SKILLSEA

STRATEGY KEY FINDINGS

Key findings, policy recommendations and proposed actions

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Executive Summary

SkillSea's mission has been to provide a future-proof educational and strategic solution for the qualitative and quantitative mismatch between demand and supply of labour for maritime shipping and to increase the horizontal, vertical and geographical mobility of maritime professionals along with the attractiveness of the sector as a career path. This report encapsulates the project's key findings and ensuing policy recommendations together with proposals for immediate or longer-term actions, formulated by mobilising stakeholder participation through industry-wide dissemination, large surveys and consensus-building methodologies. SkillSea identified key shipping trends and related skills needs (current, medium and long term). SkillSea designed strategies and tools for critical aspects of European Maritime Education and Training (MET) as well as A Vocational Education and Training (VET) Toolbox for upskilling or reskilling, flexible in terms of the European Qualifications Framework (EQF) and built on a set of key modern Educational Packages pivoting on digitalisation, sustainability and leadership.

The SkillSea solution is an integrated one: it provides coordinated tools and strategies for untying the 'triple-knot' of skills gaps, career attractiveness and mobility of maritime professionals. It turns the challenge of sustainability and digitalisation into an opportunity for a radical new approach to maritime careers. On the basis of the modern skills of the future-proof Toolbox, mobility is promoted while the poor image of maritime careers is reversed. SkillSea supports this with proposed coordinated attractiveness campaigns, the SkillSea-created Maritime Education and Training Network (MET-NET) for MET structural cooperation, and the SkillSea-proposed European Maritime Skills Forum (E-MSF) for linking METs with their stakeholders, gaps discovery and knowledge transfer.

I. Synopsis of SkillSea strategy key findings:

- Rapid emerging technologies, digital transformation on ships and in ship operations, together with an increased focus on sustainability, require the development of future-proof skills for maritime professionals – resulting in a substantial need for upskilling and reskilling these professionals.

- While a widespread introduction of autonomous ship operations offered by digitalisation and emerging technologies is not expected in the short or medium term, the increasing use of new technologies will continue to change practices onboard ships and in ship operations This will intensify the need for maritime professionals to have an in-depth understanding of the complex systems on their vessels.

- The impact of regulatory requirements for more sustainable shipping operations – including the use of 'greener' fuels and other measures to reduce emissions from shipping – is expected to be strong in the short to medium term, similarly requiring new and enhanced skills to ensure safe and environment-friendly operations.

- Occupational profiles of maritime professionals at sea are changing slowly. Related trends may accelerate and require close monitoring which can be achieved if Maritime Education and Training (MET) providers cooperate, not only among themselves but also with wider MET stakeholders.

- While increasing the need for the close following of these trends and the subsequent adaptation of MET curricula, the use of modern technology and skills to respond to the needs of digitalisation and sustainability can promote the repositioning of maritime shipping professions. Not only at sea but also ashore as a prospective career where newcomers to the labour market can apply their talent in innovation, widen their knowledge on sustainability issues and deepen their mastery of digitalisation. New skills support mobility and can enhance the attractiveness of a career in shipping, if appropriately integrated in MET provision including lifelong learning.

- Strategic cooperation among MET providers through the MET-NET network established by SkillSea should strengthen – and be strengthened by – mobility opportunities among METs. The SkillSea solution includes a number of tools for facilitating selection of strategic partners among METs and for mutual recognition of acquired credits.

- MET stakeholders across Europe should build on the provision of future-proof skills for supporting mobility. This must be within the sector itself, and also in sectors linked to shipping or even unrelated to it, by highlighting the versatile character of such skills and thus increasing career attractiveness.

- Employability in maritime shipping sector can be supported in two ways. Firstly, by the use of the proposed SkillSea tool to enable the measurement of the inclusion of relevant elements in MET curricula or the self-assessment of prospective maritime professionals. Secondly, by the use of the proposed mechanism for measuring gaps, GAPMMMET, for which input by MET stakeholders through surveys will be coordinated initially mainly by MET-NET, with the eventual involvement of E-MSF (see next page).

- In the context of a long-term action plan, the SkillSea solution is complemented by the proposal for the creation of a European Maritime Skills Forum (E-MSF), which can allow the exchange of information and of best practices while also serving as a two-way information channel between European METs and European MET stakeholders. The creation of such a forum is deemed critical for accelerating adaptation of METs to new developments in the industry, whether technological, organisational or related to sustainability and regulatory requirements.

II. Approach and organisation of the content of the report

SkillSea fully and innovatively addressed the key questions of the 2017 project call:

1. Which are the major forces impacting on maritime shipping and what trends have they set?
2. What are the major impacts of forming trends on occupational profiles, skill shortages and gaps?
3. Which actions need be taken to reduce related mismatches, and at what level?
4. Can solutions to the maritime skills issues be derived from a Blueprint methodology and content of a VET upskilling/reskilling package?
5. Can MET specific tools, based on EQF, Cedefop and ESCO elements, assist in increasing mobility, employability, MET stakeholders' cooperation and maritime career attractiveness?
6. How can a structural cooperation of European MET providers be built to support future-proof skills and improve provision?
7. How can visibility of SkillSea results assist in rolling-out best practice mechanisms for business/education partnerships?
8. How can such partnerships be implemented at a regional/national context?
9. Can implementation of SkillSea suggested strategic partnership policies be promoted by EU funding or initiatives at other levels?
10. Finally, how can the concept and the specific elements of the SkillSea strategic solution assist in supporting the sector at European level?

Following the first section of the present report, which summarises the methodology for achieving the collaborative vision of SkillSea and introduces key directions of the strategy framework, D3.7 'Key Strategy Findings' focuses sequentially on the key answers to the above list of questions. The report's final section includes an all-encompassing proposal for the implementation of the suggested SkillSea strategic solution at national, regional and eventually European level.

Overall, the core sections of the report cover the following themes:

- Emerging sectoral trends: scenarios (S2)
- Impact of emerging trends on occupational profiles (S3)
- The versatile SkillSea toolbox for future-proof skills (S4)
- Untying the triple knot: skills, mobility, and career attractiveness (S5)
- MET internationalisation, cooperation and evaluation strategies and tools (S6)
- Priority policy recommendations and proposed actions – the SkillSea legacy (S7)

A comprehensive summary of the methodology, key findings, policy recommendations and proposed actions can be found here.

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List of abbreviations

Abbreviation	Definition
AHP	Analytic Hierarchy Process
BIMCO	Baltic and International Maritime Council
Cedefop	European Centre for the Development of Vocational Training
CoC(s)	Certificate(s) of Competency
CoP	Certificate of Proficiency
DMA	Danish Maritime Authority
D&S	Digitalisation & Sustainability
DX.X	Deliverable X per work package X
DWT	Deadweight Tonnage
EACEA	European Education and Culture Executive Agency
ECVET	European Credit system for Vocational Education and Training
ECSA	European Community Shipowners' Associations
ECTS	European Credit Transfer and Accumulation System
EEA	European Economic Area
EF	Eugenides Foundation
EMSA	European Maritime Safety Agency
EQF	European Qualifications Framework
ESCO	European Skills, Competencies, Qualifications and Occupations
ETF	European Transport Workers' Federation
ETO	Electrotechnical Officer
EU	European Union
F.E.M.I.R	Future European MET Internationalisation Roadmap
GAPMMMET	Gaps Measurement Mechanism for MET
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GMDSS	Global Maritime Distress and Safety System
HE	Higher Education
HQ	Headquarters
IAME	International Association of Maritime Economists
IAMU	International Association of Maritime Universities
ICS	International Chamber of Shipping
ICT	Information and Communications Technology
ID	Identification

Abbreviation	Definition
IMLA	International Maritime Lecturers Association
IMO	International Maritime Organization
IoT	Internet of Things
ISM	International Safety Management (Code)
ISS	Internationalisation Strategy Statement
IT	Information Technology
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MARPOL	The International Convention for Prevention of Marine Pollution from Ships
MCDM	Multiple-Criteria Decision-Making
MET	Maritime Education and Training
MLC	Maritime Labour Convention
MTC	Maritime Training Centre
MoU	Memorandum of Understanding
NW	North-western
OPs	Occupational Profiles
OWS	Oily Water Separation
PREC(s)	Policy Recommendation(s)
SAP(s)	Specific Policy Action(s)
S.E.A.B.AN.T	Shipping Employability AHP Based Anticipating Tool
S.M.I.E.A	Standardised MET International Exchange Agreement
ST.E.ME.T	Strategic Evaluation MET Tool
STC Group	The Shipping and Transport College Group
STCW	Standards of Training, Certification and Watchkeeping
STRA.D.L	Strategy Direction Location
TMSA	Tanker Management Self-Assessment
Trans.I.T	Transfer International Tool
VET	Vocational Education and Training
WP	Work Package

1. Methodology & outline of contents

1.1. Building the shared SkillSea strategic vision

1.1.1. A common vision across the SkillSea alliance

The final report of WP3 on Strategy Key Findings reflects the collaboratively formed common vision of the SkillSea partnership on the way ahead. A triple knot must be untangled, consisting of the need to deliver new future-proof skills required for maritime shipping as digitalisation and sustainability change operational requirements. Secondly, the job mobility of maritime professionals needs to be improved and the career attractiveness for current and prospective maritime professionals must be increased. In order to form such a vision, a comprehensive understanding of the stakeholders and processes involved was necessary and the diversity of current shipping industry orientations had to mapped. National MET policies across Europe vary and finding a single solution within a variety of national MET EQF[1] levels in EEA countries was a challenge. This backdrop also presented a hurdle for the design of relevant educational material and strategies and tools for MET structural cooperation and connection with stakeholders in Europe, for internationalisation and evaluation for future-proof MET education.

The formulation of a shared solution was achieved by the project partnership. The partnership focused on common elements rather than on diverging ones and by using consensus-building methodologies such as Delphi and validation surveys. In the process, the inclusion of representatives of the main stakeholders in the sectoral alliance on skills for the sector played a key role in the successful completion of the task. The end result was that solid common ground was found by consensus and duly put into use. In this way, shared vision materialised and the SkillSea policy recommendations and proposed action plan were formed.

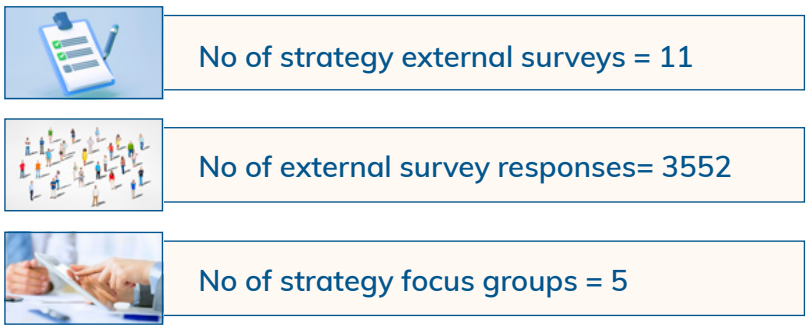
1.1.2. External input and validation

A large number of surveys, focus groups and various consultation methods with stakeholders, informed the project, as reflected in the SkillSea strategy reports. This included the wide participation of maritime professionals, MET instructors and MET managers, along with employers. Critical surveys, such as those on skills gaps and future resilience, and on evaluation and internationalisation, benefitted from the input of thousands of participants (cf. Figure 1.1).

Additional numbers contributed through the running of pilots of the educational material produced. An overall solution addressing the upskilling and reskilling needs of the maritime professional is needed, together with fostering job mobility and boosting the attractiveness of the maritime career. The overall solution as presented was reached by the assessment of needs and gaps leading to proposals for policies and actions. The internal and external surveys and other stakeholder-consultation methods used across the project secured a solid basis to reach the proposed solution.

1 *European Qualifications Framework, cf. Annex 8.*

FIGURE 1.1 SIZE AND LEVEL OF EXTERNAL INPUT TO SKILLSEA STRATEGY



1.2. Assessment, forecasting and consensus-building methodologies

1.2.1. Range of methodologies applied in SkillSea

In terms of the nature and range of methodologies applied, the results of all WP3 strategy deliverables and of other key SkillSea reports – which served as core input to this report – were based on:

- literature review
- insights from related projects
- review of relevant regulation and frameworks
- industry publications
- online surveys
- focus groups
- validation Delphi survey rounds among partners for consensus-building, including for the full list of policy recommendations and related actions

1.2.2. Methodology of the key findings report

The methodological approach for the core content of deliverable 3.7 and ensuing policy and action recommendations included in this report was based on the following consensus-building blocks:

- Early 2022, online sessions of work package leaders with consecutive rounds of polls on key strategy findings for inclusion.
- Delphi rounds on policy recommendations during the two 2022 on-site SkillSea workshops in Brussels, Belgium, and in Aalesund, Norway; a dedicated session during this last 2022 workshop provided commonly elaborated actions for implementation of policy recommendations.
- Input to the sections of the present report was sought by work package leaders, including figures and tables which referred to key findings relevant to the SkillSea strategy.
- In collaboration with the project leader, a dedicated WP leaders' workshop was organised in January 2023 in Rotterdam, with a follow-up online meeting during which a final full list of SkillSea results and related policy recommendations and concrete actions was formulated and agreed (cf. Annex 1).
- A final validation round of all policy recommendations and the formulation of a hierarchical list of 10 priority ones among them took place during the last workshop in Rotterdam in late March 2023.

- An extensive Executive Summary document for dissemination to stakeholders and participants in the final SkillSea conference, held in Brussels in May 2023, was prepared and presented at the last SkillSea workshop, then reviewed by the project management, the two stakeholder partners and assigned members of the advisory board before the submission of the final document.

1.3. Key input and themes TX

The main results of the SkillSea deliverables served as key input for this report and defined the themes covered by it. These are, in summary and with indication of the relevant section of the present document, as follows (numbers of the relevant SkillSea reports are in brackets):

1 Sustainability, digitalisation and autonomy of operations – Section 2

The trends towards sustainable and digital and smart shipping are the key drivers of current industry change. While a widespread introduction of autonomous vessels is not expected in the short or medium term, gradual implementation of supporting technology will continue to change onboard operations, while the impact of fuel transition is estimated to become stronger in the short to medium term (D3.1 and 1.1.3.).

2 The impact of current key trends on skills of maritime professionals – Section 3

Rapid technological change, digital transformation and an increased focus on sustainability, challenge future-proof skills for maritime professionals, resulting in a substantial need for upskilling and reskilling (D3.1 and D3.2).

3 Slowly emerging occupational profiles – Section 3

New skills and competencies should be promoted globally through the revised STCW Convention and Code for harmonised implementation via the International Maritime Organization (IMO). New occupational profiles are not expected to emerge in the short to medium term, but new ones may be added in the longer term. However, long-term developments depend on unforeseeable digital/technology breakthroughs or sustainability challenges. Opportunities offered by digitalisation, sustainability and emerging technologies should be effectively applied in education, reskilling and upskilling to render seafarers future-ready (D3.1, D3.2 and WP 1.2.3).

4 A commonly perceived need for updating educational material – Section 4

SkillSea surveys revealed common perceptions – at varying degrees – among industry employers and maritime professionals on outdated skills and educational material. There was also clear evidence of a common perception of the level of the short-term resilience of current skills, especially in new areas such as digitalisation and automation onboard and ashore (D2.3, D3.3).

5 A toolkit approach serves the diversity of European MET systems – Section 4

SkillSea responded to the assessed industry new trends by delivering an adaptable toolbox approach to create generic syllabi for upskilling and reskilling, flexible in terms of EQF level. Emerging training needs such as safety and security are thus also supported. The toolbox approach cultivates lifelong learning and supports intra-sectoral mobility along with management of change (D2.1 and D2.2).

7 Upgraded MET content highlights more attractive career paths – Section 5

The range of career paths open to maritime professionals will be enhanced by upgrading MET education thought the inclusion of skills required today and in the future by industries inside, at the fringe, or beyond the maritime sector. Highlighting the nature of these skills has the potential to attract a more diverse pool of prospective maritime professionals. Such an approach will help to increase the attractiveness of maritime careers, which can redress seafarer shortages and address qualification mismatches. Attractiveness-focused campaigns should highlight technological developments, digitalisation, sustainability and intra-sectoral mobility to show career opportunities related to contemporary skills in high demand (WP4 deliverables).

8 Strategy and strategic support tools for evaluation, internationalisation, employability, and cooperation – Section 6

International cooperation of METs on the basis of a roadmap for a long-term internationalisation strategy (D3.4), cooperation of MET with stakeholders (D3.5 and D5.2) and forward- looking evaluation of curricula on the basis of their response to the key current trends in shipping, can enhance the quality of education and training, as well as ultimately increasing employability (D3.3). Future-proof MET can benefit substantially if validated by stakeholders, especially if they cooperate with MET providers for knowledge-transfer, as is the case already in some European countries (D3.5 and D5.2). To assist MET providers, maritime professionals

and other MET stakeholders in strategic internationalisation, cooperation and evaluation processes, and to enable versatile employability assessments of skills profiles, four tools have been developed:

I To support strategic cooperation of MET stakeholders of diverse but appropriate as per case types, a Stakeholder Cooperation for MET Tool (S.CO.MET.T) strategy tool has been created.

II For evaluating curricula suitability in an evolving industry setting, a versatile AHP-based Strategic Evaluation MET Tool (ST.E.ME.T) was designed (D3.2).

III To assess the suitability of MET curricula for employability and the individual employability of maritime professionals, a versatile Shipping Employability AHP-Based Anticipating Tool (S.E.A.B.AN.T) has been devised. The specifications for the gaps measuring mechanism for MET (GAPMMMET) have also been devised to increase employability (D3.3).

IV To support the internationalisation process of METs, two tools have been devised: the Strategy Direction Location (STRA.D.L) can assist in locating partners according to needs. The Transfer International Tool (Trans. I.T) can be used to transfer credits, accommodating the diversity of European national MET systems (D3.4) while being based on EQF foundations.

9 Policy recommendations and strategic actions proposed – Section 7

The overall strategic solution of SkillSea to the triple-knot of skills gaps, low mobility and decreased maritime career attractiveness is detailed in the final section of D3.7. A priority list of policy recommendations and specific policy actions was built by consensus and validated internally and externally through relevant methodologies. Each of the core sections of the report includes a functional concluding figure with the relevant policy recommendations and specific policy actions, while the complete list of policy recommendations and related actions is appended at the end of this report (Annex 1).

10 SkillSea legacy: MET structural cooperation and openness through MET-NET and E-MSF - Section 7

Effective European cooperation amongst MET providers will be secured through the SkillSea designed Maritime Education and Training Network (MET-NET). Such a form of structural cooperation will support high-quality provision of MET, promoting best practice exchange and efficient use of educational resources/infrastructure (D2.3). In parallel, the proposed European Maritime Skills Forum (E-MSF) will assist in fostering cooperation among MET providers and stakeholders, increasing knowledge transfer and promoting the MET-NET initiated biennial surveys which are the basis of the GAPMMMET mechanism for gaps measurement. Along with the delivery of a future-proof educational solution and of strategic tools designed for METs, the creation of MET-NET and the proposal for E-MSF are considered key strategic outcomes, worthy of further development through follow-up projects and/or EU-supported initiatives (D2.3 D3.5 and D5.2).

2. Emerging sectoral trends and scenarios

2.1. Key shipping trends and their drivers

SkillSea reports on future skills and competencies needs and related gaps have combined literature review, technology forecasting, trend studies, case studies, semi-structured interviews, and focus groups to gain better insight into current key shipping trends and their main drivers. The results of the D1.1.3 and D1.2.1 reports point to the two global trends of digitalisation and sustainability which are both transforming 21st century society and impact the future of shipping and related skills (cf. Figure 2.1).

FIGURE 2.1 KEY SHIPPING TRENDS: DIGITALISATION AND SUSTAINABILITY

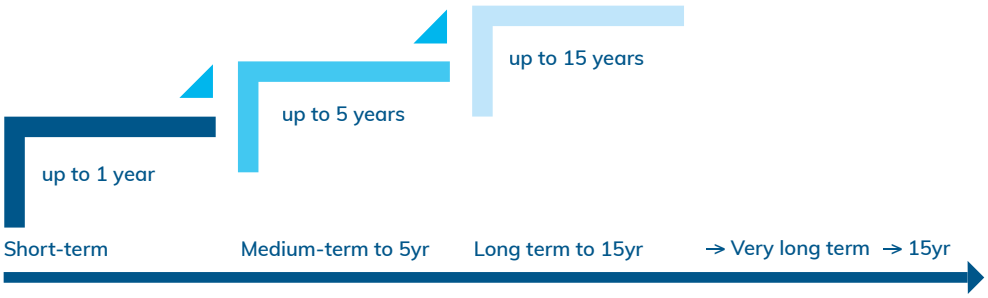
Source: ANNEX 1. Table 1. List of SkillSea key results on the basis of the 2017 call key questions

Two industry trends – digitalisation and smart shipping and sustainable shipping towards zero emissions – bring forward three questions, with the respective answers depending on the skills and occupational profiles scenarios which will materialise under the impact of such trends:

- Which will be the future core shipping industry skills and competence needs?
- What are the key skills that maritime professionals must have in the future?
- Which occupational profiles will be in less demand and which will be in higher demand?

To answer these questions, SkillSea scenarios have been created for the two trends combined as well as for each individually. The methodology followed was a qualitative one based on sampling the large number of key specialised research reports on the future of the maritime sector, and in particular those regarding the impact of these trends upon operations and the required skills of maritime professionals. All scenarios formulated underline the uncertainty element in current projections of emerging trends, with uncertainties extending and deepening in the scenarios when referring to a long-term time horizon, beyond 15 years (cf. Figure 2.2) and towards 2050.

FIGURE 2.2 TIME HORIZON OF SKILLSEA SCENARIOS FOR SHIPPING TRENDS



Source: Expanded from SkillSea (2020). D3.1 Strategy Plan Framework.

On the long-term horizon basis to 2035, two generic scenarios were constructed; one for ocean-going shipping and one for coastal shipping. Dividing the two sectors is essential, as proximity to the shore allows practically all types of new fuels to be used in the coastal sector – including from electrical power outlets, as shown in Figure 2.3A and Figure 2.3B.

