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THE ENVIRONMENTAL IMPACTS OF SHIPPING IN MALTA

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THE ENVIRONMENTAL IMPACTS OF SHIPPING IN MALTA

Melissa Abdilla*

1. INTRODUCTION

1.1 Background

The Mediterranean Sea is known as one of the crucial sea lanes for the transportation of goods and people, in and out of the region (UNEP, 2008). A growth in this industry means that there is a greater probability for further pressures on the marine environment due to: collisions, intentional and unintentional discharges of oil, air pollution and incidents with tankers, like Exxon Valdez, Erika, and Prestige in 1989, 1999, and 2001 respectively (UN, 2010). Moreover, discharge of various substances from daily activities are the foremost negative challenge for the aquatic environment. These include: operational oil spills, chemical cargo residues, anti-fouling paint, sewage, municipal waste, cleaning agents, air emissions, and non-indigenous species from the release of ballast water (UN, 2010).

There are specific legislations that address these issues on an international level, namely: the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/78), the International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 (OPRC Convention), and the United Nations Convention on the Law of the Sea (UNCLOS).

While from a regional perspective, i.e. the European Union (EU), it is covered by the Directive 2000/59/EC on Port Reception Facilities (PRF) for Ship-generated Wastes and Cargo Residues, and Directive 2005/35/EC on ship-source pollution and on the introduction of penalties, including criminal penalties, for pollution offences, as amended by Directive 2009/123/EC (Øhlenschläger, *et al.*, 2013).¹

Moreover, the Parliamentary Secretariat for Competitiveness and Economic Growth (2015) recently published the Integrated Maritime Policy for the Maltese Islands based on the EU Directive 2014/89. Member states are expected to improve their maritime governance, namely to increase cooperation between the competent authorities and relevant stakeholders in order to safeguard the sea and its habitat based on the Marine Strategy Framework Directive. The policy also expresses the need to develop more collaboration with local and foreign research institutions in order to reach the targets, and to take the necessary actions to protect the marine environment.

1.2 Objectives of the study

This study, based on a more extensive study by the same author (Abdilla, 2015) aims to examine the impacts of shipping on the marine environment around the Maltese Islands. This is because

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¹ A list of relevant conventions and regional and national legislation on the subject of this study is given in Abdilla (2015), where an extensive literature review on the subject is also presented.

small island states are substantially economically dependent on this industry, particularly for import and export of goods and services. Therefore, they are more susceptible to several environmental impacts caused by vessels, also due to the huge economic importance that tourism has on the country. In summary, the objectives of this study are:

1. To identify the most negative environmental effects associated with shipping.
2. To assess the perspective and level of awareness of Maltese public stakeholders on the marine environment.
3. To formulate recommendations for the future decision support system (DSS) for such a sector.

1.3 Layout of the study

This paper is organised in four sections. Following this introduction, Section 2 explains the methodology adopted in response to the research questions, including details on the research strategy used, and the framework for data analysis. Section 3 presents and discusses the results. Section 4 puts forward recommendations derived from this study that may be useful to decision makers.

2. METHODOLOGY

2.1 Research Design

To attain the objectives of this study, two research methods were adopted: the desk study approach, in which available statistics were reviewed and interpreted, and a survey, consisting of a semi-structured questionnaire which was distributed to a number of stakeholders (list of stakeholder respondents is presented in Table 1 and the questionnaire is appended as Annex 1). Hence, the methodology of this study evaluates a combination of secondary and primary sources.

2.2 Data Collection

Desk study approach

A desktop research of secondary data was carried out to identify the number, and types of vessels entering the ports in Malta between 2006 and 2014. This method provided background information on several issues, mainly: on the amount of ships that each country is receiving, and the main types of vessels recorded. These statistics are important for the Government and the competent authorities to be able to implement the best action plan based on the various risks that the islands have to cater for in case of an emergency.

Survey

A survey was the preferred method of primary data collection in which structured interviews were conducted with various Maltese public stakeholders. Through the selected approach, it was relatively easy to run a comparative analysis of the results; for these purposes Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) were used. The interviews were conducted between March and April 2015.

The semi-structured questionnaire was formulated to ask specific questions about important issues that would however elicit responses from the interviewees. Further amendments to the questions were made, for ease of comprehension, following an initial pilot study which was carried out with 5 out of the 21 stakeholders listed in Table 1. Participants from different sectors related to shipping were identified and invited to participate in this study in order to cover various perspectives on this subject. These were: the main competent authorities in charge of the shipping sector in the Maltese Islands and those involved in the protection of the marine environment, the private stakeholders in the shipping and recreational industry, the non-governmental environmental organisations (NGOs), and some of the local councils which are next to the coast as representatives of the general public.

The stakeholders were first approached via email, then a structured interview was formulated in order to better collect their responses. The identity of each stakeholder was kept confidential within this study mainly because the answers to most of the questions asked were likely to be subjective, although some were determined by the respective organisations' perspectives on the subject. Furthermore, it was very unlikely that the respondent would be influenced either intentionally, or unintentionally by the opinions of the researcher. From a total of 25 approached stakeholders, only four did not respond.

Table 1: List of Maltese Stakeholders involved to varying degrees in the local shipping industry

Type	Name
Law Enforcement and Environment Protection	Transport Malta (TM)
	Armed Forces of Malta (AFM)
	Regional Marine Pollution Emergency Response Centre (REMPEC)
Environmental Agencies	Fisheries Conservation and Control Division
	Malta Environment and Planning Authority (MEPA)
	Malta Aquaculture Research Centre
Commercial Sector	2 Industrial Companies
	2 Recreational Marinas
Non-Governmental Organisations	Friends of the Earth Malta
	Nature Trust Malta
	Fish for Tomorrow
	Shark Lab-Malta
Cooperatives	Għaqda Koperattiva tas-Sajd
	Koperattiva Nazzjonali tas-Sajd
Local Communities	Marsa Local Council
	Sliema Local Council
	Mellieħa Local Council
	St Paul's Bay Local Council
	Birżebbuġa Local Council

The questionnaire was divided into two sections. The first section aimed to assess the stakeholders' perspective on the environmental and economic impacts of shipping, while the second part assessed the degree of the stakeholders' awareness of the marine environment around the Maltese Islands. In all, there were ten questions, consisting of a mixture of close-

ended, dichotomous answers, Likert scale, multiple choice, and open-ended questions. Therefore, to the fixed questions most of the output was quantitative, but the respondent was able to express opinions freely, especially for the last question. This mixed method was chosen in order to increase reliability (Haralambos and Holborn, 2004).

