facilities, materials, subjects, and professional perspectives relating to a Line of Action have the ability of making the sector appealing to young talents, future employees, potential employers, and investors.

The attractiveness criterion is necessary to identify what impact a Line of Action will have on the corporate image of the shipbuilding and offshore renewables industry.

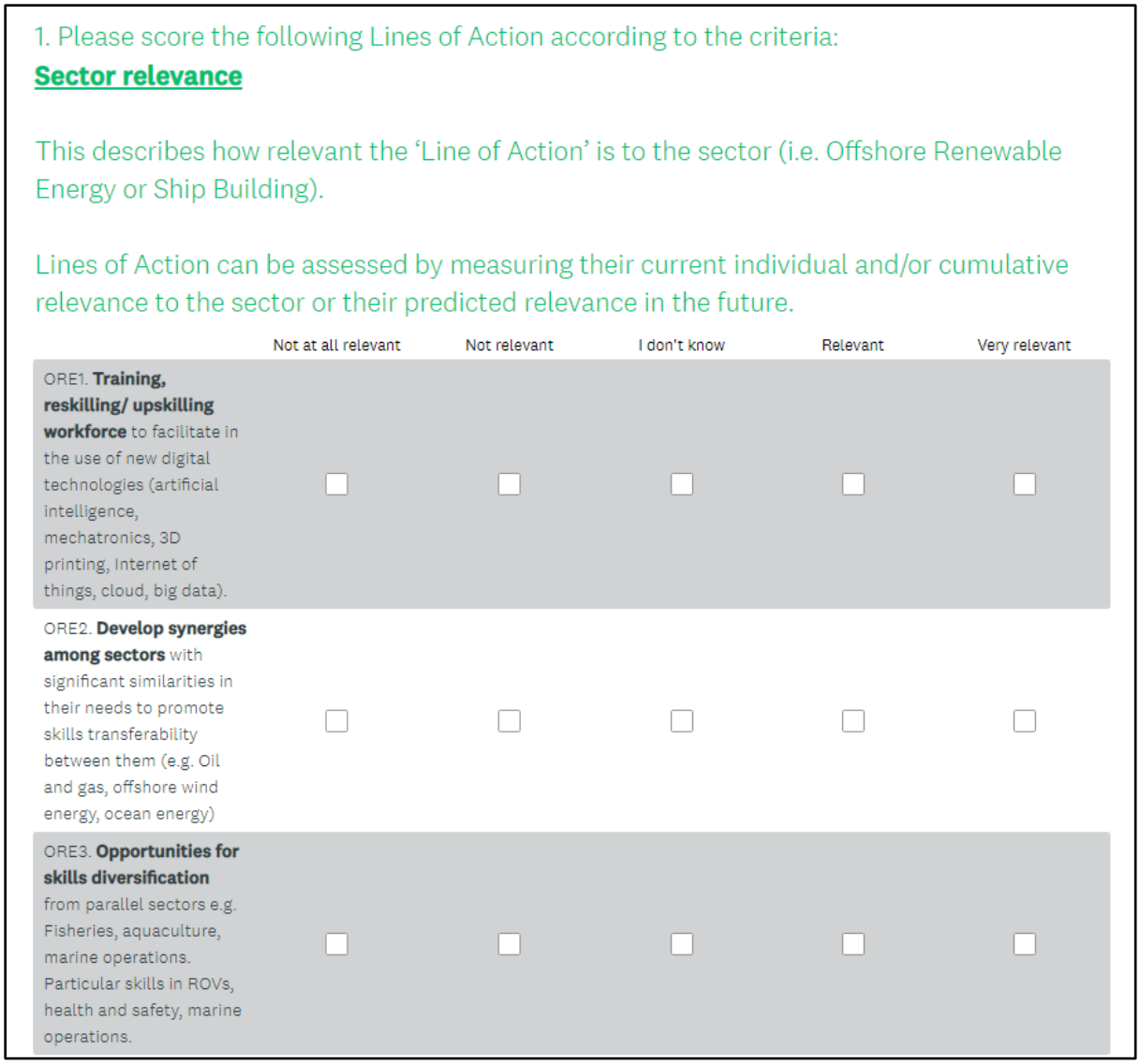
Web-based Workshop & Voting system

The workshop was held as an online webinar on Thursday 7th March 2019 from 10.00 - 12.00 GMT. The online webinar service GotoWebinar was used https://dashboard.gotowebinar.com/#/. All Experts within the Thematic Groups were invited to participate (Full list of these Experts can be found on the MATES website and intranet).

The agenda for the workshop is provided below. The workshop objectives and plan of activities to be undertaken were explained at the start of the workshop. Explanations of the short lists of 'Lines of Action' for the Shipbuilding and Offshore Renewable Energy sectors were provided next. This was then be followed by a presentation of the criteria for which the prioritisation voting was based. The voting process was then carried out and quantitative primary data was collected. A discussion session followed in order to allow for a high level qualitative primary data collection. A mixed method was used to analyse the primary data collection.

