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Awareness of Maritime Students about Marine Environmental Issues

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Abstract. Since the beginning of life on Earth, the seas have been one of the main sources providing people with food, transportation, cleaning and energy. Unfortunately they have taken this vital resource for granted and used it extravagantly until they started to notice the alarming signs of the harm they have done. It was when they realized that this harm might be irreparable, that they started to take some measures to protect the seas and to raise awareness for their importance. This paper presents the results of a survey which was given to university students from maritime-related departments to gauge the level of their awareness of marine pollution and general issues related to it. The results showed that the students are aware of the threat, and willing to do something to prevent it and reverse the damage that was already done. Almost half of the students have enough information about the pollution-related issues; however, most of them don't know much about the protection-related roles they can assume. Therefore, something further should be done not only to lead them to do their best for the protection of the seas but also to actively involve them in the activities aiming to raise public awareness for marine pollution and to prevent its effects threatening the future of the seas.

Keywords: marine pollution, university students, awareness, prevention, protection of the seas

1. Introduction

Pollution, which is described as the introduction of harmful materials into the environment [1], is one of the top topics of our time because it may cause irreparable harm not only to the environment but also to people. Because of this, some precautions must be taken to deal with different forms of pollution and to live a healthy life in a clean environment [1]. Harmful materials which cause pollution may be natural such as those created by flood or landslides; or man-made such as garbage and sewage disposed to land, toxic materials of fume from factories or pesticides used by farmers. No matter where they come from, they harm air, water and land, and make pollution the problem of every individual in the world since dangerous effects of pollutants can be carried even to the remotest places on the earth by natural means such as wind or streams.

Pollution can come in several specific types such as land pollution which refers to the contamination of land mostly by waste from industry or garbage from households, or air pollution which refers to the contamination of air caused by dangerous gases from industry or smoke from houses. Another important type of pollution, marine pollution, is caused mainly by reasons such as waste material containing chemicals, sewage, plastic discharged into oceans, oil spills from ships, land runoff, or ocean mining. In addition to these main types of pollution, some specific types such as noise, light or plastic pollution are defined.

Of these, marine pollution affects all life in and out of water since oceans and seas have a great role in producing oxygen, regulating climate, providing food, being home to many creatures, creating jobs and being an important means of transportation. They also play a major role in people's life and present many advantages for them to have a better life. Because of these advantages, water has always attracted a lot of people [2]. Popular places where people settled have mostly been around water

throughout history. They have made use of all the benefits provided by the water. They have obtained their food from water, transported their goods through it or used it for cleaning purposes. Unfortunately, they did not appreciate the value of water and used it carelessly or dumped waste or hazardous materials into it, causing marine pollution. Much of the pollution is concentrated in the shallow coastal areas, which are often next to urban centers and other concentrations of humans who are responsible for the pollution [3]. As societies developed, they demanded more for industrialization and globalization so the harm they caused to the seas grew [4].

Marine pollution intensified with the advent of the Industrial Revolution, when factories began releasing pollutants directly into rivers and streams. By the middle of the 20th century, people started to feel the negative impacts of pollution [5]. When people realized these impacts and saw that they were changing the balance of nature they started to take some precautions with an eye both to stop or reverse the pollution and to raise awareness among people for the harmful effects of pollution. These efforts to prevent marine pollution can be grouped under three headings: International Conventions and Agreements, Voluntary Agreements with Sustainable Development Goal (SDG) 14 and Educational Programs.

International Conventions and Agreements: Pollution caused by ships appeared in the oceans in the 1920s and because of the increasing accidents and concerns, a convention which aims to prevent pollution by oil in oceans, OILPOL 1954 (International Convention for the Prevention of Sea by Oil) was signed [6] [7]. Later, the movements against marine pollution started as early as the 1960s when an ecological development tried to draw the attention of people to the poisonous waste disposed on land. Then came some occasions like Earth Day, the Clean Air Act (1970) and the Clean Water Act (1972) [8].

These were followed by the London Convention in 1975, which was the first international agreement to spell out better protection for the marine environment. The agreement implemented regulatory programs and prohibited the disposal of hazardous materials at sea. An updated agreement, the London Protocol, went into effect in 2006, more specifically banning all wastes and materials except for a short list of items, like leftover materials from dredging [9]. This was followed by the establishment of Global Program of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities in 1995 [10].