All the stakeholders were classified according to their respective sector, as shown in Table 1.

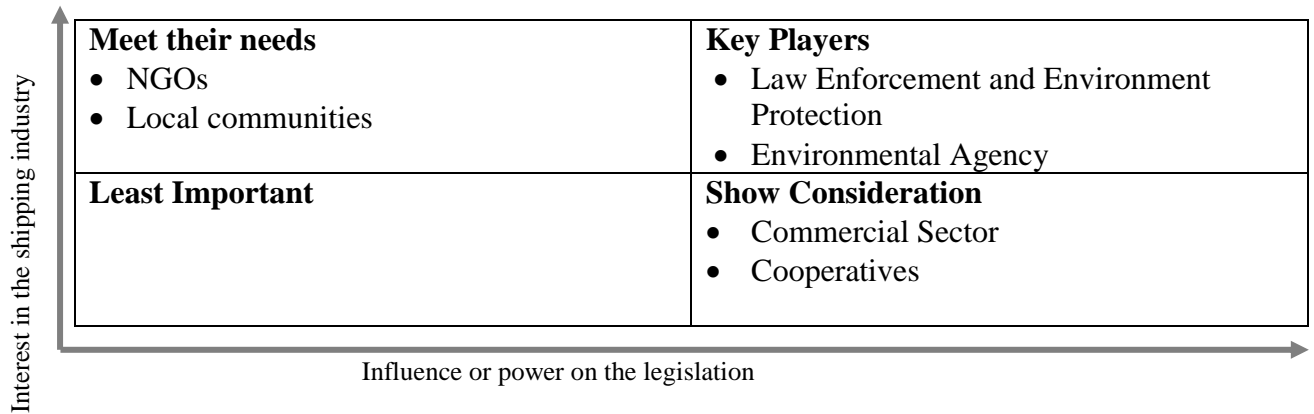
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Then, each sector was classified in terms of its influence or power on the legislation for the protection of the marine environment (Y axis), against its interest in the shipping industry (X axis), as shown in Figure 1.

For example, NGOs normally have a high influence on decision making but low personal interest in the industry itself, whereas the commercial sectors have a low influence on legislation but are highly interested in this sector since their businesses are based on shipping. Hence, the 'Key Players' were considered to be the stakeholders that are part of the 'Law Enforcement and Environment Protection' and those considered as an 'Environmental Agency'. Those which 'Show Consideration' on the subject are the business community shown as 'Commercial Sector' and the 'Cooperatives'. While the 'NGOs' and the 'Local Community' were considered to be those that 'Meet their Needs' (Morphy, 2015).

Figure 1: The stakeholder analysis



2.3 Limitations of the study

The author of this research feels that the study may have been somewhat restricted due to the time constraints of the course. In fact, initially the author wanted to follow the concept of one of the work packages in the Biodivalue Project and the recommendations mentioned in the PhD of Carpenter (2005). The intention was to carry out further research on the ship-generated waste delivered to port reception facilities, but eventually, during the initial stages of this research, it became evident that this would be too time consuming.

Another drawback was the subject itself, since there was only a limited number of stakeholders who the researcher could interview. Therefore, it was necessary to have a response from most of the stakeholders that were chosen for this research.

Overall, some of the respondents provided very general comments in some of the questions, or failed to give adequate feedback on specific information. Nevertheless, in spite of these limitations, the data gathered was of great significance and gave an added insight to the study.

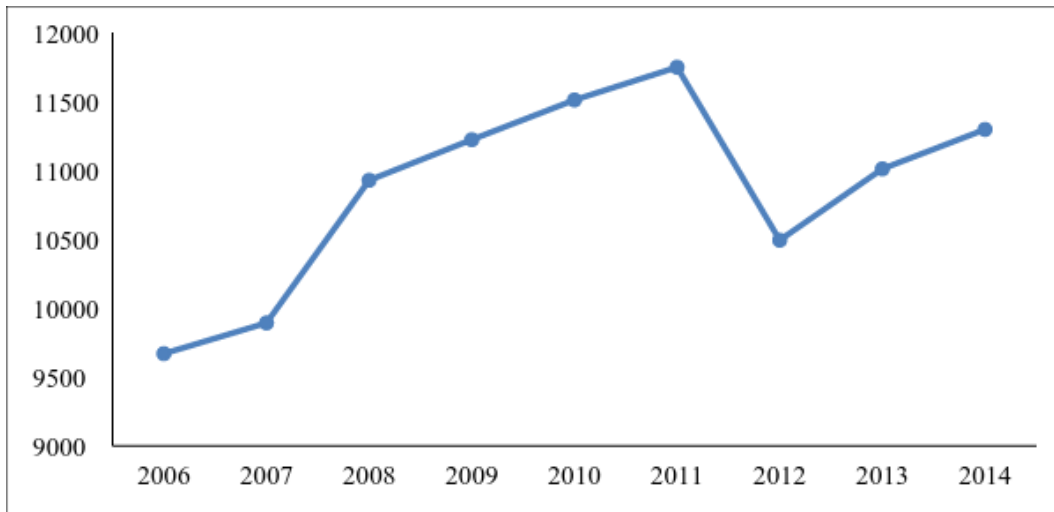
3. RESULTS AND DISCUSSION

This section presents a statistical analysis of the results achieved from secondary data, and from the questionnaire. A comparative analysis was carried out for the responses given by different stakeholders, pertaining to the sectors described in the methodology.

3.1 Data on Vessels entering Malta

Figure 2 gives an overview of the total number of vessels per year in Malta. After joining the EU in 2004, there was a remarkable growth in the number of vessels visiting Malta each year. The only drop was between 2011 and 2012, which may be the result of the global recession during that period, in which there was less trade between countries. However, these last two years an increase has been registered once again.

Figure 2: Total number of vessels recorded per year in Malta



Various types of vessels entered Maltese ports from 2006 to 2014, and these can be grouped into six categories, as shown in Table 2.

The percentage of all types of ships did not fluctuate much throughout the nine years under review. The most common ship type, scoring approximately 24% of the total volume, was recorded under dry cargo, such as livestock carriers and container vessels.

The second and third most frequent vessel type was represented by motor fishing vessels and tankers. The fishing vessels decreased by more than half between 2010 and 2014, from 10% to 3%, whereas the number of tankers remained relatively stable ranging from 4% to 6%. The registration of passenger vessels, mainly cruise liners and catamarans, varied between 2% to 4%.

