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TITLE: MARITIME EDUCATION AND TRAINING AND ITS STAKEHOLDERS INTERCONNECTIONS AND STRATEGIES



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Summary SkillSea Report

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A key part of the strategic mission of SkillSea is to devise appropriate mechanisms to enable - at a first level - the planning and delivery of actions conducive to future-proof skills, enhancing the employability and mobility of maritime professionals and, at a second stage, to point to adjustments required across European Maritime Education and Training (MET) so that these actions bear fruit for improving MET and related career attractiveness across EU-EEA countries. In this direction, the role of strategic cooperation of mapped MET stakeholders to provide appropriate feedback for the adaptation of MET content and methods to the needs of the European maritime shipping industry and society in general, is key. The D3.5 report addresses the aspects of stakeholder relationships with MET in terms of general framework, input, output, and overall connection, as well as the dynamic of the association of stakeholders with the MET systems in Europe. As the latter present a large degree of diversity across many of the facets of each national MET system, the analysis showcases two different case studies with the aim of exploring common features, goals, and outcomes of MET-stakeholder relationships and to point - beyond any divergent traits - to similarities which enable the design of usable tools and sustainable solutions applicable across the diverse environment of European MET.

The report is structured as follows: after an introduction to the methodology and to MET stakeholder typology in Chapter 1, the framework of the MET system and the MET-stakeholder relationship is set out in Chapter 2 through a PESTEL (Political, Economic, Social, Technological, Environmental and Legal) analysis framing the core subject of the report by underlining the impact of the external environment on the dynamics of MET-stakeholder interconnections. On that basis, Chapter 3 discusses the general options for MET and MET stakeholder cooperation, focusing on the analysis of case studies of such cooperation from two key players in the EU and global maritime sectors: Greece and Denmark. Adding qualitative input from a focus group on the main purposes of - and ways for - MET stakeholder cooperation, Chapter 4 presents a strategic tool for selecting the optimum type of MET stakeholder cooperation in given contexts, based on the Analytical Hierarchy Process (AHP). Finally, Chapter 5 conclusions draw attention to the contribution of this Stakeholder Cooperation for MET Tool (S.CO.MET.T) for selecting productive, inclusive and sustainable forms of MET-stakeholder cooperation at desired national, regional or EU or EEA levels, emphasising in the latter cases the value of the SkillSea strategic proposal for a related European MET Skills Forum to enable an open fruitful dialogue with MET stakeholders.

SkillSea research has shown that cooperation between stakeholders in maritime transport already exists in many European countries. For that reason, while this Stakeholder Cooperation for MET Tool (S.CO.MET.T) was developed for selecting productive, inclusive and sustainable forms of MET-stakeholder cooperation in their development phase, the Tool also can be used to assess the already existing form of stakeholder cooperation and by doing so may contribute to the further improvement of the cooperation structure.

Future-proof skills for the maritime transport sector

Project SkillSea is co-funded by the Erasmus+ Programme of the European Union

Technology and digitalisation are transforming the shipping industry. 'Smart' ships are coming into service, creating demand for a new generation of competent, highly-skilled maritime professionals. Europe is a traditional global source of maritime expertise and the four-year SKILLSEA project is launched with the aim of ensuring that the region's maritime professionals possess key digital, green and soft management skills for the rapidly-changing maritime labour market. It seeks to not only produce a sustainable skills strategy for European maritime professionals, but also to increase the number of these professionals - enhancing the safety and efficiency of this vital sector.

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LIST OF ABBREVIATIONS

Abbreviation	Definition	
АНР	Analytic Hierarchy Process	
BIMCO	Baltic and International Maritime Council	
CoCs	Certificates of Competency	
CME	Council of Maritime Education (Greece)	
DMA	Danish Maritime Authority	
DX.X	Deliverable X per Work Package X	
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	
E-MSF	European Maritime Skills Forum	
EQF	European Qualifications Framework	
ESCO	European Skills, Competences, Qualifications and Occupations	
ETF	European Transport Workers' Federation	
EU	European Union	
GDP	Gross Domestic Product	
GHG	Greenhouse Gases	
HQ	Headquarters	
HSBA	Hamburg School of Business Administration	
ICT	Information and Communications Technology	
ID	Identification	
IMO	International Maritime Organization	

IoP	Internet of People
IoT	Internet of Things
ISM	International Safety Management (Code)
IT	Information Technology
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MARPOL	Intern. Convention for Prevention of Marine Pollution from Ships
MCDM	Multiple-Criteria Decision-Making
MEC	Maritime Education Council (Denmark)
MERA	Ministry of Education and Religious Affairs (Greece)
MET	Maritime Education and Training
MLC	Maritime Labour Convention
MMAIP	Ministry of Maritime Affairs and Insular Policy (Greece)
MTC	Maritime Training Centre
S.CO.MET.T	Stakeholder Cooperation for Maritime Education and Training Tool
S.E.A.B.AN.T.	Shipping Employability AHP-Based Anticipating Tool
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
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
Trans.I.T.	Transfer International Tool
UNCTAD	United Nations Conference on Trade and Development
VET	Vocational Education and Training
WP	Work Package

Introduction: MET and its stakeholders in a strategic perspective

Stakeholders of Maritime Education and Training: The SkillSea perspective

A key part of the SkillSea strategy is to devise an appropriate framework and mechanism to fulfil its multifaceted mission based on the focal point of future-proof skills for maritime professionals. This mission covers:

- a) Monitoring and anticipating future skills needs to sustain and enhance the employability of maritime professionals.
- b) Measuring related skills gaps.
- c) Matching needs and skills and providing for the restructuring of occupational opportunities through a Vocational Education & Training (VET) programme with an appropriate content and mode of delivery.
- d) Increasing both employability and attractiveness, by providing maritime professionals with the means and direction to adjust their paths in the rapid and continuously evolving industry.
- e) Within this remit, stakeholder mobilisation and raising of awareness are essential elements of the SkillSea strategy and clearly described from the stage of the project submission (cf. INSET 1.A).

INSET 1. A

"SkillSea will provide a concrete, sustainable solution for the qualitative and quantitative mismatch between demand for and supply of labour, will increase labour mobility within the sector (horizontal, vertical and geographical) and enhance attractiveness of the sector. SkillSea follows the approach of skills needs identification (current, medium term and long-term) design and delivery of VET, the development of strategy as well as stakeholder mobilisation and awareness raising as sustainable implementation."

SkillSea project submission, p.3 of 190

As underlined in the SkillSea framework (SkillSea, 2020a), the MET-stakeholders' interconnection acquires an urgent relevance in periods of rapid technological developments (cf. INSET 1.B).

INSET 1. B

"The extent of technological and organisational change in the current period of shipping - accelerated at the same time by increasing regulation - is eventually without precedent. In this context, stakeholder cooperation is a precondition for matching the rate of response to the current wave of change; it is also essential for increasing the effectiveness and the sustainability of strategic directions and solutions."

SkillSea (2020a) Strategy plan Framework , p.15

- i. The emphasis on sustainability is creating a new focus for industry practices and skills (SkillSea, 2020a; SkillSea, 2020b).
- ii. There is increased uncertainty in terms of the trade environment (Boston Consulting Group, 2021), with the level of uncertainty rising further since the start of 2022 (Drewry, 2022).

The focus therefore turns to the promotion of selecting optimum interconnection strategies. With stakeholder cooperation in the area of professional education having been considered as a "secret of success" in the case of specific countries (Wiemann and Fuchs, 2018, p.1), this report addresses the aspects of stakeholder relationships with Maritime Education and Training (MET) in terms of input, output, and overall connection, as well as the dynamic of their association with the MET systems in Europe. As these systems are not identical and present a large degree of diversity across many of each system's facets, it is necessary to explore common features, goals, and outcomes of MET-stakeholder relationships and to showcase existing divergence, as well as similarities assessed as leading to solutions within this diverse environment. Similarly, diversity of MET systems and of responsibility for their regulation leads to an exploration of ways by which stakeholder interconnection and strategy selection can be aided through appropriate analysis and relevant simple tools.

Figure 1.1, next, presents the range of specific types of MET-related stakeholders, indicating also a more direct or indirect type of interest of these categories. However, it should be noted that beyond any specific categories considered, European societies have a fundamental stake in the MET system since:

- a. All European countries, even landlocked ones, derive a direct benefit across supply chains from efficient maritime transport of key imports and exports critical for their economy and growth.
- b. EU-EEA countries seek to contain externalities such as the social cost of pollution with the minimisation of environmental impact, depending highly on the provision of updated and suitable skills for safe operation of new generations of vessels and equipment.
- c. Through various actions, EU countries also seek to minimise the impact on the workforce of technological changes, a development which may transform the dominant business and employability paradigms (WE-TRANSFORM 2022a; WE-TRANSFORM, 2022b).

