



**Cubed Consultants Ltd**



AEE Consortium

## **INITIAL ASSESSMENT**

RESULT 3b: A report on the economic and social analysis of the use of the marine waters and of the costs of degradation of the marine environment as defined by the MSFD, stating assumptions and sensitivity of analysis and integration of this report in the MSFD Initial Assessment.



## INDEX

|   | <i>Page</i> |
|---|-------------|
| <b>Acronyms</b>   | <b>5</b>    |
| <b>Executive Summary</b>  | <b>7</b>    |
| <b>Overview</b>   | <b>13</b>   |
| 1. The task at hand   | 13          |
| <b>Literature Review</b>  | <b>15</b>   |
| 2. The Marine Strategy Framework Directive  | 15          |
| 3. The importance of this directive for Malta   | 16          |
| 4. Economic and Social Analysis   | 17          |
| a. Description of ESA approaches  | 17          |
| b. Options chosen by other EU Member States in the Mediterranean Sea                  | 20          |
| 5. Costs of Degradation   | 21          |
| a. Description of Costs of Degradation approaches                                     | 21          |
| b. Options chosen by other EU Member States in the Mediterranean Sea                  | 24          |
| <b>Economic and Social Analysis</b>   | <b>26</b>   |
| 6. Chosen approach for Malta  | 26          |
| 7. Methodology  | 28          |
| 8. Data sources   | 29          |
| 9. Assessing the usage of the marine environment by the Maltese economy               | 32          |
| i. Direct use – economic sectors  | 32          |
| ii. Direct use – other  | 59          |
| 10. An international comparison of the use of the marine environment                  | 66          |
| 11. Assessing the pressures and impacts of these activities on the marine environment | 69          |

|  | <i>Page</i> |
|--|-------------|
| <b>Costs of Degradation</b>  | <b>72</b>   |
| 12.Chosen approach for Malta   | 72          |
| 13.Methodology and data sources  | 74          |
| 14.Assessing the costs of degradation of the marine environment<br>for the Maltese economy | 76          |
| a. The Ecosystem Approach  | 76          |
| b. The Cost-Based Approach   | 89          |
| 15.The GES targets   | 96          |
| <b>Conclusion</b>  | <b>98</b>   |
| 16.Summary   | 98          |
| 17.Disclaimer  | 100         |
| 18.The way forward   | 101         |
| <b>References</b>  | <b>103</b>  |

## **ACRONYMS**

|                 |   |
|-----------------|---|
| AFM             | Armed Forces of Malta   |
| BAU             | Business as Usual   |
| BICREF          | Biological Conservation Research Foundation                     |
| CBA             | Cost Benefit Analysis   |
| CCS             | Carbon Capture and Sequestration                                |
| CIA             | Central Intelligence Agency                                     |
| CO <sub>2</sub> | Carbon dioxide  |
| CoD             | Costs of Degradation  |
| CPUE            | Catch Per Unit Effort   |
| DG              | Directorate General   |
| DPSIR           | Drivers, Pressures, State of the Environment, Impacts, Response |
| DWD             | Drinking Water Directive  |
| EC              | European Commission   |
| EP              | European Parliament   |
| ESA             | Economic and Social Analysis                                    |
| EU              | European Union  |
| FAO             | Food and Aquaculture Organisation                               |
| FTE             | Full-Time Equivalent  |
| GDP             | Gross Domestic Product  |
| GES             | Good Environmental Status                                       |
| GT              | Gross Tonnage   |
| GVA             | Gross Value Added   |
| IPPC            | Intergovernmental Panel on Climate Change                       |
| JASPERS         | Joint Assistance to Support Projects in European Regions        |
| kW              | kilowatts   |
| MBT             | Mechanical Biological Treatment                                 |
| MEPA            | Malta Environment and Planning Authority                        |
| MFSA            | Malta Financial Services Authority                              |
| MIA             | Malta International Airport                                     |

|       |  |
|-------|--|
| MRA   | Malta Resources Authority  |
| MSs   | Member States  |
| MSFD  | Marine Strategy Framework Directive  |
| MTA   | Malta Tourism Authority  |
| NACE  | Nomenclature statistique des Activités économiques dans la Communauté Européenne (nomenclature of economic activities in the European Union) |
| NGOs  | Non-Governmental Organisations   |
| NiD   | Nitrates Directive   |
| NSO   | National Statistics Office   |
| PEST  | Political, Economic, Social, Technological   |
| R&D   | Research & Development   |
| RO    | Reverse Osmosis  |
| SEMUR | Socio-Economic Research Unit   |
| TEV   | Total Economic Value   |
| UK    | United Kingdom   |
| UWWTD | Urban Waste Water Treatment Directive  |
| WFD   | Water Framework Directive  |
| WSC   | Water Services Corporation   |
| WTP   | Willingness to Pay   |

## EXECUTIVE SUMMARY

In line with the requirements of the Marine Strategy Framework Directive (MSFD) <sup>1</sup>, this report aims to provide the necessary tools that will be used in setting the targets to work towards the achievement of good environmental status, by 2020, of marine waters.

In particular, article 8(1) of the MSFD requires Member States to undertake “an analysis of the predominant pressures and impacts, including human activity, on the environmental status of those waters” as well as “an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment”.

The Economic and Social Analysis (ESA), through the *Marine Waters Accounts approach*, assesses the direct use made of the marine environment with respect to two broad types of activities:

- (i) Economic Sectors – marketed activities;
- (ii) Recreational and others – non-marketed activities<sup>2</sup>.

When considering the activities engaged in by economic sectors, it is estimated that approximately *15.4% of Malta's economy is dependent on the marine environment*<sup>3</sup> for one of the following reasons:

- (i) the marine waters provide resources that are required directly or as an intermediate consumption by these sectors;
- (ii) the marine environment is used as a direct/indirect input into the product or service provision of these sectors; or
- (iii) the marine environment acts as a sink for waste and/or by-products produced by these sectoral activities.

This compares to approximately 3-5% of Europe's GDP <sup>4</sup> that is generated from sea-related industries and services. The greater dependence of Malta on the marine environment is, however, not surprising. The fact that Malta is an island, naturally lends itself to a greater extent to marine-related activities both for recreational and marketed activities. In addition, the fact that Malta is a small island state implies that (i) the proportion of coastal area to total land area is proportionately large; and (ii) the possibility for diversification into a

---

<sup>1</sup> EC (2010)

<sup>2</sup> Non-marketed activities also include activities that are marketed but the price charged for their consumption is not a true reflection of their worth to the economy. Potable water (in the form of desalinated sea water) is an example of this.

<sup>3</sup> This reflects the average marine dependence over the period 2006-2012.

<sup>4</sup> This is estimated for 2004

variety of activities is more restrictive, implying that Malta's dependence on the marine environment would naturally be greater.

Other non-marketed activities are also assessed in this report, namely:

- (i) An evaluation of the contribution of the marine environment to non-market recreational activities in Malta – the willingness to pay for making use of beaches and similar amenities.

The studies used in this regard assess the willingness to pay to visit two beaches, Pretty Bay and Ramla Bay, during the summer months (adjusted for inflation to reflect 2012 prices) to amount to approximately €475,000 and €490,000 respectively per annum. Considering the shore length of each of these two beaches in relation to the total shore length used for bathing in Malta, the willingness to pay to visit bathing areas in the country would be estimated at around *€7 million<sup>5</sup> per annum*.

- (ii) The contribution of the marine environment to the production of potable water in Malta is based on the JASPERS (2008) report. An estimate of the direct use contribution of the marine environment to the production of potable water in Malta is made by considering the cost of replacing water production techniques, based on the desalination of sea water, with storm-water harvesting<sup>6</sup>.

The incremental cost of rainwater harvesting infrastructure is estimated to equal €9.1 per m<sup>3</sup>. Extending this cost to the 18.7 million m<sup>3</sup> of water per annum produced through desalination would yield an estimate of the avoided cost of almost €170 million per year. This can be considered as an estimate, however partial, of the value which the marine resource provides to the production of water in Malta. The bulk of this cost emanates from the need for storage and associated distribution facilities. Assuming that the costs of storage are around 75% of the total, a more prudent estimate of the contribution of the marine resource to water production in Malta is derived on the basis of 75% of the result which would imply a contribution of *€127.4 million per annum*.

---

<sup>5</sup> This estimate reflects the fact that the shorelines of Ramla Bay and Pretty Bay constitute 14% of the total shoreline length of bathing areas in Malta (source: MEPA).

<sup>6</sup> This is considered to be the only other alternative for fresh water provision on the Maltese Islands.

- (iii) The total value of the benefits from implementing the EU environmental acquis (with particular reference to the EU's water directives) is based on the ECOTEC (2001) report.

This report estimates the value of the benefits Malta was to derive from full compliance with the EU's water-related directives (by 2010), to lie in the range of €13 and €47 million.

The ECOTEC (2001) was updated in 2011 by the EC to assess the costs, to the 27 EU member states, of not implementing the EU environmental acquis. The directives that aim to improve the quality of water were analysed in this report with the estimated total cost accruing to the EU-27 member states estimated to range between €5 and 20 billion per annum.

The ESA is also intended to contribute towards the development of the DPSIR<sup>7</sup> framework by assessing how economic and non-marketed activity is causing undue pressure on the marine environment and the ensuing impacts generated. Therefore, the ESA is followed by an assessment of the impacts on the marine environment caused by those sectors that are seen to be, in one way or another, marine-dependent. Most of this assessment is carried out qualitatively, although a quantitative assessment is provided when assessing the costs of CO<sub>2</sub> emissions resulting from these marine-dependent sectors using shadow pricing. The report shows how the sectors that are most dependent on the marine environment are also those causing greatest emissions. These sectors are estimated to contribute approximately 63% of total emissions, valued at a shadow cost of some €47 million, or approximately 8% of Malta's GVA in 2011.

The linkages between the environmental impacts and the marine-dependent sectors are then used to estimate the costs of degradation of the marine environment using the *Ecosystem approach*. Two approaches are adopted, namely:

- (i) From environmental impacts to the marine-dependent economic sectors: This assessment aims to answer the question "if the marine environment (or its use) were to be degraded, which economic activities would be affected?" Therefore the report assesses how the degradation of the marine environment (magnitudes of environmental impacts) would affect the marine

---

<sup>7</sup> Drivers, Pressures, State, Impact and Response

dependent economy and, as a result, the economy in its entirety;

- (ii) From the marine-dependent economic sectors to the environmental impacts: This assessment aims to answer the question “in order to preserve the marine environment (and move to GES), which economic activities must be focussed upon in a priority manner for technological and environmental management improvements with respect to their impact on the marine environment and the associated level of costs which would be justifiable?” This will, therefore, assess how certain economic activity is causing degradation of the marine environment and, therefore, the justifiable costs (in terms of additional investment) that the country would be willing to entail in order to ensure technological and environmental management improvements that would limit damage so as to preserve the marine environment and possibly reach “good environmental status” of the marine waters.

A number of scenarios will be considered under each approach, each with varying degrees of impacts on the marine environment.

In the first assessment, i.e. from environmental impact to economic sectors, it is assumed that the deterioration of each of the 8 environmental impact indicators occurs at a rate of 5%<sup>8</sup>. Given the relationships assessed, environmental degradation is seen to be most harmful to the fishing and aquaculture sector, tourism and the group that aggregates oil, gas<sup>9</sup>, water abstraction, waste and wastewater activities. The impact of environmental degradation on the economy at large is estimated to amount to 0.4%<sup>10</sup> in terms of lost economic value added. Through scenario analysis, when estimating the effect on the economy's GVA if just one of the impact indicators were to worsen by 10% whilst keeping all others constant, the strongest effect on GVA comes from an increased contamination of marine waters by

---

<sup>8</sup> This report identifies levels of degradation without assigning a time dimension to it due to the lack of data, As more information becomes available, the analysis and results can be adapted for this purpose. The 5% loss was arbitrarily chosen for illustrative purposes.

<sup>9</sup> The term “oil and gas”, present in the MSFD guidelines list and consequently used in this study is, in the case of Malta, taken to correspond with the Electricity, Gas, Steam and Air-conditioning supply as defined by NACE 35 of Eurostat. It does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>10</sup> The loss in GVA is considered to be a level loss. This implies that the loss of 0.4% occurs once and not on an annual basis. It is, however, considered to be a permanent loss.

hazardous substances followed by other physical disturbance (including noise pollution and marine litter), and the systematic and intentional release of substances.

When considering the effects that economic activity has on the marine environment, it is estimated that the activities of 15.4% of the economy (i.e. the marine-dependent economy) cause approximately 11.7% level deterioration in the marine environment. The sectors that are considered to be causing most harm (also due to their size) are (i) Water transport, (ii) Tourism, and (iii) Oil, Gas, Water Abstraction, Waste and Wastewater<sup>11</sup>. If one were to eliminate the size of the sector, the activities of the shipping construction and transport, supporting infrastructures and fishing and aquaculture sectors would also be considered to be causing substantial degradation of the marine environment. The environmental impacts that are mostly affected by the marine-dependent economic sectors are (i) physical damage, (ii) other physical disturbance, and (iii) contamination by hazardous substances.

In scenario analysis, when estimating the additional investment required to ensure technological and environmental management improvements that would achieve a 10% level reduction in environmental degradation, two options are taken: (i) investment in those sectors that cause most environmental degradation; (ii) investment in all other sectors. In the case of (i) the required investment expenditure in those sectors causing most degradation would amount to 12.9% of the sectors' value added - equivalent to 1.2 percentage points of the total marine-dependent GVA. With respect to (ii) the required investment expenditure in those sectors causing less harm would amount to 43.1% of their value added – equivalent to 4.1 percentage points of total marine-dependent GVA. The willingness to pay for investment, in terms of annualised capital outlay values, in improvement in technology and management with respect to the impact of sectors on the marine environment can be established at the level of the foregone value added which would have to take place to achieve equivalent environmental results should this

---

<sup>11</sup> Due to the small number of operators in these sectors, data pertaining to NACE codes 35, 36, 37 & 39 (i.e. Electricity, gas, steam and air conditioning supply; Water collection, treatment and supply; Sewerage; and Remediation activities and other waste management services) have been amalgamated. Oil and gas activities reflect the importation of oil and gas and not oil exploration or hydrocarbon exploitation. Exploration activities are included in NACE code 9 (i.e. Mining Support Service Activities). There are no results to report with respect to hydrocarbon exploitation for Malta.

investment not materialise. With present patterns of degradation, the output foregone in the more damaging sectors (1.2 percentage points) would be lower than that in the less intensive sectors (4.1 percentage points) such that an investment of 12.9% is estimated to be equivalent to 43.1% in the less intensive sectors. Therefore, in order to achieve an improvement in the quality of the marine environment, it would be more effective to target those sectors that are causing greatest impact on the marine waters.

The last scenario considers the introduction of policy and/or cleaner technology, for instance, in order to reduce the responsiveness of the environmental impact indicators to economic activity by 10%. The sectors considered for this scenario are those found to cause most harm to the marine environment, namely water transport, oil, gas<sup>12</sup>, water abstraction, waste and wastewater, and tourism. This would imply that the 15.4% marine-dependent economic activity would cause a 10.8% level deterioration of the marine environment (compared to the original 11.7%). Therefore, the impact indicators would show an improvement of 8% over the business as usual scenario.

The results from this approach, particularly with respect to the inter-linkages between marine-dependent economic sectors and environmental impacts can assist in the development of the GES indicators for Malta as specified in articles 9(1) and 10(1) of the MSFD. This would be done by mapping the eight environmental impacts assessed in the ecosystem approach<sup>13</sup> to the 11 GES descriptors<sup>14</sup>. It will allow policy makers to gauge the implications on economic activity of setting specific targets and ensure their feasibility<sup>15</sup>.