Pleasure crafts are the least recorded in Malta which fluctuate between none to 1%. However, this may refer to foreign motor yachts, excluding local yachts berthing in private marinas or the free zones around the Maltese Islands. More than half of the vessels were listed as others, such as: dredgers and research vessels. Moreover, between 2009 and 2014 the percentage of this category of ships increased roughly by ten percent, from 55% to 65%.

Table 2: Description of the type of vessels entering Maltese ports

CARGO	Barge
	Barge Carrier
	Bulk Carrier
	Bunkering Barge
	Car Carrier
	Cement Carrier
	Container Vessel
	Heavy Lift Vessel
	Livestock Carrier
	Ore Carrier
	Ore/Bulk/Oil Carrier
	Reefer
	Ro-Ro Vessel
	Supply Vessel
Vehicle Carrier	
TANKERS	LNG Carrier
	LPG Carrier
	Tanker
	Tanker Double Hull
	Tanker Single Hull
PASSENGERS	Cruise Liner
	Ferry
	Passenger Catamaran Ferry
FISHING VESSELS	Fish Carrier
	Fishing Trawler
	Fishing Vessel
PLEASURE CRAFTS	Motor Yacht
OTHERS	Cable Ship
	Diving Maintenance Support
	Diving Vessel
	Dredger
	Drill Ship
	Floating Crane
	Floating Dock
	Oil Rig
	Pilot Boat
	Pontoon
	Research Vessel
	Survey Vessel
Work Boat	

The survey

The 21 stakeholders which replied to the questionnaire were grouped into six sectors according to their role in this particular research. Three of them were grouped under 'Law Enforcement and Environment Protection', and another three entities were listed as 'Environmental Agencies'. The two industrial companies and the two recreational marinas were grouped as 'Commercial Sector', and four respondents were NGOs. The two registered Cooperatives for Fishermen were named as 'Cooperatives' and the five local councils were listed as 'Local Communities'. Nearly all survey question was analysed by comparing the averages feedback obtained for each of these sectors.

3.2 Responses to the questionnaires

Section A: Investigating Attitudes on Environmental and Economic Impacts of Shipping

Question 1: Rank from 1 to 10 the below activities in terms of environmental and economic impact on the marine environment. i) Environment: One (1) being the most and ten (10) being the least problematic activity on the marine environment. ii) Economic: one (1) being the most and ten (10) being the least activity which generates economy for the country.

The first part of this question focused on which human activity the stakeholders think that are the most negative impacts on the marine ecosystem from an environmental point of view. In the second part of the same question, stakeholders were asked to rank the same activities in respect to how much they help in generating the economy of a country.

What emerges from the responses is that the most threatening activities to the marine environment are: oil pollution and fuel contamination from cargo (either operational or accidental), and bunkering (in the five offshore areas designated for bunkering, or the waiting area outside the Port of Marsaxlokk) (MEPA, n.d.). Dredging and port construction, and aquaculture were also listed at major threats. While, antifouling chemicals, and sewage treatment plants were assigned almost the same ranking by all the sectors.

Those activities which are thought to have much less of a negative effect are: fishing (not involving trawling), and hotel construction.

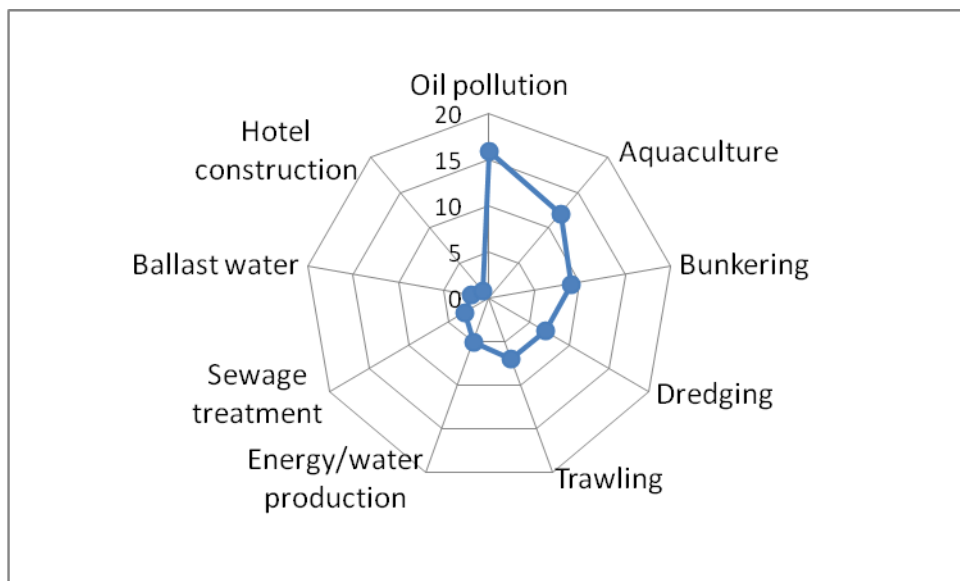
However, some differences between the responses given by the different sectors were noted, possibly because of their interest on such an issue. For instance, the answers given by 'Law Enforcement and Environment Protection' and 'Environmental Agencies' were almost the same. Another example is that the commercial sector and the cooperatives ranked fishing (by trawling) as one of the least damaging activities, unlike the NGOs. The reason given from the Cooperatives was that in Malta there are only 16 registered trawlers, of which only 9 or 10 are actually in use, hence they considered the negative impact from this activity to be of minor significance. As regards to aquaculture, the commercial sector, the cooperatives, and the local councils think that the fish farms, mainly of bluefin tuna are a problem. The cooperatives remarked on the negative effect they have on the immediate site. Whereas, the local councils stated that the soft food which is given to the tuna is leaving an oily texture when diluted in the sea, and is eventually reaching the coast.

Most respondents believe that tourism is the commercial activity which is rendering the most benefits to the economy. The stakeholders then listed: the bunkering (while the vessels are waiting to be refuelled), transportation of goods, and the port fees (when they enter the Freeport or other ports) as beneficial economic activities. The activities which are thought to generate less are; the sewage treatment plants, fishing (not involving trawling), and energy and water production. In this respect, unlike the environmental impacts, all sectors agreed more on the ranking of the different activities and their impact on the economy, this may be because they are not biased, or perhaps because the economic outcomes of these activities are more tangible than the environmental impacts on the marine environment.

Question 2: Based on your opinion, list the three (3) most significant environmental impacts (from the above activities) that are present in the Maltese waters. One (1) being the most problematic and three (3) being the least problematic activity.

