

Sustainable Development in Maritime Education and Training; Trends, Challenges and the Way Forward

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Abstract

As a run-up to the 2030 Sustainable Development Agenda, the International Maritime Organization (IMO), in 2013, adopted the concept of “a sustainable maritime transport system”. The concept stresses the role of maritime education and training (MET) in realizing a sustainable maritime transport system. Maritime education and training institutions (METIs), therefore, have to integrate sustainable development (SD) into MET.

This paper investigates the concept of an SD-based MET system vs. the business-as-usual STCW-based system. Trends within MET relating to SD are discussed while associated challenges are identified. Means of achieving an SD-based MET system are proposed while shedding light on a number of ongoing initiatives to integrate SD into MET.

Finally, the possible contributions of MET institutions to the UN’s forthcoming “*Decade of Ocean Science for Sustainable Development (2021-2030)*” are considered.

Keywords: Higher Education Institutes (HEIs), Maritime Education and Training (MET), STCW, Sustainable Development, UN Decade of Ocean Science for Sustainable Development (DOSSD)

List of Abbreviations

CoC	Certificate of Competency
DESD	Decade of Education for Sustainable Development
DOSSD	Decade of Ocean Science for Sustainable Development
ESD	Education for Sustainable Development
HE	Higher Education
HEI	Higher Education Institute
HESD	Higher Education for Sustainable Development
KSAs	Knowledge, Skills and Attitudes
MARPOL	The International Convention for the Prevention of Pollution from Ships
MarTID	Maritime Training Insights Database
MD	Millennium Development
MDGs	Millennium Development Goals
MET	Maritime Education and Training
SD	Sustainable Development
SDGs	United Nations 2015 Sustainable Development Goals
STCW	The 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TVET	Technical and Vocational Education and Training
UN	United Nations
UNCLOS	The United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
WCED	World Commission on Environment and Development

1. BACKGROUND AND LITERATURE REVIEW

1.1. Introduction

Sustainable development (SD) has progressively gained fame and momentum over the past decades with the forefront being the United Nations 2015 Sustainable Development Goals (SDGs) for 2030. Yet, the notion of SD, although not yet coined as so, may itself be traced back much further; to the late 1960s. The Intergovernmental Conference of Experts on the Scientific Basis for Rational Use and Conservation of Biosphere, 1968 was the first international gathering to discuss SD, however under the notion of ‘rational use and conservation’ [1]. Three years later, in 1972, the Conference on the Human Environment in Stockholm, Sweden was the first truly international conference devoted exclusively to environmental issues [2]. A few major gatherings convened in the years to follow. Still, a true definition of SD was yet to be developed until 1987 by the World Commission on Environment and Development familiarly known as the Brundtland Commission. “Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [3]. The same report highlighted three fundamental components to sustainable development: environmental protection, economic growth and social equity. This report became the foundation for all SD initiatives to follow. Shortly after, the Rio de Janeiro environmental conference of 1992 reaffirmed the same three components (environmental, economic and social) as the pillars of SD.

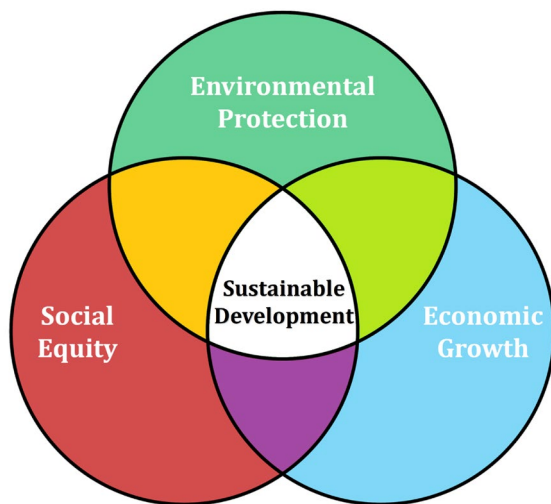


Figure 1-1 Three pillars of SD.

1.2. The Millennium Development Goals (MDGs)

The UN Millennium Development Agenda, in 2000, built on this foundation recognizing the same three pillars as the basis for SD. With a focus on the role of developed nations, the MDGs brought together national governments, the international community, civil society and the private sector to achieve 8 specific

goals defined by 18 targets. After fifteen years of concerted effort, acknowledging both successes and shortcomings, the final report on the MDGs stated:

The Millennium Development Goals (MDGs) have produced the most successful anti-poverty movement in history and will serve as the jumping-off point for the new sustainable development agenda to be adopted this year [4].