The costs of degradation of the marine environment were also estimated through the *Cost Based approach*. Two aspects were considered in this regard, namely:

- (i) The MEPA<sup>16</sup> (2011) report provides an indication of the costs of implementing the actions required by the Water Framework Directive (WFD) by 2015 as well as other EU directives including the Nitrates Directive, the Urban Waste Water Treatment

---

<sup>12</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>13</sup> Provided in Annex III of the MSFD

<sup>14</sup> Provided in Annex I of the MSFD

<sup>15</sup> The assessment "from impacts to economic sectors" is to be utilised

<sup>16</sup> Malta Environment and Planning Authority

Directive, the Bathing Water Directive, and the Drinking Water Directive, among others.

The estimated *total investment and annual operational costs* for Malta amount to approximately *€231.8 million and €22.3 million respectively*.

Half way through the implementation of the WFD, MEPA estimated the costs to date of its programme of measures<sup>17</sup>. The estimate relates to those measures that fall within its remit and is, therefore, a partial assessment.

The total costs incurred by MEPA in implementing basic and supplementary measures in line with the Water Framework Directive amount to *€90.9 million in investment costs and €132,000 in annual operational costs*<sup>18</sup>.

- (ii) MEPA's estimates of the costs involved in coastal management, including monitoring the cleanliness of the marine environment, are also assessed.

Approximately *€800,000* is expected to be spent on coastal management, half of which reflects a one time investment cost. The remaining half is expected to be spent for each cycle of the Nitrates Directive (NiD) and/or the Water Framework Directive (WFD) cycle.

In carrying out this assessment, the main risks encountered related to the lack of relevant information in the form of studies and data. In addition, while the drawing up of this report in parallel with the setting up of GES targets is useful in order for MEPA to be more aware of the feasibility of these targets, this led to difficulties in assessing the true costs of degradation of the marine environment.

---

<sup>17</sup> This relates to the actual costs incurred by MEPA between January 2010 and June 2013.

<sup>18</sup> In reality, costs incurred by MEPA are more since some could not be estimated as yet.

## OVERVIEW

### 1. The task at hand

The main aim of this report is that of carrying out an Economic and Social Analysis (ESA) of the use of the marine waters and the costs of degradation as defined by the Marine Strategy Framework Directive (MSFD). Three reports are being drawn up in this respect.

The first, *report 3A*, gave an overview of the possible approaches to undertake the ESA and costs of degradation and recommended a way forward and justification for the preferred options. Various criteria were assessed with the use of matrices in order to decide on the approaches to undertake. The selected options feature a balance between the need for in-depth information for policy formulation, meeting reporting requirements, and the limitations posed by time and other resource constraints. A substantial amount of forward-looking was also required in terms of the relevance and feasibility of application of any particular methodology for Malta. The decision was also taken in collaboration with the Malta Environment and Planning Authority (MEPA) following in depth discussions.

The following steps were undertaken in the formulation of this document.

- *STEP 1*: Conducted a literature review of approaches to socio-economic analysis of marine waters and costs of degradation;
- *STEP 2*: Identified the necessary criteria for evaluation of approaches in determining which methodologies are to be chosen;
- *STEP 3*: Coordinated with other experts on project to obtain information, both qualitative and quantitative;
- *STEP 4*: Reviewed the approaches undertaken by other EU member states;
- *STEP 5*: Evaluated the approaches identified in Step 1 using the criteria identified in Step 2;
- *STEP 6*: Drew up justification and recommendations on preferred option;
- *STEP 7*: Coordinated with other experts to provide information on results required for the completion of Results 3B and 3C.

The results from report 3A will be outlined in this report (*report 3B*) which will also carry out the actual assessments both with respect to the ESA and costs of degradation of the marine waters. The following steps will be undertaken.

*STEP 1:* Evaluate the current stock of uses of the marine waters around the Maltese Islands by different economic sectors;

*STEP 2:* Implement the selected methodology in order to assess the social and economic impacts of such a resource;

*STEP 3:* Conduct consultation sessions with MEPA representatives and those from other stakeholders to feed in to Steps 1 and 2;

*STEP 4:* Compile the Socio-economic assessment using information from Steps 1, 2 and 3;

*STEP 5:* Assess possible threats to the marine waters and their repercussions on social and economic endeavours;

*STEP 6:* Using available data together with assumptions on magnitude and impact severity, derive estimates with respect to the costs of degradation of marine waters;

*STEP 7:* Co-ordinate with other experts to communicate and refine results.

The results from report 3B will feed into the final report (*report 3C*) which involves the compiling of sheets required for MSFD reporting. There are three reporting sheets, namely:

- 8C01: Human Activities (Economic and social analysis of the use of marine waters);
- 8C02: Ecosystem services and other approaches (Economic and social analysis of the use of marine waters);
- 8C03: Cost of Degradation.

Reporting sheets 8C01 (Human activities) and 8C03 (Cost of degradation) should be completed by all Member States, regardless of the approach taken to their ESA. Reporting sheet 8C02 (Ecosystem services and other approaches) should only be completed by those Member States that have used an Ecosystem services other type of approach.

## LITERATURE REVIEW

### 2. The Marine Strategy Framework Directive

The Marine Strategy Framework Directive (MSFD) requires Member States to achieve or maintain Good Environmental Status (GES) in their waters by 2020 (Art. 1.1 MSFD). In considering its implementation, there is significant emphasis on the use of socio-economic analysis to ascertain the economic dependencies of a territory on the marine environment, and the consequent effects of marine environment degradation in its various facets. In fact Member States are requested to undertake “an analysis of the predominant pressures and impacts, including human activity, on the environmental status of those waters” as well as “an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment” (Art. 8.1 MSFD).<sup>19</sup>

In order to fulfil the requirements for the Initial Assessment, the following steps are proposed to be undertaken:

- i. *Identify and describe the different uses of the marine environment in terms of their economic and social importance and pressures*
  - Identify and describe the different uses of and pressures on the marine environment.
  - Assess direct and, if possible, the indirect benefits of the different uses of the marine environment.
  - Describe in qualitative and, if possible, quantitative terms the pressures caused by the different uses of the marine environment.

Two approaches are suggested for this purpose including:

- The Ecosystem Services Approach;
- The Marine Waters Accounts Approach.

- ii. *Describe in qualitative terms and, if possible, in quantitative terms the cost of degradation of the marine environment*

One of three different approaches could be adopted:

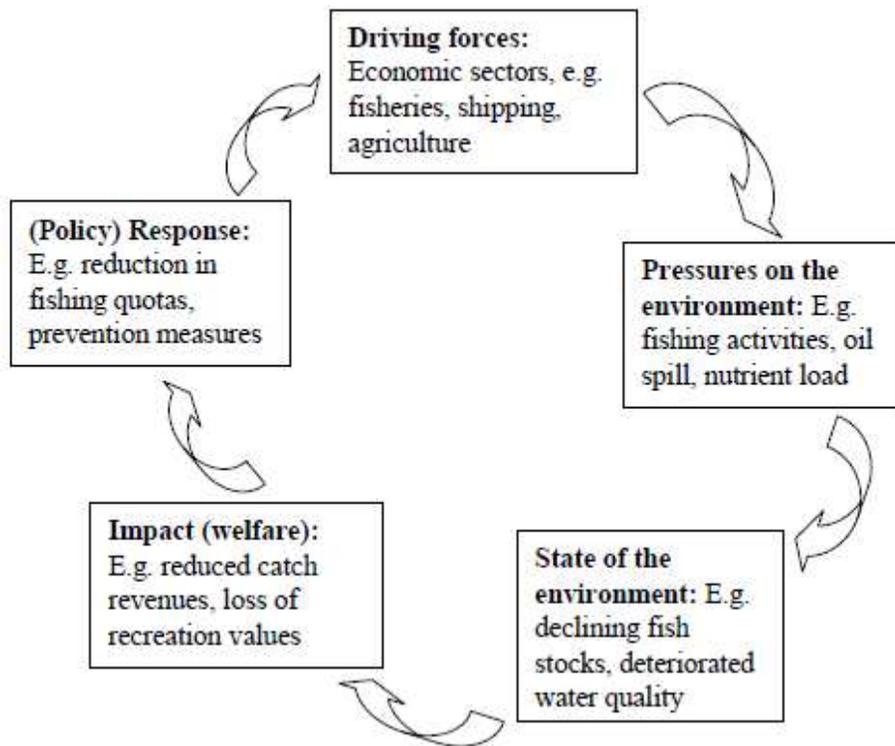
- The Ecosystem Approach;
- The Thematic Approach;
- The Cost-Based Approach.

---

<sup>19</sup> EC (2010)

The ESA is intended to contribute towards the development of the DPSIR<sup>20</sup> framework. This framework starts with a description of the Driving forces that cause environmental Pressures. These Pressures cause a change in the State of the environment. This may have Impacts on human wellbeing. If these Impacts are unwanted, policy-makers will Respond by taking actions aimed at the Driving forces to reduce their Pressures<sup>21</sup>. This is illustrated more clearly in Figure 1.

Figure 1: The DPSIR Framework



Source: EC (2010)

The ESA will aim to address three of these elements, namely (i) the driving forces, (ii) the pressures on the environment, and (iii) the impact of the activities engaged in on the marine environment.

<sup>20</sup> Drivers, Pressures, State, Impact and Response

<sup>21</sup> EC (2010)

### **3. The importance of this directive for Malta**

Given the country's geographic specificities, the Marine Strategy Framework Directive may be viewed to be of particular relevance for Malta. One of the fundamental tenets of economics is the fact that a country would be especially reliant on resources in which it enjoys a relative abundance. Malta's geographical characteristics imply a relative abundance of marine and coastal resources, with previous studies putting the dependence on them at around 15% of Gross Domestic Product.<sup>22</sup> Therefore, this issue deserves even closer consideration from the Maltese perspective.

The extent and variety of uses made of the marine waters around Malta is greater than in other countries. Firstly, a number of economic activities require direct use of the sea including, for instance, the need to desalinate sea water for final and intermediate consumption given the absence of natural springs. A number of economic sectors also make use of the marine environment in the provision of their service, for instance the tourism sector, which markets Malta as a sun and sea destination. In addition, a number of recreational and sports activities in Malta make use of the sea to a greater extent than in other countries. Accessibility, including transport and communication, in Malta also makes extensive use of the marine waters. Lastly, waste and by-products are often disposed of at sea (after treatment).

It is important to highlight, however, that the role of marine resources is abundant relative to other resources and not from an absolute perspective. Indeed, marine resources may be viewed to be very scarce in Malta in relation to the number of competing uses for them, not least because of the size of the country, as well as its location. It is also the case that marine economic issues for Malta are impacted by and have effects upon regional Mediterranean considerations.

### **4. Economic and Social Analysis**

#### *a. Description of ESA approaches*

Art. 8.1(c) of the MSFD requests an economic and social analysis of the use of marine waters, together with a description of the environmental pressures caused by these uses (8.1 (b)). The Directive does not prescribe how these analyses should be performed in practice but

---

<sup>22</sup> Cordina, G. (2006)

states that the objective is a management of the marine waters based on the ecosystem approach (see Art. 1.3 MSFD). The assessment may go beyond a description of economic and other activities that take place in their waters by also (as far as methodologically possible) quantifying the environmental pressures of those activities.

A range of approaches to undertake the Initial Assessment is available which should lead to an analysis of the link between human activities and the pressures that are caused by them, as well as the impacts these pressures have on human well-being<sup>23</sup>.

---

<sup>23</sup> In line with the DPSIR framework

### *The Ecosystem Services Approach*

The following steps illustrate the ecosystem services approach:

1. Identify ecosystem services of the marine areas in conjunction with the analysis of the current environmental status (Art. 8.1(a) MSFD) and the analysis of pressures and impacts (Art. 8.1 (b) MSFD).
2. Identify and if possible quantify and value the welfare derived from the ecosystem services using different methods to estimate the use and non-use values of these services.
  - Dividing services into final and intermediate<sup>24</sup>;
  - Focusing on the benefits generated by ecosystem services;
  - Describing and valuing benefits, by use and non-use values, derived from final ecosystem services;
  - Using the theoretical approach “Total Economic Value (TEV)”, involving economic and social aspects.
3. Identify the drivers and pressures affecting the ecosystem services and thereby, human welfare.

### *The Marine Waters Accounts Approach*

The following steps illustrate the marine water accounts approach:

1. Identify and describe the region of interest.
2. Identify and describe the economic sectors using marine waters (direct and indirect-use economic sectors and activities, non-use values).
3. Identify and, if possible, quantify the economic benefits derived from the economic sector’s use of marine waters in terms of production value, intermediate consumption, value added, number of employees and compensation of employees.
4. Identify and, if possible, quantify impacts generated by these sectors.

---

<sup>24</sup> Final services, (e.g. food provisioning, raw materials and energy) are usually easiest to identify since they link directly to human welfare, while intermediate services capture the underlying services that affect the final services (e.g. habitat, climate regulation, eutrophication mitigation and resilience) and will therefore require a deeper understanding of the dynamics and interactions of the marine ecosystems in order to be identified.

### *Capturing the Use of Marine Waters*

Various uses are made of marine waters. These can be divided between direct and indirect uses as well as non-use values.

## 1. Direct use – economic sectors

The following activities could be considered when identifying the economic sectors that use the marine waters:

- Aquaculture and mariculture
- Shipping construction and transport
- Coastal defence and flood protection
- Defence - Military
- Fisheries
- Tourism
- Mining (gravel, sand and shell extraction)
- Oil and Gas<sup>25</sup>
- Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors)
- Renewable energy (e.g. wind farms)
- Storage (of gases e.g. CO<sub>2</sub>, CCS)
- Water abstraction
- Water transport
- The use of the marine water for waste and wastewater disposal (agriculture, industry, households etc.)
- Supporting infrastructure (e.g. ports, marinas, navigation aids).

The indicators that could be used to estimate the use of the marine waters by economic sector are the following:

Production value,  
Use of intermediary products (at purchase prices),  
Gross value added,  
Employer's wages,  
Labour force.

## 2. Direct use – other activities

There are other direct uses that are not directly reflected in the above sectors, for example, recreational activities and cultural benefits such as:

- bathing,
- sport fishing,
- scuba diving,
- other recreational activities linked to the marine areas,
- educational and research activities linked to the marine areas,

---

<sup>25</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

- importance that local and national communities attach to their marine environment.

Potential indicators of importance for assessing use values not reflected in market values are:

- Expression of economic and social preferences, via public consultation, newspapers, etc.;
- Market prices for complementary products (e.g. fishing licenses, scuba equipment);
- Recreation values;
- Different survey results (e.g. opinion polls, willingness-to-pay studies).

### 3. Other benefits

#### i. Indirect use values

There are also indirect use values where individuals benefit from ecosystem services supported by a resource rather than directly using it, such as:

- the capacity of the ecosystem for carbon sequestration;
- nutrient cycling;
- resilience.

#### ii. Non-use values

Non-use values are associated with benefits people obtain from simply knowing that a particular ecosystem is maintained, and consist of:

- altruistic values (knowing that others can enjoy the services provided);
- bequest values (passing on ecosystem services intact to future generations); and
- existence values (satisfaction to humans from knowing that ecosystems continue to exist).

A qualification and, possibly, quantification of the above uses should be made under each of the methodological approaches.

#### *b. Options chosen by other EU Member States in the Mediterranean Sea*

Implementation of the MSFD will require a coordinated, coherent approach within each sub-region. This will, however, be challenging since each country is developing its own strategy. Marine spatial

planning<sup>26</sup> will therefore assist to make the ecosystem approach<sup>27</sup> a reality in coastal and marine environments as well as to provide a means for neighbouring countries to understand and work with adjacent demands on marine space and resources.

As a result, a comparison with other EU member states in the Mediterranean Sea is considered to be justifiable since it is important to assess the cooperation needs between countries using the same marine body.

The European Union has jurisdiction over 30-40% of the Mediterranean waters since, among the countries surrounding the Mediterranean Sea, seven are EU Member States and subject to implementing the MSFD objectives to achieve GES by 2020. When assessing the approaches adopted by these Member States, it is clear that the most popular one was the Marine Waters Accounts approach with all six member states<sup>28</sup> assessed having chosen this methodology.