FIGURE 2.3A SHORT-SEA SHIPPING GENERIC LONG-TERM SCENARIOS

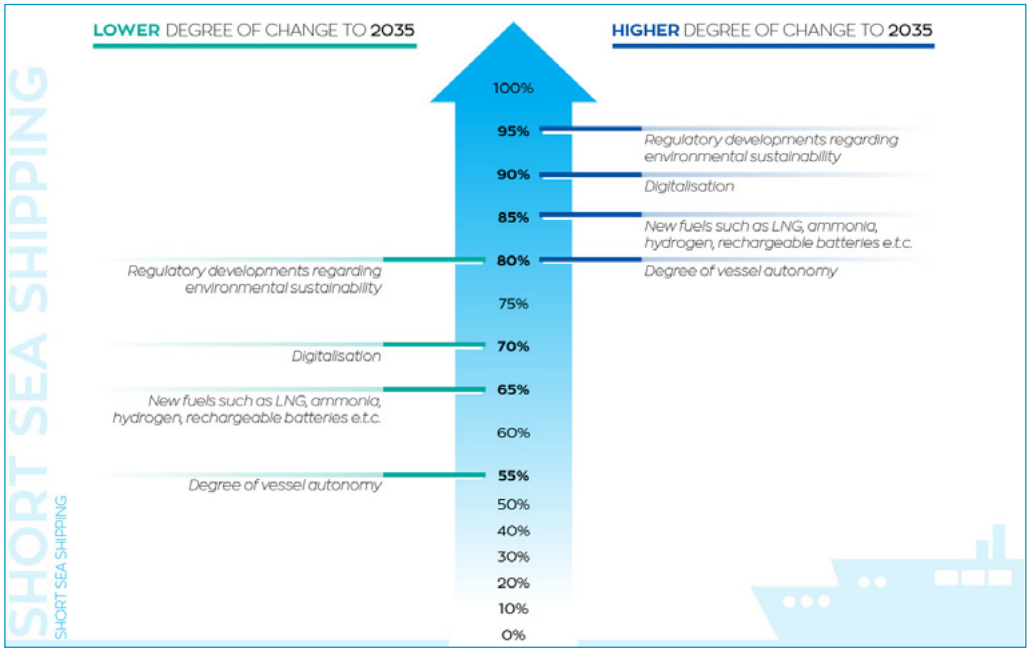
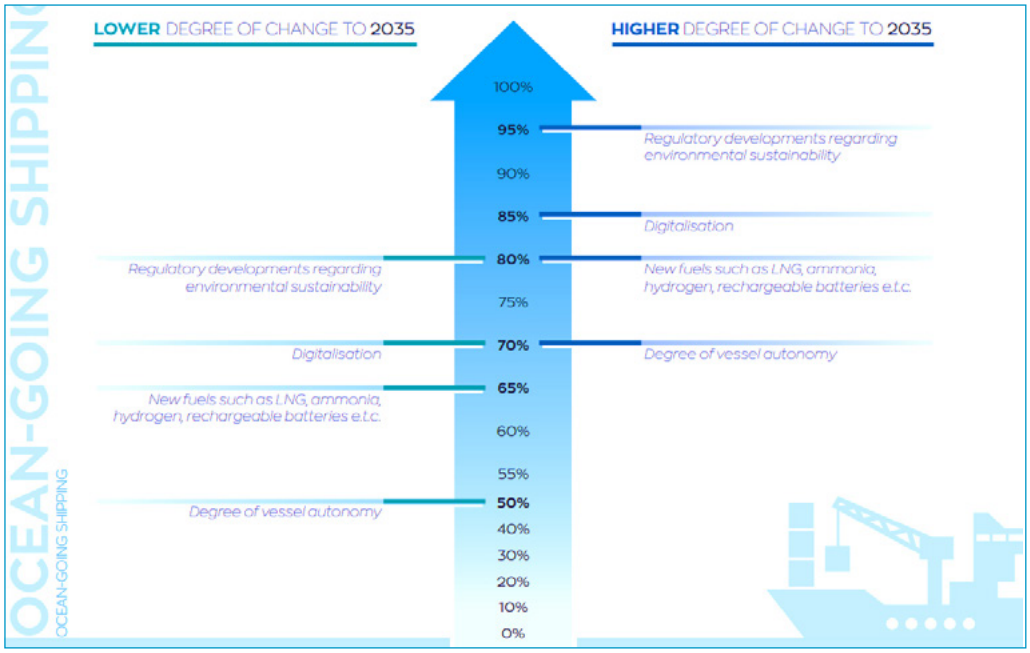


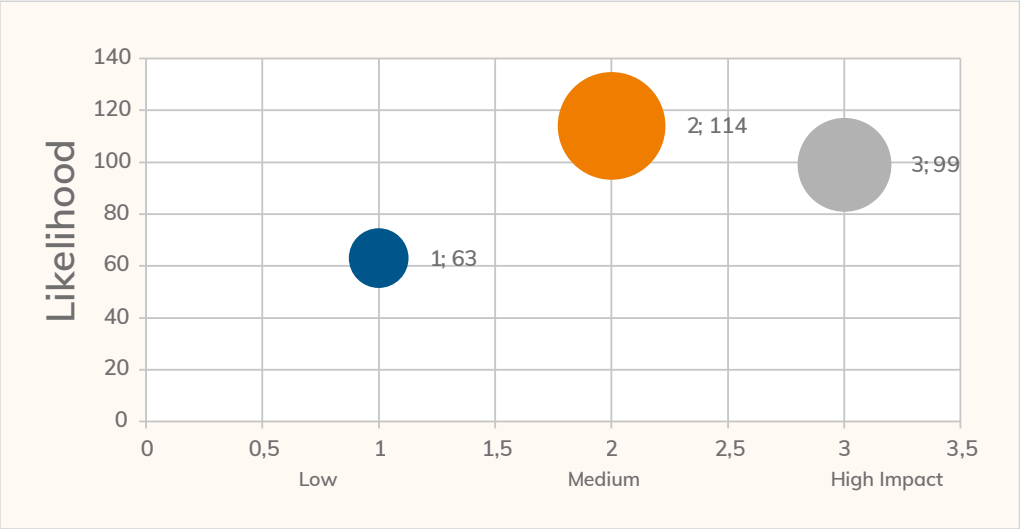
FIGURE 2.3B OCEAN-GOING SHIPPING GENERIC LONG-TERM SCENARIOS



As the pace towards digital and smart shipping and the sustainability trend do not necessarily coincide, especially when the very long-term is considered, SkillSea WP1 elaborated scenarios for the two trends separately. All these scenarios were tested and evaluated on a 0/3/9 scale across the SkillSea consortium partnership during 2022.

In terms of results for the projection to 2035, the medium impact long-term shipping sustainability scenario scored the highest, with the high impact scenario close behind it, pushing the response towards this outcome (cf. Figure 2.3A).

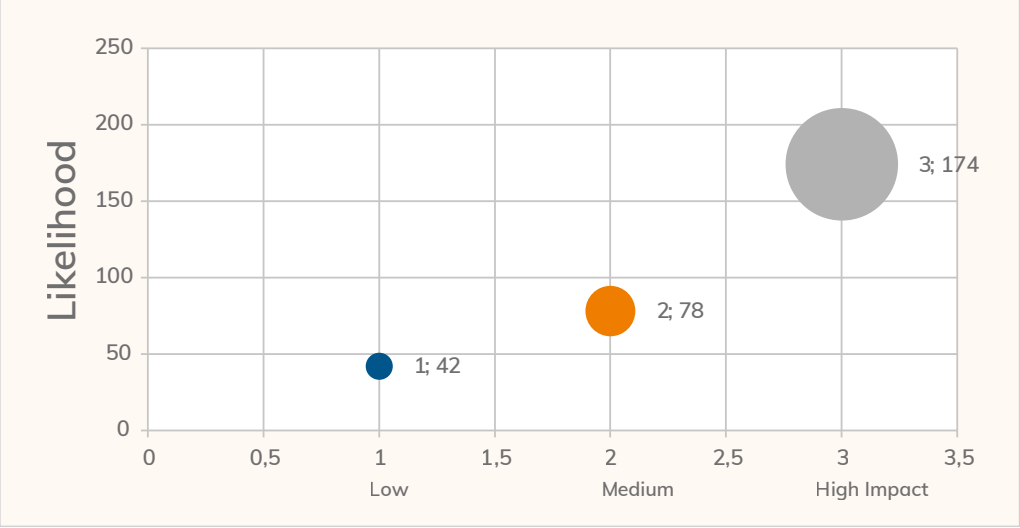
FIGURE 2.4A SKILLSEA SCENARIOS FOR THE SHIPPING SUSTAINABILITY TREND TO 2035



Note: First figure represents scenario number and second one scores on the basis of the 0/3/9 progressive likelihood scale used

When extending the time-horizon to the very long-term (i.e. with 2050 being the end-date), the high impact scenario emerged as the uncontested winner (cf. Figure 2.3B). This result does not contradict the 2035 assessment, as time in this case is the critical variable – especially for an industry where adaptation of its main 'hardware' (i.e. ships and their equipment) is not instantaneous but involves construction time-lags (SkillSea 2020a).

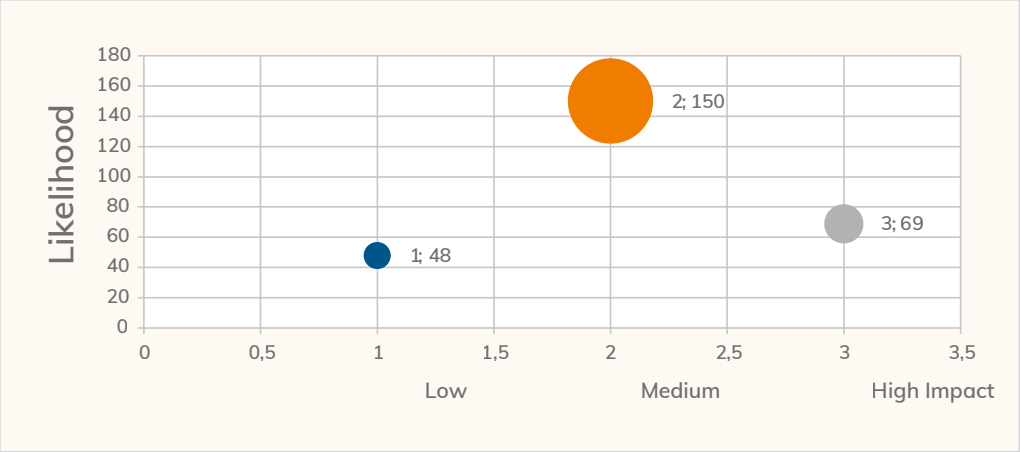
FIGURE 2.4B SKILLSEA SCENARIOS FOR THE SHIPPING SUSTAINABILITY TREND TO 2050



Note: First figure represents scenario number and second one scores on the basis of the 0/3/9 progressive likelihood scale used

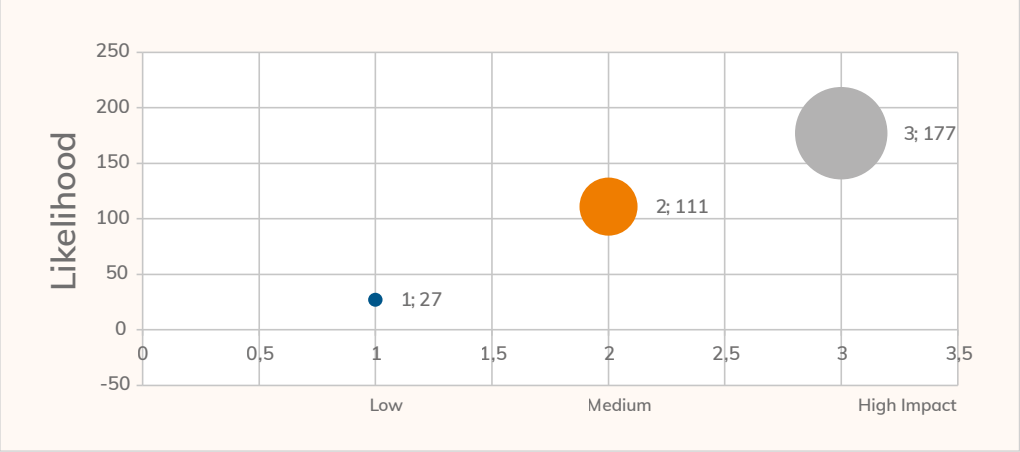
Similarly, in relation to the trend towards digital and smart shipping, from the assessment for the long-term (2035 horizon) it transpired that the medium impact scenario is the dominant one (Figure 2.4A). Looking towards the very long-term to 2050, the high impact scenario emerged as the most likely, with remote support and autonomous shipping deemed to have a big impact on seafarers' skills, competencies and role onboard (Figure 2.4B).

FIGURE 2.4C DIGITAL AND SMART SHIPPING - 2035 TRENDS



Note: First figure represents scenario number and second one scores on the basis of the 0/3/9 progressive likelihood scale used

FIGURE 2.4D DIGITAL AND SMART SHIPPING - 2050 TRENDS



Note: First figure represents scenario number and second one scores on the basis of the 0/3/9 progressive likelihood scale used

2.2. Needs of skills for sustainability and digital shipping scenarios

Figures 2.5 and 2.6 summarise the nature of the skills needs created by digitalisation and sustainability of maritime shipping, although they do not automatically translate into the speed of changes and the extent of related changes.

FIGURE 2.5 FUTURE SKILLS NEEDED FOR SHIPPING SUSTAINABILITY

Green Shipping

- Measurement, calculation and documentation of emmisions, EU and international legislation
- Operation of complex hybrid and zero emission machinery
- Environmental economics, performance management systems
- Logistics and optimalisation methods to achieve high vessel utilisation
- Advanced routeing, considering factors such as wind, currents and waves
- How to handle a variety of fuels (toxic content, explosion risks etc.)

FIGURE 2.6 FUTURE SKILLS NEEDED FOR DIGITAL & SMART SHIPPING

Digital technologies

- Basic digital technology skills as fot example
  - Sensors
  - Industrial Internet of Things
  - Networks
  - Connectivity and
  - Cybersecurity
  - Ship 4.0/Industry 4.0
- Advanced analytics and use of data in optimisation of the fleet
- Deep understanding of the complex systems onboard and systems connected to the ship to be able to serve the needed redundancy of all systems
- To update, service and repair digital systems

Related skills needs scenarios created for sustainability (cf. Figure 2.7) and digital and smart shipping (cf. Figure 2.8) vary considerably according to the trends scenarios which will ultimately materialise. In turn, this will impact on the time-horizons of skills gaps and emerging new operational profiles.

FIGURE 2.7 SKILLS IN THE THREE SCENARIOS FOR SUSTAINABILITY SHIPPING TRENDS

LOW IMPACT

MEETING IMO 2050 TARGETS by 50%

- Major use of heavy fuel oil in 2030 and transition to lower emissions' fuels towards 2050
- IMO 2050 targets for emissions met by LNG in combination with bio-LNG for ocean-going shipping
- Mix of technologies and of fuels for short-sea shipping

The IMO minimum competences/skills' requirements remain sufficient

MEDIUM IMPACT

MEETING EU2050 TARGETS

- A lot of upskilling to handle pilot technologies
- Alternative fuels as LNG, LPG, biofuel, methanol, ethane, hydrogen, and ammonia will have different risk factors and need specialised training
- Seafarers must be able to gain knowledge on the safe use and storage of carbon, of a variety of fuels as well as of battery packages
- Seafarers must be able to gain knowledge on the safe use and storage of carbon and variety of fuels as well as battery packages, all beyond current IMO requirements with significant upskilling and additions to curricula required

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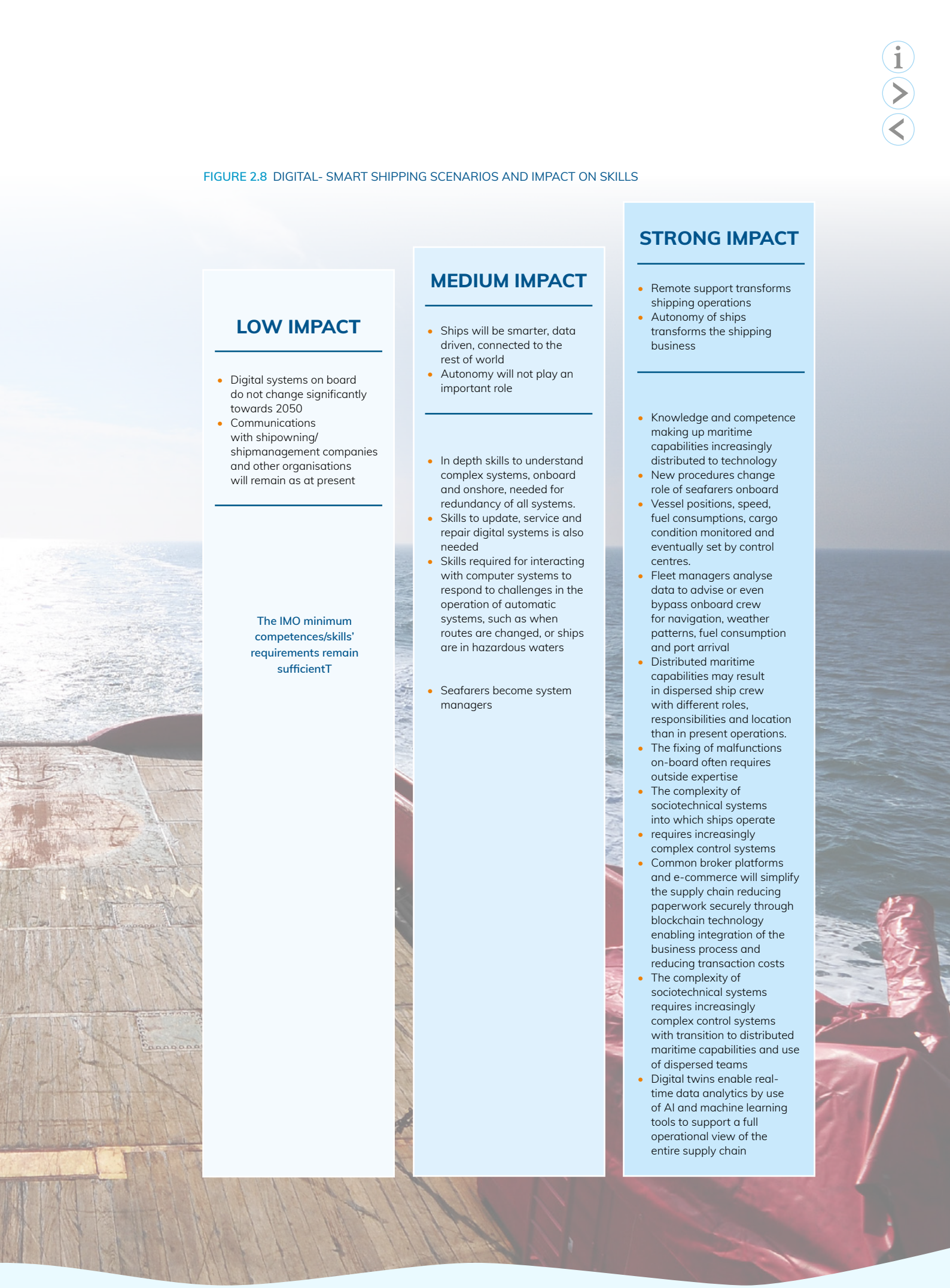
HIGH IMPACT

SHIPPING INDUSTRY LEADS: ZERO EMISSIONS BY 2035

- The 2050 goal to be achieved by 2035 and stricter demands set from 2050 onwards
- A mix of fuels including LNG, bio-LNG and e-LNG, MGO, bio MGO and e-MGO, bio methanol and e-methanol, HFO, e-ammonia, batteries and nuclear power is used
- Precise mix depends on electricity costs

- A few technologies win and are implemented in basic education, e.g., batteries, hydrogen and nuclear
- Alternative fuels as LNG, LPG, biofuel, methanol, ethane, hydrogen, and ammonia will have different risk factors and need specialised training
- Need for improved seafarer training which has been made apparent in the areas of low-sulphur fuel switchovers, the correct use of scrubbers, additional wear and tear on machinery, and the safe operation of ballast water management equipment
- All of the above is beyond IMO requirements, and requires new thinking of Maritime Education and Training

FIGURE 2.8 DIGITAL- SMART SHIPPING SCENARIOS AND IMPACT ON SKILLS



LOW IMPACT

- Digital systems on board do not change significantly towards 2050
- Communications with shipowning/ shipmanagement companies and other organisations will remain as at present

The IMO minimum competences/skills' requirements remain sufficientT

MEDIUM IMPACT

- Ships will be smarter, data driven, connected to the rest of world
- Autonomy will not play an important role

- In depth skills to understand complex systems, onboard and onshore, needed for redundancy of all systems.
- Skills to update, service and repair digital systems is also needed
- Skills required for interacting with computer systems to respond to challenges in the operation of automatic systems, such as when routes are changed, or ships are in hazardous waters

- Seafarers become system managers

STRONG IMPACT

- Remote support transforms shipping operations
- Autonomy of ships transforms the shipping business

- Knowledge and competence making up maritime capabilities increasingly distributed to technology
- New procedures change role of seafarers onboard
- Vessel positions, speed, fuel consumptions, cargo condition monitored and eventually set by control centres.
- Fleet managers analyse data to advise or even bypass onboard crew for navigation, weather patterns, fuel consumption and port arrival
- Distributed maritime capabilities may result in dispersed ship crew with different roles, responsibilities and location than in present operations.
- The fixing of malfunctions on-board often requires outside expertise
- The complexity of sociotechnical systems into which ships operate
- requires increasingly complex control systems
- Common broker platforms and e-commerce will simplify the supply chain reducing paperwork securely through blockchain technology enabling integration of the business process and reducing transaction costs
- The complexity of sociotechnical systems requires increasingly complex control systems with transition to distributed maritime capabilities and use of dispersed teams
- Digital twins enable real-time data analytics by use of AI and machine learning tools to support a full operational view of the entire supply chain

2.3. Summary Section 2 key findings: shipping industry trends

SUMMARY

Key challenges of the 2017 call	S2 SkillSea key findings 2023
Define key trends shaping shipping	Digitalisation and sustainability
	Long-term and very long-term scenarios predict gradual change
Develop scenarios for shipping future	Increasing digitalisation and new technologies will continue to radically change practices onboard ships and ashore
Provide an estimate of the trends' impact on skills	*Scenarios show that the impact of regulatory requirements for more sustainable shipping operations, including 'greener' fuels and the reduction of shipping emissions, is expected to be strong in the short to medium term*

3. Impact of new trends on gaps and occupational profiles

3.1. Impact of trends on skills gaps: key findings

The most critical impact of the new shipping trends is expected to be upon skills gaps and occupational profiles, with eventual repercussions for the European Skills, Competencies, Qualifications and Occupations (ESCO) classification.[2] This will have an effect on MET providers at all levels and regimes (cf. Annex 7) and, ultimately, for the workforce and the industry as a whole.

FIGURE 3.1 KEY IMPACT OF TRENDS ON SKILLS AND OCCUPATIONAL PROFILES

Source: ANNEX 1, List of SkillSea key results , D1.1.3 and D.3.3

Continuous updates of skills, including transversal skills, are needed – as shown by the overall data of SkillSea 3.3 in the skills gaps and employability surveys. These surveys suggest a general parallel perception of the need for continuous updates of these skills. Key findings from SkillSea WP1 and WP5 indicate that the pace of the process to update skills may not be sufficient to create immediate or medium-term significant differentiation of the current occupational profiles.

2 *The ESCO classification is a part of the Europe 2020 strategy, cf can be found here.*

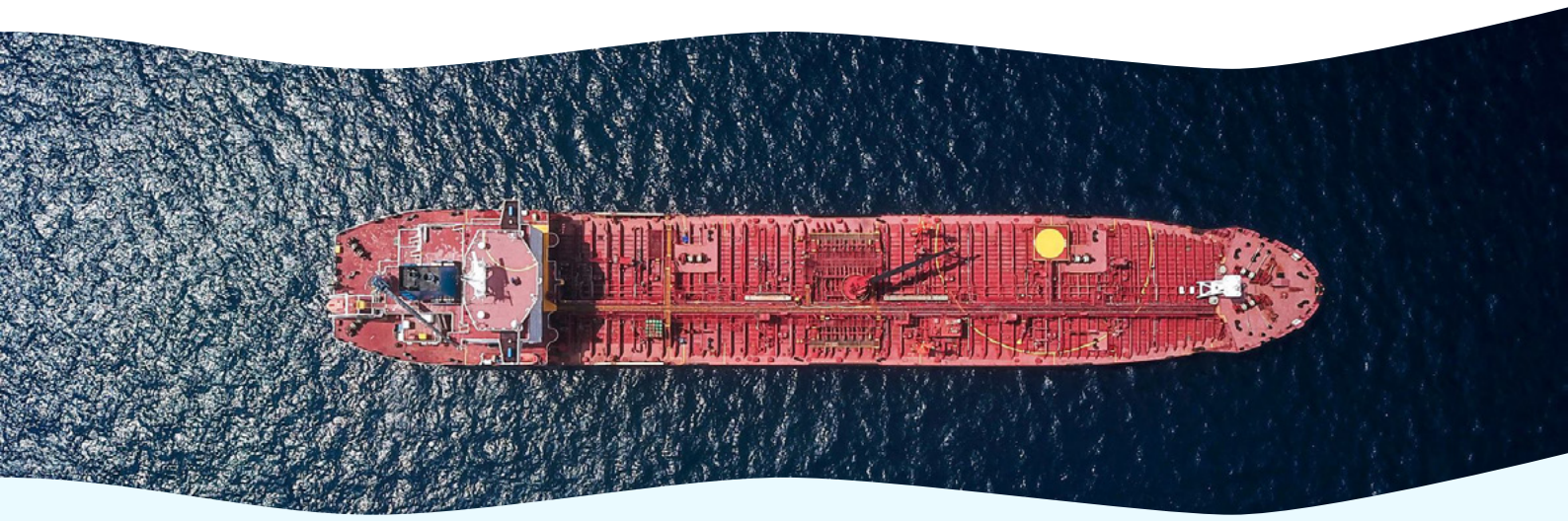


TABLE 3.2 COMMONALITY OF EMPLOYER-EMPLOYEE VIEWS ON SKILLS GAPS AND EMPLOYABILITY

TOPICS	NWEur.	S.Eur.
Possession of right skills		
Skills gaps between EU and non-EU mariners		
Blue Growth-Blue Economy		
New skills-4th revolution		
Gaps in competence and skills		
Qualitative and quantitative mismatch in demand-supply of seafarers		
STCW-need for update		
Cooperation between schools and shipowners		
Training on-board (practice+theory)		
Training in the new equipment		
Promotion of the Shipping industry (ambassadors)		
Flags and CoCs		
Lack of Engineers		
Mobility among shipping sectors		

Raised by: Blue = employee side, Orange = employer side, Green = in common
Notes: On the basis of WP3 focus groups, CoC = certificate of competence

Source: SkillSea (2022). D.3.3 Interim Report.

3.2. New occupational profiles or updated occupational profiles?

The emergence, or not, of entirely new or updated occupational profiles was researched in SkillSea through the analysis in WP1 and further investigations through WP5. This was done on the basis of the analysis of research reports and of a relevant wide survey near the end of the project, a timeframe deemed suitable to fully record shaped trends.