In 2015, G7 (the Group of Seven) Action Plan to Combat Marine Litter was adopted by the G7 (Canada, France, Germany, Italy, Japan, U.K. and U.S.) [11]. Two years later, in 2017, the G20 (the Group of Twenty) adopted the Action Plan on Marine Litter, which promoted waste prevention, resource efficiency, sustainable waste management, effective waste water treatment and storm water management, as well as awareness raising and capacity building. The G20 action plan is linked to the United Nations Environment Program (UNEP) Global Partnership on Marine Litter. In the same year, the United Nations (UN) Secretary-General's Special Envoy for the Ocean was appointed.

In addition to these, there are some international instruments with objectives to address marine pollution. They are listed below: [10] [12]

International Convention for the Prevention of Pollution from Ships (MARPOL), which addresses pollution and dumping from ships due to operational losses or accidents.

UN Convention on the Law of the Sea (UNCLOS), which focuses on the prevention of pollution from ships and land-based sources, as well as dumping and pollution transfer from one nation to another.

London Dumping Convention, which addresses deliberate at-sea disposal of land-based waste with each member regulating discharges of waste on its own ships.

Barcelona Convention, which addresses land and ocean-based waste from dumping, runoff, and discharges (including plastics) in the Mediterranean Sea region.

Cartagena Convention, which addresses pollution from ships, dumping at sea and land-based sources of pollution in the Wider Caribbean region.

European Marine Strategy Framework Directive, which addresses all litter in European Union seas based on where it is found (e.g., washed ashore, in water column, ingested by marine animals) and type (e.g. micro plastics).

Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR), which addresses European ship discharges, lost and discarded fisheries materials from vessels, land-based wastes from coastal or riverine disposal and recreational littering.

Helsinki Convention, which addresses marine pollution from all sources (e.g., point-source or diffuse inputs from land-based sources).

Some of these conventions have been effective; however, all in all they failed to address all kinds of pollutants from various sources to a meaningful extent. In addition to these conventions, many global and regional programs and instruments have been developed and initiated over the past 50 years; however, they have been demonstrably unsuccessful in achieving their goals of a clean and safe ocean environment [10].

Sustainable Development Goal (SDG) 14 and Voluntary Agreements: The United Nations SDG 14 is one of the 17 goals the United Nations adopted for peace and prosperity for people and the planet, now and into the future. It aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development. Goal 14, which is referred as Life below Water, sets a target to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution, by 2025 [13] [14].

There are also some voluntary agreements related to this field such as the Honolulu Strategy, a framework for a comprehensive and global collaborative effort to reduce the ecological, human health, and economic impacts of marine debris worldwide [10].

The United Nations Environment Assembly (UNEA), which is the world's highest-level decision-making body on the environment, adopted a resolution on marine plastic litter and micro plastics, and in December 2017 UNEA established an Open Ended Ad Hoc Working Group on marine litter and micro plastics to assess potential strategies to address the problem, including consideration of a legally binding instrument [15].

Additionally, there are a range of international non-governmental organizations (NGOs) and networks working in the area of toxic reductions, waste management, and chemical and plastic pollution such as Break Free from Plastic, Basel Action Network, Center for International Environmental Law, Friends of the Earth or Greenpeace International, and International Pollutants Elimination Network (IPEN) [10].

Educational Programs: One of the most effective ways to raise awareness among people is to educate and train them, preferably starting from a young age. Studies have proved that educational intervention activities on marine pollution can result in behavior change [16] [17]. Taking part in activities focusing on marine pollution can also result in increased awareness on this topic especially among young students. Such activities can transform them into role models who affect the behavior of the people around them [16] [18].

In one of the studies about environmental awareness, the knowledge, attitudes and behaviours of the university students who took part in a marine debris data collection study were compared before and after the study. It was found that 'knowledge' was not significantly different between the two groups, while 'attitudes' and 'behaviour' were different, which proved the efficacy of marine debris education [18]. In another study, it was found that young people's awareness and knowledge of beach litter and its impacts on the environment improved significantly after they took part in an activity to clean a beach [19]. These examples prove the importance of education in raising awareness about marine pollution among the young people [20].