FIGURE 1.1



STAKEHOLDERS WITH A DIRECT OR INDIRECT INTEREST IN MET CONTENT

Source: Adaptation of Figure 1.8 SkillSea (2020b), p.15.

The determination, and hence the adaptation of MET curricula, design, implementation and evaluation, are central themes of interest for the various stakeholders at local, regional, national (Manuel, 2017) and European level. The success of endeavours for improving MET passes through the effective strategic interconnection of its stakeholders, opening up opportunities for research into aspects of interaction and cooperation among them, with the METs themselves and with their regulators.

As discussed in Chapter 2, the generic categories of MET stakeholders can be considered as remaining essentially the same across national or regional MET systems since every country participating in maritime transport:

- a. is, by international conventions, obliged to have maritime authorities to oversee shipping activities by enforcing national and international regulations;
- b. is overseeing through appropriate regulatory bodies the delivery of STCW Convention requirements for the education and certification of maritime professionals;
- c. is owning a certain amount of ship tonnage under its flag or under other flags but controlled by entities based or legally established within the national territory. The existence of such tonnage is recorded even in the case of a couple of landlocked countries as totals measured in terms of deadweight under the flag (UNCTAD, 2021; UNCTAD, 2022) exceed by far potential inland waterways-related capacity.

d. has – as in a significant number of EU-EEA countries (cf. ANNEX 1) – a system of MET provision at EQF levels ranging from level 4 to level 8 (cf. Table ANNEX 1.1) some of which, especially in the case of EQF levels 4 to 6 is STCW-oriented.

Selecting a methodology for the task: summary of the SkillSea D3.5 report approach.

To analyse the wider context in which MET, along with its stakeholders, operate, the PESTEL framework is considered best suited as it enables the investigation of emerging user needs, creating scenarios and strategic value propositions especially at this time of rapid industry change. The PESTEL framework of analysis looks into the Political, Economic, Social, Technological, Environmental, Legal, and recently – reflecting increased societal focus on the issues – Ethical aspects, in which case the acronym is extended to PESTEL(E).

Next, the analysis proceeds through two case studies of MET and stakeholder interaction; one in Denmark and one in Greece. The analysis in each case has been formulated as a structured approach of critical aspects of the relation of specific categories of stakeholders with MET providers, users and relevant authorities involved, the two case studies are compared and contrasted to draw common elements but also to show differences in the respective approach of each country. The elements drawn from the analysis have fed the context of the discussion in the focus group formed and run at a second stage with relevant stakeholder participants. The focus group provided valuable input for the final stage of the design and validation of the Analytic Hierarchy Process (AHP)-based Stakeholder Cooperation for MET Tool (S.CO.MET.T), which can provide substantial support to the decision-making process when selecting forms of strategic cooperation between MET and its stakeholders. This cooperation can secure new knowledge about maritime education, defined in the SkillSea submission as "The main purpose of stakeholder research (involving internal and external) ones" - (SkillSea, 2018).

FIGURE 1.2

METHODOLOGY OF D3.5 ON MET AND ITS STAKEHOLDERS



Structure of the report

The structure of the report is as follows: the framework of the relationship between the MET system and its stakeholders is set through the PESTEL analysis in Chapter 2, framing the context subject of the report in its general dimensions. Chapter 3 presents the general options for MET and MET stakeholder cooperation, focusing on the analysis of the two case studies, Greece and Denmark. Adding qualitative input from the focus group on the need and purpose of MET stakeholder cooperation, the steps for devising the Analytical Hierarchy Process (AHP)-based tool S.CO.MET.T are presented in Chapter 4. In Chapter 5, conclusions highlight the usefulness of the tool for selecting productive, inclusive and sustainable forms of association between METs and stakeholders at desired levels from national to EU-EEA wide, and to the recommendation for a strategic interconnection of European METs as a key policy proposal of SkillSea, establishing a forum for dialogue among them with the potential to extend this to stakeholders.

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The context for MET stakeholder interaction and strategy: change and challenges

Declaring an interest in MET: broad stakeholder categorisation

A detailed list of MET stakeholders, as shown in Figure 1.1, is essential for the general knowledge of the range of stakeholders with a direct and indirect interest in MET. However, the enumeration of all main subcategories serves the analysis mainly as a challenge to identify common interests and distinguish eventual antithetic views which may require a negotiated interconnecting strategy. Nevertheless – and however large the number and differences involved – the categorisation of the multitude of MET stakeholders in broader categories is quite straightforward. The main caveat of the categorisation exercise is that in a wider perspective the entire society is indirectly a MET stakeholder because MET directly supplies maritime professionals for the critical international transport mode of shipping¹ with interconnection strategies left to distinct categories to determine.

FIGURE 2.1

MET providers MET students MET graduates Shipping industry Educational authorities Maritime authorities

CATEGORISATION OF MET STAKEHOLDERS FOR COOPERATION PURPOSES

Source: Authors, SkillSea WP1 and WP3 deliverables and Manuel (2017).

¹ There has been hitherto no reference below 80% with regard to the importance of shipping in the carriage of international trade; the even higher 90% figure is still being the one more often used in literature and agency reports - despite the increase of rail and of air transport. This stability of shipping's marked prevalence is mainly due to the doubling of tonnage carried by world shipping which increased by about 85% between the start of the 21st century to the end of the second decade of the latter with the as can be calculated from data for 2000 and 2019 in UNCTAD (2022); other modes of transport would need to expand even more to compete for share during that period.

Assessing the context of the MET-stakeholder interconnection: A PESTEL approach

Both MET and its stakeholders operate in a specific – although dynamic – context which is the result of the combination of a variety of forces. For the analysis of this context PESTEL is a relevant methodology, most suitable for strategic analysis of the external environment (Witcher & Chau, 2010; Kaplan et al, 2008) and encompassing the Political, Economic, Social, Technological, Environmental, Legal and, recently, Ethical aspects (denoted by the acronym PESTEL(E)). For the purpose of a comprehensive but concise review of the external environment to MET stakeholders, the classic PESTEL framework is adapted in this report with Political, Economic and Social aspects being considered together under "Socio-economic and political aspects" (cf. Figure 2.2).

FIGURE 2.2

MET STAKEHOLDER ENVIRONMENT IN AN ADJUSTED PESTEL VIEW



Source: Authors and WE-TRANSFORM (2022a) and WE-TRANSFORM (2022b)

PESTEL has been used for strategic analysis of the external environment, including stakeholders, in a variety of contexts which embrace education (Hassanien, 2017). Its adaptability at the global level is well suited for cases of open international industries and systems such as maritime shipping, which has effectively 'globalised' its resources – including maritime labour (Thanopoulou, 2000).

Socio-economic and political environment

Aspects relevant to this general category (cf. Figure 2.2) can be further divided into national and international depending on the level of the analysis. However, in the context of shipping (SkillSea, 2020a) the international factors in this category (with a potentially global effect as well) are expected to be those with a significant impact across all of the European region:

- Competition: Shipping markets in their majority in terms of fleet capacity are markets with a notable absence of monopoly power and are therefore competitive. Traditionally, competition in the largest segments of international and European shipping has been mostly based on cost leadership (*Wijnost* and *Wergeland*, 1996), hence the strong focus of shipping managers on crew levels and crew remuneration in the context of operating costs. Competitive pressures are to a large degree behind the interest in autonomy of ships, following the outcome of successive waves of automation discussed in SkillSea (2020a). Competitiveness also depends on specific economic measures and on taxation regimes (Panagiotou and Thanopoulou, 2019), while any special tax relief for maritime professionals can be included among 'attractiveness' measures.
- **Global uncertainty**: Geopolitical tensions and wars signify that trade and fleet growth are not guaranteed. On one hand, key trading routes could be excluded as a result of a conflict but on the other hand, new trade patterns may emerge possibly increasing demand in tonne-miles and also affecting energy prices and some operating costs, including victualling for the crew. The Covid-19 pandemic also impacted shipping demand and operations, as well as the sector's career attractiveness which has also been negatively affected by recent conflicts and their repercussions on maritime professionals onboard.
- **Fuel costs** are influencing both transport costs of ships and the financial viability of shipping companies and to a lesser degree due to its inelasticity the demand for sea transport.
- **Exchange rates** also impact on industry costs, with revenues in dollars, but crew costs are often in national currencies which may influence the attractiveness of employment at sea.
- **Tariffs** can also impact on world trade levels, as has happened in earlier periods.
- Sociocultural view of shipping which may or may not make render MET and its current challenges as a priority. The connection, for example, between automation and digitalisation, their impact on the workforce and the ensuing need for upskilling/reskilling may be eventually more evident in EU/EEA countries with a significant MET system and/or a significant number of owned ships/maritime professionals.
- **Political views** on general stakeholder cooperation forms can also influence the nature and level of MET-stakeholder cooperation.