*Table 1: Economic and Social Analyses undertaken by EU member states in the Mediterranean Sea<sup>29</sup>*

| <b>Economic and Social Analysis of the Use of Marine Waters</b> | <b>Cyprus</b> | <b>Greece</b> | <b>France</b> | <b>Slovenia</b> | <b>Spain</b> | <b>Italy</b> |
|---|---------------|---------------|---------------|-----------------|--------------|--------------|
| Ecosystem Services Approach                                     |               |               |               |                 |              |              |
| Marine Waters Accounts Approach                                 | X             | X             | X             | X               | X            | X            |

<sup>26</sup>

<http://www.projectpisces.eu/guide/the-msfd-and-the-ecosystem-approach/implementing-the-ecosystem-approach-through-the-msfd/>

<sup>27</sup> Malta has expressed the need, in the discussions underway on the Proposed Directive for Maritime Spatial Planning and Integrated Coastal Management, to adopt the sustainability approach when developing Maritime Spatial Plans, in view of the need to regulate the diverse range of human activities making use of the sea and the need to strike a balance between environmental, economic and social considerations.

<sup>28</sup> This assessment excludes Malta which is the 7<sup>th</sup> EU member state in the Mediterranean Sea

<sup>29</sup> Plan Bleu pour l'Environnement et le Développement en Méditerranée (2013)

According to the Marine Waters Accounts approach, the value of marine waters is addressed by assessing the financial benefits of the sectors/economic activities which are direct and indirect users of marine waters. Economic indicators that have been used to measure economic activities include (i) production value, (ii) added value, (iii) contribution to GDP and (iv) employment.

## **5. Costs of Degradation**

### *a. Description of Costs of Degradation approaches*

Three approaches were suggested by the working group on economic and social assessment set up by the European Commission in 2010<sup>30</sup> in order to assess the Cost of Degradation of marine waters, namely:

- The Ecosystem Approach,
- The Thematic Approach, and
- The Cost-based Approach.

#### *The Ecosystem Approach*

The ecosystem approach is future-facing and aims to provide an answer to the question “what should be done in the future to protect the environment?”

The “Cost of Degradation” under this approach refers to the value of (lost) ecosystem services, calculated as the potential difference between Good Environmental Status (GES) and a “Business As Usual” (BAU) Scenario<sup>31</sup>. Therefore, in this case, at least two scenarios for future states of the environment (till 2020) should be built. One is the Business As Usual (BAU) scenario; the other is an MSFD scenario. This scenario will consist of a best guess of how the ecosystems will evolve when the MSFD is implemented. Indicators for environmental status should be comparable in the two scenarios.

The following are the steps involved in meeting the requirements of the Ecosystem approach:

1. Defining GES for each component of the marine environment.

---

<sup>30</sup> EC (2010)

<sup>31</sup> The BAU scenario reflects a baseline scenario which describes the anticipated evolution in the environmental, social, economic and legislative situation in the marine environment over the agreed time horizon in the absence of the policy under consideration (i.e. if the MSFD is not implemented).

2. Assessing the environmental status in a BAU Scenario Projection: forecast of drivers and pressures or simple extensions of historic trends in the state of the environment.
3. Describing in a qualitative and, if possible, quantitative manner, the difference between GES and the environmental status under the BAU Scenario (environmental degradation).
4. Describing consequences of environmental degradation to human welfare in a qualitative, quantitative or monetary manner.

#### *The Thematic Approach*

The thematic approach assesses the current cost of degradation. The cost of degradation estimated by this methodology refers to the socio-economic impacts of current environmental degradation with regard to the reference situation.

The steps involved for the Thematic approach include:

1. Defining degradation themes<sup>32</sup>.
2. Defining the reference condition, where GES targets are achieved.
3. Describing in a qualitative and, if possible, quantitative manner, the difference between the reference condition (GES) and the present environmental status for all themes.
4. Describing consequences of environmental degradation of marine environments to human welfare in a qualitative, quantitative or monetary manner. It may include 4 types of costs:
  - a) Positive action costs: expenditures on current measures for environmental protection and prevention;
  - b) Mitigation costs: expenses for avoiding impacts linked to the loss of ecosystem services;
  - c) Transaction costs: linked to monitoring and dissemination;
  - d) Opportunity costs: loss of benefits of activities suffering from environmental degradation or lack of biodiversity resources.

#### *The Cost-Based Approach*

This approach estimates the current cost of degradation using only existing quantitative data on costs of measures currently implemented to prevent degradation of the marine environment. It does not include

---

<sup>32</sup> Examples of these are chemical compounds, marine litter, oil spills, microbial pathogens, eutrophication, invasive species, degradation of natural resources

a reference condition. The cost of degradation implied by this approach relates to the cost of avoiding today's environmental degradation, according to relevant legislation put in place for the protection of the marine environment.

The following are the steps involved in adopting the Cost-Based Approach:

1. Identifying current legislation intended to improve the status of the marine environment. This includes:
  - a) Considering all individual measures that have been put in place and have a significant effect upon the marine environment.
  - b) Considering whether measures are on land or sea; whether they are paid by public or private sectors; and the time scale they are paid over.
2. Assessing the costs of this legislation to the public and private sectors. Costs to the public sector could include subsidies, personnel costs, as well as carrying out measures for land-based activities, among others.
3. Assessing the proportion of this legislation that can be justified on the basis of its effect on the marine environment.
4. Adding together costs attributable to protecting the marine environment from the review of the different legislation.

b. Options chosen by other EU Member States in the Mediterranean Sea<sup>33</sup>

As opposed to the Economic and Social Analysis, the methodology adopted by the six EU member states under review to estimate the cost of degradation has been quite diverse.

Table 2: Estimates of the Cost of Degradation undertaken by EU member states in the Mediterranean Sea<sup>34</sup>

| Cost of Degradation                                  | Cyprus | Greece | France | Slovenia | Spain | Italy |
|--|--------|--------|--------|----------|-------|-------|
| Ecosystem Services Approach                          | X      | X      |        |          |       |       |
| Thematic Approach                                    |        |        | X      |          |       |       |
| Cost-Based Approach                                  |        |        |        |          | X     | X     |
| Other  |        |        |        | X        |       |       |
| Identifying and Valuing current Marine Ecosystem G&S |        |        |        | X        |       |       |

Cyprus and Greece used a simplified Ecosystem Services approach, focusing on the impacts in sectors directly benefitting from the use of the marine waters and the goods and services they provide, measuring the cost accumulated by these sectors (losses of financial benefits) due to the degradation of the environmental status of marine waters. The calculation of the Cost of Degradation was based on the construction of hypothetical scenarios assuming benefit losses for each of the economic sectors examined. The Cost of Degradation was considered equal to the Gross Value Added foregone.

France assessed the Cost of Degradation by analysing qualitatively and quantitatively the accounting costs (proven, perceived but also potential) related to past, current or possible degradation of the marine environment. The estimation of the Cost of Degradation

<sup>33</sup> A comparison with other EU member states in the Mediterranean Sea is considered to be justifiable since the directive specifies the need for cooperation between countries using the same marine body.

<sup>34</sup> Plan Bleu pour l'Environnement et le Développement en Méditerranée (2013)

was addressed by themes, according both to the eleven MSFD descriptors of GES and to the main pressures affecting marine ecosystems.

The Slovenian method consisted, first, of an identification of all ecosystem services that are rendered by marine waters in relation to human uses and activities; and, second, of the economic valuation of these goods and services according to published information and data. In this case, the economic estimations might correspond to a situation of total degradation of the marine ecosystems, where all goods and services are lost.

The Spanish analysis of the Cost of Degradation of the marine environment also followed the Cost-based approach, and analysed the current costs related to the established programmes for the protection of the marine environment. It provided an approximation of how much each sector pays in relation to total budget. This approach is based on the assumption that the value obtained by applying these programmes (and corresponding measures) is higher than their cost. Therefore, the current costs can be considered as a conservative estimation of degradation costs.

Italy used the Cost-Based approach in determining the cost of environmental degradation. In particular, the costs incurred by ministries and local councils to “safeguard the marine and coastal areas” have been considered.

## ECONOMIC AND SOCIAL ANALYSIS

### 6. Chosen approach for Malta

In deciding on the methodology to be adopted for Malta, a matrix approach was undertaken and presented in result 3A that assesses a number of relevant criteria. This section will reproduce this assessment, describing the criteria and the reasons for choosing one approach over another.

The criteria assessed include the following:

- data availability;
- simplicity;
- human resource availability;
- time constraints;
- consistency with DPSIR framework<sup>35</sup>;
- ability to update the assessment with relative ease (replicability);
- flexibility to reflect key priorities and changes over time;
- level of detail.

The table scores each of these criteria under both approaches to determine the most relevant one for Malta. Three of the criteria are viewed to be relevant under both approaches. However for two of these, a greater weighting was given to one over the other (seen by a double “x”) with an explanation provided later in this section.

Overall, the Marine Waters Accounts approach scored 8, when compared to the Ecosystem Services approach, which scored 5 in total, and is therefore the preferred option. The main discrepancies relate to the availability of data, simplicity, time constraints, replicability, as well as flexibility.

---

<sup>35</sup> Consistency with the DPSIR framework also implies that the methodology will be in line with Articles 13 and 14 of the Marine Strategy Framework Directive (MSFD), with specific reference to the links to subsequent elements of economic and social analysis, as well as Article 5 of the Water Framework Directive, namely with respect to the contribution of the proposed approaches to the requirements of the economic analysis, as stipulated in the Terms of Reference.

Table 3: Matrix criteria for Economic and Social Analysis Approach

|   | Ecosystem Services Approach | Marine Waters Accounts Approach |
|---|-----------------------------|---------------------------------|
| Data availability   |                             | x                               |
| Simplicity  |                             | x                               |
| Human resource availability                                     | x                           | x                               |
| Time constraints  |                             | x                               |
| Consistency with DPSIR framework                                | xx                          | x                               |
| Ability to update assessment with relative ease (replicability) |                             | x                               |
| Flexible enough to reflect key priorities and changes over time |                             | x                               |
| Level of detail   | xx                          | x                               |
| <b>Total</b>  | <b>5</b>                    | <b>8</b>                        |

With respect to data availability, the Marine Waters Accounts approach makes use of published national accounts data that is readily available by the National Statistics Office (NSO) on a quarterly basis. On the other hand, the detail required to adopt the Ecosystem Services approach, which requires the identification of the ecosystem services (both final and intermediate), is not available as yet for the Maltese islands and it is therefore not possible to date to adopt this methodology. This, of course, implies that the Marine Waters Accounts approach adopts a simpler methodology, particularly given the difficulty in assessing intermediate services, as well as making it the faster approach to undertake and that which is easily replicable given the timeliness in the publication of national accounts data. Readily available data by the NSO also makes it easier to assess changes over time with respect to the dependency on the marine environment and the effects that each sector has on it.

A number of criteria were also seen to be true for both methodologies. Firstly, both approaches are consistent with the DPSIR framework though the validity of this statement is greater with respect to the Ecosystem Services approach. This is due to the fact that few pressures can be quantified using the Marine Waters Accounts approach. CO<sub>2</sub> emissions by sector are usually easily quantifiable since they are a marketable by-product and one which would be detected in national accounts. This, however, is not true of national data for Malta where a market has not yet been developed for such emissions. However, the value of such emissions will still be estimated using shadow prices for some sectors in determining the costs of degradation.

The lack of specialised human resource availability in the marine environment, both with respect to environmental experts as well as economists with environmental expertise, implies that whichever approach is adopted to carry out the Economic and Social Analysis, as well as the Costs of Degradation discussed later, results in substantial costs.

Lastly, the level of detail that is provided by the Ecosystem Services approach is considered to be superior to that provided by the Marine Waters Accounts approach since the latter focuses mainly on the direct uses of the marine environment. Having said this, however, though the Ecosystem Services approach is considered to be a preferred option in the long-run, the level of detail that the Marine Waters Accounts approach provides is sufficient to address Malta's immediate requirements.

## **7. Methodology**

The previous section provides scores for the most suitable approach to be adopted for Malta based on a number of assessment criteria. As a result of this overview, the Marine Waters Accounts approach is the chosen methodology for undertaking the Economic and Social Analysis of Malta's marine environment. According to the Marine Waters Accounts approach, the value of marine waters is addressed by assessing the financial benefits of the sectors/economic activities which are direct and indirect users of marine waters.

This analysis will mainly assess the direct uses of the marine environment both as a factor of production as well as consumption<sup>36</sup>. In this respect, the use of the marine environment will be assessed according to which of the following three functions it fulfils, namely:

- i. *Provision of resources* – the marine environment contains a vast array of resources that are used by economic sectors as well as in other activities either directly or as an intermediate input.
  - a. *Directly* – a number of resources, which are directly extracted from the sea, are consumed as final products; e.g. fish and water;

---

<sup>36</sup> Due to data limitations, an assessment of the indirect use and non-use of the marine environment could not be undertaken.

- b. *Intermediate input* – there are also certain resources provided by the sea which are used as an input in the production of some other good, e.g. desalinated water used in the manufacture of food products.
  - ii. *Input into product/service provision* – the sea can add value to a product or service provided either directly or indirectly.
    - a. *Directly* – the sea is directly used in the provision of a particular product or service, e.g. sea transportation;
    - b. *Indirectly* – the sea adds to the experience of consuming a particular product or service, e.g. dining in a coastal restaurant.
  - iii. *Sink function* – the sea provides a sink function for waste, e.g. sewage, as well as by-products created, e.g. manure.

In addition to the direct use of the marine environment by economic sectors, the value of other direct uses will also be quantified in order to provide an indication of the value of “direct uses – other activities” as reported in the MSFD<sup>37</sup>. Three areas will be assessed in this regard, namely:

- i. The annual benefits Malta is expected to derive from full compliance with the *EU’s water-related directives*;
- ii. The costs of *increasing rain water harvesting* in Malta as an indicator of the benefits derived from the use of sea water to produce potable water;
- iii. The willingness to pay for the use of a select number of Maltese *beaches* and other similar amenities.

## 8. Data Sources

In assessing the direct uses made of the marine environment by economic sectors, national accounts data published by the National Statistics Office (NSO) is availed of. Though this data is readily available on a quarterly basis, it is published in an aggregated format with broad categories bringing together a number of sub-sectors. In order to carry out a more detailed assessment of the sectors that are directly and/or

---

<sup>37</sup> The main difference between the “direct use – economic sectors” and “direct use – others” is the fact that the former relates to marketed activities whereas the latter to non-marketed activities. Non-marketed activities also include activities that are essentially marketed but the price charged for their consumption is not a true reflection of their worth to the economy. Potable water (in the form of desalinated sea water) is an example of this.

indirectly linked with the marine environment, a formal request was made to the NSO to obtain data at a more disaggregated level. The list of sectors has been drawn up in line with those proposed within the Marine Strategy Framework Directive (MSFD). Malta's geographical characteristics particularly that of being a small island, imply that a number of other sectors may also have indirect links with the marine environment and, as a result, have also been added to the list. The full list is reproduced in Table 4 below.

Annual data was requested for the years 2006 till 2012 with 2006 being the first year where revisions have been made in line with NACE Rev.2 categories and for which, as a result, comparable data is available.

The sectoral data requested includes:

- Gross Value Added (GVA);
- Output;
- Intermediate consumption;
- Profits;
- Compensation for employees;
- Number of employees.