3.2.1. Investigating changes in occupational profiles and ESCO gaps

Results from the combined SkillSea analysis across work packages and collected survey evidence on occupational profiles converge. A number of new roles and functions (also listed in Table Annex 9.1) may be emerging either as new occupational profiles or as possible updates of existing ones. Main candidates in both categories were the roles of:

- Environmental officer
- Compliance officer
- Digital officer/cybersecurity officer
- Ship security officer

3.2.2. Changes in occupational profiles: survey results

The results from a large survey targeting maritime professionals in late 2022, with 995 overall respondents from EEA countries and one non-EEA/UK country (cf. Annex 9), strongly indicate an overall slow-paced formulation of upcoming or updatable profiles. Profiles were formulated on the basis of roles observed to be emerging in maritime operations and their relevance to onboard positions by distinguishing the profile from an eventual traditional or emerging task of shipping personnel ashore.

A Results from EEA respondents point that:

- I The profile of ship security officer onboard is clearly emerging as a new role, with about 60% of respondents attesting to this.
- II The digital/cybersecurity officer profile is considered to be not yet much of a new or updatable onboard role; only 21% of respondents opted for this option, many instead considering it to be a new role ashore.
- III Compliance officer – a role emerging from the Covid-19 pandemic – is considered as a new onboard occupational profile by around one-quarter of respondents (24%-28%).
- IV The profile of environmental officer onboard is indicated as a new occupational profile by just over one-third of respondents (35.6%) whereas a higher percentage (39.3%) state that existing onboard positions need to be updated to environmental officer.

B Results from the larger sub-group of 672 respondents, nationals of countries outside the EEA, were somewhat more conclusive on suggested occupational profiles at sea emerging either as new or updated ones (cf. Annex 9):

- I The ship security officer onboard achieved the highest score of 69.2% and 66.6%, as a new or updated profile, respectively. The role was considered to be a new or updated shoreside profile by just 8% and 7.4% of this group. Such low figures would be expected, since the role is more directly associated with the ship itself and is covered by long-established job profiles in shipping companies, with the result clearly confirming the overall consistency of the respondents' answers.
- II Results for the profile of compliance officer differed from those of EEA respondents in that the role onboard was considered as a new occupational profile by about 44% and as an updated profile by 45%. These figures were far below the results obtained for ship security officer or environmental officer (cf.IV).
- III For the digital/cybersecurity officer profile, the results of 37% and 43% for the profile as a new or updated onboard role indicate that its perception as an emerging prospective role onboard is becoming established among maritime professionals.
- IV The profile of environmental officer was indicated more clearly in this larger non-EEA sub-group as a new onboard occupational profile by about 52% and as an updatable role by 57%.

Overall, however, and considering the percentages recorded in both groups, the emerging picture is one of a slow evolution of new or updatable profiles in the areas of sustainability and digital security. Prospects for new profiles emerge rather slowly, especially when contrasted with the rapid evolution of digital developments across industries. Yet, both the analysis and the data collected show that adaptation in the field takes time and developments are forecasted to impact required skills in line with the scenarios explored in Section 2. This allows for intervention through the SkillSea educational solution – explained in Section 3 – to produce more than a marginal difference to reskilling and upskilling in areas related to shipping's digitalisation and sustainability.

3.3. Summary Section 3 key findings: gaps - occupational profiles

SUMMARY

Key challenges of the 2017 call	S3 SkillSea key findings 2023
	Additional skill sets may change current occupational profiles in the short and medium term
What are the significant impacts of key shipping trends on occupational profiles?	*New occupational profiles are not expected to emerge in the short to medium term. They may appear in the longer term, beyond 10 years, as a consequence of eventual digital/ technology/sustainability breakthroughs*
	Maritime shipping occupational profiles should, as much as possible, be linked to their functions in a way that is compatible with how they are set out in the STCW Convention to ensure that they are all are reflected in the ESCO database.

4. The versatile SkillSea toolbox for future-proof skills

4.1. Sectoral needs for upskilling and reskilling served by flexible VET

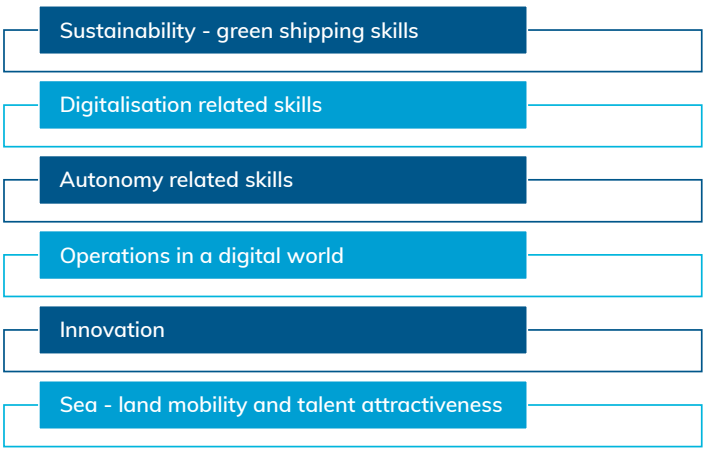
Following the analysis of skills needs by SkillSea, the areas of green shipping, digital technologies, operations in a digital world, innovation, and sea–land mobility have been identified as key to secure a flexible, yet robust, educational solution compatible with all levels and types of learning outcomes of the diverse European MET systems[3].

FIGURE 4.1 EDUCATIONAL PACKAGES FOR NEW SECTORAL NEEDS

Source: ANNEX 1, List of SkillSea key results

The educational solution of SkillSea has to respond to the key findings on assessed needs and ensuing skills in line with Sections 2 and 3, shown in summary in Figure 4.2.[4]

FIGURE 4.2 SKILLSEA ASSESSED SHIPPING TRENDS AND SKILLS NEEDS



As per the analysis in Section 2 of this report and SkillSea deliverable D1.1.3, the emerging needs for additional competencies were assessed to exist in five specific areas (cf. Table 4.1).

3 *Cf. SkillSea D3.1, D3.2 and D1.1.3 reports.*
4 *Cf. Annex 9, Figure 9.1 also for a detailed list.=*

TABLE 4.1 SKILLSEA ASSESSED AREAS FOR NEW EDUCATIONAL PACKAGES

1 Green shipping
2 Operations in a digital world
3 Digital technologies
4 Innovation
5 Sea-to-land mobility

The ensemble of related WP1 findings and the related analysis of new industry needs guided the number and orientation of the educational packages (EPs) introduced and developed by WP2, with several rounds of consortium partner consultations, as well as soundings with industry and MET providers, leading to the crystallisation of a full and flexible set of upskilling/reskilling educational packages as follows:

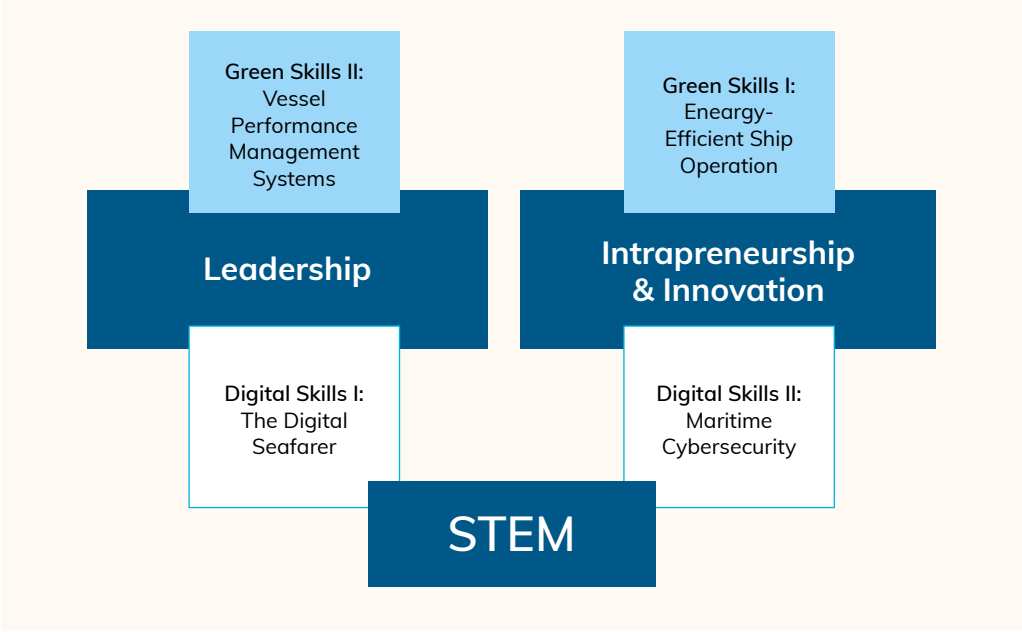
- Two EPs covering the need for green skills
- Two EPs on digital skills
- One EP in the field of science, technology, engineering and mathematics (STEM) to provide the foundation knowledge of the fast-evolving technological environment in green shipping and of operations in a digital world, with the need for competencies in this area already anticipated in the grant proposal
- An EP on intrapreneurship and innovation was launched as the analysis and SkillSea surveys had established the need for maritime professionals to be able to contribute to the maritime industry's potential in a fast-changing and challenging environment, providing opportunities for entrepreneurial innovative action
- An EP on leadership was designed to cater for sea-land mobility and for transversal skills required to move from one value chain to another, including elements such as teamwork, communication and cultural awareness

The design of the set of the SkillSea toolbox-based educational packages was complemented by the finalisation of appropriate and concise titles which communicated the content and the additional value of each EP for upskilling/reskilling, as in Figure 4.3

- Green Skills I: Energy-Efficient Ship Operation
- Green Skills II: Vessel Performance Management Systems
- Digital Skills I: The Digital Seafarer
- Digital Skills II: Maritime Cybersecurity
- Intrapreneurship and Innovation
- Leadership
- STEM (Science, Technology, Engineering and Mathematics)

A Train the Trainer programme and a guide complete the set, enabling the provision of appropriate training for EP teachers at the various levels.

FIGURE 4.3 SKILLSEA FULL SET OF EDUCATIONAL PACKAGES SHAPE TO BE IMPROVED



The educational set, as well as each individual EP, have been designed as a training supplement for upskilling or reskilling, thus enhancing mobility horizontally and/or vertically or from sea-based to land-based jobs. The full SkillSea EP set is extracurricular to formal training schemes and STCW requirements, although some of the subjects/contents are included in the STCW Convention at a lower level required to secure safe operations. As shown in the modular scheme of Figure 4.3, the structure of the VET scheme proposed by SkillSea is not only versatile in terms of EQF level but also in terms of potential combinations.

Figure 4.4 shows potential combinations of EPs for both reskilling seafarers towards shore-based maritime and related occupations and for the upskilling of maritime professionals experiencing skills gaps The latter category is expected to increase as the digital-smart and sustainability trends impact progressively on shipping business operations.

FIGURE 4. 4 UPSKILLING AND RESKILLING POTENTIAL OF THE SKILLSEA SOLUTION

	SKILLS' SET	Relevant for Roles / Occupational profiles
Digital Skills **The Digital Seafarer**	Structure, components & maintenance of shipboard network Operation and use of onboard sensors Nature and quality of shipboard generated data	All senior deck officers All senior engine officers Electrotechnical Officers Compliance Officers
Digital Skills **Maritime Cyber Security**	Maritime cybersecurity (MC) awareness and training MC Risk Management	All senior deck officers All senior engine officers Compliance Officers
Green Skills **Environmentally Friendly & Sustainable Ship Operations**	Alternative fuels and environmental impact Data collection & interpretation Energy- efficient operation, power production and consumption Energy-efficient awareness	All senior deck officers All senior engine officers (Compliance Officers)
Green Skills **Understanding and Using Performance Data**	Vessel Performance Management Systems Data collection and interpretation KPIs, calculation & documentation of emission Key elements of the green regulatory process & political structures in the maritime industry	All senior deck officers All senior engine officers Compliance Officers Vetting & Inspectors
Leadership	Cultural diversity and leadership in a multicultural industry Communication & motivation Team leadership & conflict handling	All senior deck officers All senior engine officers Compliance Officers Facilitates transition to shore-based positions
Intrapreneurship and Innovation	Innovation Creative thinking Project Management	Facilitates transition to shore-based positions
STEM	Introduction to STEM Analysis and Problem solving	Junior officers Electrotechnical Officers Electricians

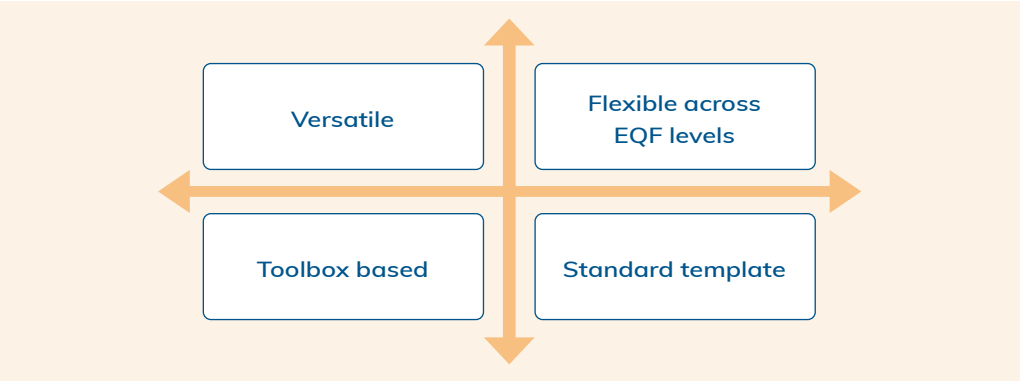
4.2. The SkillSea Toolbox: a flexible and versatile educational solution

SkillSea developed the toolbox approach to facilitate the translation of competence needs into learning objectives by MET institutions, as well as the recognition of curricula and syllabi for enhancing student mobility. A toolbox design guide was developed to support the working groups designing EPs and was tested throughout the process, with the guide including a description/explanation of each item presented in the toolbox template.

Within the toolbox approach, the SkillSea EPs were designed in a common template, with the aim to make them flexible and easy to integrate into existing curricula, and/or to adjust for meeting the needs of different target groups (VET or higher education context, upskilling or reskilling purposes). Educational packages are thus easily adaptable to the national specifications of educational systems and adaptable to sectoral requirements as these evolve (cf.Figures 4.4 and 4.5). Rendering the SkillSea EPs future-proof and flexible across EU framework levels is achieved through:

1. An easy, transparent, and recognisable form enabling educational content and its delivery to be adapted and developed to meet the emerging needs for additional competencies.
2. The chosen form of communicating learning outcomes and achieved competencies promotes mobility as the EPs, the rationale, and applicability are explained using a well-known terminology within the EU wider educational framework, based on ECVET, ECTS and EQF, thus enhancing credit recognition and student mobility.

FIGURE 4.5 THE SKILLSEA UPSKILLING AND RESKILLING EDUCATIONAL SOLUTION APPROACH



Main module particulars – as set in the seminal work of Biggs & Tang (2011) shown in Figure 4.6 – are the basis for the design of educational packages .

FIGURE 4.6 COURSE/MODULE PARTICULARS

Source: dapted from Biggs & Tang (2011)

For each EP course, details based on the toolbox approach are elaborated in a table of constructive alignment which includes learning objectives, learning outcomes, course description, assessment, and exemplary lesson material all covered on the basis of the standard common template (cf. also the full Toolbox).

FIGURE 4.7 THE SKILLSEA TOOLBOX FOR EDUCATIONAL PACKAGES

THE SkillSea Toolbox Template
Curriculum
Learning objectives Target group Entry requirements Duration
Course Description
Course outline
Learning outcomes
Teaching methods Teaching material Assessment/exam
Evaluation
Course review

4.2.1. Curriculum

To define learning outcomes, it is necessary to define the target group the course aims for and the qualification level of the European Qualifications Framework (EQF) at which it is set (cf. Annex 7 and Annex 8). Curriculum elements are interdependent, as the qualification level and the decided learning outcome (skills and competencies) define what is to be assessed and the choice of assessment method. When the skills needed are known, the level of qualifications and competencies to be achieved may be described using EQF descriptors.

Learning objectives

Course learning objectives depend on assessed industry/societal needs and are also dictating – and should be compatible with – the course description.

The target group

Course target groups are identified as being professionals expected to perform the duties requiring the skills and competencies defined in the learning objectives. The need to define a target group and the interrelation between target group and content of the course emerged clearly during the development of the initial SkillSea EPs.

Entry requirements

Content of EQF levels and elements of curricula are often subject to national-specific requirements. In the design guide, specific requirements were stated, such as what was needed to follow the course. These requirements may regard competencies such as reading, language, mathematics, or specific technical knowledge or skills. EPs can include an initial test to identify the starting competence level of students, as have a number of SkillSea model EPs.

Duration

The course duration is stated in hours specified as guided learning hours and independent study, individually or in groups. Where applicable, the duration is stated in ECTS (cf. Annex 8) with the intended learning outcome to be achieved within the time stated.

Course description

Course description is a critical element to be communicated to all stakeholders of the upskilling/reskilling course and passes through the course outline, which includes the syllabus of the educational package/module/course describing specific areas covered. A well-articulated syllabus of each EP is important and this became evident in the piloting process of the SkillSea toolbox solution.

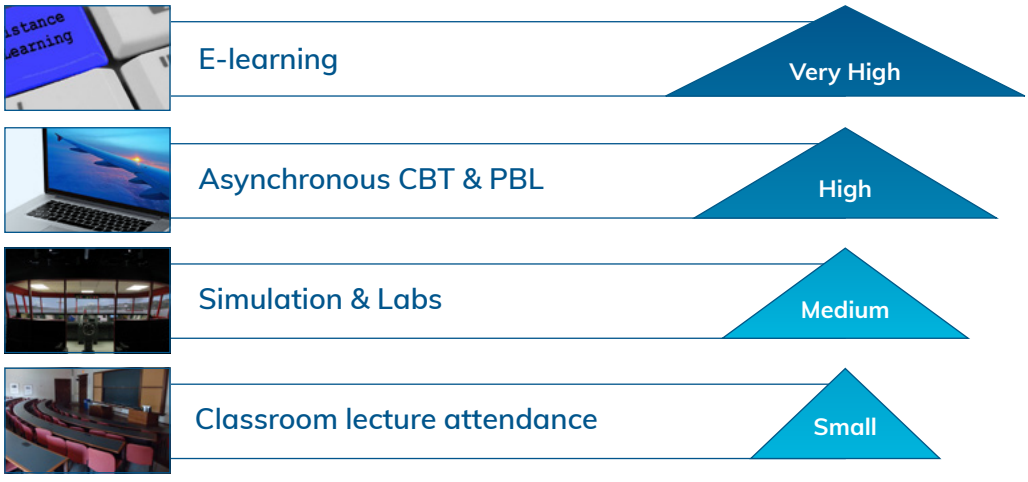
4.2.2. Learning outcomes

Learning outcomes are based on the intended teaching results in terms of knowledge and skills following the successful completion of the course by students. Learning outcomes are stated using the descriptors of knowledge, skills, responsibility, and autonomy (European Commission, 2023) and formulated using 'action verbs' (Cedefop, 2017 and Cedefop 2022). Action verbs – corresponding to generic EQF terms or relevant to a specific profession chosen – make transparent the way in which students are expected to demonstrate attained knowledge and skills, as well as responsibility and autonomy.

Teaching methods

Teaching and training methodologies have been designed to match the learning outcomes of the available alternatives; some of these favour internationalisation of the provision (cf. Figure 4.8) while facilitating the educational process independently of physical restrictions.[5]

FIGURE 4.8 DELIVERY MODES ALLOWING INTERNATIONALISATION AND REMOTE LEARNING



Note: CBT=Computer-Based Training, PBL=Problem-Based Learning.

5 *The development of the educational packages took place thanks to electronic means during the social distancing period of the Covid-19 pandemic.*

Many EPs include the possibility of blended learning, and some are even designed only as online courses. Digital Skills 1, for example, was developed to allow students to familiarise themselves with information infrastructure specific to the vessel they are working on and to complete the course whilst at sea, taking advantage of the combination of work-based learning and theoretical lessons. This requires the course to balance semi-autonomous learning with a supportive virtual environment incorporating teaching, learning and assessment. Teaching methods can vary widely between EPs relevant to MET. The educational package Green Skills I, Energy-efficient Ship Operation, is based on simulator sessions.

Teaching material

Teaching material is provided as example lessons to illustrate the use of teaching methods. Experience gained during piloting shows that teaching material should be adapted to the target group and their previous education and experience. Differences in national regulations across the diverse European MET scene, will also require teachers who want to utilise the EPs to create resources specific to learning outcomes, ensuring compatibility with their own national and organisational regulations. Furthermore, it is to be expected that teaching material may need to be continuously updated due to ongoing changes in the industry and rapid technological evolution.

Assessment

Assessment methods should mirror the desired learning outcomes and can vary accordingly depending also on delivery mode (e-delivery, asynchronous or synchronous etc). The assessment methods will be stated in the table of constructive alignment. Summative exams are recommended to correspond with the learning outcomes and the teaching method, while further examples of assessment are described in the SkillSea Toolbox Design for Educational Packages Guide.

4.2.3. Evaluation of the course

Course review

As with all training courses, the evaluation/review of EPs is essential to ensure that they remain current and of an appropriate quality. EPs are designed so that the students are provided with opportunities to evaluate the delivery and content of the package. This process should fit with the quality assurance measures adopted in the specific MET provider organisation.

INSET 4.1 REVIEWING AND PILOTING OF SKILLSEA EDUCATIONAL PACKAGESS

Example: EP Green Skills 1

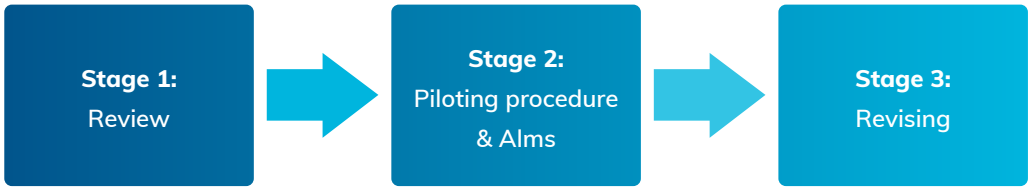
In the case of EP Green Skills 1, the toolbox and example lessons were reviewed by the University of Rijeka. Subsequently, their comments were discussed with the developing partners and suggestions were amended after a meeting clarifying ideas and intentions; the EP was then piloted by two teachers at the Blackpool & Fylde College's Fleetwood, Campus. Based on the Green Skills 1 toolbox and the available lesson material, a new course was prepared, and additional material was created as needed. The course was then delivered to a specific group of students. The experience gathered and the comments made by the two teachers - together with feedback from the students who attended the course - provided valuable input for the final adjustment of the toolbox.

4.3. Quality assurance process of the Educational Packages and the Toolbox Design Guide

4.3.1. Quality assurance in the SkillSea EP development

Three stages of quality assurance measures (cf. Figure 4.9) were designed to cover every sequence of the EP development and to ensure the desired quality before releasing the material for public use. These steps can be adopted in an adapted way when actual modules and upskilling/reskilling courses are finalised following the SkillSea Blueprint.

FIGURE 4.9 QUALITY ASSURANCE PROCESS FOR THE EDUCATIONAL MATERIAL PRODUCED



1. While developing the educational packages, one partner in each work group was appointed to review the performance and outcome of the task and provide internal feedback on quality and delivery.
2. After completion the relevant material is delivered to the piloting partners. Educational packages are essentially structured material with suggestions for overall teaching, learning and assessment methods/
3. The data collected via evaluation forms is analysed, discussed, and summarised by all SkillSea piloting partners, together with EP developers. Comments and feedback provided by the teachers who have delivered the course have been discussed and considered to adjust the EP as required.

4.3.2. Toolbox Design Guide

The Guide on Design and Implementation of educational packages produced by SkillSea WP2 includes a glossary and a description on how the EQF terminology aligns with the terminology applied in the STCW Convention and Code. As the aim of SkillSea is to promote further mobility, making qualifications transparent and comparable, it was agreed to refer to the European Qualification Framework (EQF) as the common standard across national and local systems. The curriculum design included the qualification level and the definition of learning outcomes. The learning outcomes should follow the principles described in the Cedefop Handbook on Learning Outcomes (Cedefop, 2022).

4.4. Summary Section 4 key findings: a flexible toolbox for future-proof MET

SUMMARY

Key challenges of the 2017 call	S4 SkillSea key findings 2023
	The areas of green shipping, digital technologies, operations in a digital world, innovation and sea- to-land mobility were identified and seven relevant educational packages (EPs) were designed in the common template of a toolbox.
Provide a flexible future-proof upskilling/reskilling educational solution to cater for gaps and for maintaining future-proof skills across European Maritime Education and Training systems.	*The toolbox approach adopted allows the set and individual EPs to be EQF-level flexible, easy to integrate into existing curricula and adjustable to the needs of different target groups (VET and higher education, up- and re-skilling) while adaptable to national and sectoral requirements and to new developments.*
	With EPs flexible across EU framework levels and a toolbox using the well-known EQF/ECVET/ ECTS terminology, mobility is promoted as well as MET module recognition, internationalisation and cooperation across the diverse European MET.