All the answers given for this question are summarised in Figure 3 which clearly shows that 16 of the stakeholders considered oil pollution as the most challenging environmental issue in our territorial waters. Aquaculture was mentioned by 12 entities, while 9 respondents said that bunkering has a negative impact on the marine environment. Dredging and trawling were mentioned by 7 stakeholders, and 5 selected energy and water production. Three respondents referred to the sewage treatment plants, 2 mentioned ballast water, and antifouling chemicals, and only 1 listed hotel construction as having an adverse impact on our territorial waters.

Figure 3: The most problematic environmental impacts in the Maltese waters



Question 3: From the following vessels (list provided) which do you think will pollute the marine environment the most in case of an incident? Please justify your answer.

All stakeholders believe that a tanker would pollute the marine environment the most in the event of an incident. Some of the replies are reproduced below, indicating that the stakeholders in general have a high degree of knowledge on what can happen:

- The greatest maritime ecological disasters originate from the sinking of the Exxon Valdez and the Maltese registered vessel 'Erica', both carrying crude oil. The most recent incident in the Gulf of Mexico involving one of BP's oil rigs also caused an ecological disaster which highlights the potential risks of deep sea drilling.
- Oil tankers pollute the most due to possible spills and tank cleaning which produce slops that have to be treated in tank cleaning farms
- In the case of oil leakages, the amount of runaway pollution would be too high to contain and this might lead to a number of different effects including habitat degradation and biotic mortality
- Oil spills from tankers are more difficult to control, the historical cases are an example
- It is more difficult to collect spilled oil than other materials and it has both an immediate effect on large animals and a more indirect long-term effect.
- Oil pollution always has an impact on marine biodiversity and the shorelines it hits. The damage can be catastrophic. Malta has 25% of oil traffic in the world and we are at very high risk. Our level of preparedness is not of high quality and if an incident happens it will be a disaster for the environment, the economy and as a social issue
- Spillage of oil can have a catastrophic effect on the marine environment not only in the immediate aftermath of a spill, but the long term effects on marine organisms
- They are carrying crude oil, apart from operational oil e.g. Erika vs Costa Concordia which in case of an accident more difficult to control
- They carry more oil than the other vessels, thus in case of an accident it is more difficult to control and there will be a greater impact on the marine environment

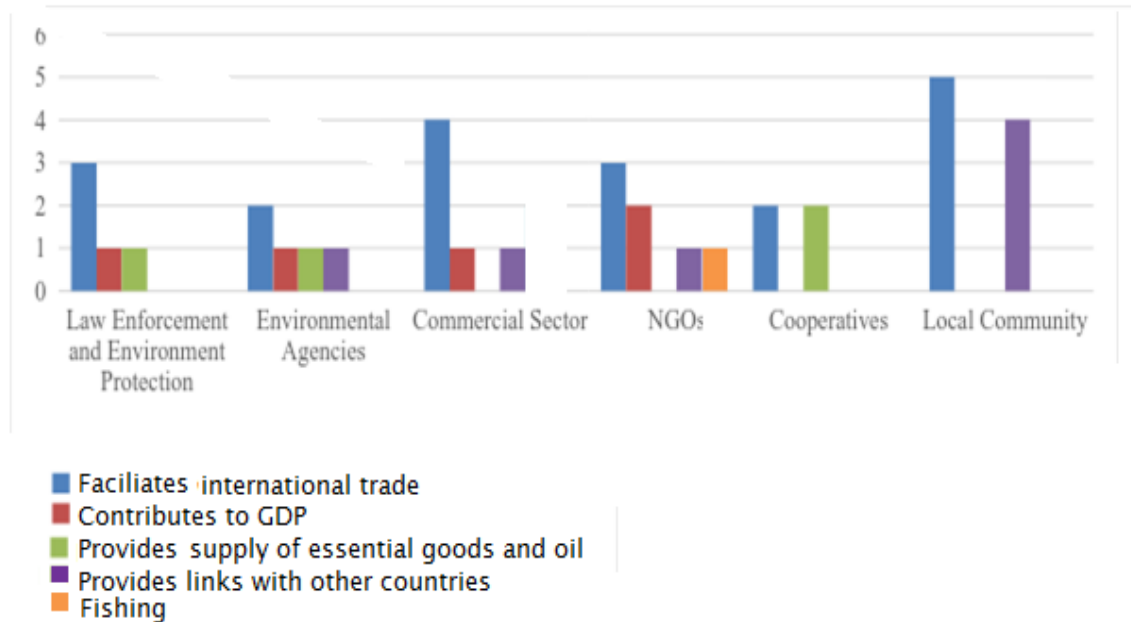
Section B: Investigating the Degree of the Stakeholders' Awareness of the Marine Environment

Question 4: *Mention two reasons why shipping is important for the Maltese economy.*

Most of the respondents, 9 in all, said that shipping is important for Malta because of import and export of goods (Figure 4). In fact, according to the National Statistics Office (NSO, 2015) the expenditure of Malta on imports was on average €10,452,151 between 2011 and 2014. Concurrently, for the same period the value of exports, mainly from the Malta Freeport, were €10,795,220 on average. This leads to indirect employment which was in fact mentioned by 7 stakeholders.

Other stakeholders mentioned that shipping contribute to the Maltese economy, while others stated that it is a means of transport to supply goods and oil, and that shipping provides the link between Malta and other countries. One of the NGOs also listed its contribution to fishing.

Figure 4: Reasons why shipping is important for the Maltese economy



Question 5: (a) Are you aware of the number of vessels under the Maltese flag and their impact on Malta's Gross Domestic Product (GDP)? (b) In your opinion, how much is this contribution in percentage?

Most of the stakeholders, 13 out of 21, were not aware of the number of vessels registered under the Maltese flag. For those who said yes, the economic contribution to Malta's GDP thought to range from 2% to 50%.

According to TM (2015), by the end of December 2014, the registered gross tonnage under the Maltese Merchant Shipping Act that can fly the Maltese Flag was 57.9 million gross tonnage, equivalent to 2,500 vessels. This places Malta in first place, as the highest Ship Register in Europe, and the sixth worldwide. In fact, Malta registered a growth rate of 12.5% when compared to 2013, since there was an increase of 6.5 million gross tonnage, at that time was placed as seventh worldwide.