Table 4: Data request of economic sectors making use of the marine environment<sup>38</sup>

| MSFD list  | NACE code   | Description   |
|--|---|---|
| Aquaculture and mariculture Fisheries  | 03  | Fishing and aquaculture   |
| Shipping construction and transport  | 30  | Manufacture of other transport equipment  |
|  | 33  | Repair and installation of machinery and equipment                                |
| Coastal defence and flood protection   | n/a   | n/a   |
| Defence - Military   | 84  | Public administration and defence; compulsory social security                     |
| Tourism  | 47  | Retail trade, except of motor vehicles and motorcycles                            |
|  | 55  | Accommodation   |
|  | 56  | Food and beverage service activities  |
|  | 68  | Real Estate   |
|  | 79  | Travel Agency, tour operator and other reservation service and related activities |
| Mining (gravel, sand and shell extraction)   | 08  | Other mining and quarrying  |
|  | 09  | Mining support service activities   |
| Oil and Gas  | 35  | Electricity, gas, steam and air conditioning supply                               |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors)                      | 49  | Land transport and transport via pipelines  |
|  | 61  | Telecoms  |
|  | 92  | Gaming  |
| Renewable energy (e.g. wind farms)   | n/a   | n/a   |
| Storage (of gases e.g. CO <sub>2</sub> , CCS)  | n/a   | n/a   |
| Water abstraction  | 36  | Water collection, treatment and supply  |
| The use of the marine water for waste and wastewater disposal (agriculture, industry, households etc.) | 37  | Sewerage  |
|  | 39  | Remediation activities and other waste management services                        |
| Water transport  | 50  | Water transport   |
|  | 52  | Warehousing and support activities for transportation                             |
| Supporting infrastructure (e.g. ports, marinas, navigation aids).                                      | 42  | Civil engineering   |
|  | 43  | Specialised construction activity   |
| Others   | 01  | Crop and animal production  |
|  | 10  | Manufacture of food products  |
|  | 11  | Manufacture of beverages  |
|  | 65  | Insurance, reinsurance  |
|  | 69  | Legal and Accounting  |
|  | 71  | Architectural and engineering   |
|  | 72  | Scientific research and development   |
|  | 75  | Veterinary activities   |
|  | 90  | Creative, arts and entertainment  |
|  | 91  | Library, museum, culture  |
| 93   | Sports activities and amusement and recreation activities |   |
| 94   | Activities of membership organisations                    |   |

<sup>38</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

In order to estimate the usage of the marine environment by each sector, a workshop was undertaken with experts at the NSO. In addition to this, various other sources and experts in specific sectors have been consulted, as will be reported throughout the document.

Documents used in estimating the value of the marine environment for other direct uses include the following:

Benefits of full compliance with the EU's water-related directives:

- o ECOTEC et al (2001), "The benefits of compliance with the environmental acquis for the candidate countries", DG Environment, European Commission, Brussels;
- o European Commission (2011), "The costs of not implementing the environmental acquis", DG Environment, Final report ENV.G.1/FRA/2006/0073, Brussels.

Estimates of the costs of increasing rain water harvesting in Malta as an indicator of the benefits derived from the use of sea water to produce potable water:

- o Estimate of the demand and supply patterns for water resources in Malta based on available information sources including MRA (2010), FAO (2006), NSO (2009);
- o JASPERS (2008) on the possibility of the further development of storm water harvesting infrastructure towards implementing a greater capture and storage of storm water and ultimate use (after necessary treatment) to meet water demand;
- o WSC (2010) estimating the total cost for the construction of major tunnels that are primarily intended for storage.

An Evaluation of the Contribution of the Marine Environment to Non-Market Recreational Activities in Malta:

- o Caruana, C. (2005), "An Economic Valuation of a Beach on the Island of Malta: Pretty Bay B'Bugia", Unpublished Dissertation, Institute of Islands and Small States Studies, University of Malta;
- o Camilleri Rolls, C. (2006), "Economic Valuation of Ramla Bay", Unpublished Dissertation, Institute of Islands and Small States Studies, University of Malta.

## **9. Assessing the usage of the marine environment by the Maltese economy**

### *(i) "Direct use – economic sectors"*

As mentioned earlier, the economic sectors chosen to be assessed in this ESA have a direct or indirect dependence on the marine environment through one of the three functions mentioned previously, namely (i) provision of resources, (ii) input into product/service provision, and (iii) sink function. This section aims to validate the reasons for the inclusion of certain sectors which may appear at face value to have few ties with the marine environment but which, on the other hand, have more of a bearing on an archipelago like the Maltese islands. This mapping exercise is portrayed more clearly in Table 5.

One must note however, that very few of these sectors depend entirely on the marine environment for their economic activities. The reason for this may be two-fold; (i) some NACE codes incorporate more than one sector/entity which implies that the use of the marine environment may not be common to all, (ii) some sectors, though making use of the sea's resources, do not do so exclusively for all aspects of their economic activity. The extent of these sectors' dependence will, therefore, be assessed in the subsequent section.

Table 5: The use of the marine environment by economic sector<sup>39</sup>

| MSFD list  | NACE code Description                  |   | Use of the marine environment |                          |   |            |                                |
|--|--|---|-------------------------------|--------------------------|---|------------|--------------------------------|
|  |  |   | Provision of resources        |                          | Input into product or service provision |            | Absorbing waste or by-products |
|  |  |   | Directly                      | Intermediate consumption | Directly                                | Indirectly |                                |
| Aquaculture and mariculture Fisheries  | 03                                     | Fishing and aquaculture   | X                             |                          |   |            |                                |
| Shipping construction and transport  | 30                                     | Manufacture of other transport equipment  |                               |                          | X                                       |            |                                |
|  | 33                                     | Repair and installation of machinery and equipment                                |                               |                          | X                                       |            |                                |
| Defence - Military   | 84                                     | Public administration and defence; compulsory social security                     |                               |                          | X                                       |            |                                |
| Tourism  | 47                                     | Retail trade, except of motor vehicles and motorcycles                            |                               |                          |   | X          |                                |
|  | 55                                     | Accommodation   |                               |                          | X                                       |            |                                |
|  | 56                                     | Food and beverage service activities  |                               |                          |   | X          |                                |
|  | 68                                     | Real Estate   |                               |                          |   | X          |                                |
|  | 79                                     | Travel Agency, tour operator and other reservation service and related activities |                               |                          | X                                       |            |                                |
| Mining (gravel, sand and shell extraction)   | 08                                     | Other mining and quarrying  | (X)                           |                          |   |            |                                |
|  | 09                                     | Mining support service activities   |                               |                          |   |            |                                |
| Oil and Gas  | 35                                     | Electricity, gas, steam and air conditioning supply                               |                               |                          | X                                       |            |                                |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors)                      | 49                                     | Land transport and transport via pipelines  |                               |                          | (X)                                     |            |                                |
|  | 61                                     | Telecoms  |                               |                          | X                                       |            |                                |
|  | 92                                     | Gaming  |                               |                          | X                                       |            |                                |
| Water abstraction  | 36                                     | Water collection, treatment and supply  | X                             | X                        |   | X          |                                |
| The use of the marine water for waste and wastewater disposal (agriculture, industry, households etc.) | 37                                     | Sewerage  |                               |                          |   | X          |                                |
|  | 39                                     | Remediation activities and other waste management services                        |                               |                          |   | X          |                                |
| Water transport  | 50                                     | Water transport   |                               |                          | X                                       |            |                                |
|  | 52                                     | Warehousing and support activities for transportation                             |                               |                          | X                                       |            |                                |
| Supporting infrastructure (e.g. ports, marinas, navigation aids).                                      | 42                                     | Civil engineering   |                               |                          | X                                       |            |                                |
|  | 43                                     | Specialised construction activity   |                               |                          | X                                       | (X)        |                                |
| Others   | 01                                     | Crop and animal production  |                               | X                        |   | X          |                                |
|  | 10                                     | Manufacture of food products  |                               | X                        |   |            |                                |
|  | 11                                     | Manufacture of beverages  |                               | X                        |   |            |                                |
|  | 65                                     | Insurance, reinsurance  |                               |                          | X                                       |            |                                |
|  | 69                                     | Legal and Accounting  |                               |                          |   | X          |                                |
|  | 71                                     | Architectural and engineering   |                               |                          |   |            |                                |
|  | 72                                     | Scientific research and development   |                               |                          | X                                       |            |                                |
|  | 75                                     | Veterinary activities   |                               |                          | X                                       |            |                                |
|  | 90                                     | Creative, arts and entertainment  |                               |                          | X                                       |            |                                |
|  | 91                                     | Library, museum, culture  |                               |                          | X                                       |            |                                |
|  | 93                                     | Sports activities and amusement and recreation activities                         |                               |                          | X                                       |            |                                |
| 94   | Activities of membership organisations |   |                               | X                        |   |            |                                |

<sup>39</sup> Where "(X)" implies the potential for such use in Malta. In addition, as in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

### *Provision of resources*

A number of the sectors assessed make use of the resources which the surrounding sea provide either directly – for final consumption – or indirectly – as an input into the production of some other good. In the case of the “fishing and aquaculture” and “water collection, treatment and supply” sectors, the direct extraction of the sea’s resources, with respect to fish and sea water respectively, necessarily implies these sectors’ total dependence on the marine environment. In addition, the activities of the latter sector also result in an important input in the production of some other sectors.

Other sectors including “crop and animal production”, the “manufacture of food products” and the “manufacture of beverages” make use, in part, of desalinated sea water as an intermediate product in the “manufacture” of their goods. With respect to the former, desalinated water is used by the livestock sector. Lastly, oil exploration activities are from time to time undertaken in Malta. Though no oil has yet been extracted, the potential still lies for a direct extraction of this resource at sea.

### *Input into product or service provision*

The use of the marine environment as a direct input into the provision of products or services is the most popular use made of the marine environment in Malta. This, however, does not imply that the sectors making use of the marine environment in this manner are totally dependent on it for their economic activity. It, however, means that in some way or another they do benefit from the existence of the marine environment in its current state.

The islandness characteristic of Malta, namely it being surrounded by the sea, gives rise to the existence and/or greater importance of certain sectors as well as that of particular activities within sectors. This may not feature in the same NACE categories in other countries, or at least to the same degree. Examples of this are the “manufacture of other {marine} transport equipment”, the “repair and installation of {marine} machinery and equipment”, “water transport”, “warehousing and support activities for {sea} transportation”, marine-related “civil engineering”, “specialised construction activity” and “architectural and engineering” activity, and “insurance and reinsurance” of marine activities. Indirectly, part of the activities of the “legal and accounting

sector" is also linked to the marine environment, also with respect to maritime insurance and maritime activities more generally.

In addition, part of the activities undertaken within the sectors related to "scientific research and development", "veterinary activities", "sports activities and amusement and recreation activities", and "membership organisations" are also directly linked to the sea and marine. The sector "library, museum and culture" is also assessed with respect to the maritime museum that also owes its very existence to Malta's dependence on the sea. In addition, part of the activities of the Armed Forces of Malta (AFM) – particularly with respect to the marine squad – is directly related to Malta being surrounded by the sea. This, as well as the functions of the customs department in Malta (wherein the vast majority of imported goods are done by sea transportation), are assessed within the NACE category "public administration and defence". Lastly, the "creative, arts and entertainment" sector includes the film industry in Malta, which has also attracted a number of blockbuster movies and which is primarily attracted by sea characteristics.

The very nature of Malta's geographical features, therefore, implies that sea-related activities are more widespread than in other countries which entails a certain dependence on the marine environment for their existence.

Other sectors also use the marine environment directly as an input into the product or service provided. The "electricity, gas, steam and air conditioning supply" is one such sector where water is required for cooling purposes in the production of electricity. In addition, the importation of oil and gas is done by sea. The use of under water cables is indispensable for the existence of the telecommunications and gaming industries. Lastly, transport of hydrocarbons via pipelines would also require direct use of the marine environment for the service it intends to provide. Though no pipelines yet connect to Malta, this will change if the gas pipeline linking Malta to the European market and the bridge between Malta and Gozo is developed.

The tourism industry also directly and indirectly makes use of the marine environment in the provision of its service. The direct use of the sea is reflected in the activities of "tour operators" and "accommodation" with a number of tourists visiting Malta to engage in sea-related activities. However, an element of indirect use also exists given greater welfare obtained by tourists who appreciate the existence of the

quality of Malta's sea even though not directly making use of it for some of their activities. The "food and beverage service activities", for instance, is indirectly affected by clients who may be more attracted to restaurants with a sea view. The same can be said of hotels in proximity of the sea as well as the real estate sector where foreigners may be particularly attracted to rooms/apartments with a sea-view. Retail trade may also be positively affected by the number of tourists attracted to Malta's sun and sea destination even though not all shops are found in coastal resorts.

### *Sink function*

The last of the three functions of the marine environment that are being considered is a sink function. The "sewerage" and "remediation activities and other waste management services" have a direct use since treated sewerage is disposed of at sea. In treating water, through desalination, waste (brine) is also produced and disposed of at sea. In addition, both "crop and animal production" give rise to waste (such as manure), and by-products (such as pesticides and manure<sup>40</sup>) that result in a run-off to the sea. Lastly, though exceptional and in need of specific permits, part of construction waste may also be disposed of at sea.

### *Assessment by sector*

In order to estimate the use of the marine environment in Malta, a sectoral analysis was undertaken<sup>41</sup> and then aggregated in order to obtain a global value for each of the variables assessed. The percentage usage of the marine environment was estimated through official documentation<sup>42</sup>, interviews with key experts<sup>43</sup>, as well as own calculations and expertise. An element of subjectivity is, of course, involved in such estimates though this falls within the limits of our margin of error.

---

<sup>40</sup> Manure can be considered both as waste or a by-product used to fertilise land.

<sup>41</sup> Some NACE categories were aggregated for confidentiality reasons due to the small number of operators in certain sectors.

<sup>42</sup> These will be made reference to when they are used within the report.

<sup>43</sup> Experts were consulted in the fields of telecommunications, gaming, food and beverage, and insurance,

Table 6: NACE 1 – Crop and Animal Production

|  | NACE Code: 1  |         |         |         |         |         |         |                |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 5,679   | 5,695   | 5,565   | 5,876   | 5,992   | 6,048   | 5,876   | 0.6%           |
| Output   | 144,758   | 142,347 | 150,666 | 148,482 | 146,741 | 150,300 | 148,614 | 0.4%           |
| Intermediate Consumption   | 70,506  | 75,186  | 83,314  | 73,339  | 71,942  | 75,924  | 74,701  | 1.0%           |
| Gross Value Added  | 74,253  | 67,161  | 67,352  | 75,143  | 74,799  | 74,376  | 73,912  | -0.1%          |
| Gross Operating Surplus  | 59,860  | 55,598  | 57,362  | 60,700  | 58,163  | 55,175  | 52,393  | -2.2%          |
| Compensation to Employees  | 19,623  | 15,756  | 15,295  | 20,151  | 21,479  | 22,076  | 22,611  | 2.4%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 9.5%  | 9.5%    | 9.5%    | 9.5%    | 9.5%    | 9.5%    | 9.5%    |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         |                |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 540   | 541     | 529     | 559     | 570     | 575     | 559     | 0.6%           |
| Output   | 13,761  | 13,532  | 14,323  | 14,115  | 13,950  | 14,288  | 14,128  | 0.4%           |
| Intermediate Consumption   | 6,703   | 7,147   | 7,920   | 6,972   | 6,839   | 7,218   | 7,101   | 1.0%           |
| Gross Value Added  | 7,059   | 6,385   | 6,403   | 7,143   | 7,111   | 7,070   | 7,026   | -0.1%          |
| Gross Operating Surplus  | 5,690   | 5,285   | 5,453   | 5,770   | 5,529   | 5,245   | 4,981   | -2.2%          |
| Compensation to Employees  | 1,865   | 1,498   | 1,454   | 1,916   | 2,042   | 2,099   | 2,149   | 2.4%           |

FTE employment is measured in number of persons. Other variables are in €000s

The use of the marine environment within NACE 1 is assessed through the following uses:

- i) Use of desalinated water as an *input into the product provision*:  
Desalinated water is, in part, used for breeding animals. Approximately 4.5% of water comes from sea water which is treated through a reverse osmosis water processor<sup>44</sup>. The rest comes from groundwater or own reservoirs;
- ii) The *sink function* for waste and other by-products. This section aims to assess the loss of use of marine environment, through degradation and/or regulation and similar restrictions, which would lead to a significant loss of economic activity.
  - i. Denitrification of manure – Part of the manure produced, either as waste or used to fertilise land, runs off into the sea. Nitrates, which are found in manure, are particularly harmful to the marine environment and, as a result, restrictions on their use could limit economic activity of this sector. Currently, approximately 750,000 tonnes of manure<sup>45</sup> are produced annually, implying an element of run off of

<sup>44</sup> FAO (2006)

<sup>45</sup> Estimate is based on a calculation taking into account the headcount in the livestock population and the average daily production of solid and liquid manure per head.

nitrate into the sea and may need to be treated in the future in order to avoid further harm to the marine environment.