1.3. Decade of Education for Sustainable Development (DESD)

From the commencement of the MD Agenda, education was recognized as an inseparable element of SD. Not only that, but it was also recognized that SD cannot be achieved without proper education committed to the concept of SD. An international recognition of the “important distinction between ‘*education about sustainable development*’ as an awareness lesson, and ‘*education for sustainable development*’ as a comprehensive tool to achieve sustainable development” was to drive things to come [5]. In 2002, the UN, announced its intention for instigating a decade dedicated to education for sustainable development (ESD). Three years later, in 2005, the UN Decade of Education for Sustainable Development (DESD) (2005-2014) was officially inaugurated. As publicized by UNESCO:

Education for Sustainable Development (ESD) empowers people to change the way they think and work towards a sustainable future. UNESCO aims to improve access to quality education on sustainable development at all levels and in all social contexts, to transform society by reorienting education and help people develop *knowledge, skills, values and behaviors* needed for sustainable development. It is about including sustainable development issues, such as climate change and biodiversity into teaching and learning. Individuals are encouraged to be responsible actors who resolve challenges, respect cultural diversity and contribute to creating a more sustainable world [6].

A review of literature from 2005 to 2015 shows that much academic attention was dedicated to ESD during the DESD. Many advantages have been asserted while, typically, a number of shortcomings have been pointed out. As the DESD reached its end in 2014, the UNESCO published its final report on the achievements of the decade. To summarize, the final report concluded that “a solid foundation has been laid for ESD at the end of the DESD, achieved by raising awareness, influencing policies and generating significant numbers of good practice projects in all areas of education and learning”. The report resumes, “despite the successes, a full integration of ESD into education systems has yet to take place in most countries [7]”. Of the ten key findings, the report notes that higher education institutions (HEIs) have also stepped up their efforts towards SD with some undergoing significant whole institution change “from

sustainability in operations and management to changes in teaching, curriculum and research, as well as participation in strengthening sustainable development in their surrounding communities [7], [8]”. Noting that in some countries (e.g. Finland, Sweden and Germany), new ESD-related specialist programs and courses are on the rise. HEIs have also been networking to promote ESD capacity building. In Finland, for example, HEIs negotiate operational and qualitative targets, as well as resource requirements, with the Ministry of Education and Culture [9]. The UNESCO (2014) highlights the potential of HEIs to stimulate local community change with regards to **SD**.

Also noted is that technical and vocational education and training (TVET) has, during the DESD, started to align with the green economy with new research and capacity building efforts emerging. The report also adds that new models and tools to help TVET reorient to SD were becoming available. However, it has been noted that TVET should focus not only on “development of skills but also of mindsets, that can influence change in the workplace and community” (UNESCO, 2014).

1.4. **The Sustainable Development Goals (SDGs)**

The 2015 UN Sustainable Development Agenda for 2030 was subsequently developed as a follow-up to the momentum created by its predecessor, the Millennium Development Agenda. Underpinning the same pillars of environment, economy and society, the UN SD Agenda now embraced 17 Sustainable Development Goals; each with its own set of indicators; in total 244 indicators (232 not counting repetitive goals) [10]. Compared to the MDGs, the SDGs urge universal and cooperative involvement of all nations; developed and poor. SDGs attempt to achieve SD in a broader more detailed manner by tackling root causes through the use of goals, targets and indicators. If any, the number of indicators in itself stands witness to this approach.

It is not the purpose of this paper to delve into the disparities between SDGs and MDGs. Nonetheless, one unique distinction is of much relevance to the research at hand. Though both agendas refer to the importance of education, the MD Agenda, while referring to middle and higher levels of education in the context of gender equality (Goal 3), only emphasizes the reach and quality of education in earlier stages; specifically, primary education (Goal 2). It seems to direct educational focus on the earlier stages of learning, however, leaving room for HEIs to act accordingly on their own. The SD Agenda, on the other hand, takes a broader more encompassing approach addressing education at all levels and for all. SDG 4: *‘Ensure inclusive and equitable quality education and promote life-long learning opportunities for all’* extends the notion of quality education beyond the primary level to include secondary and tertiary education. Target 4.3 states, *‘By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university’*, thus

stepping-up education efforts for SD to include all forms of higher education. Additionally, Target 4.B promotes increasing the number of scholarships made available to developing countries for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programs, in developed countries and other developing countries.