Environmental

There has been a marked shift towards sustainability, as analysed in SkillSea (2021a). This is reflected in more specific shifts in the areas of alternative and more environmentally friendly fuels for ships and in reducing the emissions of existing vessels through appropriate measurement. Overall MET training and the focus of shipowners among MET stakeholders depends both on energy policy and emissions measures taken internationally, regionally or even nationally in the case of big trade or shipping stakeholder nations and regions.

Technology

Technology applications in power generation and emissions have been sought with the aim of seucing cost efficiencies and reducing the environmental footprint. Related innovations include energy-saving propulsion systems, such as sail-assisted propulsion, hull air lubrication, hybrid power generation, and alternative fuels. Innovation and the speed in which new technology is applied have both accelerated since the Covid-19 pandemic, adding significantly to the new trends highlighted in SkillSea (2020a).

Together with increased automation and digitalisation, the wide range and high impact of changes in the maritime sector's technological environment (cf. Table 2.1 below) is the other key aspect, together with sustainability, which may lead to new occupational profiles, new skills need and induce new ways of interaction between the MET system and its stakeholders (SkillSea, 2020b).

TABLE 2.1

TECHNOLOGICAL ENVIRONMENT OF SHIPPING: KEY CURRRENT CHANGES

Key Factors	
	Impact
Ship automation/robotics/smart ship	Increased degrees of ship autonomy can offer benefits, such as improvements in efficiency, safety, and environmental performance. However, at the same time it will affect the human element, creating demand for higher and more specialised skills.
Electronic documents and digitalisation	Slow clearance procedures, formalities, and paperwork are main causes of inefficiencies in maritime logistics chains. Digitalisation of customs and other procedures, single window, and paperless formalities minimise delays and facilitate maritime trade.
Advanced communication systems	New communication technologies, such as radiocommunications and satellites are important for the improvement of the safety of remote ship operations, as they allow enhanced situational awareness and easier exchange of information with the shore. Specifically, state-of-the-art communication systems facilitate warning signals, emergency calls, geopositioning, tracking of marine life, communication with the office, as well as social connection with friends and family ashore.

Big data analytics/ sensors/ Internet of Things	Sensors make feasible the measurement of various parameters, such as ocean data (i.e. the physical operational environment), traffic data, engine and material performance data, data on the vessel's condition, weather routing, cargo flows, as well as the crew's physiological and mental condition. Internet of Things allows control and monitoring of systems in real-time. Overall, interaction between humans and machines is improved though new cognitive systems and machine learning. Furthermore, bid data analytics involve algorithms that identify correlations between data and facilitate decision making. Human resources in shipping are increasingly dealing with large and complex databases that require processing. Analysis of big data is a critical capability in the modern maritime industry.
Cyberthreats	Cybersecurity is important for the safety and reliability of maritime transport. The consequences of a possible cyber-attack could include ship and cargo losses or damages, crew injuries, pollution, disruption to ports' functions, and legal fees. More cyber-risks are expected to emerge as new technological systems are being introduced. Also, automated navigation systems might be obvious targets for cyber-attacks.
Energy efficiency/decarbonisation	Energy management is important throughout the vessel and pertains to any system consuming energy, such as the main engine, auxiliary engines, heating, air conditioning, etc. Energy efficiency offers a drastic reduction in fuel costs, as well as in ship's emissions.
Advanced materials	Next-generation materials, such as graphene, alloys, nanomaterials, and bio-inspired materials can have a significant impact on ship performance. There are four key areas for potential application of advanced materials: 1) Hull and structures with shape modifications, lightweight, self-diagnostic, self-heating, as well as corrosion-resistant and self-cleaning coatings. 2) Energy generation with wind turbines, solar panels, fuel cells etc. 3) Energy storage with batteries, hydrogen storage, supercapacitors etc. 4) Electronics with sensors, nano-electronics, conductive polymers etc. Depending on the material, they can offer a range of benefits, such as resistance to corrosion, protection of hull from fouling or icing, lighter weight, reduction of noise and vibration, etc. However, it should be noted that there are uncertainties about the cost, the safety, and the life expectancy of new materials.

Source: SkillSea (2020a), Chang et al. (2019), Lloyd's Register et al. (2015), , Mallouppas and Yfantis (2021), Munim et al. (2020) and Wang et al. (2019).

As analysed in SkillSea (2020b), technological change and sustainability are intertwined, with sustainability setting the scene and pace of the quest for alternative fuels. Proposals made only a few years ago, such as hydrogen, ammonia, methanol, and nuclear and renewable energy sources (Mallouppas and Yfantis, 2017) have now been deployed at sea, although in limited numbers, especially through battery propulsion with electricity as medium. Similarly, a number of operational strategies based on sensors, data transmission and Artificial Intelligence already require skills not hitherto included in traditional MET curricula.

Legal aspects

Legal issues are also arising, especially those involving decision-making, responsibility and claims, with the position and share of specific stakeholders in all of these eventually changing (WE-TRANSFORM, 2022b). This is a critical issue for maritime professionals – especially master mariners and other high-ranking crew members.

Assessing the global scene: trends in MET-stakeholder interconnection

Across WP1 deliverable reports of the SkillSea project, the current need for skills is seen to be higher than the STCW base requirements in terms of computer literacy, maritime law and leadership and teamwork (SkillSea, 2020d).



The SkillSea D1.2.2 deliverable report suggests that the future skills needed at the highest competence level are markedly higher, since they involve digital, green, and transversal skills not currently included under STCW Convention provisions and that the needs for competences at the highest standard are growing at a much faster rate than the baseline, highlighted by the way in which shipping companies have set up their own training schemes and even academies (SkillSea, 2020c).

Dynamics of interrelations of MET stakeholders in a dynamic shipping context

Stakeholder theory relating to education, and also covering professional education, clearly indicates the magnitude of the diversity of motives and the respective goals which may correspond to these (Marshall, 2018). As underlined by Cervero and Darley (2011) the different goals of education stakeholders – described for MET in Chapter 1 of the report – combine with the numbers of providers and the range of modes of delivery and formal collaboration among professional bodies to inflate complexity and possibilities for strategic stakeholder interconnection. Such differing goals can be observed in any system of education, professional or otherwise, and MET presents no grounds for an exception. However, the STCW Convention can be considered as a counterforce, as it creates common ground with its reviews pulling towards wide-range consultation and consensus across stakeholders at all levels.

A distinction should be made at this point in relation to the nature of the connection of MET stakeholders. In terms of direct involvement of MET stakeholder categories, Manuel (2017) distinguishes students, teachers, parents, employers and others with an interest in MET syllabi. These correspond to the categories indicated in Figures 1.1 and 2.2, which include - in the two left quadrants of the first and the lower half of the second - MET stakeholders external to the educational system or other types of agencies with a potential training element or training referral of maritime professionals as part of their activities. The addition of state funding and of the interests of society in general - often in the absence of full information and

appreciation by society of the contribution made by the maritime sector and maritime professionals² - is not necessarily conducive to cooperation through a societal imperative for interconnection.

Moreover, an additional factor increasing complexity in the case of the European MET is the diversity of educational levels, as these are defined through the application of the Framework for Qualifications of the European Higher Education Area for the STCW route of MET across Europe. At the start of the project, this ranged from EQF level 4 - or unclassified - to EQF level 6 (SkillSea, 2021b).

Differences in goals, different relations to MET and the diversity of EQF levels of MET provision are not the only aspects increasing complexity that a pan-European solution of interconnection of European MET stakeholders should solve.

Research in aspects of stakeholder theory in the area of education has put forward categorisations in terms of power, legitimacy and urgency, with combinations of these three attributes distinguishing at least seven classes of stakeholders. These are further grouped as latent, expectant and definitive, as analysed in Jongbloed et al. (2008) who also mention how the pace of change has pushed industry into the status of a definitive stakeholder – combining power to influence, legitimacy as directly affected, and urgency as under pressure in a changing environment – as states themselves.

For applying this framework of stakeholder theory into the specific area of MET, the interaction of goals and forces warranting stakeholder strategic interconnection needs to be represented so that the dynamics of stakeholder relations can be assessed in each case.

In a strategic cooperation perspective, the main priorities of main MET – direct and indirect – stakeholders need to be taken into account along with the main pressures of the external environment to explore the existence of common grounds for interconnection strategies. As shown in Figure 2.4, all main categories of MET stakeholders are under the double pressure of the pace of technological change and the urgent need to adjust to sustainability imperatives.

² This relative lack of visibility, especially in comparison to other transport sectors, became very evident during the COVID-19 pandemic, cf. Graham, C. (2021). Seafarers' invisibility renders them forgotten. Available at <u>https://splash247.com/seafarers-invisibility-renders-them-forgotten/</u>, last accessed November 27, 2022.

FIGURE 2.4



GOALS & FORCES AT PLAY IN A DYNAMIC MET STAKEHOLDER ENVIRONMENT

Source: On the basis of PESTEL D3.5 analysis, Mitchell (2018) and Bolmsten et al. (2021).