Today, the number of programs and courses on marine pollution is increasing as the pollution itself increases day by day. Almost all maritime universities offer programs, club activities or some courses to their students for the prevention of pollution and to increase awareness on the topic. Web sites of these universities show that there are 63 different courses in undergraduate and graduate levels about marine pollution and related issues in tertiary education institutions.

Apart from the schools, there are also some institutions or education and training centers that try to raise awareness on the subject by offering certificate programs such as Certificate in Marine Pollution Prevention and Management program given by Lloyd's Maritime Academy, Marine Environment Protection Training - MARPOL / OPA 90, MARPOL Training Courses, Petroknowledge General Awareness Workshop.

The activities that aim at raising awareness for marine pollution and the efforts to raise an environmentally conscious generation seem to increase in number with time as people are affected more and more by this pollution. It is important to raise an environmentally conscious generation who will expend some effort to prevent the pollution in the seas and to reverse its harmful effects. There are a number of conventions, agreements, protocols, clubs, courses, formal and informal activities all striving to realize this goal. The first step in this procedure is to assess the awareness level of the students so that all these activities can be geared to provide them with maximum benefit.

This study aims to gauge the awareness levels of students regarding marine pollution in a maritime undergraduate program. The result of this research can help the efforts of awareness- raising to be steered in the right direction, make up for the missing parts, and fortify the weak points.

2. Method

The data in this study was collected through a survey which consisted of 3 parts. There were two demographic questions in the first part. The second part had 10 Yes/No questions and the third one had 4 multiple choice questions. The prototype survey was given to a small group of students to make sure that the questions were understood correctly. Using their feedback, some questions were modified and the survey was given its final form.

The survey was electronically distributed to the associate degree students in a maritime university. It is important to know the awareness levels and viewpoints of maritime students on marine pollution since they are the ones who will work in the maritime sector and will have close connections with the oceans in the future. Therefore, it is important to assess their level of awareness regarding marine pollution and take necessary steps to increase it.

The "Marine Pollution Awareness Survey" was replied to by 102 students. 57% of the students who took part in the survey were women while 43% of them were men, as shown in Figure 1(a). As Figure 1 (b) shows, the majority of the respondents are between the ages of 18 and 25. Only 5 % of them are between ages 26 and 40.

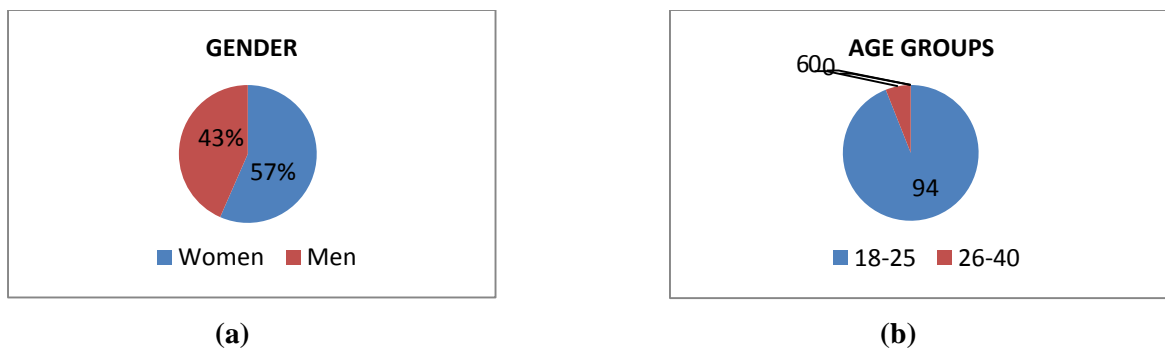


Figure 1. Demographic information of the participants

3. Findings

The table and graph below show the questions used in this part and the percentage of the responses given by the students.