1.5. Maritime Education and Training (MET)

Consequently, the International Maritime Organization (IMO), a specialized UN agency responsible for setting global standards for the safety, security and facilitation of international shipping and the prevention of pollution by ships (IMO) responded accordingly. In 2013, the IMO took up the concept of “a sustainable maritime transport system”. The concept outlines ten areas of focus (imperatives) in order to realize a sustainable maritime transport system. In recognition of the importance of MET, the second imperative is titled, “Education and Training in Maritime Professions, and Support for Seafarers”. With a clear understanding that the success of its mission depends on a well-educated and trained workforce, Goal 1 of this second imperative reads:

Goal 1 – A Sustainable Maritime Transportation System requires properly trained and educated seafarers. Such training and education should be based on, inter alia, the STCW Convention, and include refresher training and education upgrades, as necessary [11].

Hence, in a world steadily shifting to a more sustainable future, maritime education and training institutions (METIs), the forefront of MET, must quickly make a transition to incorporate the UN Sustainable Development Agenda into curriculums, training programs and courses with an eye on current and future environmental requirements, economic trends and social needs.

2. MARITIME EDUCATION AND TRAINING; TRENDS AND CHALLENGES

2.1. An STCW-based MET

The 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), which entered into force in 1984, and its Code have since been the industry’s blueprint for maritime education and training (MET). As the name implies, the STCW specifies training standards to be met by seafarers. The Code identifies three levels of responsibility; management level (applies to senior officers), operational level (applies to junior officers) and support level (applies to ratings forming part of a navigational or engine watch). Each level is divided into a set of functions onboard ship. Each function details a number of competences (minimum required skills) the seafarer must demonstrate ability to carry out *proficiently*. Having successfully met these standards, the seafarer is thus recognized as being capable of performing the duties required of

the certain level of responsibility. Only then may a seafarer be issued a Certificate of Competence (CoC) allowing him/her to work onboard seagoing vessels.

Although, widely accepted by the international shipping community, some shortcomings of the 1978 STCW have been pointed out. These shortcomings have been extensively debated by official reports, scholarly articles and the maritime community. Consequently, the convention has since its inception been subject to a number of revisions; the most significant being in 1995 and 2010. While the 1978 STCW focused almost entirely on knowledge, the following amendments of 1995 and 2010 (the Manila Amendments) introduced, among other things, the shift from a *knowledge-based* standard to a more practically oriented *competence-based* standard. The STCW, in its current form, is therefore recognized to emphasize the acquisition and demonstration of practical skills rather than interpretation of knowledge and critical thinking. It is, thus, no wonder that many experts/scholars consider MET as a vocational education system as opposed to an academic one.

The prevailing view is that, while this approach¹ addresses a degree of cognitive skills, it focuses on and gives much more emphasis to the acquisition of hands-on practical skills for the performance of specific tasks. On the other hand, academic education has been seen to be much more focused on the development of in-depth analytical and critical thinking skills; cognitive skills that are less reliant on hands-on task-oriented training, but stress critical reading and discussion [12].

The reasoning behind this approach to MET is well understood. By nature of occupation, the majority of shipboard tasks and operations (functions) require a high level of hands-on engagement with little room, if any, for personal interpretation or academic thinking. From securing the cargo on deck and maintaining and operating the ship's equipment to navigating the ship safely in congested areas; every function on board requires adequate knowledge, but more importantly a specific set of practical skills.

2.2. The Trend towards an Academic Approach to MET

Academia and educators concerned with MET, have for some time been debating the need for a pragmatic shift from the prevailing vocational system to a more academically oriented system. This trend has been demonstrated, for example, by the International Association of Maritime Universities (IAMU). Starting with seven founding members in 1999, the IAMU currently has 66-member universities from five continents among its ranks. Participating universities of the IAMU not only provide a STCW-based program granting CoCs, but also have to provide students the opportunity to pursue a minimum academic program

¹ Suggesting that MET is a vocational approach.

equivalent to a Bachelors (BSc.) degree. Most IAMU universities further provide postgraduate programs such as diplomas, Masters (MSc.) degrees and Doctoral (PhD.) degrees.