5. Untying the triple-knot: skills, mobility and attractiveness

5.1. A future skills-based solution for mobility and attractiveness

Beyond delivering an educational solution, SkillSea undertook the mission to address maritime career attractiveness, as this factor is critical for the supply of talent to the shipping industry. The consortium also undertook the mission to examine the eventual need for, and feasibility of, a European approach to maritime career attractiveness.

The SkillSea strategic solution to the triple-knot problem of current gaps across skills, mobility and attractiveness is through the broad-spectrum component of the educational upskilling and reskilling career paths which add to current MET content, and create attractive graduate profiles which fit across and beyond the maritime value chain (cf. Figure 5.1). Such an approach may fit both European and non-European graduates of European METs, as European MET certification enjoys international recognition

FIGURE 5.1 "MODERN MET SKILLS WILL TAKE YOU EVERYWHERE"

Source: ANNEX 1, List of SkillSea key results

Through the SkillSea key findings the Blueprint strategic solution to the triple-knot of challenges related to the project call (bridging skills gaps, increasing the future resilience of skills, increasing the mobility of maritime professionals, and addressing the issue of low attractiveness of maritime careers) emerges as a combined one (cf. Inset 5.1).

INSET 5.1 UNTYING THE TRIPLE KNOT OF SKILLS GAPS, MOBILITY AND ATTRACTIVENESS

New skills, delivered through a future-proof approach, support mobility and provide a basis for future attractiveness campaigns putting emphasis on modern versatile skills multiplying career paths for new entrants, whether within or beyond the maritime shipping industry.

5.2. Roots and routes of the impact of low attractiveness upon MET

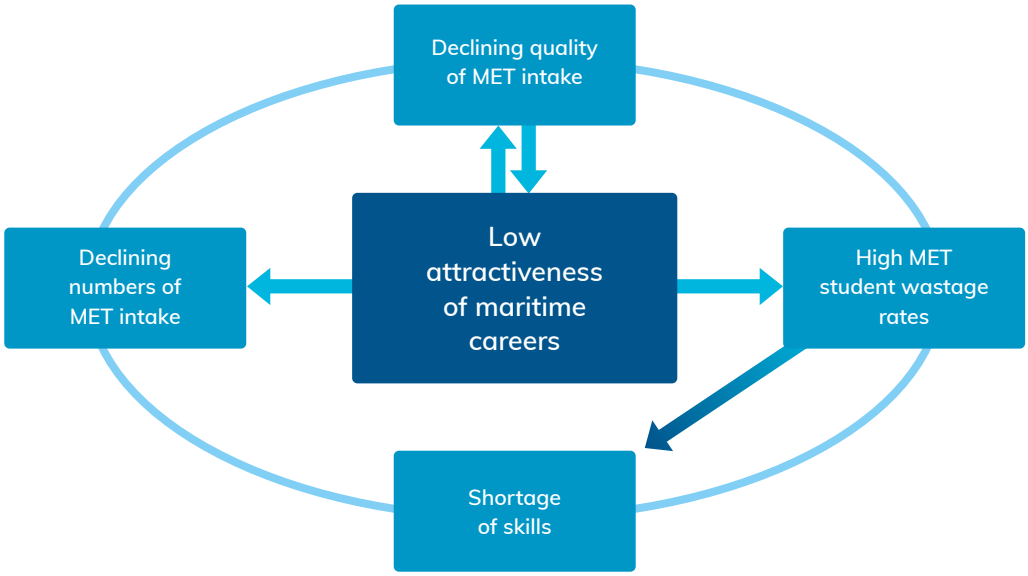
The decline in maritime career attractiveness has a multiple impact affecting European MET in an almost unbreakable loop:

A A direct impact on the quality of MET candidates as maritime careers compete with opportunities in other sectors ashore, adding to high wastage rates in MET national systems

B A direct impact on the quantity of new intake of European METs

C A final impact on the industry's shortage of skills

FIGURE 5.2 LOW ATTRACTIVENESS IMPACTS ON MET INTAKES AND SKILLS OUTPUT



Source: SkillSea WP1, WP3 and WP4 deliverables.

The number of new maritime professionals entering the labour market has declined across most European countries[6]. This was, in part, the result of the major challenge of the low attractiveness of the maritime industry, which was aggravated during the operational disruption arising from worldwide Covid-19 pandemic restrictions.

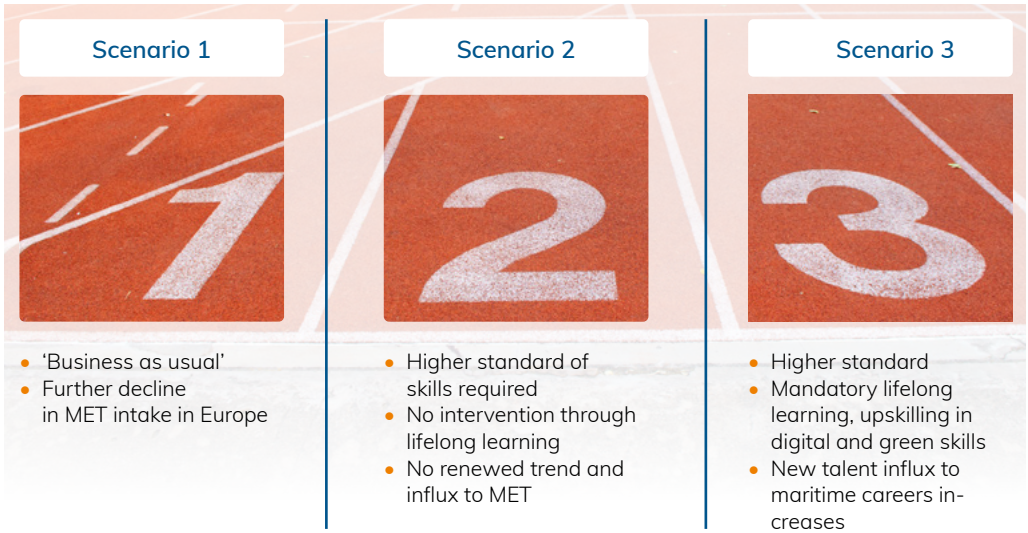
Initial 2022 MET entry data from SkillSea partners show that amidst the general shortages of labour across all transport sectors, the impact of Covid-19 has resulted in lower MET student intakes. However, with key trends aligning skills requirements for maritime careers to modern skills, this course may be positively interrupted and result in increased attractiveness, depending on the scenario of trends and skills that will materialise.

6 *Cf. SkillSea WP1 deliverables*

5.3. Three scenarios for maritime shipping career attractiveness

Three maritime attractiveness scenarios were formulated, put to the test across the numerous and diverse SkillSea partnership, ranging from METs and research institutions to industry and workforce representatives. For these three scenarios only long-term and the very long-term were considered as any short to medium-term measures cannot be expected to yield results on before the 10-year lower limit of the long-term horizon. Each scenario has been based on different assumptions regarding the degree of impact of key shipping trends and the degree of response of the broader MET system, including upskilling schemes such as the SkillSea set of educational packages.

FIGURE 5.3 KEY DIFFERENTIATION BETWEEN THE THREE ATTRACTIVENESS SCENARIOS



- In the first scenario, a minor impact upon operations of the key shipping trends analysed in Section 2 results in 'business as usual' in terms required skills, with the end result of a further decline in maritime career attractiveness and of European MET intakes.
- In the second scenario, with required skills at a higher standard and a limited, non-mandatory, uptake of lifelong learning, shortages and low attractiveness persist, with the pressure for covering skills needs intensifying on serving and experienced personnel.
- In the third more radical scenario, a high level of all skills, including transversal, is covered by mandatory new skills acquired by lifelong learning.

FIGURE 5.4 THREE SCENARIOS FOR MARITIME CAREER ATTRACTIVENESS

LOW IMPACT

- Professionalism and talent continue to be recognised on the basis of STCW certification, performance, and vessels' & roles' experience
- Organisational structures remain hierarchical

IMMEDIATE RESULTS

- Hard to attract young talents
- Shipping companies continue to hire low-cost employees

FINAL IMPACT

- Maritime Europe continuing to lose competitiveness
- European MET intake declines

MEDIUM IMPACT

- Skills at higher standard:
- Transversal skills needed to move from one value chain to another
- Lifelong learning programmes that enable seafarers to work across industries and services in the maritime shipping sector are available
- Maritime clusters with a variety of job opportunities and career paths are key for talent attractiveness.
- Improved interface between seagoing and shore-based jobs building up transversal competences and skills in the maritime sectors, such as for remote control centers

DIRECT RESULTS

- Hard to attract new talent to the sector
- Low-cost employees still a significant workforce source
- Risk of important shortages and rising demand for upskilling and specialisation

EXTENDED IMPACT

- Incentives for seafarers to return to shipping
- Incentives for staying beyond retirement age
- declines

HIGH IMPACT

- Skills at higher standard
- Transversal skills needed for moving across the value chain(s)
- Lifelong learning programmes enabling seafarers to work across the maritime shipping sector become mandatory
- Maritime clusters with a variety of job opportunities and career paths are key for talent attractiveness
- Improved interface between seagoing and shore-based jobs by building up transversal competences and skills to facilitate autonomous ship operation.

EXPECTED RESULTS

- Hard to attract new talent to the sector.
- Low-cost employees still a significant workforce source
- Risk of important shortages and rising demand for upskilling and specialisation

POSSIBLE IMPACT

- Incentives for seafarers to return to shipping
- Incentives for staying beyond retirement age
- declines

In the long-term, the internal SkillSea survey results for the 2035 perspective lean towards the medium impact (cf. Figure Annex 9) while for the 2050 horizon the high impact scenario came through clearly (cf. Figure Annex 9).

5.4. Modern skills for career attractiveness: a campaign basis

5.4.1. Turning challenge into opportunity: skills for the modern world

Increasing attractiveness is key for the sustainable growth of Europe's maritime and blue sector. While the decline in the appeal of maritime careers is a major threat in this context, the modern digital, sustainability and management of change skills, promoted through the SkillSea EPs, provide:

- A platform for increasing interest in prospective employment in the sector
- A foundation for increasing intra-sectoral mobility and diversity of career paths which start onboard
- A most suitable basis for attractiveness campaigns which can highlight technological developments, digital skills requirements and the provision of sustainability skills, and also emphasise intra-sectoral mobility to show career opportunities within and beyond the sector.

5.4.2. European maritime career days? The options that open following SkillSea

There are several actions which can be implemented to support an increased and improved profile of maritime careers (cf. Figure 5.6).

FIGURE 5.6 ATTRACTIVENESS CAMPAIGNS PLANNING AND FOCUS

- On a calendar basis, national attractiveness campaigns fit for national conditions could be coordinated, though not necessarily integrated, on a European level. This would allow increased visibility through parallel inclusions in the news and through increased presence in social media.
- The structural cooperation of METs, through the Maritime Education and Training Network (cf. Section 7) – a major functional legacy of SkillSea – can be the conduit for raising the issue at dedicated times throughout the year, ideally coinciding with the European Maritime Day.

5.5. Summary Section 5 key findings: new skills boost attractiveness

SUMMARY

Key challenges of the 2017 call	S5 SkillSea key findings 2023
	New digital, sustainability and management of change skills, as set in SkillSea EPs, provide a platform for increasing career attractiveness
Untie the triple-knot of: • Skills shortages and obsolescence • Need for mobility amidst change • Low shipping career attractiveness	*Attractiveness campaigns can thus now highlight technological developments, digitalisation, sustainability, and intra-sectoral mobility to show career opportunities related to contemporary skills (WP4 deliverables)*
	New skills increase intra-sectoral mobility and the diversity of career paths which start onboard

6. Met internationalisation, cooperation and evaluation strategies and tools

6.1. Specific strategies and tools for future-proof METs

The rapidly-changing industry and its related skills needs create additional strategic challenges for European METs. The results of research and consultation in SkillSea (2021) D.3.2, D3.4 and D3.5 reports[7], were that evaluation strategies, strategies for cooperation with MET stakeholders – along with strategic international partnerships among METs, as well as cross-border recognition of MET-acquired qualifications – increase the strength of the industry, securing efficient up-to-date provision of future-proof skills.

FIGURE 6.1 STRATEGIES AND TOOLS FOR EUROPEAN MET

Source: Table ANNEX 1.1 List of SkillSea key results

EU and EEA countries provide examples of internationalised strategies and, practically, at the level of non-STCW HE MET these largely follow – or can follow more easily – general EU HE standards and procedures of internationalisation.
For the active shipping professionals, participating in the wider European maritime cluster, MET is not provided according to one clear standard. In terms of MET provision, national boundaries are still clearly discernible from the diverse structures through which MET is provided. What has been lacking is a common strategy and shared vision across all types of METs, with an emphasis on the STCW MET diversity. This is especially in the case of METs outside HE, hence the focus of SkillSea's strategic direction - in terms of internationalisation and related tools – which uses elements of the wider EQF tools in a flexible way to enable interoperability.

6.2. European MET internationalisation strategy and tools

6.2.1. European MET internationalisation tools and proposed KPIs

Assessing current gaps in their provision and turning to internationalised strategies, MET establishments could address these more rapidly and efficiently and benefit from a quicker incorporation of new educational content, by taking advantage of synergies which may exist among the principal categories of MET (SkillSea, 2021b).

7 *Cf. SkillSea (2021). D3.2.Measuring evaluation strategies in MET, Cf. SkillSea (2021). D3.4. Internationalized strategies in MET. Report.*

In this respect, SkillSea's contribution to internationalisation strategies of METs through its key findings has been:

- The creation of structural cooperation between METs (cf. Section 7) which can also support internationalisation
- The creation of two tools assisting the internationalisation of METs: the Strategy Direction Location (STRA.D.L) can assist in locating partners according to needs, and the Transfer International Tool (Trans. IT) can be used to transfer credits, accommodating the diversity of European national MET systems (D3.4) while being based on EQF foundations
- Both these SkillSea MET internationalisation tools can assist in promoting all the related indicators, as suggested in SkillSea (2021b) and shown in Figure 6.2

FIGURE 6.2 KEY CANDIDATE MET INTERNATIONALISATION INDICATORS

Staff	Staff	Staff	Staff
☐ Number of exchanges	☐ Number of exchanges	☐ Number of shared resources	☐ Governing bodies with int. members
☐ Share of exchanges	☐ Share of exchanges	☐ Types of shared resources	☐ Number of international members
☐ Number of exchange partners	☐ Number of exchange partners	☐ Number of exchange partners	☐ Share of international members

Source: SkillSea (2021) D3.4 and IMPI (2012), Fleacă (2017) and Al-Zoubi (2019).

6.2.2. Future European MET internationalisation roadmap (F.E.M.I.R)

The SkillSea deliverable report D3.4 elaborated the long-term MET internationalisation roadmap (cf. Figure 6.2) which includes encouraging MET providers to adopt progressively:

A An Internationalisation Strategy Statement (ISS) to provide strategic focus in committing to stakeholders.

B A Standardised MET International Exchange Agreement (S.M.I.E.A) along the lines of existing Erasmus forms, taking into account the specific characteristics of MET training.

C A strategic dissemination of best practices among European METs, social media and promotion to digital networks. This can be facilitated through the structural cooperation mechanism of the Maritime Education and Training Network (MET-NET), a key SkillSea legacy (cf. Section 8).

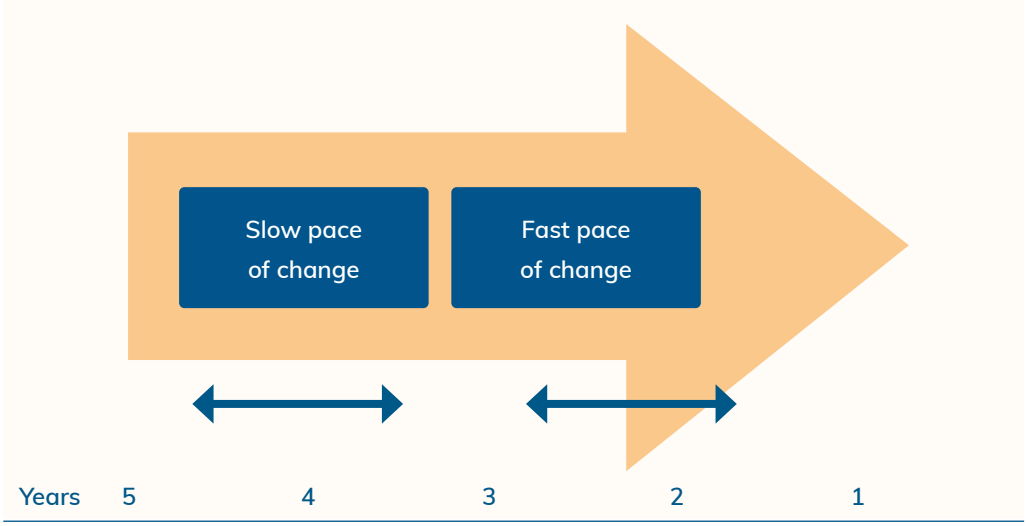
D A self-assessment exercise to monitor internationalisation progression can be facilitated when selecting through a common pool of internationalisation indicators those suitable for the diversity of the European MET scene.

None of the elements and steps of the roadmap precludes or replaces existing internationalisation provisions by MET providers already fully integrated in the European internationalisation framework in education. On the contrary, they borrow largely from the elements and practices of the Erasmus+ system, increasing compatibility among all forms and levels of the diverse European MET scene and promoting internationalisation within it.

6.3. Future European MET strategic evaluation

Sustainability and digital trends move the goalposts continuously for MET providers and their stakeholders. On the basis of scenarios in Section 2 of this key findings report, intervals for strategic MET evaluation have been set in SkillSea (2021a), as Figure 6.3. Adaptable model criteria for evaluating the provision have also been proposed in this context (ibid.)

FIGURE 6.3 MEASURING EFFECTIVENESS OF MET EVALUATION PER SPEED OF CHANGE



Evaluation intervals in years

To assess the suitability of MET curricula for employability and for the individual employability of maritime professionals, a versatile Shipping Employability AHP-Based Anticipating Tool (S.E.A. B.AN.T) has been devised (cf. Figure 6.5) through the model hierarchy in Figure 6.4.

FIGURE 6. 4 A MODEL HIERARCHY FOR A TOOL ASSISTED EVALUATION

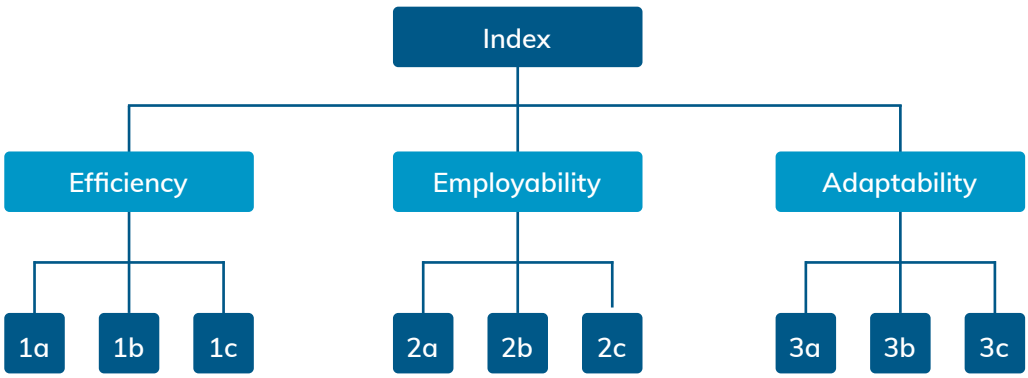
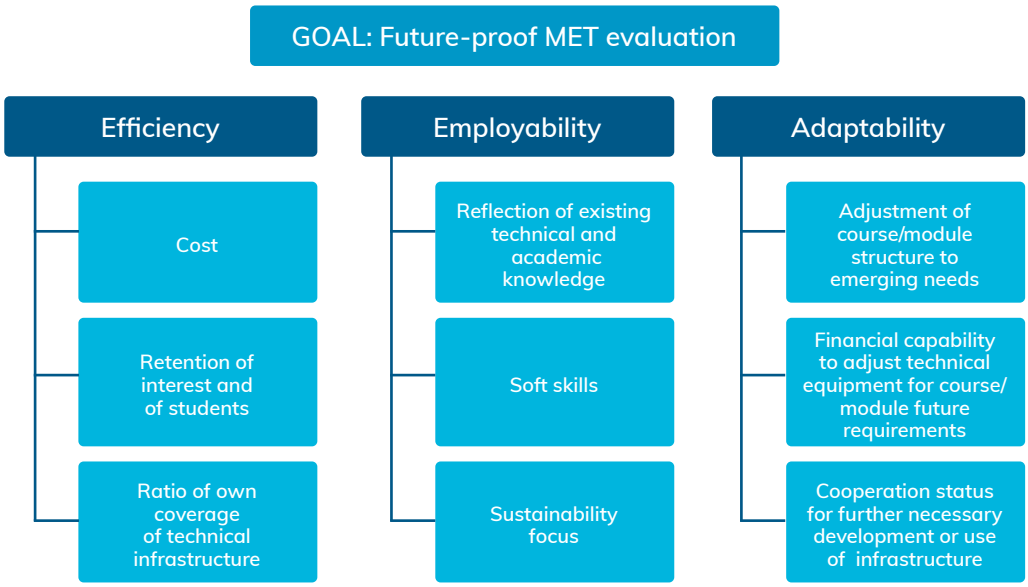


FIGURE 6.5 PURPOSE OF THE ST.E.ME.T TOOL: GOAL AND CRITERIA



GOAL: Future-proof MET evaluation

6.4. Measuring employability and skills gaps

6.4.1. Supporting the assessment of employability: the S.E.A.B.AN.T SkillSea tool

Closely related to the relevance and efficiency of MET provision, detailed specifications for an employability assessment and self-assessment tool and for a gaps-measuring mechanism have also been devised to increase employability (SkillSea, 2022a).

Employability can be measured at various levels and for a number of purposes including self-assessment for maritime shipping – onboard and ashore. It can be supported through the updatable Shipping Employability AHP-Based Anticipating Tool (S.E.A.B.AN.T), created in the context of SkillSea (2023) and based - as all SkillSea WP3 tools - on the user-friendly Multiple Criteria Decision-Making Method of the Analytic Hierarchy Process, which allows changes in the weights of criteria defining the measurement goal. In the case of S.E.A.B.AN.T this implies employability on the basis of suitable skills.

S.E.A.B.AN.T allows a structured self-assessment of maritime professionals and MET graduates' employability. Most versatile, this tool can serve different types of users. Two examples of its use are for assessing:

- How employable is the average graduate of our MET?
- How employable is my profile as a maritime professional?

The final result of this self-assessment exercise will highlight the missing elements/lower scores that need attention and the scope for self-improvement in a set criteria context. The S.E.A.B.AN.T tool can offer more, such as monitoring employability over time, against effort allocated, or against the cost of a MET or of an upskilling course and enables measurement against other parameters, such as skills versus competencies.

6.4.2. Creating a gaps measurement mechanism: the GAPMMMET surveys

To address skills gaps, the first step is their assessment through an appropriate method. Relevant stakeholders should convey their experience of such gaps and of their impact. At the same time any such mechanism must be simple, transparent and user-friendly for the diverse stakeholders involved.

The relevant SkillSea reports have resulted in the development of the Gaps Measurement Mechanism for MET (GAPMMMET).

- GAPMMMET is an internet-based survey yielding illustrative graphics informing on skills gaps and their progression over time.
- GAPMMMET graphics are generated automatically – through freely availably or, at a later stage, bespoke application.
- Surveys are planned initially on an annual basis, or biennially should the annual survey prove not to be productive.
- Surveys need to be promoted by the European MET Forum MET-NET as a form of structural cooperation of European METs.
- It is proposed that the planned annual surveys will be distributed through a link sent to subscribed selected relevant MET stakeholders, with input remaining free of charge and anonymous.

The GAPMMMET mechanism benefits from the experience gained through the SkillSea gaps surveys for both SkillSea D3.3 interim and the D3.3 final reports on employability and skills gaps. MET-NET can elaborate survey forms and graphics so that the mechanism set-up becomes user-friendly at all levels, while the European Maritime Skills Forum proposed by SkillSea serves as the ideal open form for METs to communicate with their stakeholders (cf. Section 7, infra.). It can also provide an ideal conduit for further discussion of the results of surveys.

6.5. MET and its stakeholders: strategic cooperation and the S.CO.MET.T tool

The SkillSea plan for further cooperation among stakeholders and MET passes through the creation of a roadmap – an output of WP5 – on the basis of a proposed set of subjects of common interest derived from the PESTEL analysis of this report, summarised below in Figure 6.5, in order to:

A Develop a framework for European MET stakeholder interconnection in Europe to deliver future-proof MET, promoting adaptation to a changing shipping framework and mobility of maritime professionals while fostering the shift from 'Maritime' to 'Blue' Europe.