- ii. Less organic farming – The amount of run-offs into the sea is reduced if a percentage of agricultural products are produced utilising organic farming techniques. A minimal number of agricultural units in Malta are registered as engaging in organic farming and, therefore, this sector's use of the marine environment was not reduced.

For the purposes of this report, 9.5% of this sector's activities are considered to be dependent on the marine waters.

Table 7: NACE 3 – Fishing and Aquaculture

|  | NACE Code: 3  |             |             |             |             |             |             |                |
|--|---|-------------|-------------|-------------|-------------|-------------|-------------|----------------|
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 845   | 885         | 899         | 959         | 944         | 928         | 928         | 1.6%           |
| Output   | 94,924  | 140,489     | 99,298      | 90,267      | 71,690      | 60,996      | 104,599     | 1.6%           |
| Intermediate Consumption   | 64,872  | 107,662     | 89,806      | 76,091      | 52,090      | 47,694      | 86,925      | 5.0%           |
| Gross Value Added  | 30,052  | 32,827      | 9,492       | 14,176      | 19,600      | 13,302      | 17,674      | -8.5%          |
| Gross Operating Surplus  | 24,454  | 26,408      | 3,184       | 6,600       | 12,300      | 6,575       | 11,092      | -12.3%         |
| Compensation to Employees  | 5,395   | 6,152       | 5,954       | 7,188       | 6,892       | 6,415       | 6,987       | 4.4%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>100%</i>   | <i>100%</i> | <i>100%</i> | <i>100%</i> | <i>100%</i> | <i>100%</i> | <i>100%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |             |             |             |             |             |             |                |
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 845   | 885         | 899         | 959         | 944         | 928         | 928         | 1.6%           |
| Output   | 94,924  | 140,489     | 99,298      | 90,267      | 71,690      | 60,996      | 104,599     | 1.6%           |
| Intermediate Consumption   | 64,872  | 107,662     | 89,806      | 76,091      | 52,090      | 47,694      | 86,925      | 5.0%           |
| Gross Value Added  | 30,052  | 32,827      | 9,492       | 14,176      | 19,600      | 13,302      | 17,674      | -8.5%          |
| Gross Operating Surplus  | 24,454  | 26,408      | 3,184       | 6,600       | 12,300      | 6,575       | 11,092      | -12.3%         |
| Compensation to Employees  | 5,395   | 6,152       | 5,954       | 7,188       | 6,892       | 6,415       | 6,987       | 4.4%           |

FTE employment is measured in number of persons. Other variables are in €000s

By its very nature, fishing results in a *direct extraction of resources* from the sea. As a result, the dependence on the marine environment of this sector is 100%.

Table 8: NACE 8 & 9 – Other Mining & Quarrying, and Mining Support Service Activities

|  | NACE Code: 8 & 9  |        |        |        |        |        |        |                |
|--|---|--------|--------|--------|--------|--------|--------|----------------|
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 354   | 381    | 402    | 284    | 256    | 242    | 220    | -7.6%          |
| Output   | 54,787  | 53,897 | 53,973 | 58,096 | 52,123 | 51,802 | 48,300 | -2.1%          |
| Intermediate Consumption   | 41,129  | 47,090 | 44,178 | 47,550 | 44,263 | 43,258 | 40,523 | -0.2%          |
| Gross Value Added  | 13,658  | 6,807  | 9,795  | 10,546 | 7,860  | 8,544  | 7,777  | -9.0%          |
| Gross Operating Surplus  | 8,885   | 1,888  | 5,965  | 6,528  | 4,156  | 4,817  | 4,409  | -11.0%         |
| Compensation to Employees  | 4,740   | 4,888  | 3,794  | 3,976  | 3,659  | 3,690  | 3,343  | -5.7%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 5.0%  | 5.0%   | 5.0%   | 5.0%   | 5.0%   | 5.0%   | 5.0%   |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |        |        |        |        |        |                |
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 18  | 19     | 20     | 14     | 13     | 12     | 11     | -7.6%          |
| Output   | 2,739   | 2,695  | 2,699  | 2,905  | 2,606  | 2,590  | 2,415  | -2.1%          |
| Intermediate Consumption   | 2,056   | 2,355  | 2,209  | 2,377  | 2,213  | 2,163  | 2,026  | -0.2%          |
| Gross Value Added  | 683   | 340    | 490    | 527    | 393    | 427    | 389    | -9.0%          |
| Gross Operating Surplus  | 444   | 94     | 298    | 326    | 208    | 241    | 220    | -11.0%         |
| Compensation to Employees  | 237   | 244    | 190    | 199    | 183    | 184    | 167    | -5.7%          |

FTE employment is measured in number of persons. Other variables are in €000s

Oil exploration activity are from time to time undertaken in Malta. No oil has yet been extracted<sup>46</sup> and, as a result, the use of the marine environment as a *provision of resources* is still a potential use. However, part of the activity of this sector still takes place at sea. After consulting the National Statistics Office, a 5% usage of the marine environment was considered to be a prudent estimate.

Table 9: NACE 10 – Manufacturing of Food Products

|  | NACE Code: 10   |         |         |         |         |         |         |                |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,614   | 2,576   | 2,532   | 2,515   | 2,496   | 2,508   | 2,538   | -0.5%          |
| Output   | 244,013   | 245,314 | 283,230 | 269,213 | 277,444 | 272,231 | 295,010 | 3.2%           |
| Intermediate Consumption   | 183,630   | 183,195 | 206,802 | 201,056 | 205,686 | 207,259 | 224,978 | 3.4%           |
| Gross Value Added  | 60,382  | 62,119  | 76,428  | 68,157  | 71,758  | 64,971  | 70,033  | 2.5%           |
| Gross Operating Surplus  | 27,909  | 29,170  | 43,089  | 34,258  | 37,364  | 31,646  | 34,651  | 3.7%           |
| Compensation to Employees  | 32,479  | 32,877  | 33,275  | 33,781  | 34,223  | 33,205  | 35,324  | 1.4%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 39.9%   | 39.9%   | 39.9%   | 39.9%   | 39.9%   | 39.9%   | 39.9%   |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         |                |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 1,042   | 1,027   | 1,009   | 1,002   | 995     | 1,000   | 1,012   | -0.5%          |
| Output   | 97,250  | 97,769  | 112,880 | 107,294 | 110,574 | 108,496 | 117,575 | 3.2%           |
| Intermediate Consumption   | 73,185  | 73,011  | 82,420  | 80,130  | 81,975  | 82,602  | 89,664  | 3.4%           |
| Gross Value Added  | 24,065  | 24,757  | 30,460  | 27,164  | 28,599  | 25,894  | 27,911  | 2.5%           |
| Gross Operating Surplus  | 11,123  | 11,626  | 17,173  | 13,653  | 14,891  | 12,612  | 13,810  | 3.7%           |
| Compensation to Employees  | 12,944  | 13,103  | 13,262  | 13,463  | 13,639  | 13,234  | 14,078  | 1.4%           |

FTE employment is measured in number of persons. Other variables are in €000s

<sup>46</sup> Oil extraction would feature under NACE code 6.

Desalinated sea water is, in part, used as an *input* in the manufacturing of food products in Malta. The use of reservoirs is limited in this sector and, as a result, all water is purchased from the Water Service Corporation (WSC) that sell a mix of Reverse Osmosis (RO) water and groundwater. Approximately 39.9%<sup>47</sup> of all water consumed by this sector is desalinated water.

Table 10: NACE 11 – Manufacture of Beverages

|  | NACE Code: 11   |              |              |              |              |              |              | Average Growth |
|--|---|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
|  | 2006  | 2007         | 2008         | 2009         | 2010         | 2011         | 2012         |                |
| FTE Employment   | 910   | 866          | 946          | 921          | 854          | 833          | 833          | -1.5%          |
| Output   | 70,800  | 75,526       | 81,484       | 75,411       | 74,818       | 76,701       | 79,925       | 2.0%           |
| Intermediate Consumption   | 45,816  | 48,158       | 50,911       | 45,391       | 44,915       | 48,287       | 50,408       | 1.6%           |
| Gross Value Added  | 24,984  | 27,368       | 30,573       | 30,020       | 29,903       | 28,414       | 29,517       | 2.8%           |
| Gross Operating Surplus  | 9,605   | 10,411       | 10,850       | 11,847       | 12,197       | 10,610       | 11,502       | 3.1%           |
| Compensation to Employees  | 15,380  | 16,951       | 19,717       | 18,164       | 17,693       | 17,797       | 18,011       | 2.7%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>49.5%</i>  | <i>49.5%</i> | <i>49.5%</i> | <i>49.5%</i> | <i>49.5%</i> | <i>49.5%</i> | <i>49.5%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |              |              |              |              |              |              |                |
|  | 2006  | 2007         | 2008         | 2009         | 2010         | 2011         | 2012         | Average Growth |
| FTE Employment   | 450   | 429          | 468          | 456          | 423          | 412          | 412          | -1.5%          |
| Output   | 35,046  | 37,385       | 40,335       | 37,328       | 37,035       | 37,967       | 39,563       | 2.0%           |
| Intermediate Consumption   | 22,679  | 23,838       | 25,201       | 22,469       | 22,233       | 23,902       | 24,952       | 1.6%           |
| Gross Value Added  | 12,367  | 13,547       | 15,134       | 14,860       | 14,802       | 14,065       | 14,611       | 2.8%           |
| Gross Operating Surplus  | 4,754   | 5,153        | 5,371        | 5,864        | 6,038        | 5,252        | 5,694        | 3.1%           |
| Compensation to Employees  | 7,613   | 8,391        | 9,760        | 8,991        | 8,758        | 8,809        | 8,916        | 2.7%           |

FTE employment is measured in number of persons. Other variables are in €000s

Desalinated water is also made use of as an *intermediate consumption* in the production of beverages in Malta. Given the greater need for water in this sector than in the production of food products, the dependence on the marine environment is naturally larger. On the basis of consultations carried out with experts in the sector, it is estimated that only approximately 10% of water usage by this sector makes use of private reservoirs. 55%<sup>48</sup> of the remainder requires RO water. This, therefore, amounts to 49.5% of total marine water usage.

<sup>47</sup> FAO (2006)

<sup>48</sup> FAO (2006)

Table 11: NACE 30 & 33 – Manufacture of other Transport Equipment, and Repair and Installation of Machinery Equipment

|  | NACE Code: 30 & 33  |          |         |         |        |         |         |                |
|--|---|----------|---------|---------|--------|---------|---------|----------------|
|  | 2006  | 2007     | 2008    | 2009    | 2010   | 2011    | 2012    | Average Growth |
| FTE Employment   | 4,637   | 4,579    | 2,112   | 1,199   | 1,033  | 1,064   | 1,045   | -22.0%         |
| Output   | 94,069  | 89,364   | 172,432 | 117,576 | 88,260 | 112,135 | 118,953 | 4.0%           |
| Intermediate Consumption   | 64,151  | 73,895   | 76,259  | 56,186  | 58,050 | 64,065  | 70,053  | 1.5%           |
| Gross Value Added  | 29,918  | 15,469   | 96,173  | 61,389  | 30,210 | 48,071  | 48,900  | 8.5%           |
| Gross Operating Surplus  | - 1,868   | - 30,449 | 2,854   | 7,866   | 2,715  | 16,327  | 18,439  |                |
| Compensation to Employees  | 46,793  | 56,656   | 93,250  | 53,440  | 27,398 | 31,665  | 30,407  | -6.9%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 58%   | 44%      | 88%     | 67%     | 48%    | 46%     | 40%     |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |          |         |         |        |         |         |                |
|  | 2006  | 2007     | 2008    | 2009    | 2010   | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,689   | 2,015    | 1,859   | 804     | 496    | 489     | 418     | -26.7%         |
| Output   | 54,560  | 39,320   | 151,740 | 78,776  | 42,365 | 51,582  | 47,581  | -2.3%          |
| Intermediate Consumption   | 37,208  | 32,514   | 67,108  | 37,645  | 27,864 | 29,470  | 28,021  | -4.6%          |
| Gross Value Added  | 17,353  | 6,806    | 84,632  | 41,131  | 14,501 | 22,112  | 19,560  | 2.0%           |
| Gross Operating Surplus  | - 1,084   | - 13,398 | 2,511   | 5,270   | 1,303  | 7,510   | 7,376   |                |
| Compensation to Employees  | 27,140  | 24,929   | 82,060  | 35,805  | 13,151 | 14,566  | 12,163  | -12.5%         |

FTE employment is measured in number of persons. Other variables are in €000s

The fact that Malta is an island implies that shipping is a relatively important sector to the local economy. The sea, therefore, is *directly used as an input for the provision of this good and service*. The percentage of activities attributable to shipping was estimated by the National Statistics Office (NSO) as shown in Table 11. This averages out to approximately 56% of the activities of firms within these NACE categories directly making use of the marine waters in their product and service provision.

Table 12: NACE 35, 36, 37 & 39 - Electricity, gas, steam and air conditioning supply; Water collection, treatment and supply; Sewerage; and Remediation activities and other waste management services

|  | NACE Code: 35, 36, 37 & 39 |         |         |         |         |         |         |                |
|--|----------------------------|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006                       | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 3,060                      | 2,951   | 2,829   | 2,712   | 2,600   | 2,563   | 2,488   | -3.4%          |
| Output   | 570,115                    | 594,667 | 713,950 | 644,429 | 698,185 | 721,175 | 794,206 | 5.7%           |
| Intermediate Consumption   | 488,399                    | 508,493 | 640,549 | 529,482 | 585,144 | 673,852 | 799,206 | 8.6%           |
| Gross Value Added  | 81,717                     | 86,175  | 73,401  | 114,946 | 113,041 | 47,323  | 5,001   |                |
| Gross Operating Surplus  | 31,148                     | 33,620  | 19,309  | 57,535  | 55,407  | 12,705  | 65,417  |                |
| Compensation to Employees  | 54,454                     | 56,447  | 57,986  | 56,890  | 57,109  | 59,500  | 59,685  | 1.5%           |
| <b>Proportion of Sector Activity Depending on Marine Environment</b>   |                            |         |         |         |         |         |         |                |
|  | 90%                        | 90%     | 90%     | 90%     | 90%     | 90%     | 90%     |                |
| <b>Estimated Economic Activity Dependent on the Marine Environment</b> |                            |         |         |         |         |         |         |                |
|  | 2006                       | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,754                      | 2,656   | 2,546   | 2,441   | 2,340   | 2,307   | 2,239   | -3.4%          |
| Output   | 513,104                    | 535,200 | 642,555 | 579,986 | 628,367 | 649,058 | 714,785 | 5.7%           |
| Intermediate Consumption   | 439,559                    | 457,644 | 576,494 | 476,534 | 526,630 | 606,467 | 719,285 | 8.6%           |
| Gross Value Added  | 73,545                     | 77,558  | 66,061  | 103,451 | 101,737 | 42,591  | 4,501   |                |
| Gross Operating Surplus  | 28,033                     | 30,258  | 17,378  | 51,782  | 49,866  | 11,435  | 58,875  |                |
| Compensation to Employees  | 49,009                     | 50,802  | 52,187  | 51,201  | 51,398  | 53,550  | 53,717  | 1.5%           |

FTE employment is measured in number of persons. Other variables are in €000s

The four sectors aggregated in table 12 almost exclusively depend on the marine environment for their economic activity.

NACE 35 – Electricity production requires water as an *intermediate consumption* for cooling purposes. In addition, importation of oil and gas is done by sea and, therefore, makes use of the sea *directly to provide this service*;

NACE 36 – *Direct extraction of sea water* is used for final consumption as well as an intermediate consumption for some sectors;

NACE 37&39 – Treated sewerage is disposed of at sea and is, therefore, also used as a *sink*.

Following consultations with experts at the NSO, approximately 90% of total activity of these four NACE categories was estimated to make use of the marine environment.