Table 1. YES/NO Questions in the Survey and the Percentage of Responses

QUE. NO	QUESTIONS	YES %	NO %
1	Have you ever taken part in an activity for the prevention of environmental pollution?	44	56
2	Have you ever taken part in an activity for the prevention of marine pollution?	15	85
3	Would you like to take part in such activities?	85	15
4	Would you like to organize such activities if there are not any around you?	58	42
5	Can you say your interest in environmental issues has increased during the pandemic period?	81	19
6	Has the pandemic period been effective to increase the environmental awareness among people, in your opinion?	73	27
7	Do you think that marine pollution has increased alarmingly and it is high time people took some precautions?	98	2
8	Do you think an activity to raise awareness for marine pollution is necessary?	99	1
9	Would you like to take a course to prevent or decrease marine pollution?	73	27
10	Have you heard of “Sustainable Development Goal (SDG) 14” before?	12	88

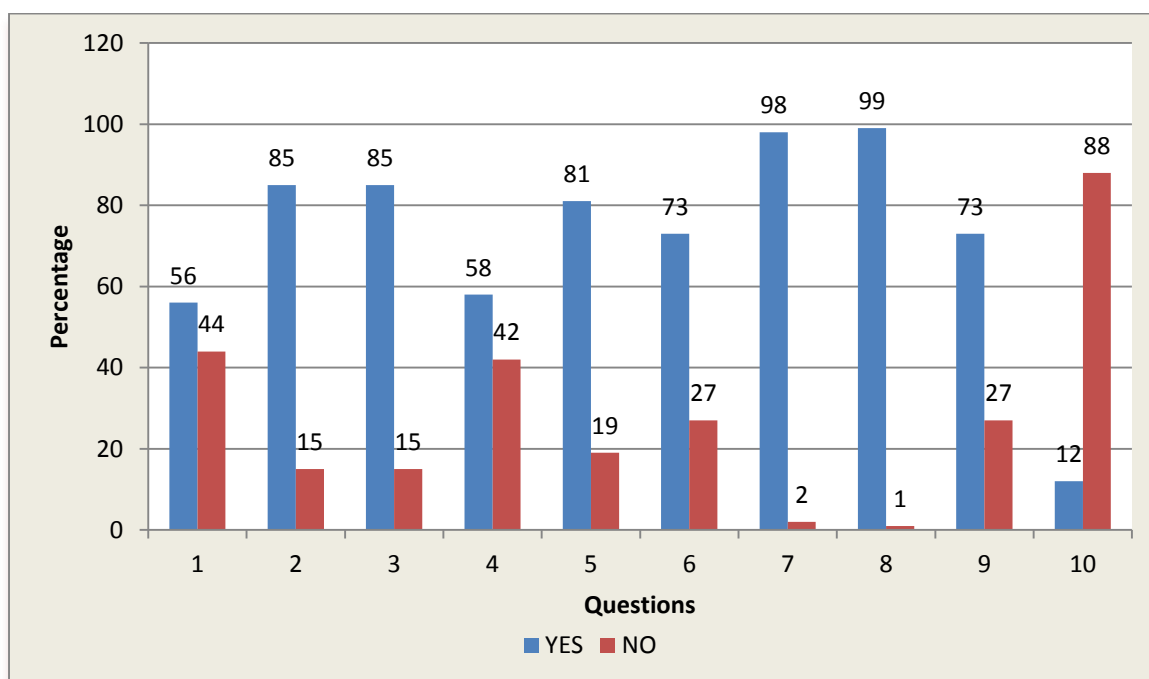


Figure 2. Responses to YES/NO questions

As Figure 2 shows, the percentage of positive answers to the first question suggests more than half of the students, which is 56 percent, haven't taken part in any kind of environmental activity. That is surprising because activities for the prevention of environment pollution such as holding conferences, demonstrations, or campaigns like garbage collecting are quite common.

Participation of the students in activities for the prevention of marine pollution is even lower. Only 15 percent of them responded to this question positively, which means 85 percent of the maritime students haven't taken part in any marine pollution prevention activity so far.

When they were asked if they wanted to take part in such activities, a great majority of them said "Yes", which leads us to think that although they want to join these activities they cannot because of some reasons. It may be because they are unaware of what kind of activities there are, or they cannot take part in them because of such reasons as lack of free time or being far from the places they are held. No matter what the reason is, the fact that they are willing to contribute to the protection of environment and marine ecosystems signals that they are aware of the fact that they should do something about this important issue.

As the answers to the fourth question suggest, it is even better to see that they are willing to do something to help the protection of environment and to draw the attention of other people to the problem. Another important point the study revealed is that the pandemic period, which all the people have suffered from in some way or another, has helped the students appreciate the importance of a clean environment and made them think over environmental issues more than they did before the pandemic period. They think the tendency to think about these issues more than before during the pandemics is something that applies to all people.