In terms of the potential for cooperation, the commonality of external pressures seems to increasingly point to the optimisation of collaboration across categories of MET stakeholders – and also locations. For collaboration that has proved effective in creating innovative MET content (Bolmsten et al, 2021) to address both the impact of technology and of sustainability, the decisive factor on all main stakeholder categories is that of time constraints.

FIGURE 2.5

GOAL SYNERGIES OF MET STAKEHOLDERS IN A STRATEGIC COOPERATION PERSPECTIVE



Source: On the basis of the findings of SkillSea WP1 and WP3 deliverables and Jongbloed et al. (2008).

Figure 2.5, above, indicates that the other strong incentive for stakeholder cooperation is potential economies through collaboration, not only in terms of adaptation times but also of necessary funds. The lack of interconnections creating formal channels of information exchange feeding industry requirements and allowing continuous feedback on effectiveness of MET adaptation inevitably results in reduced efficiency and costly additional corrective measures.

In this context, Chapter 2 of this report maps two indicative cases of MET stakeholder interconnections studies among EEA countries, showing the potential for further interconnections at the European level at a time of technological advances and an increased focus on sustainable shipping.

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MET stakeholder cooperation and strategies: cases and trends

The European landscape and existing stakeholder interconnections in MET

Stakeholder cooperation has progressively been viewed as a pillar for content and delivery adaptation at all levels of education across the spectrum from lifelong learning (Cervero and Daley, 2011) to formal Higher Education. There is also a long tradition among EEA countries in terms of interconnection of MET stakeholders (cf. Table Annex 5.1).

The diversity of MET systems and this of the position of each of the various EEA fleets in terms of size and value rankings (cf. Table Annex 2.1) is a result of the richness of Europe's maritime tradition and of its leadership during modern times. Annex 5 to this report showcases the diversity of European MET in terms of main features of interconnection of stakeholders through country summary forms for maritime EEA countries. Exploring the current directions of solutions adopted by EEA shipping countries is an exercise that could shape new solutions for the future.

The results of a recent SkillSea partner survey, which took place near the end of 2022 (cf. ANNEX 5), show that in most cases consultation mechanisms among similar types of stakeholders are organised, usually – but not exclusively – via government initiatives. Although the survey did not cover every country in the EEA area – some of which have no significant or any maritime cluster – it transpires that MET is considered across Europe to be a key area where specific consultation mechanisms allow exchange and informal or more structured forms of strategic cooperation.

Two traditional European countries – Denmark and Greece, both among those in Table Annex 5.1 – serve as case studies to illustrate potential types of mechanisms and of stakeholder interconnections in the sections which follow.

As indicated from data in Table 2.1 of Annex 2, the two country cases selected represent respectively:

- a. one of the traditional EEA maritime powers, with rankings resulting in a high ratio of value to tonnage, as indicated by combining the data in Table 2.1.
- b. the largest EEA fleet in terms of ownership first also in the world rankings and second in fleet value terms after China, while third in capacity under own flag in terms of the international rankings of EEA national registries.

Although there is scant research on European MET stakeholder interconnections, the results of the PESTEL analysis covered by this report, together with the framework developed in the previous sections, provide the context for analysing these two case studies and also taking account of research in related areas. For example, strategy concepts and solutions can be transcribed from research on stakeholder interactions in Denmark for environmental technology in shipping (Hermann and Kerndrup, 2016) and from historical examples of attracting stakeholder financial resources for MET, which has been the case for Greece.

As the analysis in the next sub-sections will highlight, while there are some differences between the two cases in terms of strategic orientation and the specifics of stakeholder interconnections, there are strong similarities in the spectrum of stakeholders involved. This feature is shared with most of the surveyed EEA countries (cf. Table Annex 5.1) and there is also a non-negligible degree of similarity in the forms of stakeholder strategic cooperation.

Case study 1 of stakeholder cooperation: Denmark

Denmark has a strategic view of clusters, which in the case of its maritime cluster has led to the merger of smaller ones (Gu, 2022). This can be corelated to Denmark's position as the third of the four leading EU countries in terms of innovation (European Commission, 2021). The concept of stakeholder cooperation is the basis for the Blue Denmark strategic vision (DMA, 2022) and the same concept has been used to foster innovation in the maritime sector (Garcia et al, 2019).

Denmark: MET provision in a nutshell

In most countries surveyed by SkillSea in previous deliverables, the spectrum of educational provision for the maritime sector includes STCW-oriented Higher Education MET degrees, STCW-MET of VET type, as well as HE provisions closely related to the subject which can be classified as non-STCW MET (SkillSea, 2021b). STCW-related MET in Denmark (cf. Table Annex 6.1) is managed and controlled by the Ministry of Higher Education and Science-Danish Agency for Higher Education in cooperation with the Danish Maritime Authority, while MET stakeholder formal cooperation passes through a Maritime Education Council (MEC) which has an advisory role on the development of maritime education.

FIGURE 3.1

THE DANISH MET SYSTEM AND ITS STAKEHOLDERS



Denmark: MET stakeholder interconnections and strategies

In line with a long tradition, a core strength of Denmark as a maritime country has been identified as the provision of an attractive framework and conditions for shipowning companies. In this context there is strong cooperation between the industry itself and the other stakeholders. In the Danish approach of MET stakeholder cooperation, the tripartite system has proved to be efficient and responsive at involving the industry, trade unions and government/regulatory bodies. Areas like the application of new technologies, the green transition, digitalisation or the adaptation to port authorities' requests, are examples of direct cooperation between the industry and METs for delivering fast responses to emerging new needs and to changing conditions through structured and ongoing communication.

An early involvement of the spectrum of key MET stakeholders is seen in the industry undertaking the responsibility to supply a set number of internships and also in the planning of the relevant legal framework. Education providers have a high level of flexibility in adapting study modalities within the regulatory framework to ensure that appropriate skills and competences - as well as the supporting learning methods and assessment forms - are integrated in the specific study programmes.

Innovation is a focus area for cooperation in Denmark, building on the critical thinking already introduced in the elementary school system and including real-life cases and cooperation with industry, with regular innovation and entrepreneurship fairs and competitions, as well as through innovation projects. Such close cooperation is also seen in the maritime cluster network and in joint efforts on marketing and recruitment like the World Careers³, with targeted campaigns and a homepage highlighting maritime education options and career examples covering shipping and - beyond - the maritime supply chain.

Denmark: MET stakeholder interconnections and strategies

As shown in Figure 3.2, the members of the Maritime Education Council of Denmark are representatives of associations of shipowners and of seafarers, lecturers and student organisations, the Royal Danish Navy, the Danish Maritime Authority and the Ministry of Higher Education and Science, meeting twice a year (Ministry of Higher Education and Science 2023).

³ <u>https://worldcareers.dk/en</u>

FIGURE 3.2



MEMBERSHIP OF THE DANISH MARITIME EDUCATION COUNCIL (MEC)

Industry, governing bodies and education providers work closely together to adapt to emerging needs in MET and to remove obstacles where possible. There are regular meetings amongst all cross-sections within the maritime cluster, with involvement of the Ministry of Higher Education and Science and the Danish Maritime Authority (and the Danish Safety Technology Authority when electrical developments are involved) and with the Presidents of Education Institutions covering all levels of the maritime education.

Figure 3.3 shows key interconnections in the area of MET in Denmark which reflect current strategic directions in the general spirit of cluster support as described in the introduction of sub-section 3.2.

FIGURE 3.3

MET STAKEHOLDER INTERCONNECTIONS IN DENMARK



Source: On the basis of Ministry of Industry, Business and Financial Affairs (2018) and WP3 partners.

Case study 2 of stakeholder cooperation: Greece

Shipping stakeholder cooperation in the case of Greece passes through the Ministry of Maritime Affairs Marine and Insular Policy (MMAIP) and related organisations or committees which MMAIP oversees or creates. Synergetic actions of shipping stakeholders have a wider historical basis in the interconnected Greek shipping community environment, which has been analysed in terms of its importance for the growth of the Greek-owned fleet since the 19th century (Harlaftis, 1992 and Harlaftis, 1996). In the post-war period, a number of committees and councils for the sector's various aspects were put in place with the participation of key stakeholders ranging from coastal shipping to – more recently – a special council on the cruise sector starting, starting with the creation in 1946 of the Fund for Maritime Education (FME) which initiated cost-sharing by specific categories of interested stakeholders of the MET system.

Greece: MET provision in a nutshell

In the case of STCW-oriented MET provision, STCW education recognised by the relevant Greek maritime authority is provided mainly by public maritime academies not currently classed within the EQF framework. However, there is a pending proposal for their classification at level 5 of the EQF⁴. There are also five continuous learning centres for updating officers' skills and two lifesaving training centres and a retraining centre for ship stewards (cf. ANNEX 6).