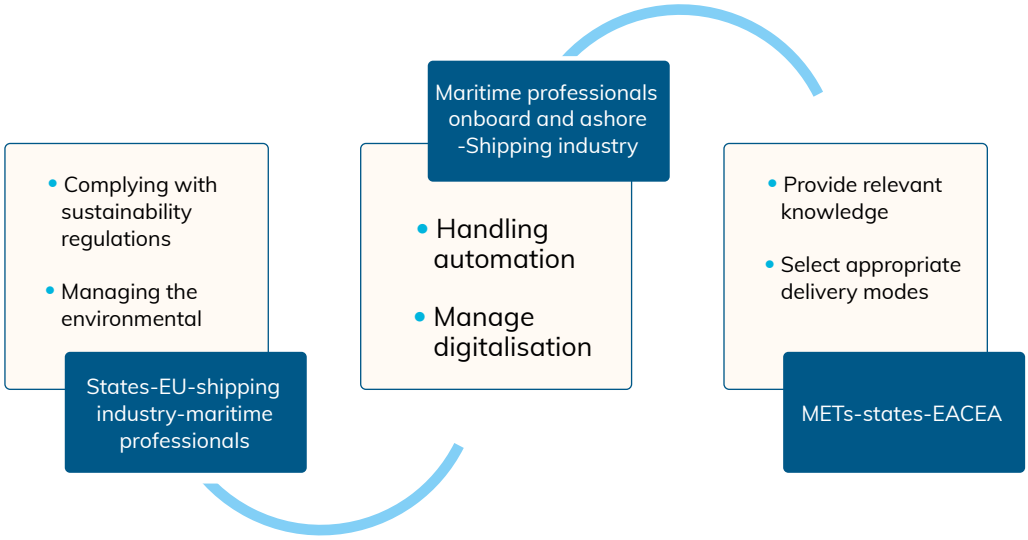
B Encourage interaction and communication among MET stakeholders. This can be done through regulatory support fostering efficient interconnection on European MET common ground, effective mentoring and on-the-job practice of future maritime professionals.

C Facilitate horizontal and vertical cooperation of MET stakeholders with the aim of rendering future-proof services and offerings of European MET.

D Remove cultural barriers to attractiveness. Communication, transparency and interaction between METs and prospective maritime professionals can support this.

E Enable cross-sectoral employment and reduce structural shortages of personnel.

FIGURE 6.6 GOALS, FEEDBACK AND DYNAMICS FOR STRATEGIC MET STAKEHOLDER INTERCONNECTION AT EEA LEVEL



To support the development of strategic cooperation of MET stakeholders of various types the Stakeholder Cooperation for MET Tool (S.CO.MET.T) strategy tool has been created. This tool supports stakeholders' cooperation decisions. It reveals not only suggested cooperation preferences between specific type stakeholders, but also their capacity to contribute to the envisaged strategic stakeholder cooperation, as well as the relative significance of such contributions based on own input. S.CO.MET.T – like all SkillSea tools – is accessible through the SkillSea website[8] which includes additional videos and files for interested users.

8 *skillsea.eu/skweb/www.skillsea.eu/index.php/activities/access-to-data-and-tools/internationalized-strategy-tools/stakeholder-cooperation-for-met-tool-s-co-met-t.html*
www.skillsea.eu/index.php/activities/access-to-data-and-tools/the-shipping-employability-ahp-based-anticipating-tool-s-e-a-b-an-t
www.skillsea.eu/index.php/activities/access-to-data-and-tools/strategic-evaluation-met-tool
www.skillsea.eu/index.php/activities/access-to-data-and-tools/internationalized-strategy-tools
www.skillsea.eu/index.php/activities/access-to-data-and-tools/internationalized-strategy-tools/strategy-direction-location-stra-d-l

6.6. Summary Section 6 key findings: strategies and tools for MET

SUMMARY

Key challenges of the 2017 call	S6 SkillSea key findings 2023
How can MET-specific tools assist in MET curricula improvement, assessing employability, identifying cooperation between MET partners, and supporting student mobility?	Internationalisation of METs in Europe can be supported through long-term strategies for international cooperation and two specifically created tools as the Strategy Direction Location (STRA.D.L) for locating internationalisation partners and Transcript International Transfer (Trans.I.T).
	Strategic evaluation is required so that METs and their stakeholders can evaluate effectiveness and currency of provision with regard to current trends. The SkillSea created Strategic Evaluation MET Tool (ST.E.ME. T) which is operable at a MET/ course/module level.
	Strategic cooperation with MET stakeholders is a current standard practice in many EEA countries and all partners can benefit by the study of best practices supported by the SkillSea created Stakeholder Cooperation for MET Tool (S.CO. MET.T) for selecting productive, inclusive and sustainable forms of MET stakeholder cooperation at desired level
	Skills gaps can be measured through annual surveys within E-MSF - on the basis of the GAPMMMET, the MET skills gap measurement mechanism - and addressed within MET-NET
	Employability can be measured at diverse levels and for a number of purposes including self-assessment. Employability can be supported through the updatable Shipping Employability AHP-Based Anticipating Tool (S.E.A.B.AN.T), based on the user-friendly Multiple Criteria Decision-Making Method of the Analytic Hierarchy Process

7. A future-proof maritime skills strategy

The final Future-proof Skills Strategy emerging from SkillSea addresses the triple-knot (of skills gaps, low attractiveness and mobility challenges for maritime careers in Europe) and also provides direction for the future in the light of emerging key findings.

FIGURE 7.1 PRIORITY POLICY RECOMMENDATIONS AND PROPOSED ACTIONS

Source: Table ANNEX 1.1 List of SkillSea key results

7.1. The Future-proof SkillSea Strategy for shipping and beyond

Changes in operational practices and developments of key inputs such as new fuels require a swift response by METs. To enable the European MET system of various EQF levels to follow these changes, the SkillSea Future-proof Skills Strategy has been based on three pillars:

I The educational toobox-based solution for updatable flexible VET upskilling and reskilling packages centred on modern digital, green and change management related skills, including intrapreneurship and leadership. This is a solution which promotes mobility and enhances attractiveness, especially among prospective newcomers to the labour market. (cf. Sections 4 and 5).

II The tools devised and the SkillSea strategic directions for internationalisation, evaluation, cooperation and employability (cf. Section 6).

III The development of two important collaboration structures: the Maritime Education and Training Network (MET-NET), a structural collaboration of MET providers; and the European Maritime Skills Forum, a collaboration of industry, education, research and authorities for knowledge transfer, serving also as an enlarged appropriate basis for the GAPMMMET measurement mechanism of gaps in MET.

7.1.1. A European strategy for a diverse MET system

Analysis of the educational structures and policies across EEA countries (cf. Annex 11) results in an overall assessment that VET education provides the largest share of educational schemes related to maritime careers onboard.

There are, however, large variations in Europe[9] in terms of:

1. Involvement of national/regional/local authorities in VET
2. Innovation/introduction of new schemes in VET education
3. Involvement of employers/employees
4. Lifelong learning regimes/frameworks

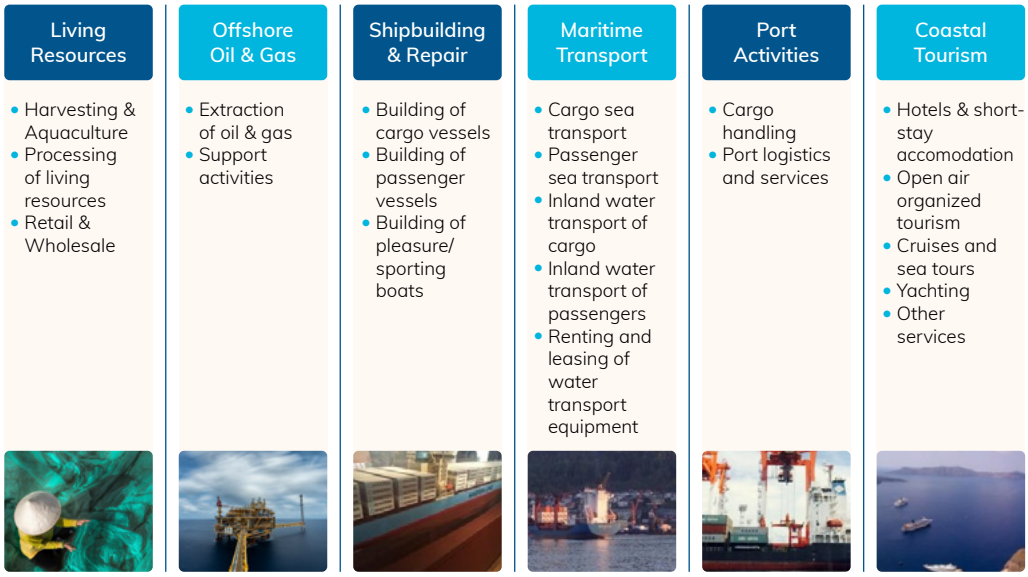
Because MET is provided in most countries in a VET context – albeit not of the same level or outside of the EQF proper – differences in aspects 1 to 4 above are observed. Practically in all European countries the national Ministry/Department of Education bears ultimate responsibility for VET education. That responsibility (or aspects of it) is delegated in a number of countries to other bodies or shared with another ministry or department. Annex 10 summarises in Table Annex 10.1 the diversity of aspects of education regimes across EEA countries and the UK, including funding and relative autonomy. Across SkillSea partner countries, the involvement of the maritime transport sector with the respective educational systems has been organised in order to best match the skills needs of the industry with the education offer from METs (cf. Table Annex 12.1).

7.1.2. Implementing the SkillSea solution for MET lifelong learning in a Blue direction

The SkillSea Future Skills Strategy has at its core the flexible Toolbox, designed to run at various levels and forms and, ideally, in the short to medium term as VET lifelong learning. While the organisation and content of all forms of education remain the responsibility of member states (cf. Annex 11), the EU supports lifelong learning by coordinating cooperation between them. The flexibility of the SkillSea Toolbox allows adoption and implementation, regardless of specific national framework, also enabling cooperation across European METs (cf. Annex 12). The SkillSea solution caters thus for mobility across maritime shipping, sea-to-shore across the maritime transport value chain, and also for the wider set of sectors of the Blue Economy. The SkillSea Toolbox flexible educational packages address the main skills required across this vast, promising and essential area of activity for the sustainable growth of Europe (cf. Figure 7.2).

9 *Vocational education and training in Europe, 1995-2035, Cedefop reference series 114, 2020; The importance of being vocational. Challenges and opportunities for VET in the next decade, Cedefop ETF, 2020.*

FIGURE 7.2 SKILLSEA DIGITAL AND GREEN SKILLS COVER BLUE ECONOMY NEEDS



Note: Pictures Microsoft Word stock images or D3.7/EF team.

Source: SkillSea (2021). D3.2. Measuring evaluation strategies in MET. Report. Informed and adapted from various EU documents especially from European Commission, Blue Growth Policy, COM(2014) 254/2 (13/05/2014) and compatible with European Commission (2016). Blue Growth and Smart Specialisation, available here. Last accessed March 17, 2023.

Both the digital skills and the sustainability perspectives permeate the SkillSea framework for strategic evaluation of the provision of METs[10]. The related tool devised by SkillSea guarantees the future-proof quality of skills provided for formal (STCW and non-STCW) MET, including upskilling and reskilling on the basis of the SkillSea educational VET solution.

Evaluation and internationalisation, along with cooperation of METs and MET stakeholders in Europe, can yield best results if supported by a general framework of adequate policies and specific actions. Among the range of such policies, SkillSea, through a long-process of consultation, has formulated a list to be commended to regulators at national and EU level.

7.2. Building the list of SkillSea priority policy recommendations

The full list of policy recommendations and the specific actions proposed, and of the methodology for reaching these, is provided in Annexes 1 to 6 appended to this report. They are directly relevant to this sub-section; apart from the full and interconnected lists of policy recommendations and specific actions proposed, they show steps followed for deriving results through intense partner consultation and consensus-building.

10 *Cf. SkillSea (2021). D3.2. Measuring evaluation strategies in MET. Report.*

From the listed priorities, the promotion of lifelong learning is considered key, along with the inclusion of broader upskilling/upgrading topics beyond STCW requirements in existing MET curricula. Prominent examples are leadership, resilience, communication, and English language skills, with opportunities offered by digitalisation, sustainability and emerging technologies being effectively applied to render seafarers future-ready.

Among the other priority policy recommendations – applying the toolbox approach to update curricula and to close gaps – the cooperation of METs and MET stakeholders to monitor gaps is essential. Improved policy support measures will increase the visibility and attractiveness of maritime careers and complement a list which, though not as exhaustive as Table Annex 1.1, is deemed essential and urgent.

TABLE 7.1 TOP SKILLSEA POLICY RECOMMENDATIONS

1	Promote lifelong learning to foster mobility in the context of the impact of emerging trends.
2	Enrich MET study programmes with broader upskilling/upgrading topics beyond STCW requirements, such as leadership, resilience, communication, and English language skills.
3	A continuous identification of skills gaps by relevant stakeholders (among others, research institutions, knowledge providers, maritime industry, and regulators) and stimulation of concerted action to close the gaps.
4	Opportunities offered by digitalisation, sustainability and emerging technologies should be effectively applied in education, reskilling and upskilling to render seafarers future-ready.
5	MET providers should be encouraged to share and extend the SkillSea educational packages to close skill gaps and further qualify maritime professionals.
6	Stimulate participation in MET-NET for the exchange of ideas and knowledge and discussion on identifying skills gaps, stimulating concerted actions to close those gaps.
7	Encourage education providers to apply the toolbox approach to close skill gaps and further qualify maritime professionals.
8	European MET study programmes should include topics related to desired skills in a common and transparent format that is easy to update and document (such as the toolbox) to foster greater compatibility of MET study programmes.
9	Take concerted action through public campaigns at the European level to improve the visibility of all the different, possible career paths of maritime professionals.
10	Capitalise on the cooperation among education providers to overcome challenges to future-proofing MET.

7.3. The SkillSea legacy: MET structural cooperation and openness

Cooperation in the maritime sector, beyond the financial-operational level where it is most visible, is part of its culture. Safety and efficiency of global shipping operations depend on the coordination and collaboration of various stakeholders across the maritime value chain. Such sectoral cooperation ranges from mutual insurance clubs for third-party liabilities to advisory forums and the key IMO committees. They also permeate the culture of European MET provision, as well in terms of informal cooperation and consultation.

Before the SkillSea initiative, there was no European mechanism, network or forum for structural MET cooperation. Worldwide international associations of academic institutions involved in MET education such as IAMU[11], and others have existed for decades, but these are at EQF level 6 and higher, so EQF 4 MET is not a part of those associations. SkillSea's answer to this gap is two bodies for cooperation within European MET. Making effective use of the strength, geographical reach and range of the project consortium, SkillSea developed the Maritime Education and Training Network (MET-NET) and the European Maritime Skills Forum (E-MSF) to promote structural cooperation for the first time at EEA level, and as a wider forum for METs to cooperate with their stakeholders.

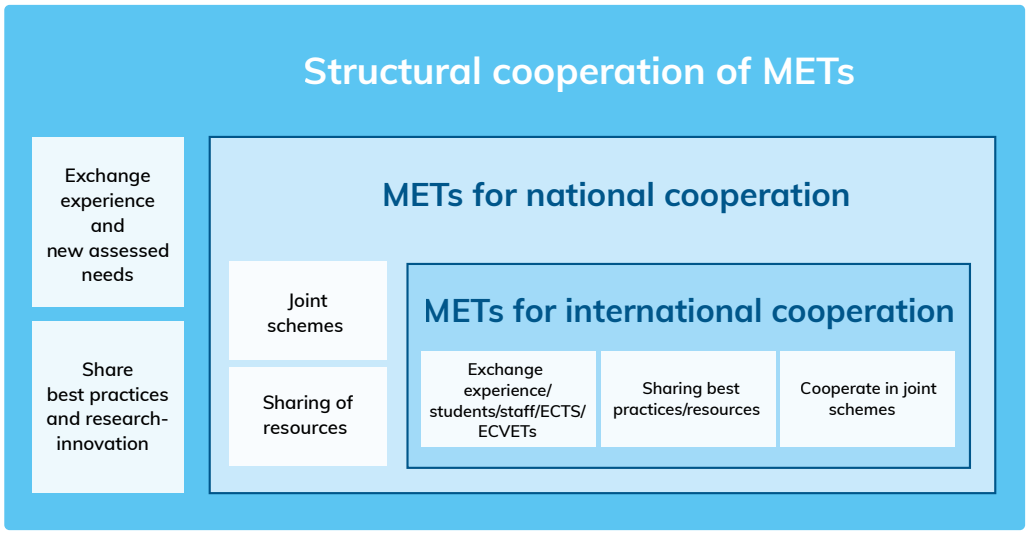
7.3.1. The Maritime Education and Training Network (MET-NET)

Focused on MET education, MET-NET seeks to develop a more structured cooperation between MET institutions in Europe, with the aim of delivering the following benefits:

- MET-NET is an ideal cooperation organisation for exchanging experiences and ideas on new learning objectives and outcomes dictated by new skills needs.
- By sharing knowledge and expertise among METs, MET-NET can help develop educational packages to update and assist the upgrading of the content and delivery for all levels of education, training, and certification of maritime professionals.
- MET-NET provides a structured network for solving internationalisation barriers and challenges faced by METs (such as those on student mobility) through common consideration and action.
- The structural cooperation of METs in the form of MET-NET promotes the creation of joint programmes on a national and cross-border basis, along with the promotion of Erasmus+ exchanges of staff and students.
- Structural cooperation can enhance awareness and dissemination of European mobility opportunities among the members of the educational communities of participating METs.
- By participating in the MET-NET, MET institutions can capitalise on the cooperation among education providers to overcome persistent challenges and to achieve the objectives identified by the SkillSea project, with METs benefitting from the latest research, innovation and best practices in the field.
- In the process of the network's creation, a number of SkillSea partners proceeded to various forms of other cooperation (project consortia, etc.) providing practical proof of the beneficial effects of structural cooperation.[12]

11 *International Association of Maritime Universities founded in 1999 with members across continents can be found here.*
12 *Cf. SkillSea (2022). D2.3. Structural Cooperation.*

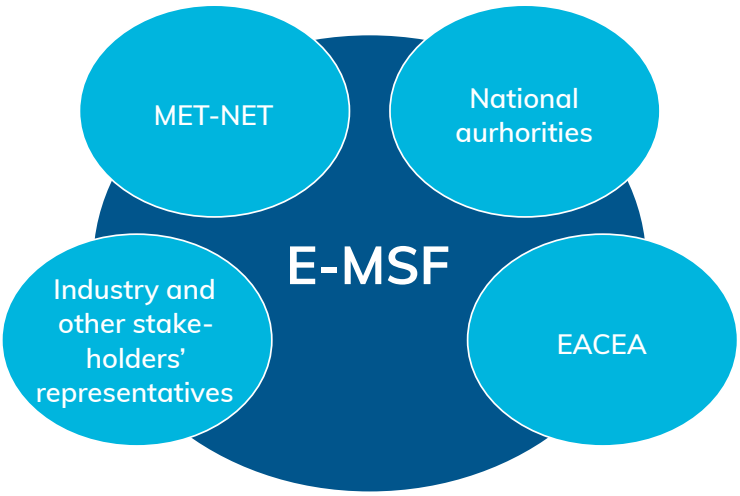
FIGURE 7.3 MET STRUCTURAL COOPERATION THROUGH MET-NET



Overall, the structural cooperation in the form of MET-NET is vital for ensuring the high-quality provision of European MET. This helps to prepare well-equipped maritime professionals for shipping, thus enhancing safety, quality and efficiency in the industry. The network provides a unique opportunity for MET institutions to share best practices and experiences on learning methods, new systems, and approaches.

In a much broader perspective, MET-NET will contribute to the creation of the E-MSF (cf. Figure 7.6), which is proposed to materialise as a manifestation of the openness of European METs. Similarly to MET-NET, the E-MSF is proposed to continue beyond the project's lifetime, supported by MET-NET with the cooperation of key MET stakeholders outside the maritime educational system (in their role as employee or employer representatives, or advisers). The E-MSF has been designed to bring together organisations involved in MET planning and strategy, provision of MET education, as well as research in related areas, in order to promote the development of the maritime industry. By bringing together key players in these areas, the E-MSF aims to facilitate the creation of new knowledge and the sharing of best practices. This type of cooperation is critical for driving innovation in the maritime sector and for ensuring that stakeholders are well-informed about the latest developments.

FIGURE 7.4 MET-NET + MET STAKEHOLDERS = E-MSF



Both E-MSF and MET-NET reflect the importance of cooperation and knowledge sharing in the maritime sector. By working together, METs stakeholders can better address challenges and opportunities, enhance safety and efficiency, and drive progress in this essential industry. The Memorandum of Cooperation, signed in May 2023 at the final SkillSea conference by maritime education providers participating in the consortium, has been prepared to establish the foundation core of cooperation of European METs through MET-NET, with the prospect of also announcing the plan to invite stakeholders to an open, productive dialogue for contemporary MET content to serve current industry needs through the European Maritime Skills Forum (E-MSF).

7.4. Open to MET stakeholders: a European Maritime Skills Forum

The SkillSea project has played an essential role in addressing the skills gap in the maritime sector by developing innovative new educational materials and methods to improve the quality of MET institutions. After the SkillSea project ends, it is important to ensure that the positive outcomes achieved during the project are maintained and will be expanded. The European Maritime Skills Forum (E-MSF) presents a unique opportunity to carry on the legacy of the SkillSea project.

- The E-MSF brings together MET institutions, industry stakeholders, and policy-makers to develop strategies and recommendations to improve the quality of MET and address the skills gap in the maritime sector.
- The E-MSF provides a platform for cooperation and knowledge sharing among MET institutions and other stakeholders in the maritime sector. Through the E-MSF, MET institutions have access to easily accessible knowledge and tools for continuous updating of educational material and upskilling of the workforce. Knowledge transfer is thus achieved in a non-formal, yet semi-structured way through periodic events and exchanges.
- The E-MSF will provide an appropriate basis for the update of the GAPMMMET surveys informing on skills gaps, thus strengthening the feedback relationship between METs and their stakeholders.
- Furthermore, the E-MSF is an ideal platform to capitalise on the cooperation among education providers to overcome the persistent challenges identified by the SkillSea project.

To achieve its goals, the E-MSF needs to stimulate participation among MET institutions and other stakeholders from the maritime sector. By promoting the E-MSF as a European instrument for the exchange of relevant EU-funded research results, MET institutions can use the Forum to gain access to easily accessible knowledge and tools for continuous updating of educational material and upskilling of the workforce. Both the structural cooperation created in the form of MET-NET and the proposed informal cooperation with MET stakeholders in the form of the European Maritime Skills Forum (E-MSF) represent the two key constituent parts of the SkillSea legacy proposal which will continue supporting the strategic solution provided by the project and its outcomes.

7.5. Summary Section 7 key findings: policy for a Future-proof European MET

SUMMARY

Key challenges of the 2017 call	S7 SkillSea key findings 2023
How can the European blueprint methodology assist in overcoming maritime sector challenges and foster increased stakeholder cooperation?	Internationalisation, evaluation, cooperation of METs and with its stakeholders in Europe can be supported through respective long-term strategies assisted by strategic tools created by SkillSea
	A key legacy of SkillSea is the creation of the MET structural cooperation in the form of the Maritime Education and Training Network (MET-NET) and the prospective creation of the European Skills Forum (E-MSF)
Provide policy recommendations for a final Future Skills Strategy for European MET and maritime professionals	*A top priority emerging is the promotion of lifelong learning in order to address emerging trends in shipping*
	A key priority is that key required technical knowledge and skills must be supplemented by leadership, resilience, communication, and English language support.