A great majority of the students, that is 98 percent, think marine pollution has increased alarmingly and it is high time people took some precautions against it. It is promising to see that they are aware of the danger; however, there seems to be a contrast because although they know that something should be done as soon as possible they don't do much as the first two questions in this study revealed. That means they expect others to intervene in this problem despite its significance. This result proves the findings of a research conducted by CONE which reveals that 90% of Gen Z'ers believe companies, not individuals, must act to help social and environmental issues [21]. Their answer to the next question confirms this finding. They say that something should be done to raise awareness for marine pollution; however, only 58 percent of them want to take part in such an activity as suggested by the responses to the fourth question above.

73 percent of the respondents want to get some education to prevent or decrease marine pollution. It is quite promising that they want to learn about the danger posed by the marine pollution. Considering the fact that they want to fight against it as shown by question 3, they believe that to know about the enemy will help them defeat it and education is one of the keys to cope with this problem.

The answer of the students to the last question reveals that the information they have about marine pollution is very limited and they need to learn more. The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030 [22]. SDG 14 refers to conserving and sustainably using the oceans, sea and marine resources for sustainable development [23]. The fact that only 12% of the respondents know about it proves that they need to learn more about issues related to marine pollution.

In addition to Yes/No questions in the second part, the survey included four multiple choice questions in the third part which were asked to learn about the general knowledge of the students on specific marine pollution issues.

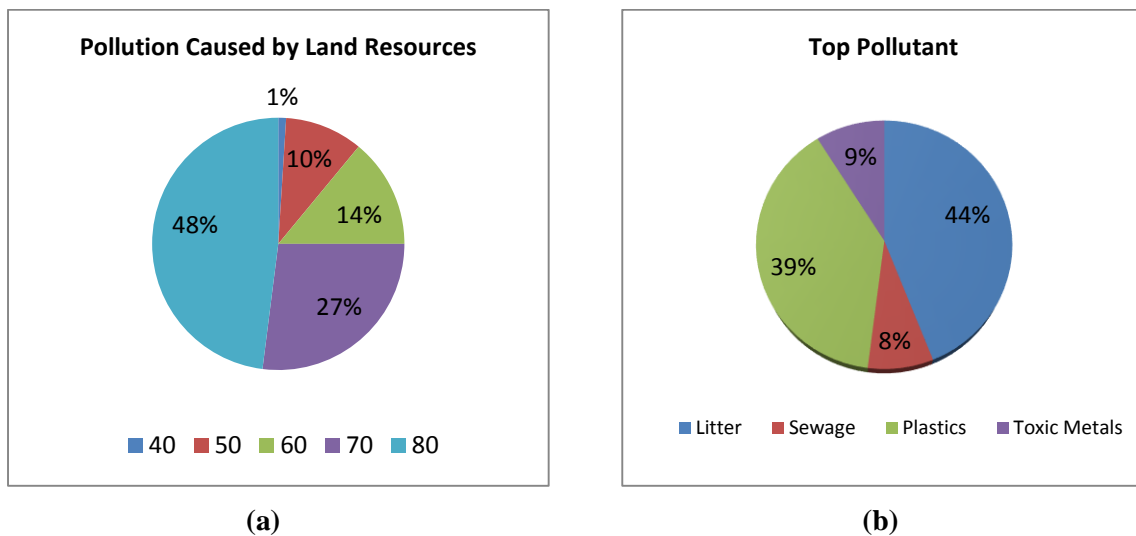


Figure 3. Distribution of Responses to the Questions 11 and 12

Responses to general questions show that the students have some overall information about marine pollution issues. The first question in this group was "What percentage of marine pollution comes from the land?" The correct answer is 80% [24] [25]. 48 percent of the students answered this question correctly while 27 percent said 70% of marine pollution comes from land, which is close to the correct amount, as shown in Figure 3 (a). The next question, which was "Which of the following constitutes the majority of the waste?" was asked to learn if the students had any information about the main marine pollutants. The choices were plastics, oil spills, sewage, ocean mining and toxic materials. The correct answer was plastics [26]. As Figure 3 (b) shows, 39% of the students answered this question correctly but the majority of the students, which is 44%, said it was domestic litter.