A number of Maritime Training Centres – all private institutions – also provide STCW-oriented courses endorsed by maritime authorities outside Greece, including authorities of EU countries such as Cyprus, while serving as revision centres when preparing for renewals of STCW-required maritime professional certification. The 11 (soon to be 14) operating STCW-MET Marine Academies and related schools are dispersed across islands and coastal regions of Greece.

FIGURE 3.4

THE GREEK MET SYSTEM AND ITS STAKEHOLDERS



In terms of non-STCW oriented educational provision, there are currently three undergraduate courses – Level 6 of the EQF – provided by state-funded universities and more provided by educational centres, which as a rule are operating under franchise by European universities. A number of post-graduate courses at EQF level 7 are offered by state-funded and private institutions alike, in association with foreignproviders, while there is significant activity at Level 8 with a number of shipping-focused PhDs. Shipping postgraduate courses focus especially on ship management, together with a variety of short courses. Many of these courses are offered in English.

⁴ Cf. sub-section 3.3.2.

In the area of non-STCW oriented MET, stakeholders participate through regular official procedures for evaluation and accreditation as decreed by law following EU evaluation frameworks of Higher Education. For a number of postgraduate offerings formal advisory boards have been set up, mainly with stakeholders from the shipping industry. In matters of public MET the decisive stakeholder interconnecting body is the Council of Maritime Education (CME), founded 25 years ago.

Greece: MET stakeholder interconnections and strategies

Historically, the first step for the creation of official interconnections between Greek MET stakeholders was the formation of the Fund for Maritime Education (FME). This was a solution of necessity at a time of financial hardship for the country in the late 1940s. The mechanism is still key in attracting contributions towards the costs of the Greek MET system which, initially drawn on a voluntary basis, are now compulsory.

The next major initiative was the creation of the Council of Maritime Education (CME), which was established by Law 2638 of 1998. Under the provisions of this law, the composition of the membership is decreed by official ministerial decisions and renewed every two years with the participating stakeholder organisations. The CME members include the presiding General Secretary of the Ministry of Maritime Affairs and Insular Policy (MMAIP) and the representative from the Ministry of Education and Religious Affairs (MERA), which are the relevant authorities in the case of the Greek MET system, and representatives of stakeholders illustrated in Figure 3.5. As in the Danish case, the industry offers placements onboard for students of the Greek Maritime Academy system.

FIGURE 3.5



MEMBERSHIP OF THE GREEK COUNCIL OF MARITIME EDUCATION (CME)

In recent years, the efforts to update curricula in the main Greek STCW-MET path have been coordinated

Source: (Greek) Law 2638/98

by a special specialists' and stakeholders' committee formed on the initiative of the Ministry of Maritime Affairs and Insular Policy, which is coordinated by the Eugenides Foundation (EF) and presided over by a high-calibre academic personality. Also recently, a special Working Committee on the Digitalisation of Maritime Education and Training, which is currently (2022) in operation, has been created by MMAIP with the digitalisation of administration and content being among the priorities of the Ministry.5

FIGURE 3.6

MET STAKEHOLDER INTERCONNECTION IN GREECE



Source: MMAIP

⁵ Included also in the 2022 published development plan as in Ministerial decision 21168 in Government Gazette 1193B.

Comparing and contrasting two cases of MET stakeholder interconnections and strategies

Having a well-embedded character in Denmark – with alliances of MET stakeholders expanding voluntarily among MET providers in recent years – and a deep-seated tradition of stakeholder collaboration in Greece, interconnections of MET stakeholders are overseeing the MET system with the ability to make suggestions for content and related actions. These two examples from well-known maritime nations in southern and northern Europe indicate that cooperation is an inherent trait of the culture of MET stakeholders. Improvements for selecting optimum strategies and for exchanging views and cooperating at a national or even European level can be assisted by appropriate tools and, eventually, by the proposal for the operation of suitable fora for an EEA-wide form of cooperation among MET stakeholders on MET-related issues. To this effect, further consultation and canvassing are essential and the D3.5 focus group had the mission to complement the analysis with information from relevant stakeholders.

The 2022 focus group on stakeholder cooperation

The organisation of the D3.5 focus group

Within the framework of exploring interconnections and strategy – at the core of D3.5 – two of the WP3 partners⁶ organised a focus group in autumn 2022, seeking to obtain the opinions and views of participants in a structured and useful way for the needs of the report, as well as to support strategic policy recommendations.

The use of focus groups in problems and research questions in social sciences is well-assessed (Wilkinson, 1998). In the form of a group interview – involving a small number of participants with similar focus on the subject question – these groups provide a solid basis for the analysis of reactions and of the provided feedback. Moreover, focus groups can be combined with quantitative methodological approaches⁷; in this way they circumvent the inherent limitations of qualitative methodological patterns and enable researchers to address controversial problems or issues (Nyumba, Wilson, Derrick, & Mukherjee, 2018). In the context of the completion of this report, the use of a focus group was a key qualitative methodological tool and served also as input for the AHP-based Stakeholder Cooperation for MET tool (S.CO.M.E.T) to promote strategic interconnecting with other MET stakeholders with the aim of maximising efficient contributions. The focus group took place on 24 October 2022 via teleconferencing.

Key points from D3.5 focus group proceedings

The discussion in the D3.5 focus group session revolved around the themes encapsulated by the programmed focal points presented in detail in Figure 3.7. These were asked by stages or re-synthetised in the course of the actual discussion to create a climate of familiarity and prompt a fuller response.

⁶ WP3 leader Eugenides Foundation (EF) and Hamburg School of Business Administration (HSBA).

⁷ Cf. Tobias O., N., Kerrie, W., Christina J., D., & Nibedita, M. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution, 9*, 20-32.

FIGURE 3.7

DISCUSSION THEMES FOR THE D3.5 FOCUS GROUP

 1: Do you think that the current framework of operation of MET serves the needs of the industry? if 'yes', do you see a balance among the interests of states, employers and employees? if 'no', which element is missing to bring the system back to a balance?	
2: The lack of interest of young people in the marine professions reflects an impediment, a gap in the communication between the MET suppliers (= offer of MTCs) and the society, mainly with young people and their mentors and professional advisors (at schools, etc.). Do you agree that the 'marketing' of the maritime professions fails in many cases?	
3: Can you propose a way for a better cooperation among MTCs and stakeholders (local society, administrations, employers, employees, etc?).	
4: Are there any best practices you have experienced, or you would like to propose?	

Participants in the focus group were representative of main categories of MET stakeholders. They received invitations through SkillSea Consortium partners and had been drafted mainly by the WP3 HSBA-EF team. They were senior/expert members of either maritime companies or MET schools established in EEA countries or – as in one case – involved with the training, outside Europe, of crews exclusively for Europe-based companies (cf. Annex 3).

Focus group discussions were recorded for further use by the SkillSea research teams, with the consent of participants, who were informed accordingly on this. They were also assured that the files will be available only as far as required for verification purposes by the funding authority or to SkillSea WP leaders for further research.

It should be noted that for the purpose of any such communication, sensitive information or anything that could spark controversies over regional, national, and other interests is redacted. In this way, terms such as "my organisation", "our country", "our business cluster", etc, replaced national identities or affiliations. Therefore, no points of the following analysis are a verbatim reproduction of the recordings. In terms of agreed procedure, the agenda of the focus group discussion was set as shown in Figure 3.8 (actual duration is approximate).

FIGURE 3.8

AGENDA OF THE D3.5 FOCUS GROUP



Conclusions from the focus group discussion on the D3.5 focal points on stakeholder strategies, as well as other ensuing remarks of a general interest for SkillSea in relation to MET are summarised as follows:

- a. In relation to the first focal point question about the balance of stakeholder contribution in terms of interconnection strategies : "Do you think that the current framework of operation of MET serves the needs of the industry? if 'yes', do you see a balance among the interests of states, employers and employees? if 'no', which element is missing to bring the system back to a balance?", participants emphasised that the current framework of MET as dictated by the STCW Convention is not fully satisfying the current needs of the industry. The underlying reason, they stated, is that STCW sets down task-oriented training which is not sufficient in the current operational environment. Additional contributions derived from the discussion suggested that employability is not practically linked with the delivered quality of MET but with local conditions in the labour market competing with shore-based employment. From the turn of the discussion, it became evident that a higher level, but stakeholder-inclusive, collaborative approach on MET issues beyond current STCW provisions is deemed essential.
- b. In relation to the second focal discussion point with starter question "The lack of interest of young people for the marine professions reflects an impediment, a gap in the communication between the MET suppliers (= offer of MTCs) and the society, mainly with young people and their mentors and professional advisors (at schools, etc.). Do you agree that the 'marketing' of the maritime professions fails in many cases?" the input of the focus group in terms of potential stakeholder strategy was encapsulated in one key remark: A possible strategy for educational facilities providing MET beyond just STCW-oriented is to offer a 'holistic' educational approach.