A number of challenges, though, may be identified. For one, such universities need to find the delicate balance between the vocational needs embodied by the STCW and the time and resources required for an academic degree on both the institutional and individual level. In fact, the question of whether a more academic approach may affect the quality of practical or onboard training in METIs has been posed [13], [14]. [15], while discussing “commonly agreed principles in establishing an effective MET”, list nine relevant considerations. Altogether, these nine considerations illustrate the challenges associated with finding the above-mentioned balance. Also noted is that any academic degree to be successful should be accredited by local authorities at the least; which while ensuring quality and acceptance of the program, also adds to the challenge [15].

Despite these challenges, the trend towards an academic approach to MET is quite evident. In response, the IAMU, in 2013, published a report titled “Balancing vocational and academic education: A global profiling of maritime universities reviewed by their curricula and instructor qualifications”. Pointing to the challenge associated with staff qualifications, the research notes, “there is still a large gap between what could be considered ideal in a Maritime University in terms of lecturer qualifications and the status quo” [14].

2.3.The Trend towards a more Sustainable Career for Seafarers

MET under the STCW has for decades been providing the shipping industry with well-trained, job-competent seafarers. However, this has been the exact focus; to prepare the seafarer for a job at sea; on board a vessel, that is. Very little consideration, if any, was given to the idea of a seafarer shifting to a shore-based career if wanting or needing. At the same time, many seafaring careers today may be shorter than in the past, because of increasing employment mobility, or because of the growth of professional opportunities ashore [11].

Partly, the trend towards awarding an academic degree in MET comes from this need; the need to prepare the seafarer for a career shift when needed. This certainly may not be in the direct interest of stakeholders within the shipping industry. But, as Manuel (2017) argues, “seafarers and their paths to fulfilled *life-long learning* and the associated evolution of careers within the wider industry and beyond, should not be limited by the interests of any specific stakeholder”. This trend seemingly lines-up very well with the concept of *life-long learning* as expressed in SDG4. Encouraging this trend, IAMU’s Haiphong statement declares, “Degrees for seafaring officers should also provide a preparation for those seafarers who wish to transition to shore-based careers beyond their service at sea” [16].

The challenges associated with this trend, though, should not be overlooked. Increased attrition from the seafaring career will certainly be an issue. As seafarers become more capable of making the shift to a shore-based or an entirely different career, it may become harder and harder for shipping companies to fulfill the required onboard manning requirements, thus affecting the operability of the ship and shipping as a whole. Unless the shipping industry succeeds in making seafaring more satisfactory, this may certainly become a problem! This exception in itself constitutes a challenge; how to make a career in seafaring more rewarding without causing an increase in shipping costs? It is for this reason and others that the introduction of SD procedures in shipping and MET is considered almost synonymous with increasing the cost of shipping itself [15], [17].

2.4. The Trend towards defining new Training Requirements

In line with the above two trends, is the emerging trend in MET to define new training requirements for seafarers. Slightly differing, this trend is primarily driven by the needs of the maritime industry. As new technologies are made available onboard vessels, new competences are needed. While 15% of respondents to the 2018 MarTID report described the STCW as “not aligned to industry needs”, a similar percentage viewed the instrument as adequate for seafarer training with the caveat of proper implementation [18]. The same report identified a number of training priorities for the following five years including technology-related training, safety and competence skills, and environmental and cultural training. Furthermore, it can be firmly asserted that “the role of the modern seafarer is changing” (MarTID, 2019). Accordingly, seafarer training methods should be and are changing. In this respect, the IAMU launched a 2-year Global Maritime Professional (GMP) initiative in 2017. The initiative aims to produce a “Body of Knowledge (BoK)” text for the required knowledge, skills and attitudes (KSAs) of a GMP. The initiative builds on an extensive survey of maritime stakeholders which aims to identify current and future requirements (KSAs) for the GMP. The GMP-BoK text, which was inaugurated in July 2019, uses Bloom’s Taxonomy (revised) to prescribe intended learning outcomes for the identified KSAs across the three domains of the taxonomy [20].