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  - D1.1.1 Methodology (M3)
  - D1.1.2 Current and skills needs (Reality & Mapping) (M10)
  - D1.1.3 Future Skills and competence needs (Possible future development) (M12)
  - D1.2.1 Skills and Competence GAP between current and future needs (M12, M36)
  - D1.2.2 Identification of mismatches on a structural basis (M15)
  - D1.2.3 Impact on occupational profiles (M15)
  - D1.3 Recommendations for Education and Training (M18)
  - D2.1 Guide on Design and Implementation of Education Packages (M48)
  - D2.2 Educational Packages for specified skills (M48)
  - D2.3 Structural Cooperation(M48)
  - D2.4 Guide on Business/Education Partnerships (M48)
  - D3.1 Strategy Plan Framework - Summary (M18) v0.1
  - D3.2 Measuring evaluation strategies in MET (M24) v0.2 # Summary v0.1
  - D3.3 Employability, Anticipating Skills needs and GAP measurement (M28, M48) v0.2
  - D3.4 Internationalized Strategies in Maritime Education Training (M18) v0.1
  - D3.5 Maritime Education Training and its stakeholders: interconnections and strategies (M46)
  - D3.6 BLUEPRINT Maritime Shipping Portal (M3-M48) v0.1
  - D3.7 Strategy key findings (M48) v0.1
  - D4.2 Dissemination materials (M6, M24, M36, M45)
  - D4.3 Dissemination Activities (M24, M48)
  - D5.2 The Roadmap towards a sustainable skills strategy (M12, M30, M48)

ANNEXES

ANNEX 1

TABLE ANNEX 1.1 SKILLSEA KEY FINDINGS, POLICY RECOMMENDATIONS AND PROPOSED ACTIONS

	SKILLSEA key findings cover the following elements of the call	SKILLSEA key findings (in brackets references to deliverables)	Key policy recommendations	Suggestions of concrete actions for policy implementation	Stakeholders to take action
1	*What are the scenarios and trends in the maritime sector?*	**Impact of new fuels and autonomous vessels** • While a widespread introduction of autonomous ship operations offered by digitalisation and emerging technologies is not expected in the short or medium term, the increasing use of new technologies will continue to change practices onboard ships and in ship operations, intensifying the need for maritime professionals to have an in-depth understanding of the complex systems on their vessels. • The impact of regulatory requirements for more sustainable shipping operations, including the use of 'greener' fuels and other measures to reduce emissions from shipping, is expected to be strong in the short to medium term, similarly requiring new and enhanced skills to ensure safe and environment-friendly operations together with the health and safety of seafarers (D1.21, D1.1.2, D1.1.3, D1.2.2, D1.2.3, D3.1 and D3.3.)	1a Closely monitor the evolving technologies in maritime transport in order to gather the most accurate, up-to-date, unbiased view of the developments that are taking place. 1b Update scenarios for future development on a yearly basis.	1 Liaise in E-MSF with the most important representatives of the maritime transport sector and the technology providers for the sector. 2 Visit forward-looking seminars and conferences. 3 Follow relevant (scientific) publications (e.g. DNV studies). 4 Define consequences of scenarios and trends for education needs.	
2	*What are the most significant forces affecting the maritime sector, and how are the corresponding trends influencing skills gaps/ shortages?*	**Changes and the need for new and upgraded skills** • Rapid emerging technologies, digital transformation on ships and in ship operations and an increased focus on sustainability require the development of future-proof skills for maritime professionals, resulting in a substantial need for upskilling and reskilling. • The SKILLSEA surveys revealed common perceptions - at varying degrees - among industry leaders and maritime professionals on outdated skills and educational material. There was also a common perception of the level of the short-term resilience of current skills, especially in areas such as digitalisation and automation on ships and in ship operations, and ashore (D3.1, D3.2, D1.1.2 and D1.1.3, D3.3)	A continuous identification of skills gaps by relevant stakeholders (among others, researcher institutions, knowledge providers, maritime industry, regulators) and stimulation of concerted action to close the gaps.	1 Organise regular meetings (e.g. once each year) initiated by the European Maritime Skills Forum (E-MSF; worked out in conclusion 10) with the support of MET-NET to bring the relevant stakeholders together to provide input for closing the skills gaps. 2 Identify needed skills in cooperation with the maritime transport sector and where relevant comparable economic sectors. 3 Presentation of analysis in E-MSF, a panel discussion by experts and dialogue on the impact of these results. 4 Education providers to adapt Educational Programmes and/or upskilling and reskilling. 5 E-MSF, with the support of MET-NET will initiate the skills gap analysis tool survey and present findings, compared with EMSA and others' findings. 6 Send feedback to EMSA and make it available to member states' regulatory bodies and other interested parties through the SKILLSEA portal. Members may distribute further in their networks.	
3	*What are the significant impacts on occupational profiles?*	**Emerging occupational profiles** • Occupational profiles in the shipping industry should, as much as possible, be linked with the functions set out in the STCW Convention to ensure that all functions in STCW are reflected in the ESCO occupational profiles. • New occupational profiles are not expected to emerge in the short to medium term. However, new ones may appear in the longer term, as developments beyond 10 years ahead can be expected as a consequence of digital/technology/sustainability breakthroughs. Additional skill sets may likely change the current occupational profiles in the short and medium term (D3.1, D3.2 and WP 1.2.3)	3a Align ESCO system and structure with IMO decisions on STCW. 3b Improve the focus on additional skills instead of the outdated focus on new job profiles. 3c Opportunities offered by digitalisation, sustainability and emerging technologies should be effectively applied in education, reskilling and upskilling to render seafarers future-ready.	1 Maritime Training and Education Network (MET-NET) cf. 7 infra.): look at best practices and implement them in relation to skillsets. 2 Integrate the profiles Electrical Technical Rating (ETR) and Electrical Technical Officer (ETO) in ESCO. 3 'Translate' the significant impact of developments in maritime transport into new skills that can be transferred to educational programmes.	
4	*Which actions must be taken to reduce related skill gaps, and at what level? How can some of the identified skills gaps be closed?*	**Toolbox approach** • SKILLSEA has responded to the assessed industry trends by delivering an adaptable toolbox approach to create tailor-made syllabi for upskilling and reskilling, flexible in terms of EQF level. Emerging training needs such as safety and security are thus also supported. • The toolbox approach cultivates lifelong learning and supports intra-sectoral mobility (D2.1, D2.2). • Updating educational material • Educational Packages Green Skills, Digital Skills, Leadership, Intrapreneurship & Innovation, STEM, Train the Trainer, and a guide have been delivered for the toolbox; these support future responses to new and emerging educational needs, increasing attractiveness and employability (D3.3, D2.1, D2.2, D1.1.3, D4.4)	4a Encourage education providers to apply the toolbox approach to close skill gaps and further qualify maritime professionals. 4b Enrich MET study programmes with broader upskilling/ upgrading topics beyond STCW requirements, such as leadership, resilience, communication, and English language skills.	**Current SKILLSEA partners:** 1 present the SKILLSEA project development and its results, 2 Participate in congress/seminars at national/ international/ European level, 3 Use/promote the SKILLSEA website to get more people connected/linked. **Future MET-NET partners:** 1 Organise a yearly Maritime Day Congress, 2 Organise (online) information sessions with MET providers and other relevant stakeholders to: – Promote the relevance and benefits of the SKILLSEA toolbox and Educational Packages (EPs); – Encourage, stimulate, and support MET providers in applying the toolbox with common terminology and the developed EPs; – Continuously update the toolbox and EP contents (which includes maintaining this capacity in terms of structure and finances). 3 Support the collaborative development of new EPs in MET-NET. – MET providers integrate EPs in the educational structures of European member states for certification and academic recognition. – Increase staff mobility.	
5	*Which concrete, sustainable solutions are needed for the qualitative and quantitative mismatch between demand and the supply of labour?*	As well as enhancing the educational offer, improved mobility between onboard and onshore positions of all educational levels will be of vital importance to maintain the skills level of current and future employees in maritime transport and, whenever possible, to expand the number of staff positions onboard (D1.2.2).	5a Improve and promote opportunities for career mobility and progression. 5b Develop appropriate solutions for systemic blockages which hamper mobility. 5c Promote lifelong learning to foster mobility in the context of the impact of emerging trends. 5d Training should be generic to facilitate mobility of seafarers across a broad range of ship types and trades. 5e Remove (official and unofficial) obstacles restricting intra-sectoral mobility.	1 Promote the use of relevant tools developed by SKILLSEA. 2 Raise awareness of the importance of mobility among industry representatives and policymakers at regional and national levels at relevant events. 3 Investigate the potential for regulatory change to improve the possibilities of mobility. 4 Promote the visibility of career opportunities onshore, offshore, and on ships and in ship operations. 5 Investigate the potential for recognition of prior learning. 6 Where appropriate, MET providers should engage further with the European Credit System for Vocational Education and Training (ECVET) with the aim of improving the recognition and transferability of individuals' learning outcomes achieved in both formal and non-formal contexts. 7 Raise awareness of the EPs through the E-MSF; ask users' preferences on delivery. 8 Use SKILLSEA EPs to deliver updated knowledge continuously (by the education provider of the customer's choice). 9 Inform of options for micro-credentials (education providers to initiate). 10 Provide and inform of updates to the ESCO database through E-MSF (MET providers to initiate).	

STAKEHOLDERS

1  Maritime Education and Training Institutes

2  Maritime Transport Sector

3  Competent authorities and other regulatory bodies

	SKILLSEA key findings cover the following elements of the call	SKILLSEA key findings (in brackets references to deliverables)	Key policy recommendations	Suggestions of concrete actions for policy implementation	Stakeholders to take action
6	*How to increase the attractiveness of the maritime sector?*	**Improve and promote the attractiveness of the maritime transport sector** • The opportunities of the maritime transport sector and the range of maritime career paths should be promoted to attract a more diverse pool of prospective maritime professionals. Increased maritime career attractiveness can address maritime professional shortages and qualification mismatches. • National campaigns fit for local conditions could be coordinated, though not necessarily integrated, on a pan-European basis. • Campaigns can highlight technological developments, digitalisation, sustainability, and intra-sectoral mobility to show career opportunities related to contemporary skills (WP4 deliverables).	6a Dispel outdated and inaccurate perceptions of the maritime industry to improve its attractiveness. 6b Take concerted action to improve the visibility of maritime professionals' different possible career paths through public campaigns at the European level, in particular, directed to young people.	1 Communicate current characteristics of the maritime transport sector instead of 'old', outdated images. 2 Use more general themes such as 'the ocean' to attract more interest for the sector, in particular to young people. 3 Involve a specialised agency. 4 Promote the widespread use of dissemination tools developed by **SKILLSEA**. 5 Organise a yearly event with MET providers and industry focusing on sectoral developments, (new) skills, career paths and opportunities, new jobs, mobility, etc. 6 Involve the young to promote the maritime sector and begin introducing maritime transport in secondary education. 7 Better target possible recruitment from other, current, maritime sector students. 8 Analyse competences (ESCO) and the labour market to identify possible equivalences and gateways for students from other maritime sectors.	
7	*Which benefits can be derived from fostering increased European MET cooperation?*	**MET cooperation** • The development of the Maritime Education and Training Network (MET-NET), which was started by **SKILLSEA**, remains important. MET-NET is necessary to achieve a level-playing field with other organisations of MET stakeholders. • MET-NET will enable the sharing of resources and expertise to enhance the education and training provided to maritime professionals. Improved cooperation increases knowledge sharing, builds trust, and inspires further developments and progress, thus contributing to increased learning and mobility within the sector (D2.3, 3.1, 3.4, 1.1.3, 1.1.2)	7a Stimulate participation in MET-NET for the exchange of ideas and knowledge and for the discussion on identifying skills gaps, stimulating concerted actions to close those gaps. 7b Capitalise on the cooperation among education providers to overcome challenges to future-proofing MET. 7c MET providers should be encouraged to share and extend the educational packages to close skill gaps and further qualify maritime professionals.	1 Industry presentations of innovative developments. 2 MET providers/academia exchanging knowledge/ experience regarding common issues (staff shortages, skills gaps, etc.). 3 Promoting new technologies and solutions through channels to stimulate participation. 4 Organise workshops, seminars, summer schools, traineeships, etc. (face-to-face/online). 5 Knowledge transfer. 6 Facilitate mobility. 7 Share best practices on education. 8 Improve recognition to facilitate mobility. 9 Exchange information to promote the toolbox and the Education Packages. 10 Disseminate newly developed educational packages. 11 Organise workshops for teachers. 12 Encourage critical review of educational packages in MET.	
8	*How can MET-specific tools assist in MET curricula improvement, assessing employability, identifying cooperation between MET partners, and supporting student mobility?*	**Strategic tools** Strategic tools have been devised in the context of **SKILLSEA** to assist MET providers, maritime professionals, and other MET stakeholders: A A Strategic Evaluation MET Tool (ST.E.ME.T) was designed to evaluate curricula suitability (D3.2). B An Analytic Hierarchy Process (AHP) tool has been produced (D3.5) to support MET stakeholder strategic partnership form, the Stakeholder Cooperation for MET Tool - S.CO.MET.T C A Shipping Employability AHP Based Anticipating Tool (S.E.A B.AN.T) has been devised to assess the suitability of MET curricula for employability and the individual employability of maritime professionals. The specifications for a gaps-measuring mechanism have also been devised to increase employability (D3.3 and D2.2). D Two tools have been devised to support the internationalisation process of METs. The Strategy Direction Location (STRA.D.L) can assist in locating partners according to needs. The Transfer International Tool (Trans. IT) can be used to transfer credits, accommodating the diversity of European national MET systems (D3.4) while being based on EQF foundations (D3.4)	8a European MET study programmes should be encouraged to include topics related to desired skills in a common and transparent format that is easy to update and document (such as the toolbox) to foster greater compatibility of MET study programmes.. 8b European MET stakeholders should take into account existing different approaches to organising and structuring education, training and certification, including formats of delivery of training.	1 Define desired skills. 2 Use the formats and tools developed in **SKILLSEA** for current and future educational programmes and modules in the toolbox framework. 3 Raise awareness of **SKILLSEA** Toolbox as an appropriate response to new skills needs. 4 Support MET providers in the inclusion of developing topics and skills. 5 Put the Train-the-Trainer guides of the developed tools and instruments into use. 6 Involve MET providers in the continuous updating of teaching materials.	
9	*How can the European blueprint methodology assist in overcoming maritime sector challenges and foster increased stakeholder cooperation?*	**Maritime Skills Forum** Establishing a sustainable European Maritime Skills Forum (E-MSF) will assist in sharing best practices, fostering cooperation among MET providers and maritime stakeholders, and increasing knowledge transfer. (D3.5 and D5.2).	9a E-MSF should be promoted as a European instrument for harvesting synergies with related sectoral projects. 9b Inform ESCO on relevant developments of maritime professions in EU projects.	1 Demonstrate the feasibility and potential contribution of the E-MSF to stakeholders. 2 Develop the vision, mission, objectives and activities of E-MSF into a long-term action plan. 3 Use E-MSF to share knowledge and tools amongst the stakeholders. 4 Involve relevant stakeholders in the creation of E-MSF. 5 Incorporate the E-MSF page in the **SKILLSEA** website. 6 Encourage social partners to take the lead. 7 Recognise and support E-MSF as the centre for the exchange of relevant EU-funded research. 8 Create a common gateway website for completing and running EU-funded research in the area of MET (and more general maritime transport). 9 During E-MSF events, a dialogue between regulatory bodies, social parties and MET providers on improved recognition of seafarers' training, experience and qualifications can occur. ESCO can be informed on latest developments. 10 Encourage the update of maritime profiles in accordance with STCW requirements. 11 More fluid communication among national authorities, regulators, industry, and universities. 12 Evaluate current European grant programmes on their opportunities to finance development of European sectoral cooperation.	

STAKEHOLDERS

1 Maritime Education and Training Institutes

2 Maritime Transport Sector

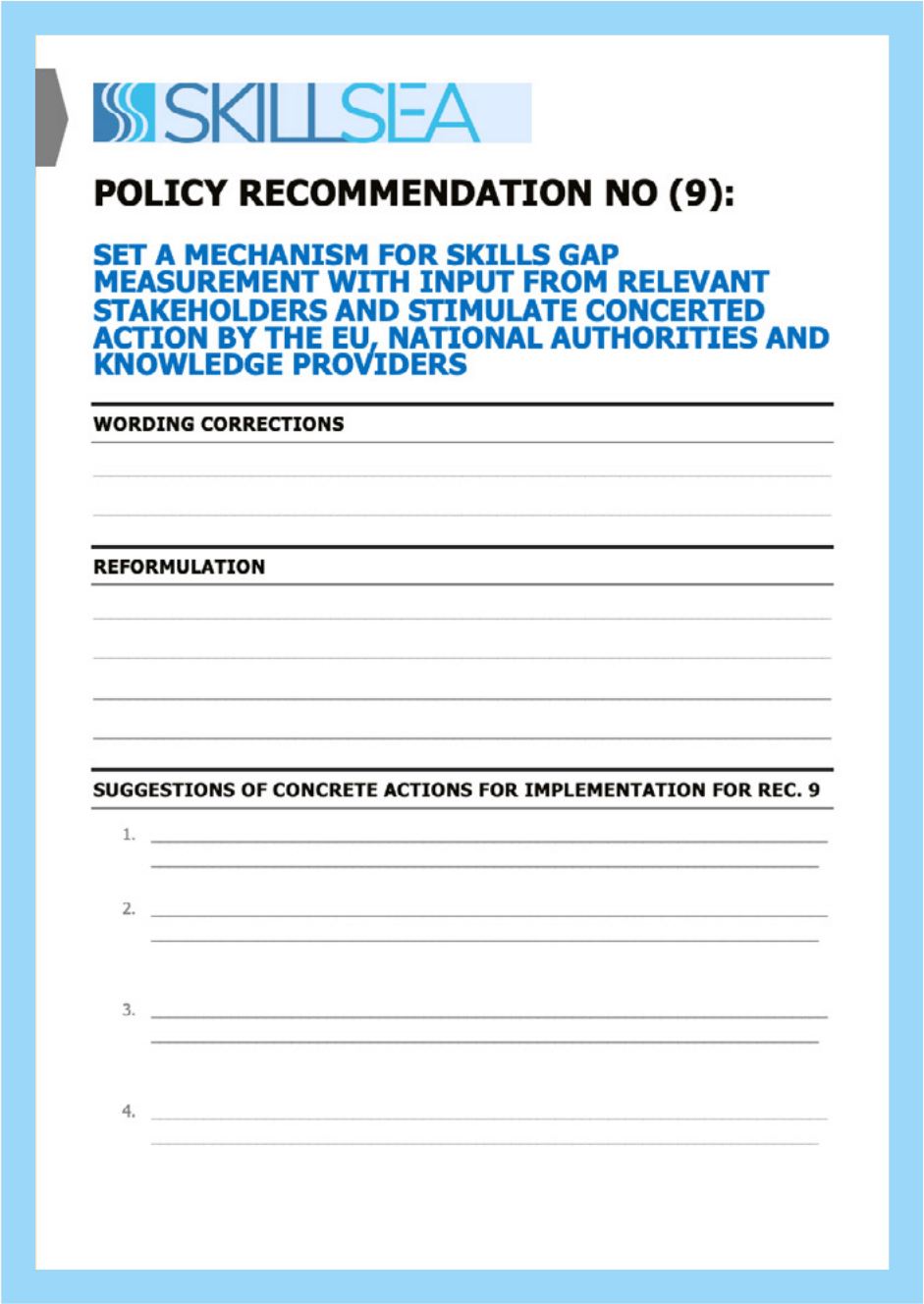
3 Competent authorities and other regulatory bodies

TABLE ANNEX 1.2 FULL LIST OF SKILLSEA POLICY RECOMMENDATIONS

1. A continuous identification of skills gaps by relevant stakeholders (among others, researcher institutions, knowledge providers, maritime industry, regulators) and stimulation of concerted action to close the gaps.
2a.Closely monitor the evolving technologies in maritime transport in order to gather the most accurate, up-to-date, unbiased view of the developments that are taking place. A solution should be devised to credit MET seafarer education that is not a degree education (BSc) with some form of ECTS study points or similar that could be used in further education.
2b. Update scenarios for future development on a yearly basis.
3a. Align ESCO system and structure with IMO decisions on STCW.
3b. Improve the focus on additional skills instead of the (old-fashioned) focus on new job profiles.
3c. Opportunities offered by digitalisation, sustainability and emerging technologies should be effectively applied in education, reskilling and upskilling to render seafarers future-ready.
4a. Encourage education providers to apply the toolbox approach to close skill gaps and further qualify maritime professionals.
4b. Enrich MET study programmes with broader upskilling/upgrading topics beyond STCW requirements, such as leadership, resilience, communication, and English language skills.
5a. Improve and promote opportunities for career mobility and progression.
5b. Develop appropriate solutions for systemic blockages which hamper mobility.
5c. Promote lifelong learning to foster mobility in the context of the impact of emerging trends.
5d. Training should be generic to facilitate mobility of seafarers across a broad range of ship types and trades.
5e. Remove (official and unofficial) obstacles restricting intra-sectoral mobility.
6a. Change the perception of the maritime industry to improve its attractiveness.
6b. Take concerted action to improve the visibility of all the different, possible career paths of maritime professionals through public campaigns at the European level.
6c. 6c. Improve the opportunities for people with other backgrounds to enter the maritime transport sector and attract more women and prospective maritime professionals from currently under-represented groups.
9a. Stimulate participation in MET-NET for the exchange of ideas and knowledge and for the discussion on identifying skills gaps, stimulating concerted actions to close those gaps.
9b. Capitalise on the cooperation among education providers to overcome challenges to future-proofing MET.
9c. MET providers should be encouraged to share and extend the educational packages to close skill gaps and further qualify maritime professionals.
8a. European MET study programmes should be encouraged to include topics related to desired skills in a common and transparent format that is easy to update and document (such as the toolbox) to foster greater compatibility of MET study programmes.
8c. European MET stakeholders should take into account existing different approaches to organising and structuring education, training and certification, including formats of delivery of training.
10a. E-MSF should be promoted as a European instrument for harvesting synergies with related sectoral projects.
10b. Update ESCO on relevant developments of maritime professions in EU projects.

ANNEX 2

FIGURE ANNEX 2.1 FORM FOR FINAL ROUND OF SKILLSEA POLICY FORMULATION RECOMMENDATIONS



SKILLSEA

POLICY RECOMMENDATION NO (9):

SET A MECHANISM FOR SKILLS GAP MEASUREMENT WITH INPUT FROM RELEVANT STAKEHOLDERS AND STIMULATE CONCERTED ACTION BY THE EU, NATIONAL AUTHORITIES AND KNOWLEDGE PROVIDERS

WORDING CORRECTIONS

REFORMULATION

SUGGESTIONS OF CONCRETE ACTIONS FOR IMPLEMENTATION FOR REC. 9

1.

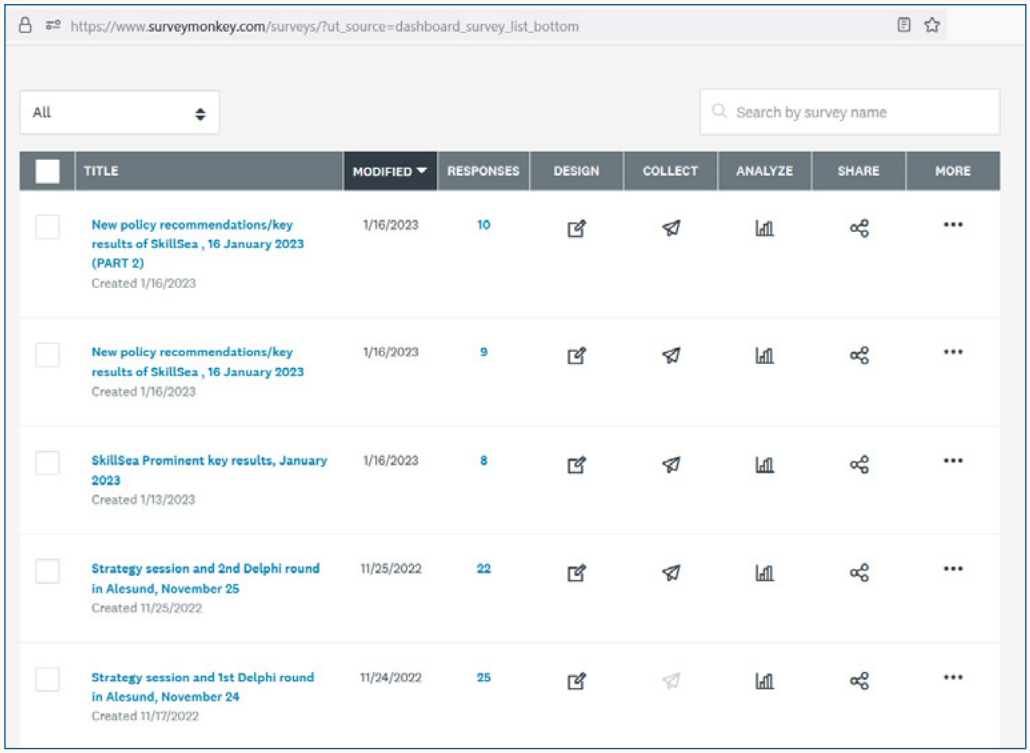
2.

3.

4.