As an example, a common curriculum on nautical sciences was mentioned that would lead to two different specialisations, one for maritime professionals onboard and one for maritime professionals onshore. This could address many goals simultaneously, as the shift from shore to sea could be achieved within a reasonable time and an extra course attracting young professionals to the industry and offering them the sea/shore option would enable MET to stay close to society and provide a feasible choice.

c. Finally, in the context of the general discussion, the participants emphasised the importance for all stakeholders of cooperation in such areas as soft and digital skills, creating mentoring capacity, and improving the understanding of 'greening' policies.

The D3.5 focus group input to the Stakeholder Cooperation for MET tool (S.CO.MET.T)

As a second key contribution, the focus group fully validated the design of the hierarchies related to the proposed Stakeholder Cooperation for MET Tool (S.CO.MET.T) for selecting productive, inclusive and sustainable forms of MET stakeholder cooperation at desired national or EU level.

In this way, the models and the ensuing tool, presented in the next Chapter, are based on input verified – in a qualitative way – by the invited D.3.5 focus group experts. Verifying the hierarchies was essential for constructing an applicable tool to assist with the selection of interconnection strategies, with set goals according to criteria relevant to MET stakeholders.

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4.Strategic decision-making for optimizing stakeholder cooperation in MET

The contribution of an additional tool in the strategic toolkit of SkillSea WP3

The selection of optimum strategic interconnections by MET stakeholders and the related mission of D3.5 can be supported and fulfilled by adding a multiple-criteria decision-making (MCDM) tool in the strategic toolkit of SkillSea.

This kit of tools includes, in the context of reports D3.2 and D3.4, four AHP-based tools which are already designed – with the first three completed as well:

- a. the Strategy Direction Location (STRA.D.L.) tool, which has been designed to facilitate strategic choices between the options open to METs for international cooperation
- b. the Transfer International Tool (Trans.I.T.), an exchange tool which uses fundamental ECTS/ECVET elements that are easily adaptable between levels and educational programmes to facilitate student mobility.
- c. The SkillSea WP3 toolkit also includes the Strategic Evaluation MET Tool (ST.E.ME.T) –which was devised in the context of the D3.2 deliverable – for measuring evaluation strategies in a dynamic perspective and for steering educational content according to skills requirements in the changing environments of sustainability, digitalisation and automation.
- A fourth MCDM-based tool S.E.A.B.AN.T (Shipping Employability AHP Based Anticipating Tool)
 has been proposed in the context of the SkillSea D3.3 interim report on employability (SkillSea 2021).

The Stakeholder Cooperation for MET Tool (S.CO.MET.T) – which is presented in the following sections of this Chapter – complements and completes the set of tools for assisting MET stakeholders.

The steps for S.CO.MET.T: a usable tool for strategic MET stakeholder interconnection

Stakeholder Cooperation for MET Tool (S.CO.MET.T) is based on the proposed Analytic Hierarchy Process (AHP)⁸ hierarchy, as shown in Figure 4.1. Decision-making is nowadays often assisted through the use of multiple-criteria decision-making (MCDM) methods. Among them, AHP has been thoroughly analysed; its essentials can be found in the publications of its pioneer Saaty (Saaty, 1977; Saaty, 1994; Saaty, 2001)⁹ and subsequent research.

Selecting AHP as a suitable methodology for the S.CO.M.E.T.T tool, as with the other WP3 SkillSea tools, is based on:

- 1. AHP being a method based on relative and not absolute comparisons, whereby the relative importance among criteria is easy to define through the user-friendly scales deployed, while its foundations are compatible with modern understanding of human decision-making.
- AHP is flexible when it comes to incorporating judgements and personal values in a logical way, which is valuable when dealing with problems which are characterised by unavoidable subjectivity

 an issue that AHP attempts to limit by exposing the foundations of the decision through the breaking-down of criteria forming the ultimate decision/solution sought.
- 3. AHP provides a framework which allows group participation in decision-making, and therefore the criteria and their weights can be extracted through consensus and appropriate weighting of the opinion of the relevant each time decision-makers.
- 4. AHP has a long and successful record of applications to many problems of policymaking and assessing impacts of various natures across industries and categories of decision-makers. The decision model is simple to construct, as well as being intuitive and in line with general thinking, and does not require specialised expertise from the users, only a simple software¹⁰ to derive the values involved¹¹.

The PESTEL analysis described in Chapter 2 identified the critical factors that determine the operational environment of an MET/MTC educational facility. It should be noted that a PESTEL analysis is a strategic framework commonly used to evaluate the business environment in which a firm operates. In this regard, the aim of the S.CO.MET.T tool is to transpose the findings of the PESTEL analysis (Fig. 2.1) into a multi-criteria decision support tool that reveals the preferences of a stakeholder and its capacity to influence.

The rationale behind the proposed model is rather simple. The findings of the PESTEL analysis are presented in the form of a hierarchy, as in Figure 4.1, for the purpose of devising the AHP-based tool.

⁸ For the AHP as a user-friendly versatile multicriteria decision making method see Saaty, T. L. (2001). Fundamentals of the analytic hierarchy process. In *The analytic hierarchy process in natural resource and environmental decision making* (pp. 15-35). Springer, Dordrecht, Saaty, T.L., (1994) *Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process.* First Edition, RWS Publications and Saaty, T.L., Forman, E.H. (2003). *The Hierarchon: A Dictionary of Hierarchies.* Volume V of the AHP Series, 3rd Edition, RWS Publications.

⁹ Cf. Saaty (2001), op.cit., *Saaty* (19 94) op.cit *and* Saaty and Forman (2003), op.cit.

¹⁰ There are also free software packages available on the internet.

¹¹ Saaty has presented the fundamental scale which is widely used in AHP applications and permits pair-wise comparisons in Saaty (1977).

FIGURE 4.1



PROPOSED AHP HIERARCHY FOR STRATEGIC STAKEHOLDER COOPERATION

This approach implies that all parameters are independent. While this assumption may eventually be considered debatable, it is useful for the purpose of creating a tool adapted to the goals of the SkillSea project. Moreover, it is confirmed through existing analyses.¹²

For every parameter (for example, for such parameters as 'Trade' and 'MARPOL', in level III) a stakeholder provides input, in the form of:

- High probability to impact
- Possible to impact
- Neutral
- Low probability to impact
- Beyond own control

Moreover, for such level 2 parameters as 'political' and 'legal', the scale of Saaty, as presented in the D3.2 and D3.5 reports of SkillSea, is considered. A stakeholder can reveal preference by providing input subject to limiting the error of judgement below a 10% threshold, as dictated by the underlying theory of AHP. Apparently, the model and its rationale serve the following purposes:

- 1. Ideally a stakeholder can contribute to all parameters and levels of the PESTEL analysis; in this case all weights would be equal.
- 2. However, in reality, a stakeholder can only impact some parameters. For example, while a local chamber of commerce can assist in promoting technologies, such as AI and automation, through synergies and business partnerships, it cannot affect fuel prices. In contrast, the Ministry of Energy or Transport can affect the fuel price by imposing a levy or a tax, or submit policy proposals related

¹² Cf. Chapter supra.

to international instruments, such as SOLAS and STCW, but it cannot mobilise local stakeholders to support the work of an MET/MTC institution.

3. Considering these examples, it is expected that the hierarchy is valid for all stakeholders involved by getting a simple Yes/No answer for every parameter a stakeholder has the power to affect. A simple numerical example can enlighten further.

Assume at this point that the local chamber of commerce, which represents the business community of the region, responds as shown in Table 4.1 below:

TABLE 4.1

EXAMPLE RESPONSE OF A LOCAL CHAMBER OF COMMERCE

Field	Weight (hierarchy)	Input Yes/No	result
Trade	0.016	No	0.000
Competition	0.016	No	0.000
Global uncertainty	0.016	No	0.000
Energy prices	0.016	No	0.000
STCW	0.063	No	0.000
MLC	0.063	No	0.000
SOLAS	0.063	No	0.000
H&S	0.063	No	0.000
ESG	0.063	No	0.000
Sustainability	0.045	Yes	0.045
Fuel	0.045	Yes	0.045
MARPOL 73/78	0.223	No	0.000
Automation	0.104	Yes	0.104
AI	0.104	Yes	0.104
Cloud	0.104	Yes	0.104
Political	0.063		0.000
Legal	0.313		0.000
Environmental	0.313		0.089

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Technological	0.313	0.313
	1.000	0.402

From its own angle, in view of its own goals and priorities, a national union of shipowners would eventually respond as follows to the same questions:

TABLE 4.2

EXAMPLE RESPONSE OF A NATIONAL UNION OF SHIPOWNERS

Field		Input Yes/No	result
	Weight (bierarchy)		
Trade	0.014	No	0.000
Competition	0.014	No	0.000
Global uncertainty	0.014	No	0.000
Energy prices	0.042	Yes	0.042
	0.012		0.012
STCW	0.013	Yes	0.013
MLC	0.013	Yes	0.013
SOLAS	0.013	Yes	0.013
H&S	0.016	Yes	0.016
ESG	0.030	No	0.000
Sustainability	0.298	No	0.000
Fuel	0.060	No	0.000
MARPOL 73/78	0.060	Yes	0.060
Automation	0.298	Yes	0.298
AI	0.060	No	0.000
Cloud	0.060	No	0.000
Political	0.083		0.042
Legal	0.083		0.053
Environmental	0.417		0.060
Technological	0.417		0.298

1.000 0.452

Apparently, the results yield the following findings as shown in Table 4.3 below.