Table 1 Draft Agenda for the online workshop

Time	Item
10:00-10:15	Introductions & Instructions
10:15-10:25	Background
10:25-10:45	Presentation of lines of action (Shipbuilding)
10:45-11:05	Presentation of lines of action (Offshore Renewable Energy)
11:05-11:20	Presentation of Criteria
11:20-12:00	Voting
12:00-12:20	Qualitative data collection
12:20-12:30	Conclusions and Next Steps


1. Please score the following Lines of Action according to the criteria:

Sector relevance

This describes how relevant the 'Line of Action' is to the sector (i.e. Offshore Renewable Energy or Ship Building).

Lines of Action can be assessed by measuring their current individual and/or cumulative relevance to the sector or their predicted relevance in the future.

	Not at all relevant	Not relevant	I don't know	Relevant	Very relevant
ORE1. **Training, reskilling/ upskilling workforce** to facilitate in the use of new digital technologies (artificial intelligence, mechatronics, 3D printing, Internet of things, cloud, big data).	☐	☐	☐	☐	☐
ORE2. **Develop synergies among sectors** with significant similarities in their needs to promote skills transferability between them (e.g. Oil and gas, offshore wind energy, ocean energy)	☐	☐	☐	☐	☐
ORE3. **Opportunities for skills diversification** from parallel sectors e.g. Fisheries, aquaculture, marine operations. Particular skills in ROVs, health and safety, marine operations.	☐	☐	☐	☐	☐

Figure 2 Example question from the survey showing how each Line of Action will be scored allowing each Line of Action to be scored and hence prioritised.

The voting results will be collated and scored. This will be used to compare the 'Lines of Action' and prioritize them based on each score. This information will be presented in the Baseline Strategy.

Cross referencing with secondary data collected previously through the stakeholder consultation and baseline data collection work done to date within MATES will be performed. Quantitative and qualitative analysis are to be carried out using a combination of the following methods:

- Quantitative analysis (statistical analysis, cost and benefit analysis, risk analysis)
- Qualitative analysis (language and object analysis, and actor-network analysis).

Below there is an example of the collated data and graphs that will be produced. These data will be presented and analysed in the Baseline Strategy and will be used to fully scope the 'Pilot Actions'.

Table 2 Example of scoring results (dummy data) with a sum calculation. Basic example of analysis to determine prioritised list of Lines of Action

Lines of Action	Sector relevance	Geographic relevance	Political relevance	Attractiveness	Urgency	Cost	Impact on employability	Total Score
SB 1	1	4	4	17	19	4	17	**66**
SB 2	14	18	20	5	4	7	2	**70**
SB 3	9	18	0	13	20	10	4	**74**
SB 4	6	20	2	2	2	11	12	**55**
SB 5	1	5	2	5	16	18	11	**58**
SB 6	18	2	3	9	18	9	14	**73**
SB 7	10	9	19	15	6	10	9	**78**