The advantages of registering under the Maltese flag are the regulations of the Merchant Shipping Act of 1973 which are a complete package of international maritime services and facilities that the maritime industry requires. Additionally, since Malta is a member of the EU, ships registered under the Maltese flag will also be registered under the EU Flag, irrespective of their nationality. The Maltese flag is also on the White List of the Paris Memorandum of Understanding (MoU) and Tokyo MoU, and on the Low Risk Ship List of the Paris MoU, which addresses port state control on safety and pollution after Amoco Cadiz sank in 1978 (TM, n.d. a).

The administration of Malta is also known as being well-organised and highly receptive, since it is very active in EU fora and international organisations. Moreover, it is assisted by a specialised shipping registry supported by a long term customer relationship. Besides, ships of 25 years and

over are not allowed to register, and vessels between 15 and 24 years have to undergo inspection before their registration is accepted (TM, n.d. a).

Question 6: The Maltese Islands lie along the major oil transportation route of the Mediterranean Sea, this means that we have a high risk of oil pollution. Are you familiar with the 'National Marine Pollution Contingency Plan' (NMPCP)? Can you mention one or two aims?

Only 6 of the stakeholders were not familiar with the NMPCP, five of which were the Local Councils. The rest were able to mention some of the objectives of the NMPCP, namely: to ensure preparedness of the stakeholders involved in case of an accident, to detect and treat any pollution within a concise time frame, and to safeguard the Maltese coast in case of an oil spill.

Question 7: Are you aware of the 'Ballast Water Management' (BWM) Convention of the Integrated Maritime Organization (IMO)? If yes, can you briefly describe what is it about?

Eight stakeholders, comprising three NGOs, one cooperative and four local councils, did not know that there is a Ballast Water Management' (BWM) Convention. On the other hand, four of the stakeholders had a high level of knowledge on what this convention entails. Three of the respondents gave a moderate reply, whereas the remaining six entities gave broad answers.

Two specific answers were:

- To minimise movement of sea water from one region to another so as to reduce alien species. It requires vessels to have a ballast management plan where the water is exchanged in at least 200m below sea level. There are also measures where ships are equipped with special equipment to avoid physical ballast water.
- This provides guidelines to use ballast water treatment plants in order to eliminate any living organisms within ballast water loaded by a ship in one part of the world and then discharged in another distant part of the world. This will help to eliminate the transfer of alien species in the water that will disturb the natural balance of the sea in another part of the world.

Question 8: In your opinion, is Malta prepared in case of an emergency within our territorial waters?

The responses to this questions are summarised in Table 3 which was generated through the SPSS package by applying the statistical technique known as the Kruskal Wallis Test, which allows a comparison between the multiple categories so as to verify whether the observed differences are due to chance or if they have statistical significance. Hence, the rating scores were sorted according to an ordinal categorical scale rather than a metric scale such that the negative aspect (definitely not) had the lowest rating score (1) and the positive aspect (definitely yes) had the highest rating score (5).

The median rating score provided by the Cooperatives was the largest (4.5), which means that this category tends to agree more with the statement than the rest. This is followed by the Local Community (4.0), the Commercial Sector (3.5), and the NGOs (3.5). The smallest rating score were the Environment Protection and Law Enforcement, and the Environmental Agencies, both 3.0. Thus, most of the stakeholders believe that Malta is prepared in case of an emergency within our territorial waters. However, the difference in the median rating scores is not statistically

significant because the p-value (0.283) exceeds the 0.05 level of significance. This means that the results obtained, with a 95% level of confidence, are due to chance.

Table 3: Preparedness in case of an emergency within our territorial waters

	N	Mean	Median
Law Enforcement and Environment Protection	3	3.00	3.0
Environmental Agencies	3	3.33	3.0
Commercial Sector	4	3.50	3.5
NGOs	4	3.00	3.5
Cooperatives	2	4.50	4.5
Local Community	5	4.20	4.0

$X^2(5) = 6.244, p = 0.283$

Question 9: Are you willing to contribute towards mitigating the negative impacts of a marine disaster e.g. oil spill, within the Maltese territorial waters?

Most of the stakeholders are willing to assist in mitigating the impacts of a marine disaster occurring within Maltese territorial waters. Five of these, mainly the competent authorities and the cooperatives, stated that they can provide the required equipment and staff, while another five, namely the NGOs, said that they can contribute on a voluntary basis.

The competent authorities specified that they have to command and control the situation, and three of them also stated that they have to comply with the law, and are in charge of enforcement during such an operation. The commercial sectors also stated that they would be willing to provide financial support and call external contractors for assistance if needed.

On the other hand, the local communities said that they are not in a position to help in case of an emergency, primarily because of financial implications. Two of them also pointed out that they do not have the necessary staff and equipment to do so. However, they declared that it does not mean that they would not be concerned if such a disaster occur, especially if it is within their geographical jurisdiction.

Question 10: Do you have any further comments you would like to add about anything that we have discussed?

Most of the stakeholders did not have any other comments to add. However, one of the stakeholders stated that, there should be more coordination/agreement between all the stakeholders involved within the shipping and maritime sectors. Other comments included (1) that more working groups should be set up to ensure that all procedures and equipment are in place should an oil spill occur, and that (2) there needs to be more information on this topic. The cooperatives stated that sometimes the authorities look more into the economic aspect rather than the environmental aspect, and if they do, usually they start with fishing e.g. by establishing quotas, although in their opinion fishing is the least problematic in terms of impact on the marine environment. While the local communities specified that although the localities which are next to the sea are not responsible for such activities, they are still affected through a number of incidents e.g. Birżebbuġa with the Freeport, and St Paul's Bay with the fish farms of bluefin tuna.

3.3 Discussion

The environmental aspect

In the first question of the survey, the respondents were asked to rank different anthropogenic activities according to the possible negative impact on the marine environment. From this research, it was concluded that in reality very few studies have been carried out to assess the current situation in Malta. This was also noticed in relation to the financial and economic aspects of such negative aspects.