TABLE 4.3

RESULTS OF THE NUMERICAL EXAMPLE

	Chamber	Union
Political	0.000	0.042
Legal	0.000	0.053
Environmental	0.089	0.06
Technological	0.313	0.298

The results of Table 4.3 show that:

- 1. Both stakeholders cannot significantly impact wider issues, such as politics and legal, even if they closely cooperate.
- 2. Both stakeholders can contribute to technological issues.
- 3. They also need support from other stakeholders to tackle political, legal, environmental issues to the benefit of MET (and of society, etc.).
- 4. Hence these two stakeholders should be contacted when it is necessary to address a technical issue. When a political or legal issue need to be addressed, other types of stakeholders should be approached to tackle it.

As a conclusion, this model reveals not only the relative preference of a specific stakeholder, but also the capacity of this type of stakeholder to contribute and the relative significance of such contributions based on own input.

The application of the Stakeholder Cooperation for MET Tool (S.CO.MET.T) therefore leads to the realisation of the need to approach other stakeholders and to the selection of interconnections for ad hoc or more broad aspects requiring stakeholder cooperation in the area of MET.

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5. Conclusions: EEA MET stakeholder cooperation as strategy

Main conclusions of the report

Analysis of the two case studies in Section 3 and the results of the D3.5 focus group demonstrate that the way to promote further cooperation between MET and its stakeholders should be a roadmap – which is an anticipated output of the SkillSea 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 5.1, in order to:

- a. Develop a framework for European MET stakeholder interconnection in Europe to deliver futureproof MET, promoting adaptation to a changing shipping framework and the mobility of maritime professionals while fostering the shift from "maritime" to "blue" Europe.
- b. Encourage interaction and communication among MET stakeholders through regulatory support to foster efficient interconnection on European MET common ground, together with effective mentoring and on-the-job practices of future maritime professionals.
- c. Facilitate horizontal and vertical cooperation of MET stakeholders, with the aim of rendering the services and offerings of European MET future-proof.
- d. Remove cultural barriers to attractiveness through increased communication, transparency and interaction between METs and prospective maritime professionals.
- e. Enable cross-sectoral employment and reduce structural shortages of personnel.

The creation of the Stakeholder Cooperation for MET Tool (S.CO.MET.T) within the framework of SkillSea WP3 provides a useful, yet simple, strategic aid for selecting appropriate forms of interconnections of MET stakeholders according to commonly desired goals.

This developed WP3 SkillSea tool is an objective-oriented decision-support tool, that is also transparent and fully quantified. In this regard S.CO.MET.T is further expandable and ready for refinement, either by improving the translation of linguistic and human input to numerical data or by expanding criteria, thus incorporating new insight in the tool or adjusting it to local or specific needs.

Such forms of interconnection assisted by S.CO.MET.T can be at a local, national, regional or EU or EEA level. However, the issues to be addressed (cf. Figure 5.1) and the need for strategic stakeholder interconnection is, in all these cases, at their base.

FIGURE 5.1



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

The SkillSea strategic perspective on MET stakeholder strategic interconnection

In terms of policy implications, the feasibility of a non-normative yet game-changing inclusion of MET providers in a wider European forum for maritime skills – closely related to career attractiveness – is put forward through the D3.5 analysis of related stakes and challenges created by the external global environment. The term non-normative deserves special attention, as MET is a service regulated, offered and requested in the global market, while the European MET approach serves European objectives as well. Therefore, a careful balance is required to keep European MET not only competitive but also a leader in the global offering. In this regard, the conclusions of this report may not be seen simply as issues for consideration but rather as urgent priority.

A mechanism across interested EEA MET providers in the creation of a forum focused on skills – the European Maritime Skills Forum (E-MSF) – is justified on the basis that the competences stipulated and model STCW courses for the education and training of maritime professionals are already fully internationalised, and have been for several decades, through the STCW framework. Moreover, it is necessary to consider wider policies of the EU, such as the Green Deal or gender and diversity issues, which are not addressed in the IMO framework. This is because STCW does not identify the ways in which European MET follows thorough consultation with the industry, other stakeholders and bodies responsible for educating young people.

In this context, and also drawing also from the analysis of the case studies of the key EU shipping players, Greece and Denmark, common elements were identified in this report supporting:

the definition of common goals in the area of MET provision of education and training, and also of related research.

the creation of a European forum for the exchange of information at the appropriate level between interested MET institutions with the potential participation of interested stakeholders enabling exchange of best

practices in content and delivery and also of new information for emerging requirements for MET providers. Such a forum could also facilitate a better interaction and exchange of views among MET service providers or supporters and employers, as well as MET students/graduates.

the more permanent or ad hoc research groupings for basic and applied research in the area of MET. Research in the MET field and in the area of maritime and blue professions should be further intensified, as it is necessary to identify the causes of any imbalances in the market at an early stage and communicate possible solutions with all stakeholders in a transparent way.

Overall, and as key direction for policy action, the development of a mechanism to create a voluntary MET forum at EEA level, eventually in the form of a European MET Skills Forum (E-MSF), as described above in (ii), could create opportunities for exchange, cooperation and further research on the adaptation and creation of future-proof skills for maritime professionals at a time of rapid technological and regulatory developments affecting the entire European and global shipping industry. It could also create an interface for MET providers and MET stakeholders to freely interact with the aim of improving the provision of education to support the future of maritime skills in Europe. Such an interface would be informal in terms of regulatory standing, yet direct in terms of contact and generating opportunities for a constructive exchange of views.

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ANNEXES

ANNEX 1: EEA MET & EQF DIVERSITY

TABLE ANNEX 1.1

INDICATIVE DIVERSITY OF MET IN EUROPE AT SkillSea START

(EEA countries)

Diversity of MET Institutions	Total		Post Grad. Studies Available		Members of	
Diversity of MET institutions	No.	%	No.	%	No.	%
Universities providing only Maritime Education	8	13	7	87	6	75
University Faculties offering Maritime Education	14	23	13	93	8	57
University Departments offering Maritime Education	8	13	7	87	3	37
University Schools offering Maritime Education	9	15	6	67	2	22
Maritime Academies or Institutes, parts of Universities which offer B.Sc. Diploma	13	21	6	46	4	0.31
Maritime Academies which offer B.Sc. Diploma and they are not part of a University	8	13	7	87	6	75
Maritime Academies, colleges or institutes which do not offer B.Sc. Diploma	1	1.6	0	0	0	0
Total	61		46	75	29	48

Source: SkillSea (2021b). Table ANNEX 1.1, p.86.

TABLE ANNEX 1.2

LEVELS OF THE FRAMEWORK FOR QUALIFICATIONS OF THE EUROPEAN HIGHER EDUCATION AREA (EQF)

Learning	Knowledge	Skills	Responsibility & autonomy
outcomes relevant to levels	Knowledge is described as theoretical and/or factual.	Skills 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).	Responsibility & autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	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	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic 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	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	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
Level 6	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	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for

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		specialized field of work or study	managing professional development of individuals and groups
Level 7	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	Specialized 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	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialized skills and techniques, including synthesis & 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

NB: Each of the eight EQF levels is defined by a set of descriptors indicating the learning outcomes relevant to qualifications at that level in any system of qualifications.

Source: Adapted from <u>https://europa.eu/europass/en/description-eight-eqf-levels</u> last accessed November 20, 2022.

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 2: EU-EEA COUNTRIES IN KEY MARITIME NATIONS' FLEET RANKINGS

TABLE ANNEX 2.1

RANKING IN WORLD FLEET TONNAGE AND VALUE (EEA COUNTRIES)

(Former EU member UK in brackets)

EU-EEA	Tonnage World rank	Value World rank
Greece	1	2
Germany	7	5
Norway	9	9
(UK)	10	7
Denmark	13	12
Belgium	17	24
Netherlands	23	15
France	25	16
Italy	26	17

Source: Share in world ownership and value ranking as for key fleets by ownership size and value in UNCTAD (2022). Review of Maritime Transport. Geneva, Tables 2.4, p.39 and Table 2.5, p.40. Data in the source's tables are provided for 25 countries on value basis and 35 countries on the basis of size of owned fleet. In the latter case Cyprus is also included in place 29 but not in the value rankings which cover only the top 25 fleets in the world by value.