Table 13: NACE 42 & 43 –Civil Engineering and Specialised Construction activity<sup>49</sup>

|  | NACE Code: 42 & 43  |             |              |             |             |             |             | Average Growth |
|--|---|-------------|--------------|-------------|-------------|-------------|-------------|----------------|
|  | 2006  | 2007        | 2008         | 2009        | 2010        | 2011        | 2012        |                |
| FTE Employment   | 5,094   | 5,093       | 4934         | 5,429       | 5,417       | 5,416       | 5,431       | 1.1%           |
| Output   | 263,357   | 273,955     | 270802       | 288,423     | 290,754     | 290,402     | 294,293     | 1.9%           |
| Intermediate Consumption   | 175,235   | 182,717     | 180615       | 185,463     | 188,163     | 188,136     | 190,150     | 1.4%           |
| Gross Value Added  | 88,122  | 91,238      | 90188        | 102,960     | 102,591     | 102,265     | 104,144     | 2.8%           |
| Gross Operating Surplus  | 40,903  | 40,477      | 38249        | 49,308      | 48,246      | 47,371      | 49,233      | 3.1%           |
| Compensation to Employees  | 45,453  | 49,109      | 50135        | 51,615      | 52,141      | 53,155      | 53,726      | 2.8%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>7.0%</i>   | <i>7.1%</i> | <i>22.3%</i> | <i>6.1%</i> | <i>0.0%</i> | <i>8.5%</i> | <i>8.8%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |             |              |             |             |             |             | Average Growth |
|  | 2006  | 2007        | 2008         | 2009        | 2010        | 2011        | 2012        |                |
| FTE Employment   | 356   | 363         | 1,100        | 332         | 0           | 461         | 479         | 5.1%           |
| Output   | 18,406  | 19,547      | 60,370       | 17,631      | 21          | 24,706      | 25,931      | 5.9%           |
| Intermediate Consumption   | 12,247  | 13,037      | 40,264       | 11,337      | 14          | 16,006      | 16,754      | 5.4%           |
| Gross Value Added  | 6,159   | 6,510       | 20,106       | 6,294       | 7           | 8,700       | 9,176       | 6.9%           |
| Gross Operating Surplus  | 2,859   | 2,888       | 8,527        | 3,014       | 3           | 4,030       | 4,338       | 7.2%           |
| Compensation to Employees  | 3,177   | 3,504       | 11,177       | 3,155       | 4           | 4,522       | 4,734       | 6.9%           |

FTE employment is measured in number of persons. Other variables are in €000s

Marine-related construction is undertaken to an important extent in Malta due to it being an island. The sea is, therefore, used *directly* as an input in the provision of marine infrastructure, and accounted for by these two sectors. Approximately 8.6%<sup>50</sup> of the economic activity of these sectors is estimated to be tied to marine-related infrastructural projects and, therefore, to make use of the marine environment.

In addition, part of construction waste may be disposed of at sea. Since the occurrence of this is limited, and requires specific permits, it has not been taken into account in computing the extent of the use of the marine environment of these two sectors.

<sup>49</sup> Over past years the fluctuations experienced in the percentage use of the marine environment were project driven. These are likely to continue in forthcoming years as a number of initiatives are expected to be developed in this sector.

<sup>50</sup> Estimate NSO

Table 14: NACE 47 – Retail trade, except of motor vehicles and motorcycles

|  | NACE Code: 47   |             |             |             |             |             |             |                |
|--|---|-------------|-------------|-------------|-------------|-------------|-------------|----------------|
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 12,955  | 13,314      | 13,672      | 14,142      | 14,449      | 14,678      | 14,788      | 2.2%           |
| Output   | 350,575   | 368,394     | 386,368     | 408,327     | 417,125     | 428,878     | 436,033     | 3.7%           |
| Intermediate Consumption   | 125,082   | 138,541     | 152,037     | 164,516     | 168,070     | 172,940     | 178,585     | 6.1%           |
| Gross Value Added  | 225,493   | 229,852     | 234,331     | 243,812     | 249,056     | 255,938     | 257,448     | 2.2%           |
| Gross Operating Surplus  | 124,505   | 118,523     | 112,049     | 120,290     | 118,128     | 122,381     | 121,011     | -0.5%          |
| Compensation to Employees  | 97,095  | 107,835     | 118,576     | 119,418     | 126,388     | 129,881     | 133,974     | 5.5%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>5.6%</i>   | <i>6.4%</i> | <i>6.1%</i> | <i>5.5%</i> | <i>6.8%</i> | <i>7.6%</i> | <i>8.2%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |             |             |             |             |             |             |                |
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 724   | 856         | 829         | 775         | 984         | 1,122       | 1,208       | 8.9%           |
| Output   | 19,590  | 23,681      | 23,422      | 22,381      | 28,396      | 32,785      | 35,624      | 10.5%          |
| Intermediate Consumption   | 6,990   | 8,906       | 9,217       | 9,017       | 11,442      | 13,220      | 14,591      | 13.0%          |
| Gross Value Added  | 12,601  | 14,776      | 14,206      | 13,363      | 16,955      | 19,565      | 21,034      | 8.9%           |
| Gross Operating Surplus  | 6,957   | 7,619       | 6,793       | 6,593       | 8,042       | 9,355       | 9,887       | 6.0%           |
| Compensation to Employees  | 5,426   | 6,932       | 7,188       | 6,545       | 8,604       | 9,929       | 10,946      | 12.4%          |

FTE employment is measured in number of persons. Other variables are in €000s

A proportion of retail trade is sold to tourists. The fact that Malta is a sun and sea destination indirectly helps to add to the number of tourists and, as a result, increase the amount of retail sales. Therefore, indirectly, the sea is used as an *input in the provision of this service*.

An estimate of the dependence on the marine environment of this sector is taken by multiplying the element of tourist consumption in total expenditure (excluding expenditure on hotels and restaurants)<sup>51</sup> by the number of tourists who are estimated to be attracted to Malta in order to engage in sea-related activities<sup>52</sup>. This provides us with an estimate of approximately 6.6% p.a. of retail trade that is dependent on the marine environment.

<sup>51</sup> Source: NSO

<sup>52</sup> This is estimated more precisely for NACE 55 "Accommodation"

Table 15: NACE 49 - Land transport and transport via pipelines

|  | NACE Code: 49   |         |         |         |         |         |         |                |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,403   | 2,612   | 2,692   | 2,515   | 2,440   | 2,674   | 3,075   | 4.2%           |
| Output   | 94,006  | 104,659 | 109,689 | 108,466 | 123,851 | 128,841 | 148,443 | 7.9%           |
| Intermediate Consumption   | 48,575  | 55,890  | 58,661  | 58,962  | 68,686  | 74,339  | 89,932  | 10.8%          |
| Gross Value Added  | 45,431  | 48,769  | 51,028  | 49,503  | 55,165  | 54,502  | 58,511  | 4.3%           |
| Gross Operating Surplus  | 35,107  | 37,234  | 41,358  | 38,534  | 48,099  | 40,169  | 27,949  | -3.7%          |
| Compensation to Employees  | 12,712  | 15,042  | 15,549  | 16,644  | 16,471  | 22,811  | 37,601  | 19.8%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | -   | -       | -       | -       | -       | -       | -       |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         |                |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | -   | -       | -       | -       | -       | -       | -       | 0%             |
| Output   | -   | -       | -       | -       | -       | -       | -       | 0%             |
| Intermediate Consumption   | -   | -       | -       | -       | -       | -       | -       | 0%             |
| Gross Value Added  | -   | -       | -       | -       | -       | -       | -       | 0%             |
| Gross Operating Surplus  | -   | -       | -       | -       | -       | -       | -       | 0%             |
| Compensation to Employees  | -   | -       | -       | -       | -       | -       | -       | 0%             |

FTE employment is measured in number of persons. Other variables are in €000s

Currently no pipelines exist in Malta apart from the pipeline connecting Libya and Sicily which passes on Malta's continental shelf. Therefore, the extent to which this sector is using the marine environment has no impact on Malta's economic activity. However, this will change if a gas pipeline linking Malta to the European market and the bridge between Malta and Gozo are developed. In this case, the sea will be *directly used in the service provision of this sector*.

Table 16: NACE 50 – Water transport

|  | NACE Code: 50   |        |         |        |        |        |        |                |
|--|---|--------|---------|--------|--------|--------|--------|----------------|
|  | 2006  | 2007   | 2008    | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 498   | 368    | 554     | 553    | 574    | 519    | 529    | 1.0%           |
| Output   | 64,179  | 86,079 | 107,984 | 78,719 | 75,259 | 79,779 | 75,801 | 2.8%           |
| Intermediate Consumption   | 48,220  | 68,825 | 89,580  | 63,356 | 60,375 | 61,191 | 60,126 | 3.7%           |
| Gross Value Added  | 15,960  | 17,254 | 18,404  | 15,363 | 14,884 | 18,587 | 15,675 | -0.3%          |
| Gross Operating Surplus  | 8,346   | 10,071 | 11,464  | 8,193  | 9,838  | 11,224 | 4,629  | -9.4%          |
| Compensation to Employees  | 11,185  | 10,900 | 10,614  | 10,956 | 11,337 | 10,765 | 11,616 | 0.6%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 100%  | 100%   | 100%    | 100%   | 100%   | 100%   | 100%   |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |         |        |        |        |        |                |
|  | 2006  | 2007   | 2008    | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 498   | 368    | 554     | 553    | 574    | 519    | 529    | 1.0%           |
| Output   | 64,179  | 86,079 | 107,984 | 78,719 | 75,259 | 79,779 | 75,801 | 2.8%           |
| Intermediate Consumption   | 48,220  | 68,825 | 89,580  | 63,356 | 60,375 | 61,191 | 60,126 | 3.7%           |
| Gross Value Added  | 15,960  | 17,254 | 18,404  | 15,363 | 14,884 | 18,587 | 15,675 | -0.3%          |
| Gross Operating Surplus  | 8,346   | 10,071 | 11,464  | 8,193  | 9,838  | 11,224 | 4,629  | -9.4%          |
| Compensation to Employees  | 11,185  | 10,900 | 10,614  | 10,956 | 11,337 | 10,765 | 11,616 | 0.6%           |

FTE employment is measured in number of persons. Other variables are in €000s

Water transport necessarily implies that this sector requires the sea in order to provide its service. Therefore 100% dependence is attributable to this NACE category.

Table 17: NACE 52 – Warehousing and support activities for transportation

|  | NACE Code: 52   |         |         |         |         |         |         |                |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 3,173   | 3,249   | 3,250   | 3,530   | 3,985   | 3,895   | 3,622   | 2.2%           |
| Output   | 273,114   | 345,259 | 383,831 | 407,785 | 494,466 | 549,689 | 594,175 | 13.8%          |
| Intermediate Consumption   | 104,424   | 151,756 | 194,723 | 206,781 | 281,800 | 322,147 | 346,227 | 22.1%          |
| Gross Value Added  | 168,691   | 193,502 | 189,108 | 201,004 | 212,666 | 227,542 | 247,948 | 6.6%           |
| Gross Operating Surplus  | 124,863   | 142,411 | 135,745 | 145,124 | 143,676 | 159,997 | 183,473 | 6.6%           |
| Compensation to Employees  | 60,934  | 67,019  | 65,283  | 71,695  | 83,667  | 83,520  | 78,774  | 4.4%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 90%   | 90%     | 90%     | 90%     | 90%     | 90%     | 90%     |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         |                |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,856   | 2,924   | 2,925   | 3,177   | 3,587   | 3,506   | 3,259   | 2.2%           |
| Output   | 245,803   | 310,733 | 345,448 | 367,007 | 445,019 | 494,720 | 534,758 | 13.8%          |
| Intermediate Consumption   | 93,981  | 136,581 | 175,250 | 186,103 | 253,620 | 289,933 | 311,604 | 22.1%          |
| Gross Value Added  | 151,822   | 174,152 | 170,197 | 180,904 | 191,399 | 204,788 | 223,153 | 6.6%           |
| Gross Operating Surplus  | 112,377   | 128,170 | 122,170 | 130,611 | 129,309 | 143,997 | 165,126 | 6.6%           |
| Compensation to Employees  | 54,841  | 60,317  | 58,755  | 64,526  | 75,301  | 75,168  | 70,897  | 4.4%           |

FTE employment is measured in number of persons. Other variables are in €000s

Warehousing includes the activities of the Malta Freeport Corporation, which makes use directly and exclusively of the sea in its operations. This NACE category also includes the activities of ship chandlers, among others, that make *direct use of the sea in order to service ships/cruise liners*. Given the high incidence of marine activity in this NACE category, and following consultations with experts at the NSO, a 90% dependence was assumed for this sector.

Table 18: NACE 55 – Accommodation

|  | NACE Code: 55 |         |         |         |         |         |         |                |
|--|---------------|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 7,622         | 7,705   | 7,974   | 7,265   | 7,072   | 7,032   | 6,957   | -1.5%          |
| Output   | 318,953       | 332,764 | 347,625 | 327,414 | 386,054 | 404,457 | 437,823 | 5.4%           |
| Intermediate Consumption   | 165,052       | 167,064 | 170,420 | 187,094 | 221,521 | 231,983 | 251,693 | 7.3%           |
| Gross Value Added  | 153,900       | 165,700 | 177,205 | 140,319 | 164,533 | 172,474 | 186,131 | 3.2%           |
| Gross Operating Surplus  | 48,719        | 57,726  | 66,316  | 45,963  | 70,625  | 78,697  | 91,687  | 11.1%          |
| Compensation to Employees  | 104,145       | 107,026 | 109,904 | 93,450  | 92,894  | 92,759  | 93,463  | -1.8%          |
| <b>Proportion of Sector Activity Depending on Marine Environment</b>   |               |         |         |         |         |         |         |                |
|  | 62.30%        | 62.30%  | 62.30%  | 62.30%  | 62.30%  | 62.30%  | 62.30%  |                |
| <b>Estimated Economic Activity Dependent on the Marine Environment</b> |               |         |         |         |         |         |         |                |
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 4,749         | 4,801   | 4,968   | 4,526   | 4,406   | 4,381   | 4,334   | -1.5%          |
| Output   | 198,708       | 207,312 | 216,570 | 203,979 | 240,512 | 251,977 | 272,764 | 5.4%           |
| Intermediate Consumption   | 102,828       | 104,081 | 106,172 | 116,560 | 138,008 | 144,525 | 156,804 | 7.3%           |
| Gross Value Added  | 95,880        | 103,231 | 110,399 | 87,419  | 102,504 | 107,451 | 115,959 | 3.2%           |
| Gross Operating Surplus  | 30,352        | 35,963  | 41,315  | 28,635  | 43,999  | 49,028  | 57,121  | 11.1%          |
| Compensation to Employees  | 64,882        | 66,677  | 68,470  | 58,219  | 57,873  | 57,789  | 58,227  | -1.8%          |

FTE employment is measured in number of persons. Other variables are in €000s

A substantial part of tourism activity in Malta entails sea-based entertainment. Tourists make use of the sea both directly, in the activities they engage in, as well as indirectly, since the pleasure reaped in consuming certain goods and services are greater given that the sea is accessible and visible. Examples of the latter are in booking sea-view rooms since; although not directly making use of the sea, the view embellishes their experience and welfare.

In order to estimate the proportion of tourists that make use of the sea, a survey carried out by the Malta Tourism Authority (MTA) in 2012<sup>53</sup> was made use of. This survey provides a snapshot of the activities that tourists engaged in during their stay in Malta. The list of activities is found in Table 19 below.

<sup>53</sup> MTA (2012), "Market Profile Analysis Year 2012", Research Unit, Market Support & Development.