2.5. An SD-based MET – Challenges and Barriers

“The role of appropriate education and training in transferring knowledge, maintaining competence, driving necessary change, addressing emerging challenges, and mitigating the negative consequences of previous actions and decisions are imperative and undisputed” [12]. Simply stated, this is what an SD-based MET system is all about. Yet, the process towards SD is no simple task. It is a transformational process that requires a whole-institution approach geared towards change for a better more sustainable future. [21] identify five dimensions of the whole-institution approach as being; teaching and learning, research,

campus operations, outreach, and administration including assessment and reporting. They further define *transformational change* as “the change (i.e. difference in characteristics) in the state from a *business-as-usual university* to a *sustainable university* where sustainability has been fully integrated [21]. This transformational change from a STCW-based MET to a SD-based MET, therefore, has to incorporate the above-mentioned five dimensions. It is not a matter of only updating or reforming curricula to include sustainability concepts. It is a process of reforming the whole institution to where sustainability becomes a core value inherent into the system. A SD-based MET needs, therefore, to be, among others, a values-based system. [22] take the concept of values even further. They argue the need for a fourth core pillar to SD. Proposing “values” as the missing fourth pillar, Burford et al. (2013) maintain that SD cannot be achieved without integrating the concept into our ethics and values systems. Similarly, a SD-based MET system should be one that challenges the learner not only academically but morally as well.

The integration of sustainability principles in technical education necessarily requires students not only gaining knowledge but also skills and competences related to sustainability, such as the development of critical thinking, future envisioning, systemic thinking, as well as the questioning of one's own values [8].

Contrary to the business-as-usual model of the STCW which mostly engages the learner within the cognitive and psychomotor domains (of Bloom’s Taxonomy), a SD-based MET must engage the learner more frequently within the affective domain. This is certainly a concept well embraced by the GMP initiative described earlier. The challenge is, therefore, for MET to become a whole-institute process that engages the learner not only academically but morally as well. The learner must also learn not only to react (to the situation at hand) but also to become proactive; to critically look into the future, anticipate what may come and to plan accordingly. In a nutshell, sustainability needs to become much more than a mere set of habits; it must become a way of life.

Moreover, a number of other factors may compound the challenges faced during the process of transformation to a SD-based MET. To mention a few; the multi-cultural nature of the maritime field makes normalizing values and standardizing curricula a challenging task. For this reason, an outcome-based approach to MET, as employed by the GMP, initiative may suite best. Nonetheless, each university (or universities with similar cultural backgrounds) should develop its/their own model to redefine the curricula of their courses and to promote integrative approaches, keeping in mind that “there is no set formula to do this” (Filho et al., 20180).

METIs need to be continuously on the lookout and ahead of technological advancements, which are normally industry driven. Consequently, METIs have

to maintain strong ties with the maritime industry and stakeholders as a whole. This task alone can be very challenging in a field with so many stakeholders with diverse interests as illustrated in Figure 2-1. Many others are also involved but in a less direct manner. Much of the feedback about the successes and shortcomings of MET does come from both industry and stakeholders; yet, another reason to maintain these ties. Unfortunately, industry and stakeholders are mostly concerned with their own interests which may sometimes contradict the notion of sustainability. It becomes the burden of METIs and, fortunately, the IMO to find a balance.