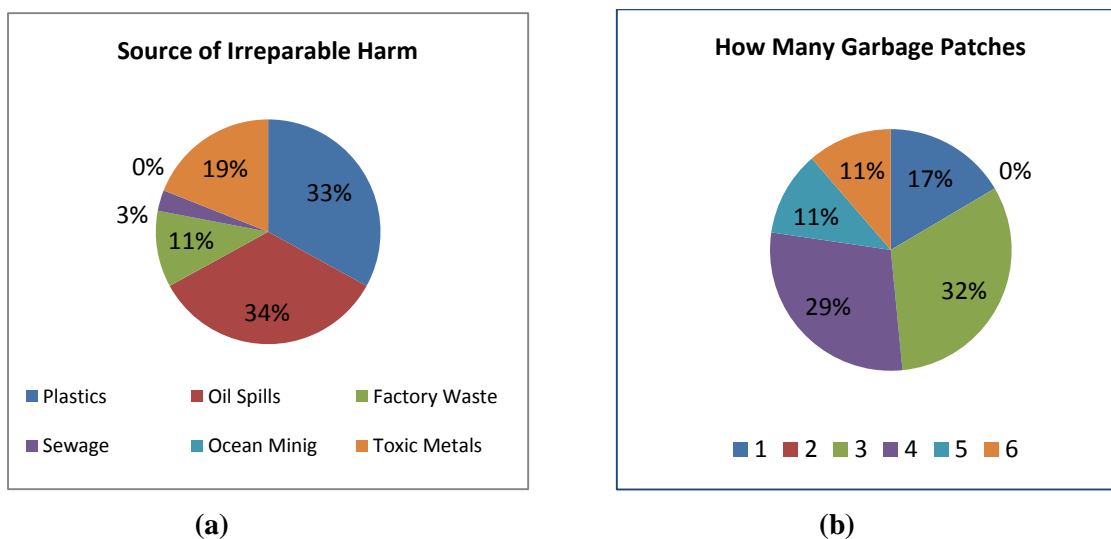


Figure 4. Distribution of Responses to the Questions 13 and 14

When the students were asked about the pollutant that gives irreparable harm to marine life, they were indecisive between oil spills and plastics. As seen in Figure 4 (a), the distribution of the votes were very close to each other, which proves that they didn't have a clear idea for the answer which was plastics [27].

The next question was about the floating garbage patches in the ocean. These patches are large areas of the ocean where litter, fishing gear, and other debris - known as marine debris - collects [28]. The students were asked how many islands like this there are. While correct answer was "5" [29], the percentage of the respondents who answered correctly was 11. As Figure 4 (b) shows, the majority which is 32 percent said "3", and 29 percent of the respondents said "4". All in all, it can be deduced that nearly half of the students know something about marine pollution; however, the other half does not have adequate information on such an important issue for maritime.

4. Conclusions

Environmental pollution, and marine pollution as a subunit of it, are important issues to solve for a clean and healthy world. Unfortunately, the world and its oceans are getting polluted at an alarming speed and all people must do their best to stop this. This study, which aimed at determining the awareness level of maritime students about marine pollution, found that students are concerned about marine pollution and believe something should be done to prevent it. However, more than half of them haven't taken part in any kind of activity against environmental pollution yet. The percentage of those who have participated in an activity against marine pollution is even lower. Most of them indicated they wanted to join such activities and more than half of them said they were willing to organize them given the opportunity. That is, they know the problem, they are concerned about it, yet they either don't know how to participate in any activities aimed to cope with the problem or are too reluctant to do it.

The study also found that the knowledge of the majority of the students on issues concerning marine pollution is not good enough. Most of them roughly know something but what they know is not detailed and accurate. They do not have precise information even on some basic issues such as SDG 14, one of the most important steps for the fight against marine pollution. However, it is promising that they are eager to learn about preventing or decreasing pollution.

It is clear that the students are aware of marine pollution and its harmful effects but there is a contradiction because they believe something should be done, yet they don't do much. They should be more responsive and active about issues regarding marine pollution and take firm steps to prevent it. On the other hand, it seems they need guidance to realize what they can do and where to start. They should be given education and training to direct their potential and energy to these delicate issues which are of vital importance for the future of the seas. They have a lot to do about the fight against pollution both as young people and as prospective members of the maritime sector.

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