ANNEX 3

FIGURE ANNEX 3.1 ROUNDS OF SKILLSEA POLICY FORMULATION RECOMMENDATIONS



ANNEX 4

FIGURE ANNEX 4.1 INITIAL WORK PACKAGE 1 INPUT FORM TO D3.7 ON WP KEY FINDINGS

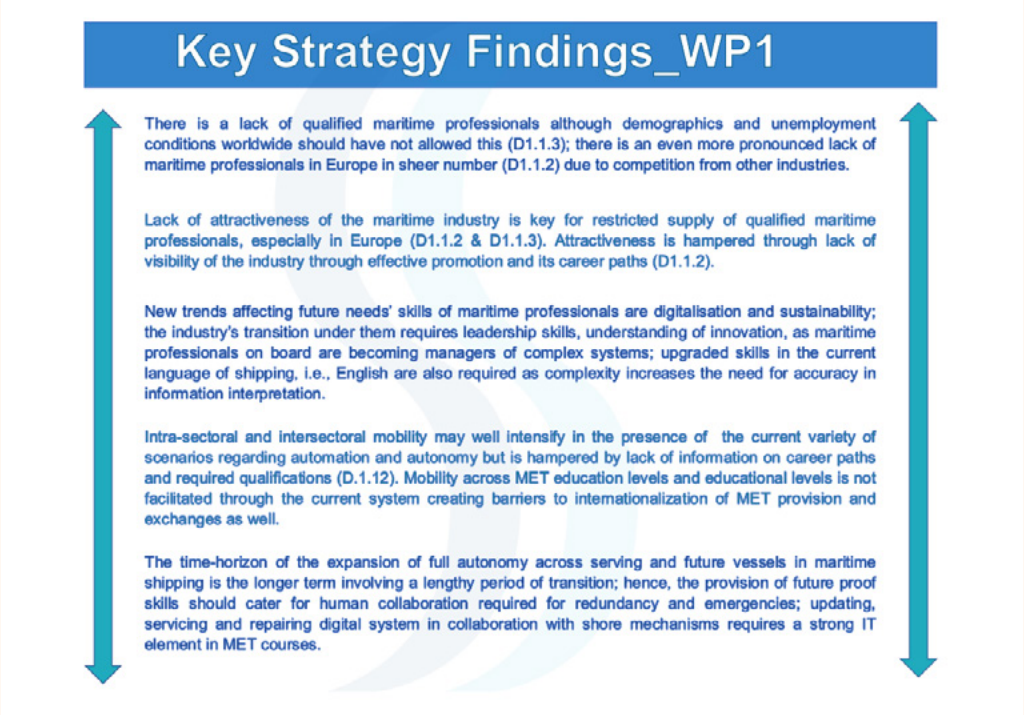


FIGURE ANNEX 4.2 INITIAL WORK PACKAGE 2 INPUT FORM TO D3.7 ON WP KEY FINDINGS

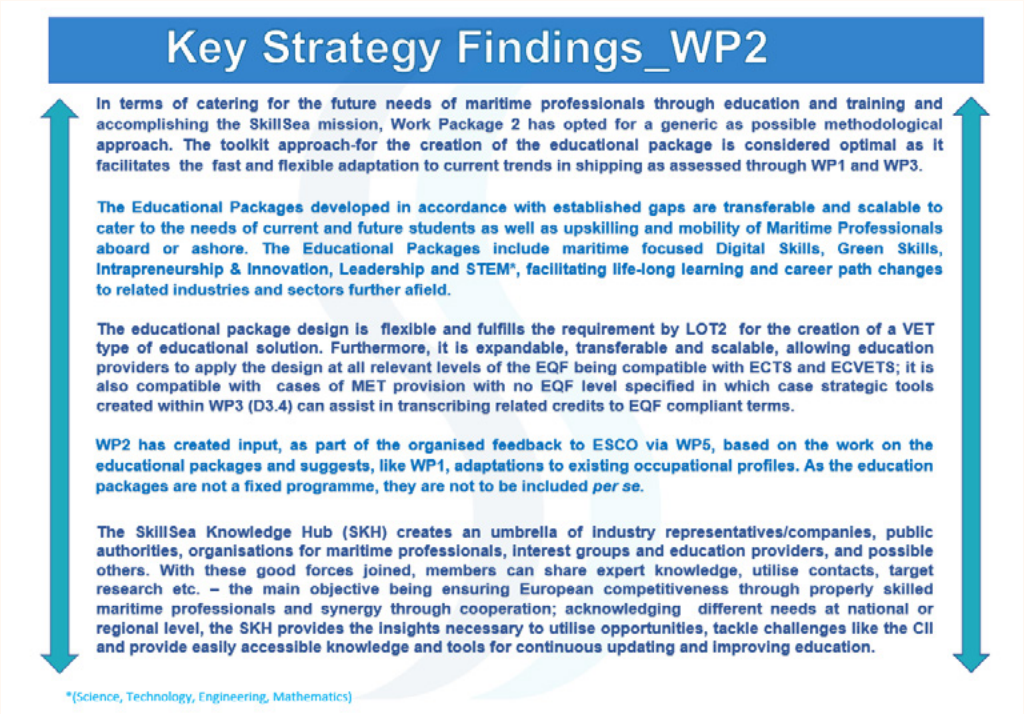


FIGURE ANNEX 4.3 INITIAL WORK PACKAGE 3 INPUT FORM TO D3.7 ON WP KEY FINDINGS

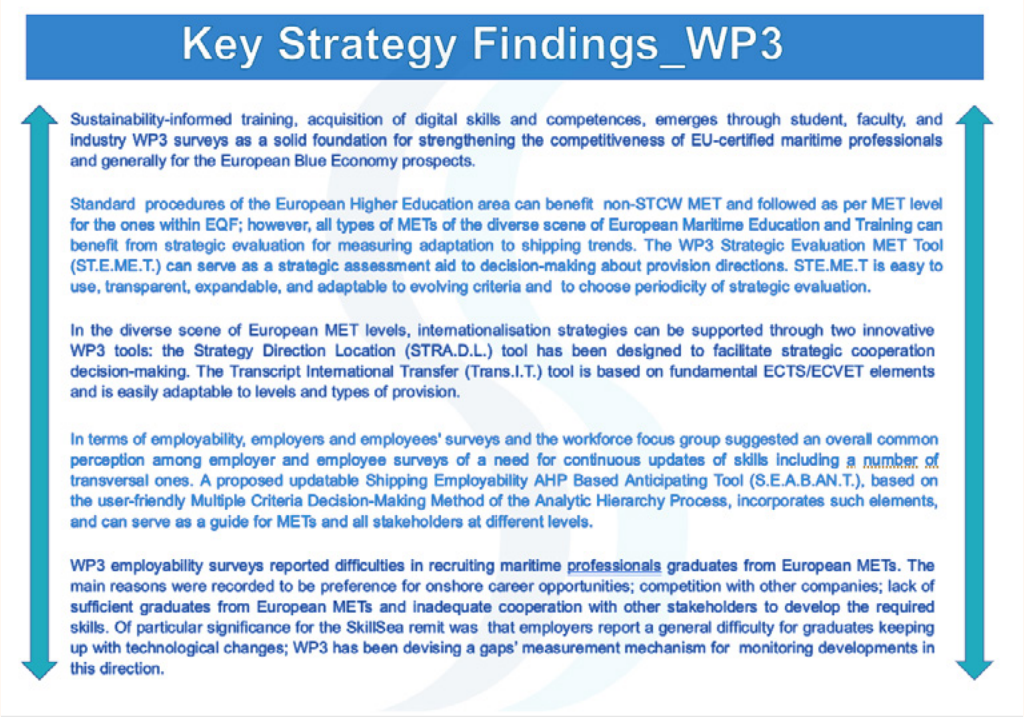


FIGURE ANNEX 4.4 INITIAL WORK PACKAGE 4 INPUT FORM TO D3.7 ON WP KEY FINDINGS

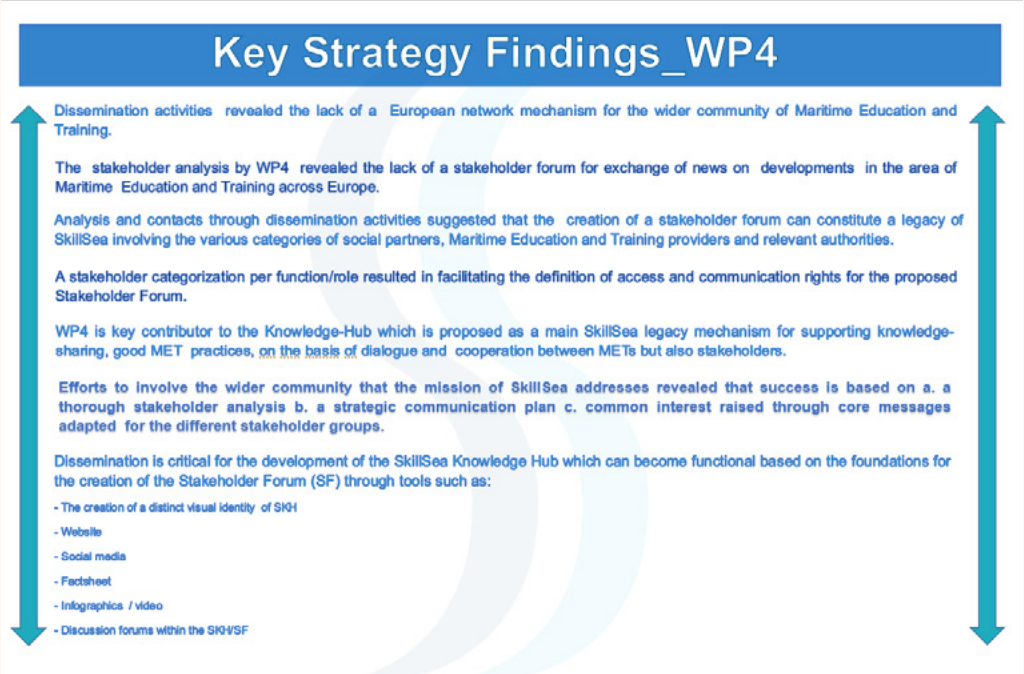
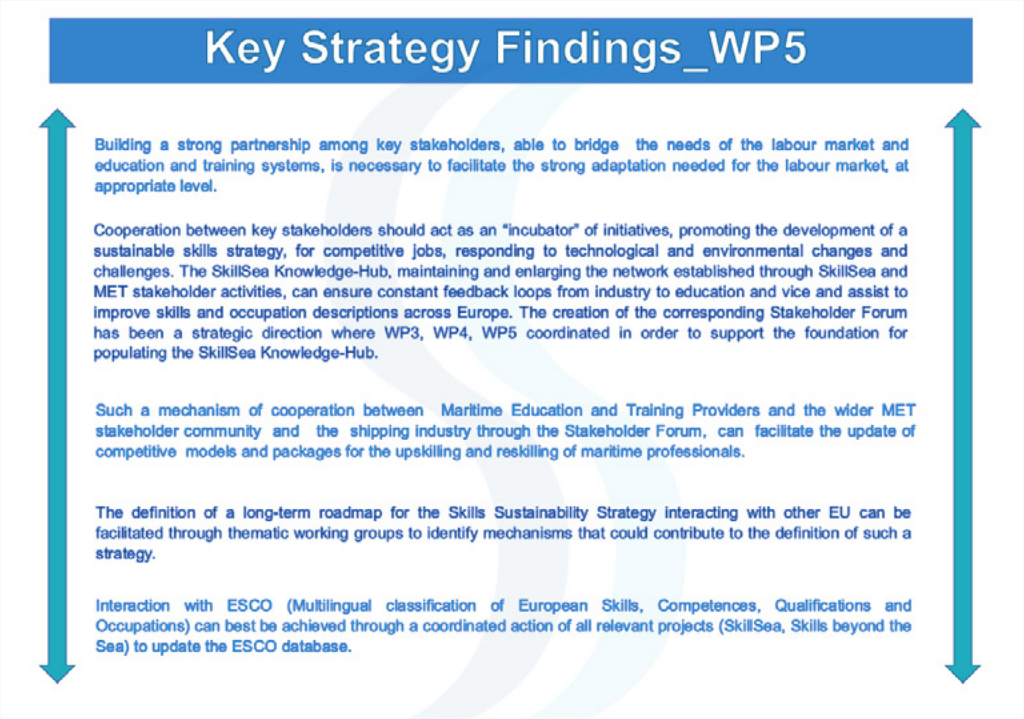


FIGURE ANNEX 4.5 INITIAL WORK PACKAGE 5 INPUT FORM TO D3.7 ON WP KEY FINDINGS



ANNEX 5

TABLE ANNEX 5.1 EXAMPLE OF INITIAL SKILLSEA WP INPUT TO POLICY RECOMMENDATIONS

Policy Recommendations WP3

1st

Strategic tools supporting the cooperation and mobility across European METs, such as those created in the context of SkillSea and similar projects, should be widely supported and advertised by relevant European mechanisms.

2nd

A mechanism for the update of ESCO at regular intervals in the area of maritime professions should be supported through its official integration in the ESCO database.

3rd

The Knowledge-Hub by SkillSea should be promoted as a European hub for exchange of funded research results; in periods of technological transition the monitoring of demand & supply of maritime professionals and career path mapping within and beyond shipping can assist structural adjustment and in-time interventions.

4th

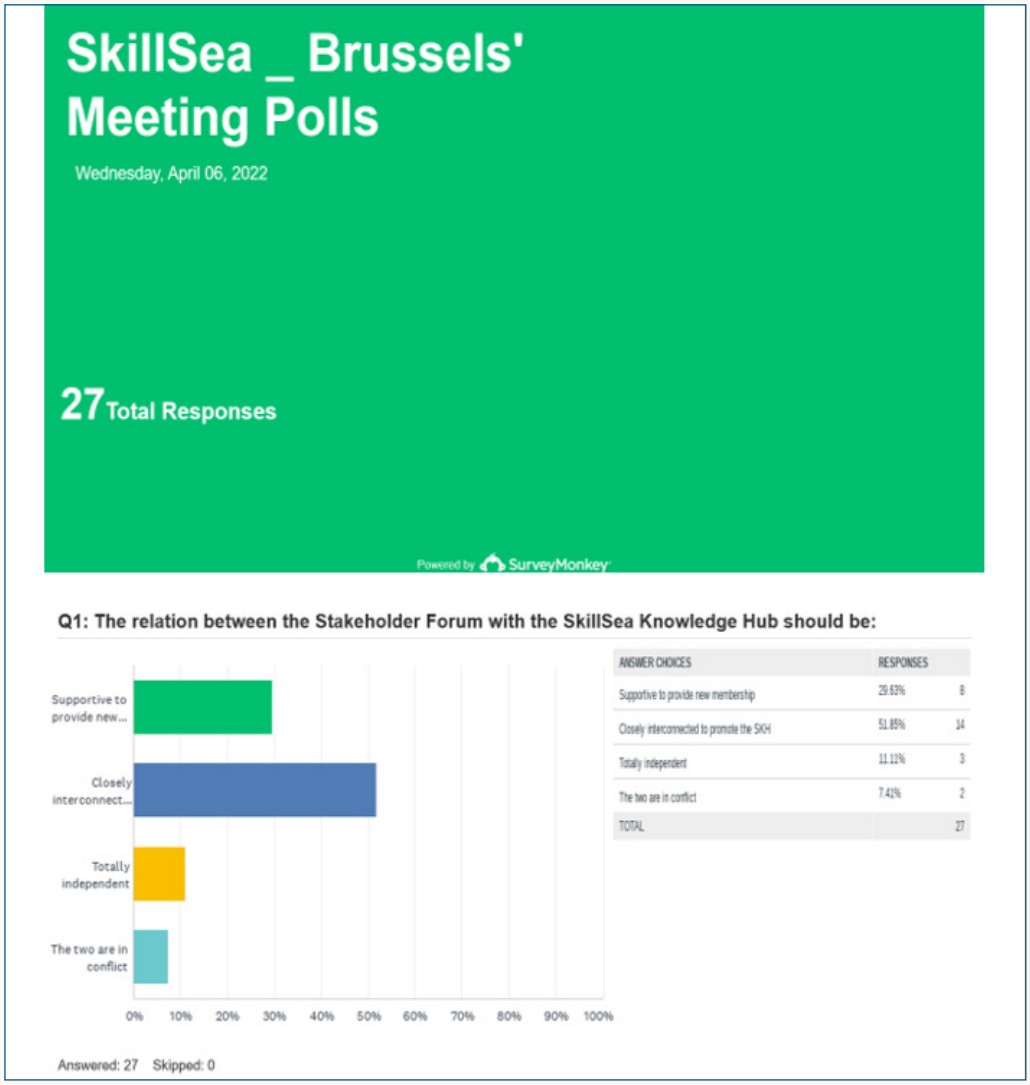
The gap mechanism designed in the context of SkillSea WP3 should be adopted by the relevant EU authorities incorporated along relevant European survey tools.

5th

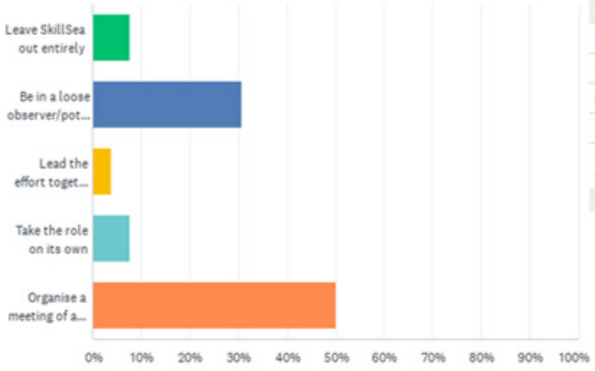
Concerted action should be taken for the promotion of the visibility of career paths of maritime professionals through public campaigns at European level.

ANNEX 6

FIGURE ANNEX 6.1 D3.7 POLL



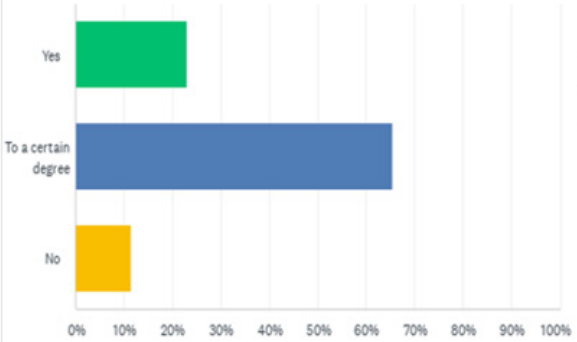
Q2: Should SkillSea play a leading role in the interaction with ESCO (Multilingual classification of European Skills, Competences, Qualifications and Occupations) among relevant projects (SkillSea, Skills beyond the Sea) to update the ESCO database?



ANSWER CHOICES	RESPONSES	
Leave SkillSea out entirely	7.69%	2
Be in a loose observer/potential contributor role	30.77%	8
Lead the effort together with other projects	3.85%	1
Take the role on its own	7.69%	2
Organise a meeting of all shipping/transport skills' related projects to provide general feedback to ESCO	50.00%	13
TOTAL		26

Answered: 26 Skipped: 1

Q3: Do you believe that an integrated Skills strategy of attractiveness and qualifications' promotion can be promoted through some coordinated nonprescriptive EU action (eg. A non-normative European Maritime Skills Alliance?)



ANSWER CHOICES	RESPONSES	
Yes	23.08%	6
To a certain degree	65.38%	17
No	11.54%	3
TOTAL		26

ANNEX 7

FIGURE ANNEX 7.1 PROVISION OF EDUCATION AND TRAINING FOR MARITIME PROFESSIONALS IN EUROPE

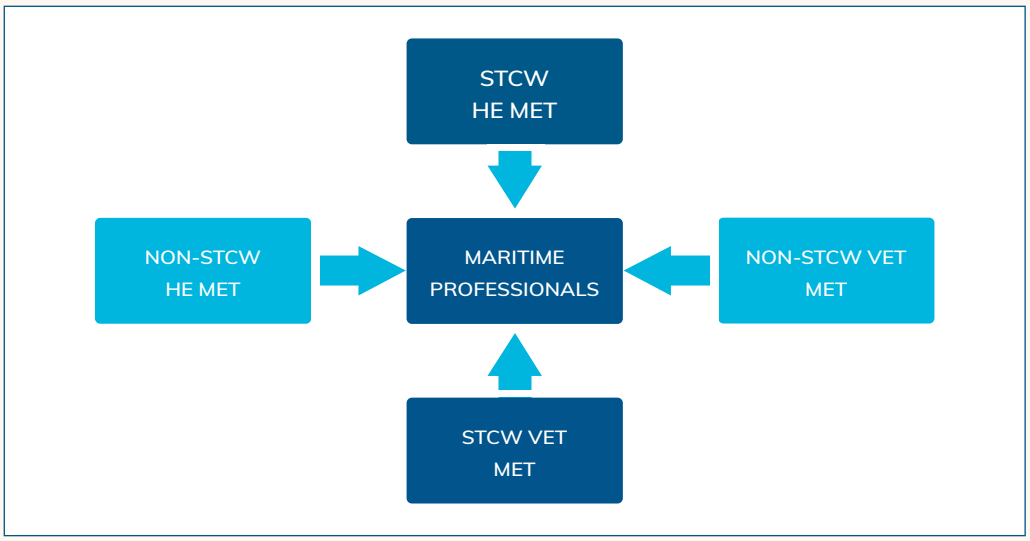
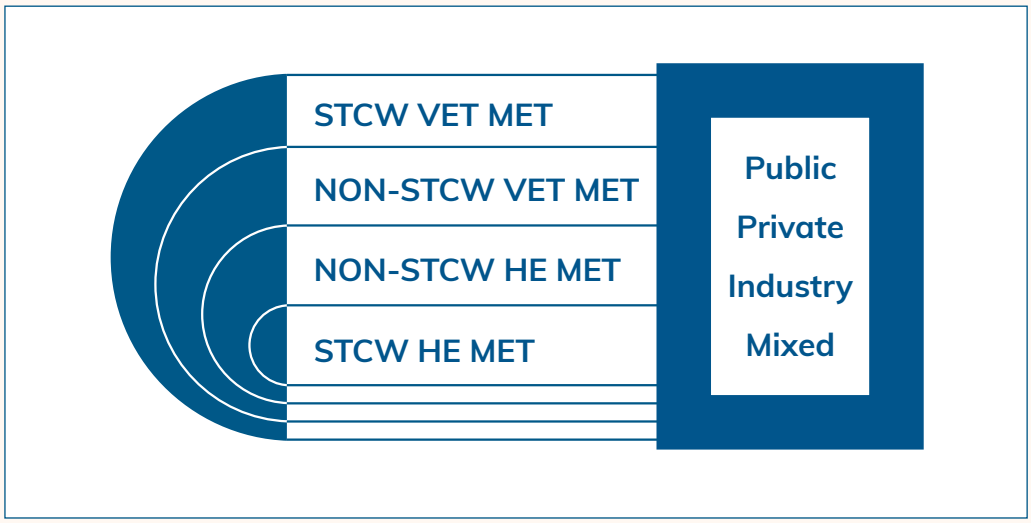


FIGURE ANNEX 7.2 PRINCIPAL CATEGORIZATIONS OF STCW - MET PROVISION



Source: SkillSea (2020). D3.1 Strategy Plan Framework Report, Figure 1.2, p.16.

ANNEX 8

TABLE ANNEX 8.1 LEVEL DESCRIPTORS OF THE EUROPEAN QUALIFICATIONS FRAMEWORK

	Knowledge	Skills	Responsibility and autonomy
Level	In the context of EQF, knowledge is described as theoretical and/or factual	In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments)	In the context of the EQF responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility
Level 1 The learning outcomes relevant to Level 1 are:	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2 The learning outcomes relevant to Level 2 are:	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information In order to carry-out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3 The learning outcomes relevant to Level 3 are:	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to methods, tools materials and information	Take responsibility for completion of tasks in work or study. Adapt own behaviour to circumstances in solving problems
Level 4 The learning outcomes relevant to Level 4 are:	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5[1] The learning outcomes relevant to Level 5 are:	Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others

	Knowledge	Skills	Responsibility and autonomy
Level 6[2] The learning outcomes relevant to Level 6 are:	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialized field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision- making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7[3] The learning outcomes relevant to Level 7 are:	Highly specialized knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8[4] The learning outcomes relevant to Level 8 are:	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

Source: www.ec.europa.eu/ploteus/en/content/descriptors-page, accessed December 15, 2019. European Commission (2023). Description of the 8 EQF levels. Available at www.europa.eu/europass/en/description-eight-eqf-levels, last accessed 21 May 2023.

NOTE: As mentioned by the source, the Framework for Qualifications of the European Higher Education Area provides descriptors for three cycles agreed by the ministers responsible for higher education at their meeting in Bergen in May 2005. Each cycle descriptor offers a generic statement of typical expectations of achievements and abilities associated with qualifications that represent the end of that cycle.

1 The descriptor for the short cycle developed by the Joint Quality Initiative corresponds to the learning outcomes for EQF level 5.
2 The descriptor for the first cycle corresponds to the learning outcomes for EQF level 6.
3 The descriptor for the second cycle corresponds to the learning outcomes for EQF level 7.
4 The descriptor for the third cycle corresponds to the learning outcomes for EQF level 8.