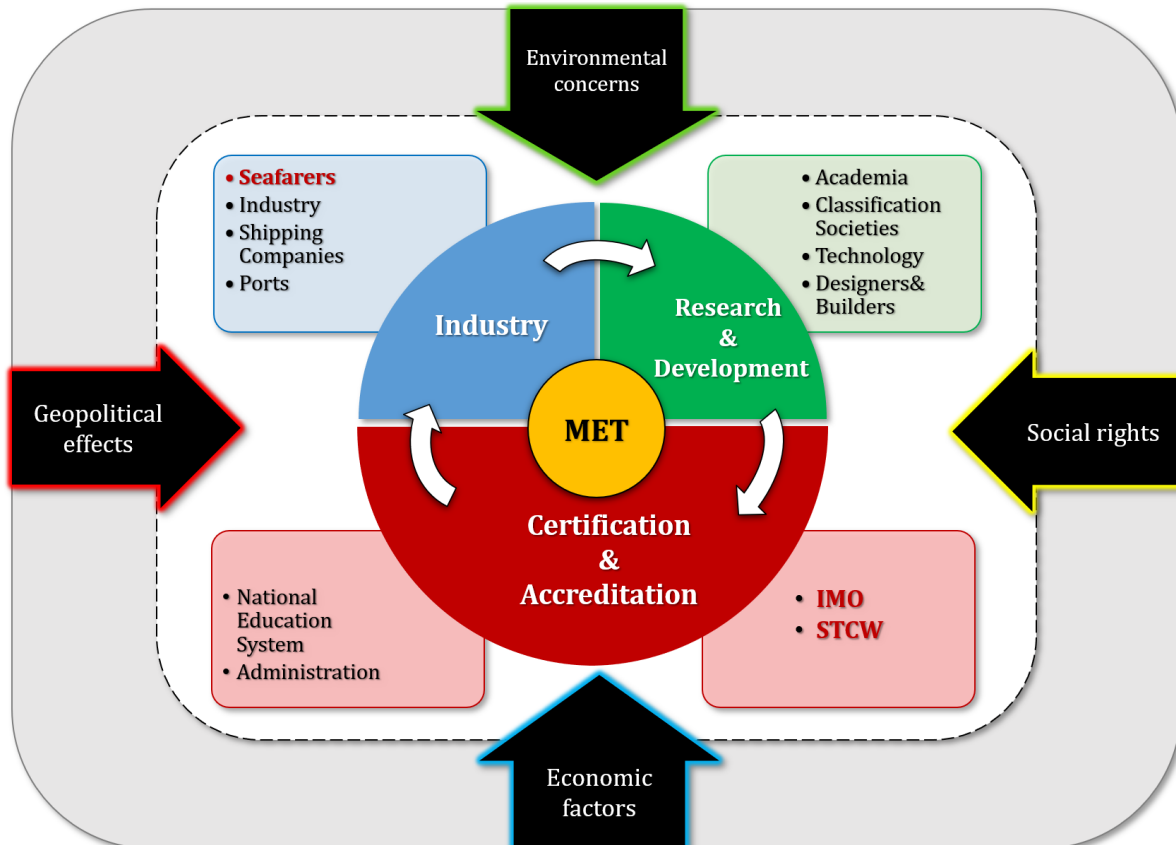


Figure 2-1: MET stakeholders and drivers

Furthermore, as discussed earlier, by nature of the STCW, there exist some differences between a STCW-based MET system and a SD-based MET system. Table 1 provides a summary of the most significant differences between both. Once more, these differences imply the need for a transformational approach in order to achieve a successful SD-based MET system. For one, the business-as-usual top-down approach to MET alone may not provide the required mechanism to fully integrate SD in MET. A complementary bottom-up approach may prove to be very useful especially if the learners are successfully motivated into becoming active change agents. Change agents as defined by [23] are “individuals, groups or networks within or outside the organization that engage in an active and conscious effort to change organizational structures.” Change agents in this sense may be students, teachers, administrators... etc., or

stakeholders from outside the institution. The more the involved change agents, the stronger the push towards a SD system. Nevertheless, the role of institution leaders should not be underestimated. “Leaders can strongly influence a process of change in mindsets, practices and curricula to incorporate sustainability into higher business education institutions. Whereas bottom-up leadership initiatives are crucial, leadership support from top management is seen as important to enable larger, more radical steps of transformation” [24], [25].

Table 1: Comparison between STCW-based and SD-based MET

STCW-based MET	SD-based MET
Content with minimum competence requirements	Challenges the individual to achieve higher standards
Concerned with onboard skills	Concerned with individual’s interaction with ship, society and environment
Focus on knowledge and skills (cognitive and psychomotor domains)	Knowledge, skills and values (cognitive, psychomotor and affective domains)
Reactive (learn to respond to situation)	Proactive (learn to anticipate and act)
Vocational in nature	More academic and critical
Focused on the trainee	Whole institute approach
Does not prepare individual for possible career shift	Possible career shifts in mind

Additionally, a number of challenges experienced by most HEIs may be expected. To quote some:

- The ambiguity and complexity of the actual sustainability concept which is seen as an abstract and complex topic [24].
- Financial challenges; universities may lack financial means and may be unable to secure the necessary funding [24], [26].
- Stakeholders inclusion in the process of transformation to SD; due to their vast number and different interests it may be difficult to motivate all stakeholders to become involved in the process [27], [28].
- Lack of trained personnel and educators in sustainability [24], [29].
- Rigidity of the institution and resistance to change; SD requires some degree of organizational flexibility based on communication, support systems and leadership [8], [30].