ANNEX 3: FOCUS GROUP MEMBERSHIP (COUNTRY AREA AND FIELD OF ACTIVITY)

TABLE ANNEX 3.1

D3.5 FOCUS GROUP PARTICIPANTS PER COUNTRY AND FIELD OF ACTIVITY

Participant	Country area	Field of activity
1	Northern Europe	STCW MET Level 6
2	Northern Europe	STCW MET Level 6
3	Southern Europe	HR Manager Shipping Co
4	(non-European country)	Crew Agency
5.	Orestis Schinas (HSBA)	Moderator

ANNEX 4: ESSENTIAL ELEMENTS OF THE ANALYTIC HIERARCHY PROCESS

TABLE ANNEX 4.1

ANALYTIC HIERARCHY PROCESS ESSENTIALS

The Analytic Hierarchy Process (AHP) is a most suitable Multicriteria Decision Making Methodology (MCDM) for defining essential employability criteria and following their suitability through updates and industry workforce consultation mechanisms. Other methodologies such as the Technique for Order of Preference by Similarity to Ideal Solution, (TOPSIS) can be combined with AHP.

AHP is a MCDM based on hierarchies and relative or absolute comparisons of the attributes of the alternatives. The structure of hierarchies permits the decomposition of decision-goals to criteria which is an effective way to address complex problems involving choices.

The essential decision factors are organised in steps and levels of importance. Further to the advantages of breaking down a decision problem into criteria and sub- criteria, a hierarchy may consider qualitative properties and factors as well.

Once the hierarchy of a problem is set, then discovery of the weight of criteria follows through AHP questionnaires which proceed through pairwise comparisons assessing the relative priority of main and sub-criteria

Following the discovery of the relative importance of criteria and sub-criteria, then proceeding with the ranking of alternatives follows¹³.

Source: On the basis of Saaty 1977, Saaty 1994, Saaty 2001.

¹³ The comparison matrices have specific mathematical characteristics, such as being reciprocal, and the diagonal elements are equal to unity.

ANNEX 5: EUROPEAN MET STAKEHOLDER COOPERATION COUNTRY SURVEY

FIGURE ANNEX 5.

EUROPEAN MET STAKEHOLDER INTERCONNECTIONS COUNTRY SURVEY FORM

SKILLSEA PARTNER EEA COUNTRY:

.....

NUMBER OF STAKEHOLDER CONSULTATION MECHANISMS IN ANY SHIPPING AREA	Total Number	STAKEHOLDER CONSULTATION MECHANISMS FOR MET	Total Number
CATEGORIES OF PARTICIPATING SHIPPING STAKEHOLDERS	Estimated Number of categories	CATEGORIES OF PARTICIPATING MET STAKEHOLDERS	Est. Number
NOTES:			

TABLE ANNEX 5.1

SHIPPING – MET STAKEHOLDER MECHANISMS SKILLSEA EEA PARTNER SURVEY

SKILLSEA PARTNER EEA COUNTRY	STAKEHOLDER CONSULTATION MECHANISMS IN ANY SHIPPING AREA	Total Number	STAKEHOLDER CONSULTATION MECHANISMS FOR MET	Total Number	CATEGORIES OF PARTICIPATING SHIPPING STAKEHODLERS	Estimated / Number of categories	CATEGORIES OF PARTICIPATING MET STAKEHODLERS	Est. Number	NOTES
Germany	Nationale Maritime Konferenz Maritimes Bündnis Tripartite Meetings for MLC changes (only ad hoc)	3	StAk: Ständiger Ausschuss der Küstenländer	1	Union (verdi) Shipowners' Association Regional Authorities Pilots METs Government Ministries	6	Regional Authorities (Länder) METs	2	National governm ent has no say in education, thus it is typically the regional authorities (Länder)
Belgium	Maritime Education & Training/ Antwerp Maritime Academy (1) Cruise Sector (Antwerp & Zeebrugge) (2) Coastal passenger shipping (Antwerp & Zeebrugge) (2)	5	Maritime Education & Training/ Antwerp Maritime Academy (1)	1	Shipowners' Unions' National Associations of Shipping Educators Students Local Authorities METs Government Ministries	7	Shipowning Unions' National Associations of Shipping Educators Students METs Government Ministries	6	
The Netherlands	Education (12) Training (8) KVNR VvWB NML NMT BTC's	25	Breed Maritiem overleg HBO clusteroverleg SBB HTW WTI Maritiem Tech Platform Innotecs MBO-raad WISTA	9	KVNR Nautilus Lecturers VOR Rotterdam Municipality MET's LenT NML NMT PFA (fishing) VISKED IRO HISWA	14	KVNR Nautilus Lecturers Students MET's LenT Rotterdam Municipality NMT NMT IRO HISWA	11	
Sweden	Ferry and RoRo Sector (1) Tank and Bulk Sector (1) Sector of Special Tonnage (1) Inland shipping (1) Maritime Education & Training (2)	6	STAKEHOLDER CONSULTATION MECHANISMS FOR MET Council of Maritime Education (3) Forum of Maritime Education (1) Committee of Education and Recruitment (1)	5	Swedish Shipowners' Association The swedish Confederation of Transport Enterprises The Swedish Transport Agency The Swedish Aratiume Administration Maritime Officers' Association METs Instructors Students	8	Swedish Shipowners' Association The Swedish Confederation of Transport Enterprises The Swedish Transport Agency The Swedish Maritime Administration Maritime Officers' Association METS Instructors Students	8	
Norway	Maritime Education and Training (2) Aquaculture - fish- farming (2) Fisheries (1) Shipping general 11)	16	Dev. Competence program. (1) Conduct research (1) Educational conference participation Presentation at Conference (11) Participate in panel disc.(4) Working committee (4)	6	1.Norwegian Shipowners ssociation 2.Global Aquatech HUB 3.Shipyards 4.Ship Finance 5.Class Societies 7.Ship Insurance 6.Class Societies 8.Deck Officers Union 9.Engineering officers Union 11.Students 12.Local & National Authorities 13.METs 14.Government Ministries	14	1.Deck Officers Union 2.Engineering officers Union 3.Norwegian Shipowners association 4.Instructors 5.Faculty 6.Students 7.METs 8.Government Ministries 9.Simulator providers	9	The GATH Conference, Shipping Konferansen (Alesund) Nor Fishing, Nor Shipping, Offshore Northern Seas (ONS) Aqua Nor, Verftkonferansen, Sjøsikkerhebblenferansen, Sjøsikkerhebblenferansen, Nagic, Martlim Utdanningskonferanse, Klyngekonferansen, Rederfforbundets som merskole, MARKOM II som terskole, MARKOM II
Spain	National/Regional management of the Spanish shipping (2) Auxiliary and Shipbuilding companies (4) National maritime authority (1) Passenger and Roll-on roll-off shipping (4) Maritime Education & Training (7)	19	Fund form MET Council of Marine Studies Institutions (3) Ad-hoc Committess (2)	7	Government Ministries METs Local/National Autorities Students Instructors Chamber of Shipping Shipowners Auxillary and Shipbuilding companies Maritime Professionals' Union Shipowners' Unions'		Government Ministries METs Students Instructors Chamber of Shipping Maritime Professionals' Union Shipowners' Unions'		
Denmark	Innovation (2) MET (3)	5	1.Contact Committee for Maritime Research 2.Maritime Research Alliance 3. Maritime Education Council	3	Shipowners' Unions' Danish Maritime Authority Maritime Professionals' Union Instructors Students Local Authorities METs Government Ministries	8	Danish Maritime Authority Maritime Professionals' Unions Instructors Students METs Government Ministry	6	The cooperation model in Denmark is a tripartite one, with close cooperation between industry, authorities and education providers.
Greece	Cruise Sector (1) Coastal passenger shipping (1) Maritime Education & Training (4)	6	1.Fund for MET 2.Council of Maritime Education 3. Ad-hoc Comm ittees (2)	4	Shipowners' Unions' Chamber of Shipping Maritime Professionals' Union Instructors Students Local Authorities METs Government Ministries	7	Shipowning Unions' Chamber of Shipping Maritime Professionals' Union Instructors Students METs Government Ministries	6	Numbers exclude stakeholder consultation/cooperation mechanisms in the area of ports. They include ad-hoc committees on MET.

ANNEX 6: DANISH AND GREEK STCW-MET

TABLE ANNEX 6.1

DANISH STCW-MET 2022

5 Marine Engineer Colleges:

1 Maritime Education Centre for Ship's Officers (Single and Dual purpose Deck and Engine):

2 Nautical Colleges

2 Schools & 2 Sailing Training Vessels for Ordinary Ratings

Source: Ministry of Higher Education and Science (2022), <u>https://ufm.dk/en/education/higher-education/nigher-education/higher-educatii/higher-education/higher-education/higher</u>

TABLE ANNEX 6.2

GREEK STCW-MET 2022



Source: Ministry of Maritime Affairs and Insular Policy, Greece



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