ANNEX 9

FIGURE ANNEX 9.1 SKILLSEA ASSESSED SHIPPING TRENDS AND SKILLS' NEEDS IN DETAIL

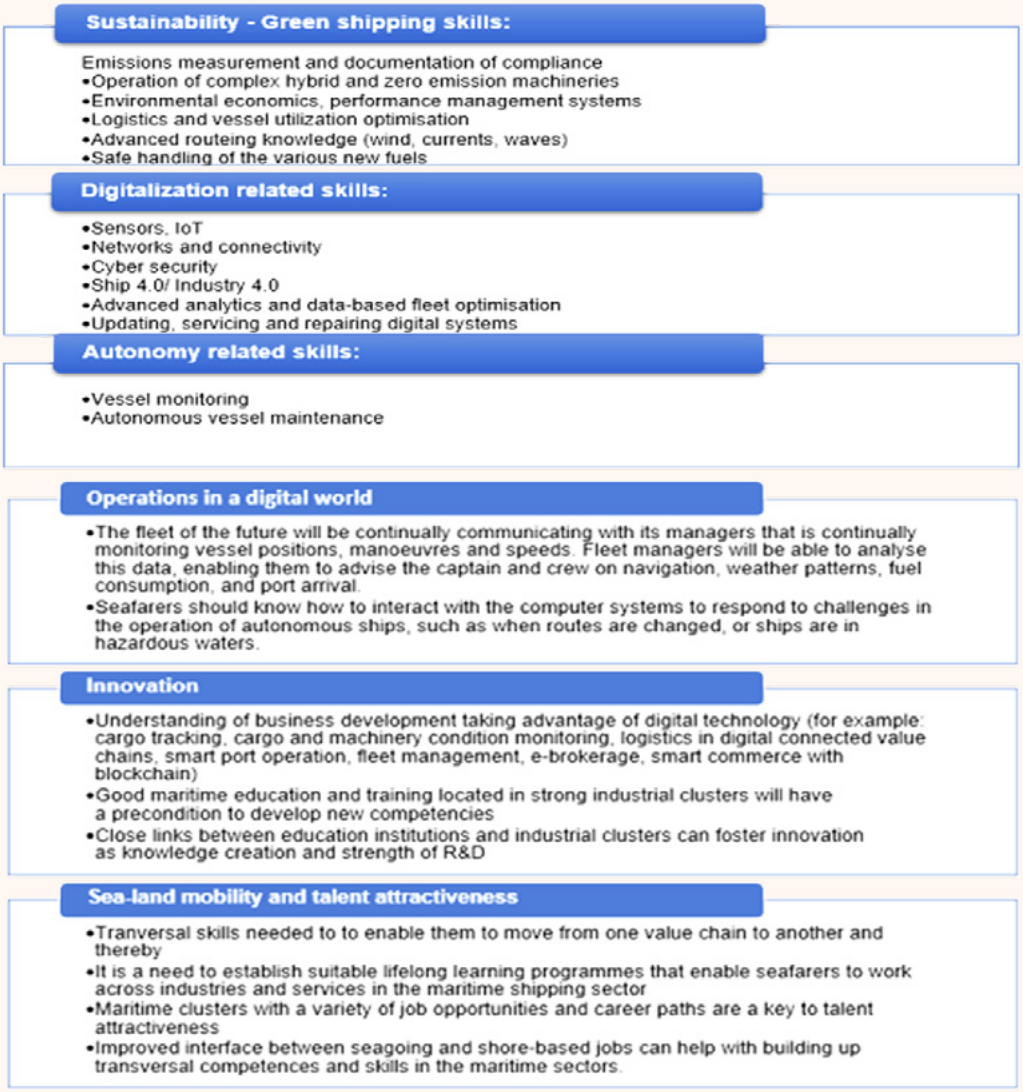


TABLE ANNEX 9.1 MISSING CURRENT OCCUPATIONAL PROFILES AND STCW COMPETENCIES

Missing profiles			
STCW III/6:	CoC		Electro-Technical Officers –
STCW III/7:	CoP		Electro-Technical Rating

Missing competencies Chap. 5 STCW Code for Standards Regarding Special Training Requirements per type of ship			
STCW V/1-1-1:	CoP		Masters, officers and ratings, basic oil and chemical tankers
STCW V/1-1-2:			Masters, officers and ratings, advanced oil tanker cargo
STCW V/1-1-3:			Masters, officers and ratings, advanced chemical tanker cargo
STCW V/1-2:			Masters, officers and ratings on liquefied gas tankers
STCW V/1-2-1:			Masters, officers and ratings on basic liquefied gas tankers cargo ops
STCW V/1-2-2:			Masters, officers and ratings on advanced liquefied gas tankers ops.
STCW V/2-1:			Masters, officers, ratings and other personnel on passenger ships, crowd control
STCW V/2-2:			Masters, officers, ratings and other personnel on passenger ships, crisis management
STCW V/3-1:			Masters, Officers and Ratings on ships subject to IGF Code Advanced training
STCW V/3-2:	CoP		Masters, Officers on ships subject to IGF Code Advanced training
STCW V/4-1:			Masters and deck officers on ships operating in polar waters, Basic Training (Polar Code)
STCW V/4-2:			Masters and deck officers on ships operating in polar waters Advanced training (Polar Code)

Other

STCW VI/2-1:	CoP		Issue of certificates of proficiency in fast rescue boats.
STCW VI/3:	CoP		Training in advanced firefighting.
STCW VI/5:	CoP		Issue of certificates of proficiency for ship security officers.
STCW VI/6:	CoP		Security-related training and instruction for all seafarers.

STCW Code - Additional Resources under STCW Convention			
SECTION B			Sections B-V/a, B-V/b, B-V/c, B-V/d, B-V/e, B-V/f - additional special training requirements for personnel on certain types of ships
Other IMO codes alongside the STCW (some samples)			
HSC Code	CoP		Proficiency as deck/engine officer on high-speed craft
IMDG Code	CoP		Proficiency in classification, packing, securing, segregation, documentation, marking, labelling, stowage, and risks with dangerous cargo shipment
ISPS Code	CoP		Proficiency as a ship security officer
ISM Code	CoP		Proficiency in security-related equipment (ECDIS type-specific training)

FIGURE ANNEX 9.2A RESPONSES FROM EEA EMPLOYEES ON NEW OCCUPATIONAL PROFILES

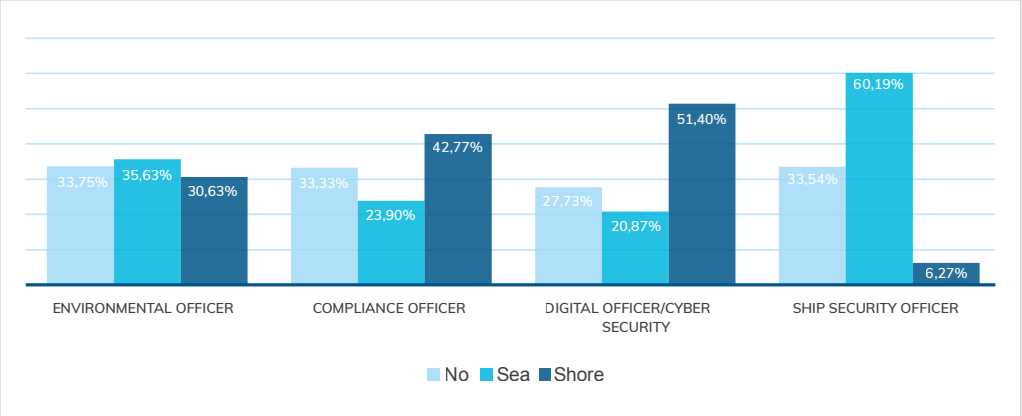


FIGURE ANNEX 9.2B RESPONSES FROM EEA EMPLOYEES ON UPDATED OCCUPATIONAL PROFILES

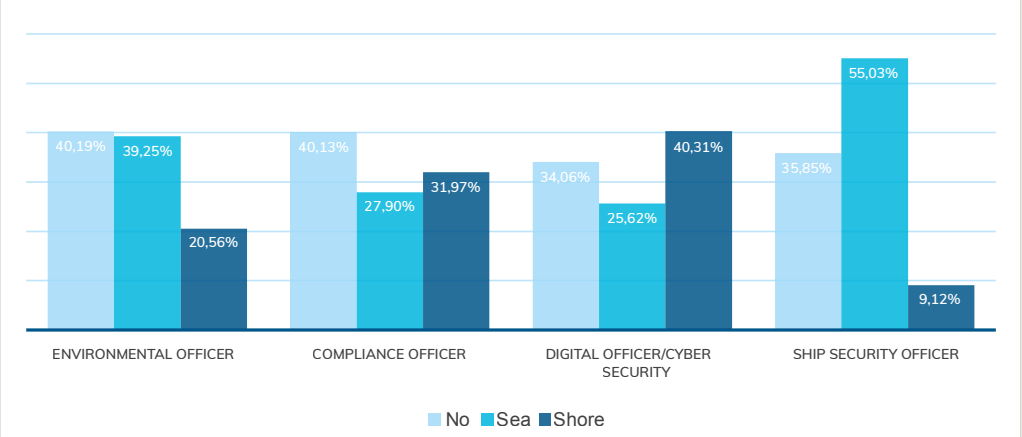


FIGURE ANNEX 9.3A NON-EEA/UK RESPONSES ON NEW OCCUPATIONAL PROFILES

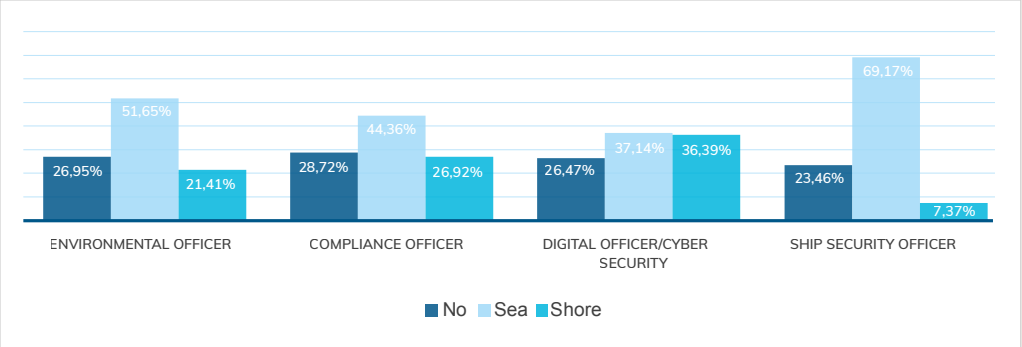


FIGURE ANNEX 9.3B NON- EEA/UK RESPONSES ON UPDATED OCCUPATIONAL PROFILES

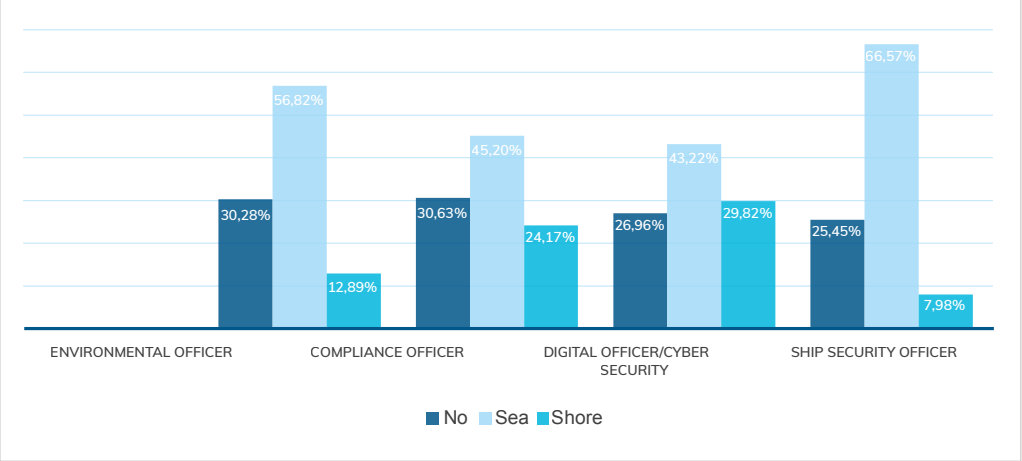


FIGURE ANNEX 9.4A THREE SCENARIOS FOR ATTRACTIVENESS 2035 TRENDS

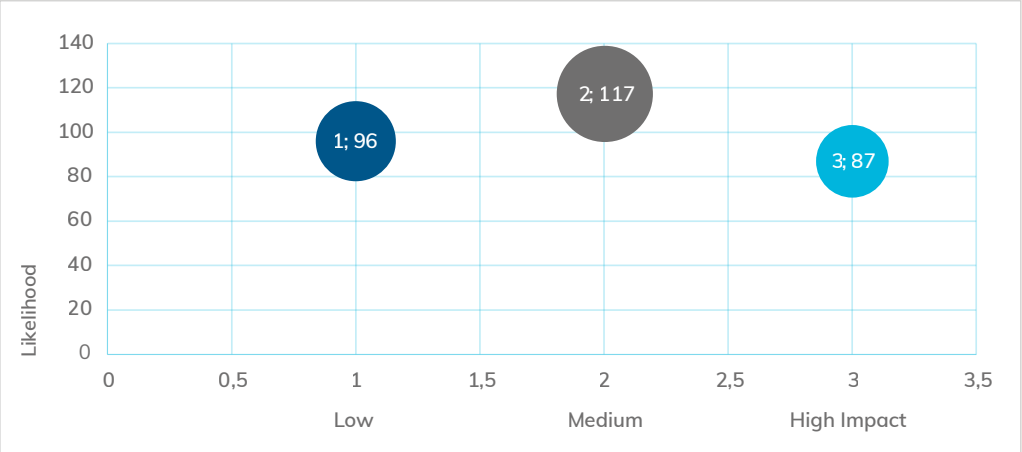
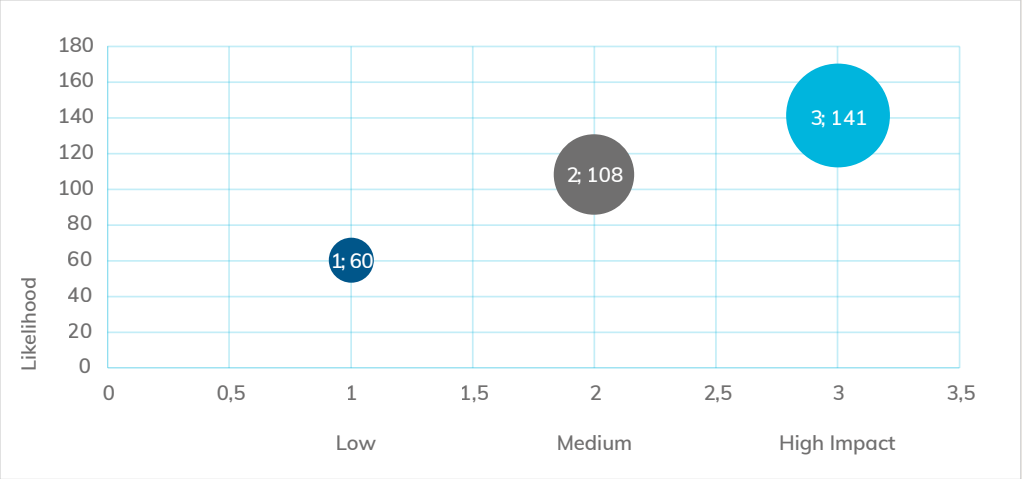
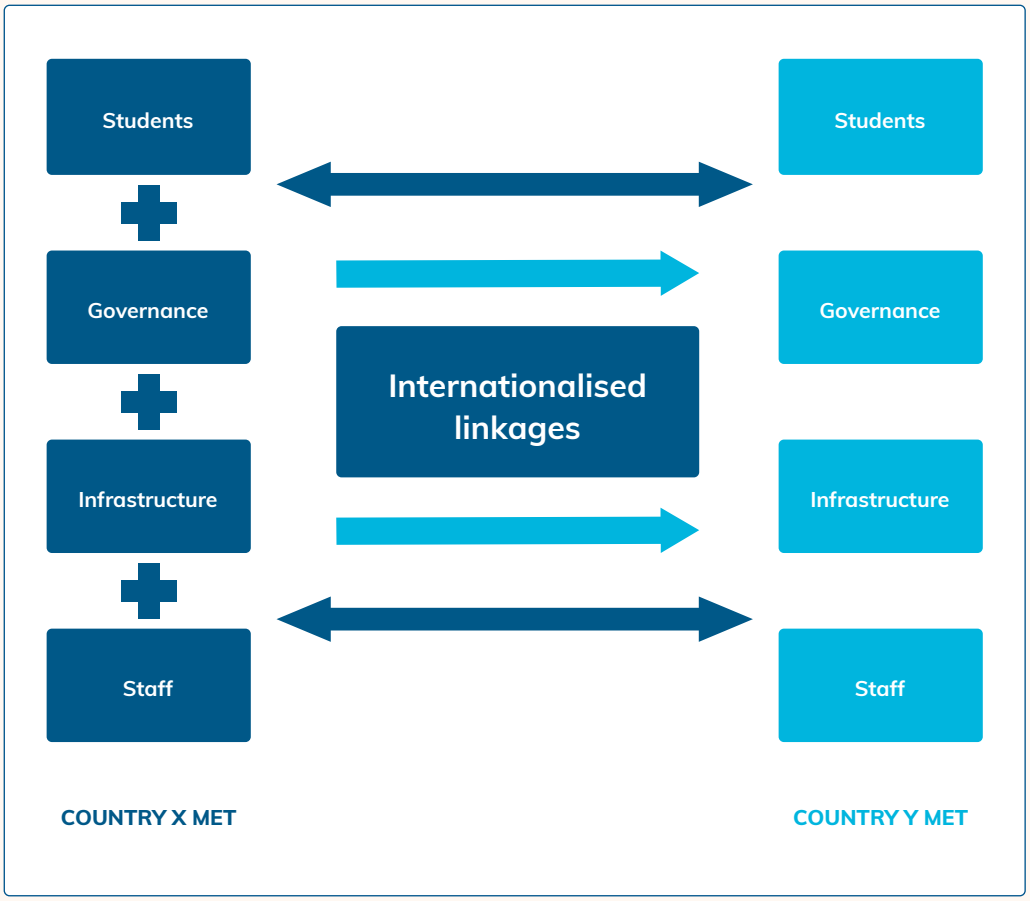


FIGURE ANNEX 9.4B THREE SCENARIOS FOR ATTRACTIVENESS 2050 TRENDS



ANNEX 10

FIGURE ANNEX 10.1 DIRECTION PATHWAYS OF KEY INTERNATIONALISATION LINKAGES



ANNEX 11

TABLE ANNEX 11.1 STAKEHOLDER COOPERATION FOR MET IN EUROPE

Germany **Berufsbildungs-stelle Seeschiffahrt e.V. (BBS)**	BBS is responsible for vocational training. Its function is comparable to the tasks of chambers of industry and commerce or chambers of crafts. The main tasks of the BBS are advising the training shipping companies, monitoring vocational training, keeping a vocational training register, conducting examinations and providing information and advice.
Italy **Blue Italian Growth Technology Cluster (BIG)**	BIG promotes the sustainability of the blue economy sector. It is represented by a strategic partnership of universities, research sentres and industry which play a key role for the dialogue with public authorities at national and regional level. The Cluster BIG aims at responding to the main social challenges in a sustainable way and according to the macroeconomic trends of the blue economy sector. Cluster BIG supports the analysis and development of crucial themes for the blue economy sector defined at global, European and Mediterranean level through the institution of dedicated Working Groups and the draft of a yearly Action Plan. The Action Plan aims at designing a Roadmap for the innovation and development of specialisation strategies. Since its first action plan in 2017, Cluster BIG has launched a Working Group dedicated to skills and jobs with the aim to bridge the gap between supply and demand in marine and maritime activities. Today the trajectory skills and jobs is devoted to the design of innovative training paths in the Blue Economy sector, including the reskilling and upskilling of professionals, by involving all the actors operating in training and education and by enhancing the dialogue at Institutional level.
Norway **The industry programme for maritime involves a tripartite cooperation**	The Norwegian Seafarers' Association, NHO Shipping, the Norwegian Shipowners' Association, the Norwegian Maritime Officers' Association, the Norwegian Machinist Association, Nito, Tekna, Norwegian Industry, Industri Energi, the Norwegian Confederation of Trade Unions, cooperate with the Norwegian Confederation Norway of Trade Unions (NHO) to find targeted educational programmes for everyone working in the industry. Social partners in Norway have a certain influence on the development of the content and organisation of vocational training.
United Kingdom **Many related multi-stakeholder collaboration structures:**	• The Merchant Navy Training Board (MNTB) sets the policy for new entrant education and training arrangements and existing seafarer training requirements. It is housed within the offices of the UK Chamber of Shipping, and works closely with shipping and ship management companies, nautical educational establishments and organisations, seafarer trade unions, the Maritime & Coastguard Agency and industry organisations with an interest in seafarer education and training. There is a wide range of careers promotion activities through the 'Careers at Sea' brand. • The Maritime & Coastguard Agency (MCA) is a UK government agency that oversees the maritime sector of the UK, including education and training. It produces legislation and guidance on maritime matters and provides certification to seafarers. MCA is an executive agency, sponsored by the Department for Transport (Aviation, Maritime and Security Group): • The UK Chamber of Shipping is the trade association and voice of the UK shipping industry. It works with Government, parliament, international organisations and others to champion and protect the industry on behalf of its members. • The national maritime cluster of the UK is "Maritime UK". The maritime industries come together through Maritime UK to make progress on key areas of shared interest. Members of Maritime UK agreed their key national priorities for 2020-22 as: People, Innovation, Regional Growth, Environment and Competitiveness. Each of the priorities correspond to key ambitions set out within the government's Maritime 2050 strategy (2019). Maritime UK works with members and government partners to deliver its recommendations and monitor delivery. Maritime UK and the Department for Transport have established a Maritime Skills Commission to lead the sector's work in ensuring the maritime sector has a pipeline of talented people to serve all parts of the sector covering shipping, ports, leisure marine, engineering, science and professional services. Maritime UK plays no role in seafarer education and training. In addition, the International Association of Maritime Institutions is a platform for an exchange of views between colleges and the various national bodies involved in the training and certification process. It works closely with the Technical Committee of the Merchant Navy Training Board (MNTB), which is the body primarily responsible for the co-ordination of Merchant Navy training in the UK and work closely together with the industry and the MCA.
In the Netherlands **Foundation for Cooperation on Vocational Education, Training and the Labour Market (SBB)**	In the Netherlands, until 1 August 2015, the Centres of Expertise on Vocational Education, Training and the Labour Market (KBBs) formed the link between the vocational education sector and trade and industry associations. Organised by sector, their managing boards comprised representatives of employers and employees, and in most cases, educational institutions. As of 1 August 2015, the KBBs' statutory tasks and role were transferred to the SBB which is a collaborative venture between secondary vocational education and trade and industry associations responsible for developing a clear qualification framework, ensuring that the knowledge and skills taught at MBO are in line with developments in the world of work. The SBB also monitors the quality of student assessment and ensures work placements.

ANNEX 12

TABLE ANNEX 12.1 EEA EXAMPLES OF VET EDUCATIONAL STRUCTURES

Netherlands	lifelong learning education and training for employees is executed and organised by private institutions. As in many other SkillSea partner countries it is assumed that the underlying reason the relative delays of formal VET educational systems to incorporate fast changes in curricula and new material.
Denmark	most of the VET schools provide both education programmes for adults and for young people. All providers of adult vocational training, including the adult educational centres are associated with one of the 13 centres for adult education and continuing training, each coordinating guidance activities, contact to enterprises and employees etc. for a specific geographical area.
France:	the objective is to develop the professional integration or reintegration of adults, to maintain them in employment, to encourage the development of their skills, to enable workers to adapt to changing techniques and working conditions, to promote their social advancement through access to the various levels of culture and professional qualification and their contribution to cultural, economic and social development. The responsibility for adult education is shared by all the economic and social partners involved (each of which can act independently). In this respect, the state does not have the same predominant position as it has in initial training. Adult continuing training has formed an open market in which various service providers operate. This means that there are many training providers co-existing on the market – companies, public institutions, private organisations, non-profit associations – for some of which training is their main activity, while for others it is secondary, i.e., an activity on the side or to support the sale of a product.; continuous maritime vocational training is open to employed adults in activity or looking for a job. It allows active employees (seafarers) to adapt to technical and technological changes, but also to the conditions of their work and offers job seekers a recognized professional qualification. In all cases, it promotes social advancement by enabling everyone to reach the highest level of qualification, starting from a modest level; such training is provided by maritime vocational training organisations approved by the Minister of the Sea.
Greece	lifelong learning includes all organised learning activities provided by a substantial number of organisations, fully or partly subsidised by the state, addressing general adult educational needs, often within Universities or VET schools
Croatia	commercially operated entities providing short courses. There are more than 40 entities, usually specialised for courses in particular segments (STCW, yachts, simulations, etc.) and providing very different sets of courses.

Constanta Maritime University
Danish Maritime Authority
Danish Shipping
École Nationale Supérieure Maritime
ESA
Estonian Maritime Academy
Eugenides Foundation
European Community Shipowners' Associations
European Transport Workers' Federation
Fleetwood Nautical Campus
ForMare
Hamburg School of Business Administration
Liverpool John Moores University
National Maritime College of Ireland
Nautilus
Norwegian University of Science and Technology
Sea Europe
Secrétariat général de la mer
Sindicatul Liber al Navigatorilor
STC Group
Stena
Svendborg International Maritime Academy
University of Cadiz
University of Rijeka
University of the Aegean

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