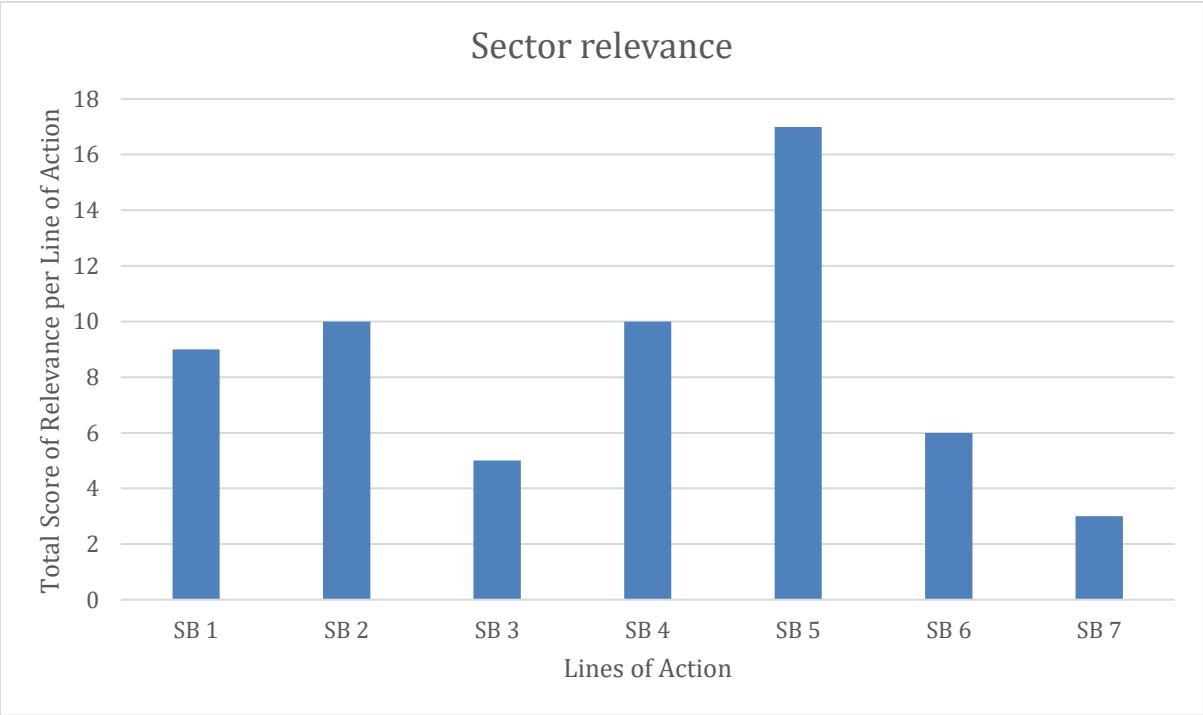


Figure 3 Example showing how data could be presented (dummy data) to show overall validation of Lines of Action per criteria

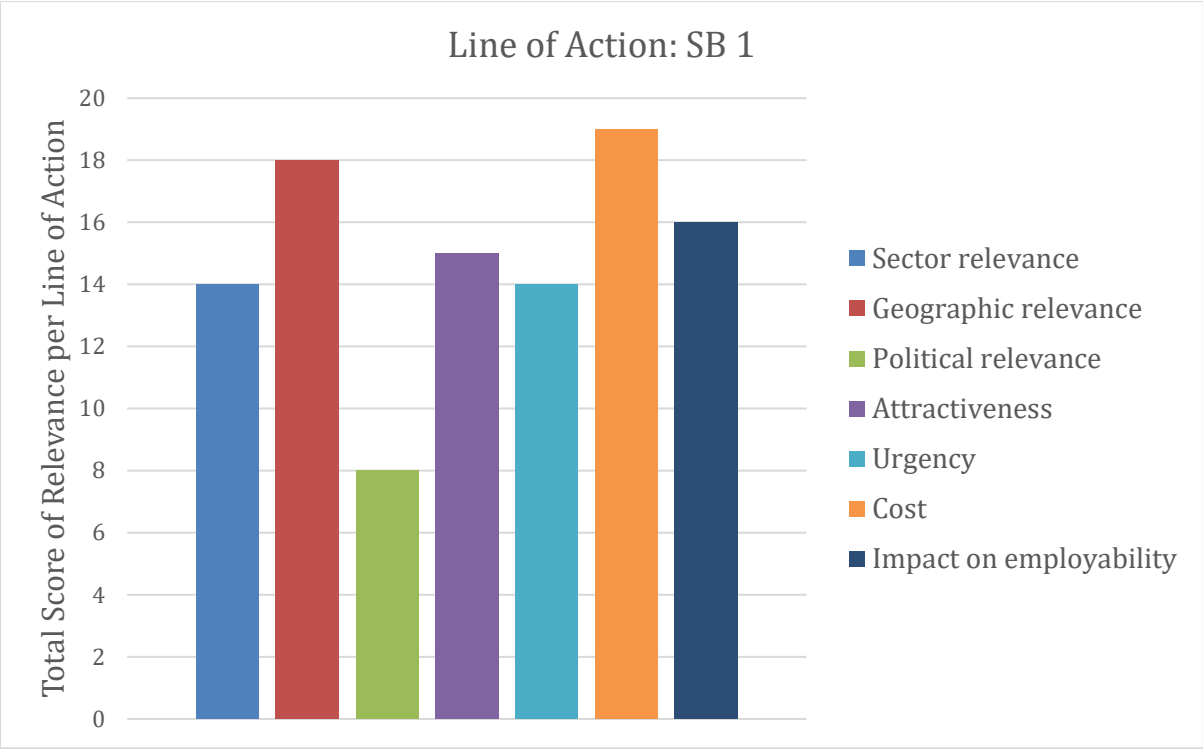


Figure 4 Example showing how data could be presented (dummy data) to show overall score of Lines of Action per criteria