With the above-mentioned trends and challenges in mind, METIs, working individually and collectively, need to seek appropriate methods to become SD-based. The delicate balance requires embracing a transformational process where the institution as a whole is not only engaged but committed to the process. For this transformation to be fruitful, METIs must fully understand the present needs of industry and society as well. However, no less important is the institution’s ability to read the future and determine the way forward.

3. The UN Decade of Ocean Science for Sustainable Development (DOSSD)

On the 6th of December 2017, the 72nd UN General Assembly (UNGA) proclaimed the period from 2021 to 2030 to be the UN Decade of Ocean Science for Sustainable Development (DOSSD). The decade aims to...

support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean [31].

With the decade scheduled to start in January 2021, we are currently in the Preparatory Phase running from 2018 to 2020 as outlined by the United Nations General Assembly. Quite obviously, the UN, in a similar effort to the DESD, is currently directing global efforts to concentrate on the sustainability of the oceans.

Primarily concerned with shipping, METIs are very well situated to effectively contribute to this global effort. The International Convention for the Prevention of Pollution from Ships (MARPOL) is a core instrument of the IMO. The convention includes six annexes. The first five are dedicated to the preservation of the oceans and waters by preventing any and all means of pollution from sea-going vessels. The United Nations Convention on the Law of the Sea (UNCLOS) lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources [32]. Both instruments are included as competence requirements of the STCW. In other words, METIs are already taking part in the preservation and governance of the oceans. Yet, METIs are capable of contributing further to the success of the DOSSD. To start, METI staff and researchers can revisit the above two conventions seeking ways to better align them with the objectives of the DOSSD.

METIs, may also play a significant role in enhancing the science associated with the DOSSD. The World Maritime University (WMU), for example, in May 2018 inaugurated the WMU-Sasakawa Global Ocean Institute (GOI) in preparation for the DOSSD. The aim of the GOI is to act as a focal point for *ocean science-policy-law-industry-society* interface. The Arab Academy for Science, Technology & Maritime Transport (AASTMT) in responding to the DOSSD is currently in the early stages of developing an undergraduate program on ocean sustainability, with a similar post-graduate degree planned. METIs may cooperate among themselves or with regional institutions and organizations (governmental and non-governmental) to enhance ocean sustainability on a regional scale. METIs can also develop short online courses or diplomas fostering awareness of the objectives of the DOSSD. To further promote awareness, METIs may hold conferences, research groups and workshops focused on ocean governance and sustainability. They can also host communal events and activities to engage society and foster greater awareness.

In conclusion, how and what METIs can contribute to the DOSSD is only limited by their motivation and creativity. With this in mind, METIs need to purposefully partake and contribute to the DOSSD. After all, without sustainable oceans what would the purpose of maritime education and training be?

4. Conclusions and Recommendations

- MET has been undergoing a transition from a vocational approach to a vocational/academic approach which paves the way to sustainability.
- METIs are progressively becoming aware of the need to integrate SD in their curriculums, yet few have actually started the process.
- MET SD global initiatives are on the rise. Nonetheless, more cooperation is required in order to match the universal nature of shipping and the rising need for sustainable development.
- The STCW may well remain the basis for competence-based training required onboard. Yet, a more academic values-based approach to SD is needed. The IAMU GMP initiative is a good step in this direction. However, the GMP is an outcome-based approach that only prescribes the KSAs; it is the individual institution's role to develop the methods.
- As METIs move towards SD, a transformational mindset is necessary where a whole-institution approach involving management, staff, students, stakeholders, infrastructure... etc. is employed.
- To achieve a SD-based MET system, a combination of both top-down and bottom-up approaches is essential. While institution leaders play a very important role in setting the standards and motivating their staff, change agents acting from the bottom-up can be a strong catalyst stimulating the process of transformation to sustainability.
- METIs may employ a SD team comprised of motivated volunteers from staff and students to act as change agents. Devotion and creativity are a must.
- A comprehensive study may be required. This study should aim to define the means to progressively but timely transform METIs to a SD-based MET system.
- METIs are well situated to contribute to the DOSSD, but need to qualify staff, effectively mobilize resources, and be innovative.

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