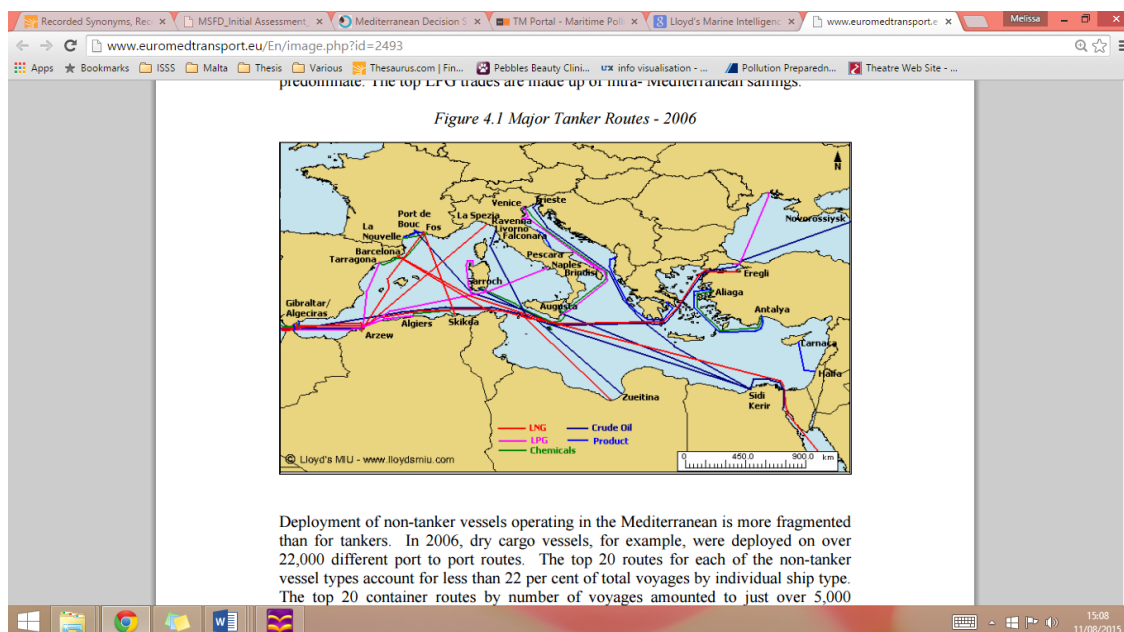
For instance, in 2012 MEPA carried out the first survey of the Maltese coastal waters, which was mainly a study on the state of the marine sediment, and its biota, from various points around the Maltese Islands (Ambiente Italia and AIS, 2013). There have been other regional studies on the Neptune Grass (*Posidonia oceanica*) which have been conducted as part of an Environment Impact Assessment (EIA) or similar studies. This is listed as a priority species under the Habitats Directive (92/43/CEE) since it is endemic to the Mediterranean and forms an important habitat for many species. It was also noticed that most threats are generally due to: the disruption of the sediment by human modifications of the coastline, degradation by trawling and anchoring, salinity increase from water desalination facilities or sewage treatment plants, and the production of invasive species (Díaz-Almela and Duarte, 2008).

Another study was carried out as part of the Biodivalue Project, on the quantity and quality of waste produced by different vessels generally: Waste Oil (Annex I), Sewage (annex IV), and Garbage (Annex V) of the MARPOL Convention. These should be delivered to the port reception facilities in Malta when the ships arrive, as per the PRF Directive. The findings from this report were that the waste disposed in Malta is not even close to the estimated values which the vessels are generating in reality.

This may be due to lack of standardisation in the EU Directive, which is leading to either illegal dumping or disposal in non-EU countries where particular restrictions on disposal are much less stringent (AIS, 2014).

However, the results of the secondary data collected in this study clearly shown that the Maltese Islands have a greater risk of oil pollution than other EU countries as they are very near to the major oil transportation route of the Mediterranean Sea (Figure 5). Additionally, we have a large number of port calls for importation and exportation of goods, or even just for refuelling or waste disposal. Hence, it is a must that the Maltese Government follows the guidelines of the MARPOL Convention, the OPRC Convention, and the Barcelona Convention. It also should sustain a good environmental status by complying with the Marine Strategy Framework Directive (MSFD), and the National Integrated Maritime Policy.

Figure 5: Lloyd's Marine Intelligence Unit for REMPEC (2008)



Despite numerous activities which may have a short or long term adverse impact on the marine environment, the biggest problem remains the pollution by oil or other harmful substances from ships. Annex I of the MARPOL Convention regulates the prevention of pollution by waste oil from operational measures and accidental discharges. In fact, Regulation 15 prohibits discharges, especially in special areas like the Mediterranean Sea (Figure 1), but satellite imaging detected potential illegal oil spills near the Maltese Islands between 1999 and 2004 (MEPA, n.d.). Moreover, unfortunately accidents of oil spill from groundings, collisions, structural failures, fires and explosions are still occurring, mostly attributable to a combination of issues (MEDESS-4MS Project, 2015).

No major pollution incidents were reported within the Maltese territorial waters between 1999 and 2014. Although there were some minor operational spills recorded in the Maltese ports, around 70% of which occurred in the Gran Harbour, Marsamxett Harbour, and the Port of Marsaxlokk, the rest were coastal or offshore spills. However, the scale of some of these oil spills is not even available, and does not necessarily classify according to the MSFD requirements. Nevertheless, Malta still has to be prepared and retain a high standard in case of an emergency (MEPA, n.d.). As regards to Hazardous and Noxious Substances (HNS) incidents, Malta had three cases within its territorial waters in 1988, 2002 and 2006 which were resolved by the Civil Protection Department (CPD) with specific equipment and protecting clothing (EMSA, 2013).

The Pollution and Incidence Response Unit (PIRU) which falls under TM, is currently the Competent Authority responsible for coordinating maritime related issues. Nonetheless, during large scale cases, the PIRU has the support of several entities like: the CPD, AFM, MEPA, REMPEC, and EMSA, amongst others. All of these have a specific role in order to retain Malta's good reputation within regards to safety, or adherence to the NMPCP in order to detect and treat any pollution within a concise timeframe (MEPA, n.d.).

For small-scale maritime related incidents, inspectors have to go on site to give an initial assessment and determine the relevant actions needed to control the incident. Besides, the PIRU is also part of the CleanSeaNet project of EMSA, which focuses on identifying oil spills at sea by satellite imagery. Furthermore, EMSA conducts oil pollution response exercises annually, with other response units as part of ongoing oil and HNS spill response training to maintain a high standard service (EMSA, 2015).

In fact, Malta has three Government non-specialised vessels and equipment for anti-pollution response, located in the Port of Valletta. There are: 1,150m Vikoma offshore booms, Vikoma AquaWeir skimmer with a capacity of 250m³, and two submersible pumps with a capacity of 80 m³, and 120 m³, respectively, and limited dispersant stockpiles. However, there are no Government specialised anti-pollution vessels or private resources under contract or agreement in case of an oil or HNS accident (EMSA, 2012b). As regards to usage of oil spill dispersants, these are not usually allowed, especially in ports, or within 3-miles away from the coast, and in any area with less than 60m depth, although, these may be allowed as a secondary option after applying the mechanical recovery method, and obtaining an official authorisation from MEPA (EMSA, 2014).