Table 19: Activities tourists in Malta engaged in (2012)

| <b>Activities Engaged In</b>     |          |                                 |          |
|----------------------------------|----------|---------------------------------|----------|
| <b>Sport/Outdoor Activities:</b> | <b>%</b> | <b>Recreational Activities:</b> | <b>%</b> |
| Swimming                         | 43.2     | Spa/wellness                    | 14.8     |
| Diving                           | 5.3      | Shopping                        | 56.5     |
| Other watersports                | 3.6      | Nightlife/clubbing              | 7.2      |
| Walking/hiking                   | 44.8     | Dine at restaurants             | 66.7     |
| Climbing                         | 0.8      | Casino                          | 2.2      |
| Golf                             | 0.3      | Cinema                          | 3.2      |
| Attend sports events             | 1.5      |                                 |          |
| Participate in sports events     | 0.9      |                                 |          |
| <b>Cultural Activities:</b>      | <b>%</b> | <b>Attend cultural events:</b>  | <b>%</b> |
| Go sightseeing                   | 86.1     | Theatrical performance          | 2.4      |
| Visit historical sites           | 77.6     | Dance                           | 1.5      |
| Visit museums                    | 50.1     | Opera                           | 0.7      |
| Visit churches                   | 68.4     | Music/concert                   | 5.1      |
| Visit arts/crafts sites          | 30.4     | Festas/folk/festival            | 12.3     |
| Visit local produce sites        | 18.0     | Visual arts                     | 3.3      |

Cultural activities were popular with tourists particularly the visiting of historical sites, churches and museums. Other activities engaged in included dining, shopping, walking/hiking and swimming.

Market Profile Year 2012

Source: MTA (2012)

Some of the activities listed in Table 19 are not considered crucial in attracting tourism to Malta. As a result, the more relevant activities were considered for this exercise and an estimate of the use of the marine environment was made for each of these activities. The resultant dependence on the sea of this sector (assumed to be one of the most indicative sectors for tourism activity in Malta) is found in Table 20.

Table 20: Dependence of Tourism Sector on the Marine Environment

|   | Percentage of tourists engaging in activity | Assumed dependence of activity on marine environment | Combined Effect |
|---|---|--|-----------------|
| Swimming  | 43.2  | 100  | 4,320           |
| Diving  | 5.3   | 100  | 530             |
| Other watersports   | 3.6   | 100  | 360             |
| Walking/hiking  | 44.8  | 75   | 3,360           |
| Nightlife   | 7.2   | 25   | 180             |
| Restaurants   | 66.7  | 75   | 5,003           |
| Sightseeing   | 86.1  | 75   | 6,458           |
| Historical  | 77.6  | 25   | 1,940           |
| Local Produce   | 18  | 50   | 900             |
| Music   | 5.1   | 0  | -               |
| Festa   | 12.3  | 0  | -               |
| <b>Total Score</b>  |   |  | <b>23,050</b>   |
| <b>Potential Score</b>  |   |  | <b>36,990</b>   |
| <b>Proportion of activity dependent on marine environment</b> |   |  | <b>62.3%</b>    |

As a result, the direct/indirect use of the marine environment in the provision of tourism-related services is estimated to amount to 62.3%. It is important to note that although a lot of summer activities take place by the sea, a lot less is undertaken in the winter months when approximately 30% of tourism to Malta takes place<sup>54</sup>.

<sup>54</sup> Source: NSO, *Departing Tourists*, various issues.

Table 21: NACE 56 - Food and beverage service activities

|  | NACE Code: 56   |         |         |         |         |         |         |                |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 5,916   | 6,240   | 6,609   | 6,688   | 6,953   | 7,433   | 7,763   | 4.6%           |
| Output   | 260,029   | 284,386 | 312,430 | 299,677 | 339,824 | 363,049 | 386,149 | 6.8%           |
| Intermediate Consumption   | 183,572   | 202,527 | 223,827 | 202,939 | 230,764 | 246,578 | 263,177 | 6.2%           |
| Gross Value Added  | 76,457  | 81,859  | 88,603  | 96,739  | 109,060 | 116,471 | 122,971 | 8.2%           |
| Gross Operating Surplus  | 30,761  | 32,924  | 35,548  | 43,105  | 51,228  | 54,355  | 57,017  | 10.8%          |
| Compensation to Employees  | 44,400  | 47,747  | 51,769  | 52,208  | 56,240  | 60,786  | 65,094  | 6.6%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 75%   | 75%     | 75%     | 75%     | 75%     | 75%     | 75%     |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         |                |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 4,437   | 4,680   | 4,957   | 5,016   | 5,215   | 5,575   | 5,822   | 4.6%           |
| Output   | 195,022   | 213,290 | 234,323 | 224,758 | 254,868 | 272,286 | 289,611 | 6.8%           |
| Intermediate Consumption   | 137,679   | 151,896 | 167,870 | 152,204 | 173,073 | 184,933 | 197,383 | 6.2%           |
| Gross Value Added  | 57,343  | 61,394  | 66,452  | 72,554  | 81,795  | 87,353  | 92,229  | 8.2%           |
| Gross Operating Surplus  | 23,071  | 24,693  | 26,661  | 32,329  | 38,421  | 40,766  | 42,762  | 10.8%          |
| Compensation to Employees  | 33,300  | 35,810  | 38,827  | 39,156  | 42,180  | 45,589  | 48,821  | 6.6%           |

FTE employment is measured in number of persons. Other variables are in €000s

Although restaurants do not make direct use of the sea, people are generally more attracted to dine in restaurants with a sea view. As a result, this sector makes *indirect use of the sea in the provision of its service*. Following consultations with experts in the sector, this dependence is estimated to be 75% given the great incidence of coastal restaurants in Malta.

It may be argued, however, that coastal towns in Malta are those which attract most trade and, as a result, restaurants situated in the proximity of Malta's coasts are generally more sought after. This causality dilemma, however, does not preclude the fact that whatever the reason for dining in a particular restaurant, a certain amount of welfare is derived from enjoying a sea view.

Table 22: NACE 61 – Telecoms

|  | NACE Code: 61 |         |         |         |         |         |         |                |
|--|---------------|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 2,051         | 1,789   | 1,769   | 1,807   | 1,537   | 1,466   | 1,372   | -6.5%          |
| Output   | 270,392       | 260,107 | 268,147 | 216,741 | 222,968 | 225,186 | 225,942 | -2.9%          |
| Intermediate Consumption   | 128,671       | 122,308 | 131,808 | 113,200 | 118,121 | 117,248 | 110,264 | -2.5%          |
| Gross Value Added  | 141,721       | 137,798 | 136,339 | 103,541 | 104,848 | 107,937 | 115,678 | -3.3%          |
| Gross Operating Surplus  | 91,828        | 90,443  | 91,703  | 42,909  | 58,797  | 59,911  | 73,783  | -3.6%          |
| Compensation to Employees  | 47,466        | 44,793  | 42,219  | 57,543  | 42,884  | 44,327  | 38,730  | -3.3%          |
| <b>Proportion of Sector Activity Depending on Marine Environment</b>   |               |         |         |         |         |         |         |                |
|  | 35%           | 35%     | 35%     | 35%     | 35%     | 35%     | 35%     |                |
| <b>Estimated Economic Activity Dependent on the Marine Environment</b> |               |         |         |         |         |         |         |                |
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 718           | 626     | 619     | 633     | 538     | 513     | 480     | -6.5%          |
| Output   | 94,637        | 91,037  | 93,851  | 75,859  | 78,039  | 78,815  | 79,080  | -2.9%          |
| Intermediate Consumption   | 45,035        | 42,808  | 46,133  | 39,620  | 41,342  | 41,037  | 38,592  | -2.5%          |
| Gross Value Added  | 49,602        | 48,229  | 47,719  | 36,239  | 36,697  | 37,778  | 40,487  | -3.3%          |
| Gross Operating Surplus  | 32,140        | 31,655  | 32,096  | 15,018  | 20,579  | 20,969  | 25,824  | -3.6%          |
| Compensation to Employees  | 16,613        | 15,678  | 14,777  | 20,140  | 15,009  | 15,515  | 13,556  | -3.3%          |

FTE employment is measured in number of persons. Other variables are in €000s

A substantial part of the telecoms sector's activity makes *direct use of the sea* due to its dependence on cables between Malta and Sicily for its service provision, whilst the remaining traffic is catered for by satellite. On the basis of consultations carried out with experts<sup>55</sup> in the sector, it can be estimated that the share of the contribution of marine-related activities to the overall activity within the telecommunications sector is around 35% of the total.

<sup>55</sup> Personal communications

Table 23: NACE 65 - Insurance, reinsurance

|  | NACE Code: 65 |          |          |          |          |          |          |                |
|--|---------------|----------|----------|----------|----------|----------|----------|----------------|
|  | 2006          | 2007     | 2008     | 2009     | 2010     | 2011     | 2012     | Average Growth |
| FTE Employment   | 455           | 511      | 548      | 562      | 561      | 610      | 621      | 5.3%           |
| Output   | 79,576        | 101,691  | 91,881   | 97,894   | 108,293  | 104,699  | 91,902   | 2.4%           |
| Intermediate Consumption   | 76,964        | 99,639   | 89,790   | 94,582   | 105,852  | 100,545  | 87,698   | 2.2%           |
| Gross Value Added  | 2,612         | 2,052    | 2,091    | 3,312    | 2,441    | 4,154    | 4,204    | 8.3%           |
| Gross Operating Surplus  | - 8,856       | - 11,003 | - 12,403 | - 10,984 | - 13,812 | - 12,008 | - 14,430 | 8.5%           |
| Compensation to Employees  | 11,461        | 13,049   | 14,486   | 14,285   | 16,240   | 16,154   | 18,630   | 8.4%           |
| <b>Proportion of Sector Activity Depending on Marine Environment</b>   |               |          |          |          |          |          |          |                |
|  | 4%            | 4%       | 4%       | 4%       | 4%       | 4%       | 4%       |                |
| <b>Estimated Economic Activity Dependent on the Marine Environment</b> |               |          |          |          |          |          |          |                |
|  | 2006          | 2007     | 2008     | 2009     | 2010     | 2011     | 2012     | Average Growth |
| FTE Employment   | 18            | 20       | 22       | 22       | 22       | 24       | 25       | 5.3%           |
| Output   | 3,183         | 4,068    | 3,675    | 3,916    | 4,332    | 4,188    | 3,676    | 2.4%           |
| Intermediate Consumption   | 3,079         | 3,986    | 3,592    | 3,783    | 4,234    | 4,022    | 3,508    | 2.2%           |
| Gross Value Added  | 104           | 82       | 84       | 132      | 98       | 166      | 168      | 8.3%           |
| Gross Operating Surplus  | - 354         | - 440    | - 496    | - 439    | - 552    | - 480    | - 577    | 8.5%           |
| Compensation to Employees  | 458           | 522      | 579      | 571      | 650      | 646      | 745      | 8.4%           |

FTE employment is measured in number of persons. Other variables are in €000s

Approximately 4%<sup>56</sup> of all insurance activity in Malta is carried out on maritime vessels and on goods transported by sea. Therefore the sea is directly responsible for the service provision of part of this NACE category.

<sup>56</sup> MFSA (2011), "Insurance Principals Statistics 2011 – General Business",  
url:<http://www.mfsa.com.mt/pages/viewcontent.aspx?id=51>

Table 24: NACE 68 – Real Estate

|  | NACE Code: 68 |         |         |         |         |         |         |                |
|--|---------------|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 550           | 618     | 595     | 572     | 580     | 613     | 547     | -0.1%          |
| Output   | 394,405       | 409,404 | 404,122 | 433,381 | 447,508 | 460,053 | 461,768 | 2.7%           |
| Intermediate Consumption   | 95,411        | 99,068  | 90,322  | 100,282 | 109,564 | 112,344 | 114,951 | 3.2%           |
| Gross Value Added  | 298,994       | 310,335 | 313,800 | 333,099 | 337,944 | 347,709 | 346,817 | 2.5%           |
| Gross Operating Surplus  | 293,536       | 304,177 | 308,018 | 325,957 | 332,316 | 338,899 | 338,098 | 2.4%           |
| Compensation to Employees  | 4,559         | 5,353   | 5,080   | 6,037   | 6,201   | 7,725   | 7,958   | 9.7%           |
| <b>Proportion of Sector Activity Depending on Marine Environment</b>   |               |         |         |         |         |         |         |                |
|  | 1.0%          | 1.0%    | 1.0%    | 1.0%    | 1.0%    | 1.0%    | 1.0%    |                |
| <b>Estimated Economic Activity Dependent on the Marine Environment</b> |               |         |         |         |         |         |         |                |
|  | 2006          | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 6             | 6       | 6       | 6       | 6       | 6       | 5       | 0%             |
| Output   | 3,944         | 4,094   | 4,041   | 4,334   | 4,475   | 4,601   | 4,618   | 0%             |
| Intermediate Consumption   | 954           | 991     | 903     | 1,003   | 1,096   | 1,123   | 1,150   | 0%             |
| Gross Value Added  | 2,990         | 3,103   | 3,138   | 3,331   | 3,379   | 3,477   | 3,468   | 0%             |
| Gross Operating Surplus  | 2,935         | 3,042   | 3,080   | 3,260   | 3,323   | 3,389   | 3,381   | 0%             |
| Compensation to Employees  | 46            | 54      | 51      | 60      | 62      | 77      | 80      | 0%             |

FTE employment is measured in number of persons. Other variables are in €000s

The assessment of this sector is done with respect to foreigners who purchase property in Malta and who are generally more inclined to purchasing sea-view homes. These, therefore, would make *indirect use of the marine environment*.

In order to allow for an effect, albeit minimal, of this sector, and in the absence of better information in this regard, a prudent estimate of 1% of total sales to foreigners is assumed.

Table 25: NACE 69 – Legal and Accounting

|  | NACE Code: 69   |         |         |         |         |         |         | Average Growth |
|--|---|---------|---------|---------|---------|---------|---------|----------------|
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    |                |
| FTE Employment   | 2,038   | 2,219   | 2,556   | 2,785   | 3,028   | 3,344   | 3,541   | 9.6%           |
| Output   | 86,447  | 104,163 | 125,895 | 141,523 | 160,870 | 177,926 | 188,919 | 13.9%          |
| Intermediate Consumption   | 23,297  | 25,787  | 28,741  | 47,800  | 54,659  | 60,459  | 64,566  | 18.5%          |
| Gross Value Added  | 63,149  | 78,376  | 97,154  | 93,724  | 106,211 | 117,467 | 124,354 | 12.0%          |
| Gross Operating Surplus  | 39,548  | 51,752  | 68,940  | 59,805  | 68,128  | 74,581  | 78,079  | 12.0%          |
| Compensation to Employees  | 22,941  | 25,991  | 27,514  | 33,103  | 37,168  | 42,158  | 45,781  | 12.2%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 2%  | 2%      | 2%      | 2%      | 2%      | 2%      | 2%      |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |         |         |         |         |         | Average Growth |
|  | 2006  | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    |                |
| FTE Employment   | 41  | 44      | 51      | 56      | 61      | 67      | 71      | 9.6%           |
| Output   | 1,729   | 2,083   | 2,518   | 2,830   | 3,217   | 3,559   | 3,778   | 13.9%          |
| Intermediate Consumption   | 466   | 516     | 575     | 956     | 1,093   | 1,209   | 1,291   | 18.5%          |
| Gross Value Added  | 1,263   | 1,568   | 1,943   | 1,874   | 2,124   | 2,349   | 2,487   | 12.0%          |
| Gross Operating Surplus  | 791   | 1,035   | 1,379   | 1,196   | 1,363   | 1,492   | 1,562   | 12.0%          |
| Compensation to Employees  | 459   | 520     | 550     | 662     | 743     | 843     | 916     | 12.2%          |

FTE employment is measured in number of persons. Other variables are in €000s

Given that Malta is an island, a certain amount of legal activity involves maritime affairs. Therefore, part of the activities of this sector makes *indirect use of the marine environment in the provision of its service*. Again in the absence of better information, a prudent estimate was taken for this sector amounting to approximately half the percentage of marine-related insurance, i.e. 2%.