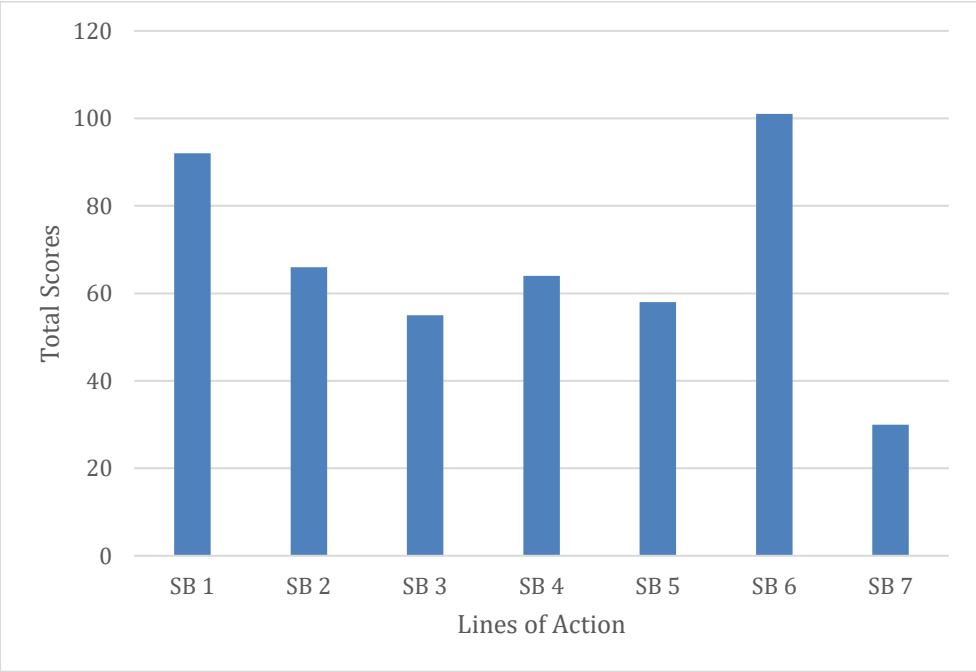


Figure 5 Overall comparison of total scores of Lines of Action

Scoring System

A score was applied to each result according to the formula below. Using this formula, a single score was assigned to each Line of Action within each criterion. This allowed the Lines of Action to be ranked according to each criterion. Using this formula means that if all Experts voted for the top scoring option for a Line of Action within a criterion; that Line of Action will be rewarded a score of 1.0.

$$Total\ Score = \frac{(n * Total\ votes\ for\ Option\ 1) + (n-1 * Total\ votes\ for\ Option\ 2) + (n-2 * Total\ votes\ for\ Option\ 3)}{(n) * Total\ number\ of\ votes}$$

It should be noted that 'I don't know' was an option within all questions. This was done in order to remove the possibility of blind voting due to lack of knowledge. In all cases the 'I don't know' responses were removed from the analysis to avoid this bias affecting the results.

For example, within the criteria Sector Relevance, the Experts were asked to choose an option from the following list; 'Very relevant', 'relevant', 'not relevant', 'not at all relevant', and 'I don't know'. The distribution of scores is shown below.

Table 3 Example of how scores were applied to answers to calculate Total Score

Response	Score
Very relevant	4
Relevant	3
Not relevant	2
Not at all relevant	1

This was carried out for the following criteria, for both Shipbuilding and Offshore Renewable Energy.

1. Sector relevance
2. Political support
3. Urgency
4. Impact on Employability
5. Attractiveness

Question 2. Geographic relevance and Question 5. Cost ranking have been scored slightly differently due to the different format of these two questions.

In order to combine these five criteria and provide an overall score for each Line of Action under these standard criteria, the scores were combined, and weighting was applied in order to consider the relative importance of some criteria over others. Weighting was applied as can be seen in the formula below but multiplying each of the scored for the weighted criteria by a factor of 1.5. The other two unweighted criteria were simply multiplied by a factor of 1 only. The following criteria were considered to be more important and hence were weighted in the calculation of the overall scores

1. Sector relevance
2. Urgency
3. Impact on Employability

The overall scores were calculated as follows (Where x is the Total possible score for that criteria):

$$Overall\ Score = \frac{[Total\ score\ sector\ relevance] * 1.5 + [Total\ score\ political\ relevance] + [Total\ score\ urgency] * 1.5 + [Total\ score\ impact\ on\ employability] * 1.5 + [Total\ score\ attractiveness]}{x[sector\ relevance] * 1.5 + x[political\ relevance] + x[urgency] * 1.5 + x[Impact\ on\ employability] * 1.5 + x[Attractiveness]}$$

Conclusion

This report sets out to deliver: 1) Lines of Action, 2) Criteria to prioritise the Lines of Action, and 3) Consultation and online voting for Lines of Action prioritisation.

These were achieved by the following results:

- 10 Ship Building (SB) Lines of Action defined and 12 Offshore Renewable Energy (ORE) Lines of Action Defined
- 7 Criteria for prioritisation were established Sector relevance

    1. Geographic relevance
    2. Political relevance
    3. Urgency
    4. Cost
    5. Impact on employability
    6. Attractiveness
- Web-based workshop and online voting system conducted

The findings contained in this report will be used to inform D3.2 and the follow-on fine-tuning and detailed planning of the Pilot Actions.

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