The economic aspect

As per Article 8 of the MSFD, the Member States had to assess the anthropogenic activities which are putting pressure on the marine environment in order to analyse the economic and social impacts of these activities.

The Biodivalu Project conducted a financial and economic assessment of four anthropogenic activities. These are: the water pollution caused by the discharging of toxic and polluting substances at sea, the toxic and polluting substances (anti-fouling chemicals) which are contaminating the marine sediment, the loss of biodiversity due to the introduction of alien species from ballast water, and the collection and disposal of ship generated waste. However, this study presented only a database of the estimated monetary value and did not go into details on what is the effect on the Maltese economy (Equinox Advisory Ltd, 2015).

On the other hand, some of the activities which are having a negative impact on the marine environment were discussed as part of the Initial Assessment of the MSFD. For example, one of the activities with the most impacts is considered to be aquaculture, since there is an increase of nutrients and organic matter from uneaten fish food and fish waste. This industry started in the early 1990s with the production of European seabass (*Dicentrarchus labrax*) and Gilt-head seabream (*Sparus aurata*). By 1999, the demand for offshore increased, and in 2000 the first cages for wild tuna were set up. The ten licensed sites belong to either the Malta Aquaculture Research Centre (MARC), which is the national body for aquaculture research, or to the other six registered operators. At the MARC there is the only hatchery in Malta, where an ongoing study on spawning and juvenile rearing methods for the amberjack (*Seriola dumerili*) is being carried out. They are regulated by the Fisheries Conservation and Management Act of 2001, and have to comply with the EU Directive 708/2007 regarding the use of alien and locally absent species in aquaculture, and with the Aquaculture Strategy for Malta (MEPA, n.d.).

From the Economic and Social Analysis carried out by Adi Associates Environmental Consultants Ltd. (2012), it was concluded that on average the aquaculture and the fisheries sector contributed to 0.3% of the Maltese GDP between 2006 and 2012. For instance, in 2007

bluefin tuna production alone reached a total gross value added (GVA) of €53 million, which is estimated to be equivalent to 964 direct and indirect full-time jobs. Furthermore, a substantial growth is expected in this sector in the coming years due to current research at the MARC.

In the case of dredging, it is done by the abrasion of the seabed that leads to physical loss of the benthic habitat. This is normally carried out for coastal engineering projects and port constructions. However, dredging is also done in some parts of the Port of Marsaxlokk once a year, and there are also records for the Grand Harbour and Marsamxett Harbour. This material is eventually disposed of at the offshore spoil ground situated in the North eastern coast of Malta (MEPA, n.d.).

Dredging for port construction is regulated through the development and planning policies, whereas, disposal at sea is addressed in the Waste Management Plan. However, it is difficult to calculate the economic impact of this activity, since it is being considered under the Civil Engineering and Specialised Construction activity (NACE codes 42 & 43), for which the average annual growth in GVA amounted to 6.9% p.a. between 2006 and 2012 (MEPA, n.d.). As stated earlier, maritime transport is one of the most important activities in Malta, mainly due to: the container transshipment terminal (Malta Freeport), the oil bunkering facilities, ship repair facilities, yacht marinas, and a cruise passenger terminal, together with numerous merchant ships registered under the Maltese flag. It is assumed that 56% of these activities make direct use of the sea resulting in marine litter, spills of oil or hazardous substances, and other physical damages caused by anchoring (MEPA, n.d.).

Between 2006 and 2012 there was an average decline in employment which amounting to 26.7% p.a. mostly due to the privatisation of the Malta Shipyards. Although, there was still an average annual growth in the GVA of 2.0% p.a. (MEPA, n.d.). On the other hand, Malta Freeport Corporation had an average annual growth in the GVA of 6.1% p.a. and a 2.1% p.a. growth in employment. In the case of cruise liner terminals and yacht marinas, these are incorporated in the 6.6% p.a. of the retail trade, since the sea is used indirectly as an input to the tourism industry. However, this is projected to grow since tourism in general is predicted to increase (MEPA, n.d.).

Malta has three desalination plants for the production of potable water in Pembroke, Ċirkewwa and Għar Lapsi. Statistics show that in 2011, 56% (16,721,969m³ out of 29,782,523 m³) of the potable water was produced by the desalination plants. The effect of brine discharges have not been assessed yet, but it is presumed to have minor environmental impact on the environment, and Water Services Corporation states that they do not use any chemicals during this process (MEPA, n.d.).

As regards to wastewater infrastructure, previously the raw sewage was discharged by means of a submarine pipeline located outside Xgħajra. Subsequently, there was the construction of the three sewage treatment plants in Tà Barkat, Mellieħa, and Gozo. As a result of this activity the benthic habitats near the sewage outflows are being degraded (MEPA, n.d.).

When it comes to the economic impact, considering all the employment provided jointly by all the sectors under review, between 2006 and 2012, there was an average annual drop of 3.4% p.a. in employment. Although the GVA of the same sectors increasing from €73.5 million to €101.7 million between 2006 and 2010, dropping subsequently in 2012 (MEPA, n.d.).

3.4 Concluding remarks

It is a fact that illegal discharges from vessels are still an issue within the EU Member States even though there are a number of conventions and policies in place to safeguard the marine environment. Besides, monitoring of and enforcement on the numerous vessels that are using the Mediterranean Sea is very difficult. The actions and resources that can be taken are also very limited, particularly outside territorial waters. More rigorous laws on ship registration will minimise the chances of catastrophic accidents at sea. However, these obligations are only imposed on those countries that ratified certain conventions, or are in the EU (MEPA, n.d.).

On the other hand, EMSA is continuously compiling inventories and conducting the necessary exercises within the coastal Member States on oil and HNS spill responses, to be adequately prepared in case of an emergency. All this, together with constant monitoring with satellite imagery through the CleanSeaNet project, and reporting, are leading to much safer means of transport.

However, the several impacts on the environment, economic and social aspects resulting from a possible catastrophic event are still not quantified (NAO, 2014). This should pile more pressure on Malta's preparedness for any oil or HNS pollution near and in our territorial sea, so as to safeguard our social and economic development from any unforeseen consequences.

Although Malta has the NMPCP in place, the auditor's report by the National Audit Office (NAO) in 2014 concluded that there are various issues that need to be addressed so that Malta will be fully prepared. For instance, the risk assessments were based on qualitative rather than quantitative data, and took only 4 nautical miles into consideration.

Moreover, since a legal notice is not in place, the plan fails to apportion a clear responsibility on any of the stakeholders involved. This is also evident from the fact that around 90% of the roles within the Emergency Response Control Centre (ERCC), such as OnScene Commander (Shoreline Operations) and Salvage Master, still are not appointed. In addition, TM is forced to depend on limited offshore equipment available since the inventory of the Oil Spill Response (OSR) is not regularly updated. All these shortcomings may be the cause of insufficient funds allocated to this sector. For example, it was calculated that an extra €950,000 is needed for the Competent Authority to invest in robust equipment in addition to the expenditure needed for the maintenance of the OSR vessels and the up keep of all the equipment (NAO, 2014).

In the NAO Report (2014), it was also stated that between 2010 and 2013 about 40% of the main stakeholders did not take part in the annual training mentioned in the NMPCP which is offered by the Competent Authority. This will eventually result in lack of, or inadequate response in case of an emergency, and might also be a detriment to the other stakeholders involved. Overall, several gaps in the NMPCP were noted, which will ultimately effect the performance of the involved stakeholders during a catastrophic event.

4. RECOMMENDATIONS

On the basis of the responses to the questionnaires and the discussion presented in this study relating to these responses, the following recommendations are being put forward to minimise the environmental impact from shipping:

- It is highly recommended that Malta should have more coordination between all the stakeholders involved. This should be done through the harmonisation and standardisation of practices through the implementation of straight-forward systems, more collaboration from baseline ministries, and by minimising the ‘silo mentality’ normally adopted by different Ministries. This would ensure that limited resources are used efficiently.
- A legal notice based on the NMPCP should be implemented to address vacuum policies. Hence, enforcement can take place to increase participation and commitment from all the stakeholders involved.
- Most of the environmental impacts listed as damaging the marine ecosystems arise due to illegalities. Hence, setting up a monitoring system to check on these pollutants should help the policy makers establish whether certain thresholds are being exceeded (Equinox Advisory Ltd, 2015).
- Enhanced collaboration between the government, the competent authorities and private entities together with the application for EU funds should be encouraged. For instance, in Cyprus a commercial ship gave permission to the Government of Cyprus to install a continuous plankton recorder (CPR) for marine research.
- It is also recommended that the NMPCP is revised regularly to reflect the adaptive management plans based on recent data, such as the Biodivalve Project and other similar studies.
- The formulation of a Marine Spatial Planning (MSP) for the Maltese Islands will definitely support sustainability and the proper use of marine resources. It will also minimise the conflicts between multiple anthropogenic activities and designations of biological diversity and protected areas (Deidun, *et al*, 2011).

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APPENDIX 1: SURVEY QUESTIONNAIRE

Section A: Investigating Attitudes on Environmental and Economic Impacts of Shipping

Question 1: Rank from 1 to 10 the below activities in terms of i) environmental and ii) economic impact on the marine environment. i) One (1) being the most and ten (10) being the least problematic activity on the marine environment. ii) One (1) being the most and ten (10) being the least activity which generates economy for the country.

i)	a) Aquaculture	ii)	a) Aquaculture
	b) Shipping – bunkering (anchored vessels waiting for refuel)		b) Shipping – bunkering (vessels waiting for refuel)
	c) Shipping – dredging and port construction e.g. Freeport and breakwaters		c) Shipping – entering the Freeport or other ports
	d) Shipping – oil pollution/fuel contamination from cargo		d) Shipping – transportation of goods
	e) Shipping – anti-fouling chemicals e.g. in marinas		e) Shipping – marinas and free zones
	f) Fishing – trawling		f) Fishing –from trawling
	g) Fishing – not involving trawling e.g. nets, lines		g) Fishing – other methods not involving trawling
	h) Tourism – hotel construction		h) Tourism
	i) Energy/Water Production – e.g. power stations and reverse osmosis		i) Energy/Water Production – e.g. power stations and reverse osmosis
	j) Sewage Treatment Plants – sewage outfall		j) Sewage Treatment Plants

Question 2: Based on your opinion, list three (3) most significant environmental impacts (from the above activities) that are present in the Maltese waters.

Question 3: From the following vessels which do you think will pollute the marine environment the most, in case of an incident? Please justify your answer.

a) Cargo vessels e.g. car carrier, container carrier, livestock carrier	b) Tankers e.g. LPG tankers, oil tankers
c) Fishing vessels e.g. trawlers, fish carrier	d) Passenger vessels e.g. cruise liners, ferries
e) Pleasure crafts e.g. motor yachts	f) Other boats e.g. dredger, oil rig, research vessel

Reason: _____

Section B: Investigating the Degree of the Stakeholders' Awareness of the Marine Environment

Question 4: Mention two reasons why shipping is important for the Maltese economy.

Question 5: a) Are you aware of the number of vessels under the Maltese flag and their impact on Malta's Gross Domestic Product (GDP)? b) How much do you think is the contribution (in percentage) for the Maltese economy?

a)	Yes		No	
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b) Contribution on Malta's GDP:	
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Fact: As at December 2014, the registered gross tonnage under the Merchant Shipping Act was 57.9 million gross tons, with over 2,500 merchant vessels fly the Maltese Flag. Malta has now become the 6th largest Ship Register worldwide, and 16,639 applications out of 191,376 were processed by officers serving, or wanting to serve on Maltese ships (Transport Malta, Press Release 27th January 2015 - Malta Flag record performance in 2014).

Question 6: The Maltese Islands lie along the major oil transportation route of the Mediterranean Sea, this means that we have a high risk of oil pollution. Are you familiar with the 'National Marine Pollution Contingency Plan'? Can you mention one or two aims?

Yes		No	
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Question 7: Are you aware of the 'Ballast Water Management' (BWM) Convention of the Integrated Maritime Organization (IMO)? If yes, can you briefly describe what it is about?

Yes		No	
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Question 8: In your opinion, is Malta prepared in case of an emergency within our territorial waters?

Definitely Not	Probably Not	Not Sure	Probably	Definitely
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Question 9: Are you willing to contribute towards mitigating the negative impacts of a marine disaster e.g. oil spill, within the Maltese territorial waters?

i) Yes			ii) No	
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i) If yes, choose one or more options:

Financial contribution		Provide the required equipment	
Provide the necessary staff		Contribute on a voluntary basis	
Other (please specify):			

ii) If no, choose one or more options:

Financial implications		Cannot provide the required equipment	
Cannot provide the necessary staff		It's not our obligation	
Other (please specify):			

Question 10: Do you have any further comments you would like to add about anything that we have discussed?