Table 26: NACE 71&72 – Architectural and engineering, and scientific research and development

|  | NACE Code: 71 & 72  |        |         |        |         |         |         |                |
|--|---|--------|---------|--------|---------|---------|---------|----------------|
|  | 2006  | 2007   | 2008    | 2009   | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 1,675   | 1,807  | 1,712   | 1,629  | 1,773   | 1,790   | 1,766   | 0.9%           |
| Output   | 114,632   | 99,775 | 108,702 | 97,912 | 109,828 | 115,900 | 105,156 | -1.4%          |
| Intermediate Consumption   | 70,903  | 55,633 | 52,974  | 48,046 | 53,500  | 56,753  | 52,085  | -5.0%          |
| Gross Value Added  | 43,729  | 44,142 | 55,727  | 49,866 | 56,328  | 59,147  | 53,071  | 3.3%           |
| Gross Operating Surplus  | 14,831  | 14,838 | 31,976  | 27,144 | 30,850  | 34,208  | 28,723  | 11.6%          |
| Compensation to Employees  | 29,055  | 28,916 | 23,305  | 22,200 | 24,860  | 24,404  | 23,978  | -3.1%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 5%  | 5%     | 5%      | 5%     | 5%      | 5%      | 5%      |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |         |        |         |         |         |                |
|  | 2006  | 2007   | 2008    | 2009   | 2010    | 2011    | 2012    | Average Growth |
| FTE Employment   | 84  | 90     | 86      | 81     | 89      | 90      | 88      | 0.9%           |
| Output   | 5,732   | 4,989  | 5,435   | 4,896  | 5,491   | 5,795   | 5,258   | -1.4%          |
| Intermediate Consumption   | 3,545   | 2,782  | 2,649   | 2,402  | 2,675   | 2,838   | 2,604   | -5.0%          |
| Gross Value Added  | 2,186   | 2,207  | 2,786   | 2,493  | 2,816   | 2,957   | 2,654   | 3.3%           |
| Gross Operating Surplus  | 742   | 742    | 1,599   | 1,357  | 1,543   | 1,710   | 1,436   | 11.6%          |
| Compensation to Employees  | 1,453   | 1,446  | 1,165   | 1,110  | 1,243   | 1,220   | 1,199   | -3.1%          |

FTE employment is measured in number of persons. Other variables are in €000s

In consultation with experts at the NSO, an estimated 5% of architectural and engineering activities as well as R&D in Malta are assumed to pertain to marine-related activities. With respect to the former, Malta's geographical characteristics necessarily imply a certain level of activity in marine infrastructural projects. Scientific R&D in Malta (including the University of Malta) also engages in marine research and it is, therefore, suitable to assess this sector as a user of the marine environment. In both these cases, the sea is being used as a *direct input in the provision of these services*.

Table 27: NACE 75 – Veterinary activities

|  | NACE Code: 75   |       |      |       |       |       |       |                |
|--|---|-------|------|-------|-------|-------|-------|----------------|
|  | 2006  | 2007  | 2008 | 2009  | 2010  | 2011  | 2012  | Average Growth |
| FTE Employment   | 17  | 18    | 19   | 41    | 43    | 52    | 57    | 22.8%          |
| Output   | 984   | 1,025 | 730  | 3,287 | 3,239 | 3,652 | 4,014 | 26.4%          |
| Intermediate Consumption   | 657   | 729   | 440  | 1,910 | 1,883 | 2,131 | 2,353 | 23.7%          |
| Gross Value Added  | 327   | 297   | 290  | 1,378 | 1,355 | 1,521 | 1,661 | 31.1%          |
| Gross Operating Surplus  | 248   | 197   | 199  | 1,242 | 1,178 | 1,278 | 1,376 | 33.0%          |
| Compensation to Employees  | 62  | 84    | 74   | 112   | 148   | 224   | 273   | 27.8%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 5%  | 5%    | 5%   | 5%    | 5%    | 5%    | 5%    |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |       |      |       |       |       |       |                |
|  | 2006  | 2007  | 2008 | 2009  | 2010  | 2011  | 2012  | Average Growth |
| FTE Employment   | 1   | 1     | 1    | 2     | 2     | 3     | 3     | 22.8%          |
| Output   | 49  | 51    | 37   | 164   | 162   | 183   | 201   | 26.4%          |
| Intermediate Consumption   | 33  | 36    | 22   | 95    | 94    | 107   | 118   | 23.7%          |
| Gross Value Added  | 16  | 15    | 15   | 69    | 68    | 76    | 83    | 31.1%          |
| Gross Operating Surplus  | 12  | 10    | 10   | 62    | 59    | 64    | 69    | 33.0%          |
| Compensation to Employees  | 3   | 4     | 4    | 6     | 7     | 11    | 14    | 27.8%          |

FTE employment is measured in number of persons. Other variables are in €000s

As in the previous NACE category, a part of the activities of veterinaries deal directly with the sea since marine animals are also treated. Again in consultation with the NSO, an estimated 5% of this sector's activities are estimated to *directly make use of the marine environment in providing this service.*

Table 28: NACE 79 – Travel Agency, tour operator and other reservation service and related activities

|  | NACE Code: 79   |              |              |              |              |              |              | Average Growth |
|--|---|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
|  | 2006  | 2007         | 2008         | 2009         | 2010         | 2011         | 2012         |                |
| FTE Employment   | 1,344   | 1,339        | 1,351        | 1,465        | 1,448        | 1,469        | 1,471        | 1.5%           |
| Output   | 135,506   | 116,879      | 135,521      | 114,405      | 120,188      | 127,695      | 152,033      | 1.9%           |
| Intermediate Consumption   | 73,628  | 63,236       | 73,584       | 67,524       | 71,024       | 75,611       | 90,452       | 3.5%           |
| Gross Value Added  | 61,878  | 53,643       | 61,937       | 46,881       | 49,164       | 52,084       | 61,581       | -0.1%          |
| Gross Operating Surplus  | 40,351  | 31,937       | 39,707       | 26,838       | 29,061       | 31,922       | 41,625       | 0.5%           |
| Compensation to Employees  | 20,929  | 21,128       | 21,613       | 19,322       | 19,289       | 19,528       | 19,540       | -1.1%          |
| <b>Proportion of Sector Activity Depending on Marine Environment</b> | <b>62.3%</b>  | <b>62.3%</b> | <b>62.3%</b> | <b>62.3%</b> | <b>62.3%</b> | <b>62.3%</b> | <b>62.3%</b> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |              |              |              |              |              |              | Average Growth |
|  | 2006  | 2007         | 2008         | 2009         | 2010         | 2011         | 2012         |                |
| FTE Employment   | 837   | 834          | 841          | 912          | 901          | 915          | 916          | 1.5%           |
| Output   | 84,365  | 72,768       | 84,374       | 71,228       | 74,828       | 79,502       | 94,655       | 1.9%           |
| Intermediate Consumption   | 45,840  | 39,370       | 45,813       | 42,040       | 44,219       | 47,075       | 56,315       | 3.5%           |
| Gross Value Added  | 38,525  | 33,397       | 38,562       | 29,188       | 30,609       | 32,427       | 38,340       | -0.1%          |
| Gross Operating Surplus  | 25,122  | 19,884       | 24,721       | 16,709       | 18,093       | 19,875       | 25,915       | 0.5%           |
| Compensation to Employees  | 13,030  | 13,154       | 13,456       | 12,030       | 12,009       | 12,158       | 12,166       | -1.1%          |

FTE employment is measured in number of persons. Other variables are in €000s

This NACE code groups together the activities of travel agencies and tour operators. The former relates to tourism by Maltese out of Malta whereas the latter concerns tourism into Malta. As a result, the activities of tour operators are particularly interesting to assess in line with the assessment carried out for NACE code 55, “accommodation”.

In order to calculate the proportion of tourists coming in Malta to enjoy marine-related activities, the following estimate was taken:

the total number of foreigners visiting Malta in 2012<sup>57</sup> was multiplied by the proportion of tourists who are estimated to come to Malta to engage in sea-related activities (estimated to be 62.3%<sup>58</sup>);

this was added to the total number of tourists who visit Malta on cruise liners<sup>59</sup>;

the total value was then divided by the total traffic flow at Malta's international airport as well as cruise liner passengers<sup>60</sup>.

<sup>57</sup> Source: MIA (2012)

<sup>58</sup> As explained for NACE 55, 62.3% is considered to be the percentage of foreign tourists who come to Malta to engage in sea-related (in/direct) activities.

<sup>59</sup> Source: NSO

Approximately 62.3% of the activity carried out by this sector was found to relate to tourists visiting Malta and making *direct or indirect* use of the marine environment.

Table 29: NACE 84 – Public administration and defence; compulsory social security

|  | NACE Code: 84   |             |             |             |             |             |             |                |
|--|---|-------------|-------------|-------------|-------------|-------------|-------------|----------------|
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 12,475  | 12,563      | 12,944      | 12,378      | 12,086      | 12,472      | 13,090      | 0.8%           |
| Output   | 462,351   | 493,195     | 521,832     | 545,143     | 561,952     | 591,046     | 638,310     | 5.5%           |
| Intermediate Consumption   | 166,205   | 178,411     | 187,461     | 195,165     | 205,107     | 216,926     | 245,645     | 6.7%           |
| Gross Value Added  | 296,145   | 314,784     | 334,371     | 349,978     | 356,845     | 374,120     | 392,665     | 4.8%           |
| Gross Operating Surplus  | 48,349  | 49,419      | 52,437      | 54,868      | 57,464      | 311,563     | 66,834      | 5.5%           |
| Compensation to Employees  | 247,796   | 265,365     | 281,934     | 295,110     | 299,381     | 62,557      | 325,831     | 4.7%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>5.4%</i>   | <i>5.2%</i> | <i>5.0%</i> | <i>4.9%</i> | <i>4.8%</i> | <i>4.4%</i> | <i>4.4%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |             |             |             |             |             |             |                |
|  | 2006  | 2007        | 2008        | 2009        | 2010        | 2011        | 2012        | Average Growth |
| FTE Employment   | 675   | 650         | 642         | 605         | 579         | 554         | 582         | -2.5%          |
| Output   | 25,023  | 25,520      | 25,870      | 26,648      | 26,905      | 26,270      | 28,370      | 2.1%           |
| Intermediate Consumption   | 8,995   | 9,232       | 9,293       | 9,540       | 9,820       | 9,642       | 10,918      | 3.3%           |
| Gross Value Added  | 16,028  | 16,289      | 16,577      | 17,108      | 17,085      | 16,628      | 17,452      | 1.4%           |
| Gross Operating Surplus  | 2,617   | 2,557       | 2,600       | 2,682       | 2,751       | 13,848      | 2,971       | 2.1%           |
| Compensation to Employees  | 13,411  | 13,731      | 13,977      | 14,426      | 14,334      | 2,780       | 14,482      | 1.3%           |

FTE employment is measured in number of persons. Other variables are in €000s

A part of the activities of the public sector relate to the marine environment. Particular reference here is made to the activities of the marine squad of the Armed Forces of Malta (AFM) as well as the customs department, since most goods are imported to Malta by sea.

The customs department is estimated to employ approximately 3.7% of total employees in public administration<sup>61</sup>. In addition, approximately 1.3% of government expenditure is estimated to be spent on irregular migration<sup>62</sup>. As a result, approximately 4.9% p.a. is estimated to have been spent on activities that make use of the marine environment as a *direct input into their service provision*.

<sup>60</sup> Source: NSO

<sup>61</sup> Source: NSO

<sup>62</sup> EP (2010) reports that Malta spends approximately 0.26% of its GDP on migration. This value (0.0026) is then multiplied by the economy's GDP and divided by the sector's output to estimate the expenditure on migration as a proportion of total expenditure incurred by this sector.

Table 30: NACE 90 – Creative, arts and entertainment

|  | NACE Code: 90   |        |        |        |        |        |        |                |
|--|---|--------|--------|--------|--------|--------|--------|----------------|
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 1,057   | 1,071  | 1,137  | 882    | 955    | 1,009  | 1,150  | 1.4%           |
| Output   | 20,480  | 21,082 | 27,879 | 21,040 | 25,423 | 30,832 | 32,752 | 8.1%           |
| Intermediate Consumption   | 10,122  | 9,452  | 10,965 | 10,359 | 11,330 | 13,109 | 15,685 | 7.6%           |
| Gross Value Added  | 10,358  | 11,630 | 16,915 | 10,681 | 14,093 | 17,723 | 17,068 | 8.7%           |
| Gross Operating Surplus  | 6,556   | 7,401  | 12,422 | 7,436  | 10,285 | 14,057 | 13,470 | 12.8%          |
| Compensation to Employees  | 3,355   | 3,805  | 4,017  | 2,690  | 3,175  | 3,040  | 3,148  | -1.1%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 2%  | 6%     | 26%    | 8%     | 20%    | 26%    | 17%    |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |        |        |        |        |        |                |
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 21  | 64     | 296    | 71     | 191    | 262    | 196    | 44.9%          |
| Output   | 410   | 1,265  | 7,249  | 1,683  | 5,085  | 8,016  | 5,568  | 54.5%          |
| Intermediate Consumption   | 202   | 567    | 2,851  | 829    | 2,266  | 3,408  | 2,666  | 53.7%          |
| Gross Value Added  | 207   | 698    | 4,398  | 854    | 2,819  | 4,608  | 2,901  | 55.3%          |
| Gross Operating Surplus  | 131   | 444    | 3,230  | 595    | 2,057  | 3,655  | 2,290  | 61.1%          |
| Compensation to Employees  | 67  | 228    | 1,044  | 215    | 635    | 790    | 535    | 41.3%          |

FTE employment is measured in number of persons. Other variables are in €000s

Part of this NACE category relates to the film industry in Malta which is primarily attracted by sea characteristics. A number of blockbuster movies have been shot locally including, among others, Munich, Troy, The Count of Monte Cristo, and Gladiator<sup>63</sup>. The marine environment is, therefore, *directly used as an input into the provision of this service activity*. The film industry accounts for approximately 15%<sup>64</sup> of this NACE category – growing by approximately 43% p.a. over the six year period.

<sup>63</sup> For full list: [http://en.wikipedia.org/wiki/List\\_of\\_films\\_shot\\_in\\_Malta](http://en.wikipedia.org/wiki/List_of_films_shot_in_Malta)

<sup>64</sup> Source: NSO

Table 31: NACE 91 - Library, museum, culture

|  | NACE Code: 91   |        |        |        |        |        |        |                |
|--|---|--------|--------|--------|--------|--------|--------|----------------|
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 430   | 413    | 458    | 419    | 390    | 387    | 353    | -3.2%          |
| Output   | 11,183  | 13,179 | 13,831 | 12,399 | 12,028 | 13,098 | 12,746 | 2.2%           |
| Intermediate Consumption   | 2,523   | 3,502  | 3,779  | 3,660  | 3,520  | 4,087  | 4,017  | 8.1%           |
| Gross Value Added  | 8,660   | 9,677  | 10,052 | 8,739  | 8,509  | 9,011  | 8,729  | 0.1%           |
| Gross Operating Surplus  | 1,088   | 2,009  | 2,113  | 568    | 851    | 1,027  | 1,689  | 7.6%           |
| Compensation to Employees  | 7,550   | 7,648  | 7,915  | 8,143  | 7,621  | 7,954  | 7,019  | -1.2%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 5%  | 5%     | 5%     | 5%     | 5%     | 5%     | 5%     |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |        |        |        |        |        |                |
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 22  | 21     | 23     | 21     | 19     | 19     | 18     | -3.2%          |
| Output   | 559   | 659    | 692    | 620    | 601    | 655    | 637    | 2.2%           |
| Intermediate Consumption   | 126   | 175    | 189    | 183    | 176    | 204    | 201    | 8.1%           |
| Gross Value Added  | 433   | 484    | 503    | 437    | 425    | 451    | 436    | 0.1%           |
| Gross Operating Surplus  | 54  | 100    | 106    | 28     | 43     | 51     | 84     | 7.6%           |
| Compensation to Employees  | 378   | 382    | 396    | 407    | 381    | 398    | 351    | -1.2%          |

FTE employment is measured in number of persons. Other variables are in €000s

This NACE category is being assessed with reference to the Maritime Museum in Malta which owes its very existence to the *direct use of the marine environment* in economic activity in Malta. After consultation with experts at the NSO, it is estimated that approximately 5% of this sector reflects the activities of this museum.

Table 32: NACE 92 – Gaming

|  | NACE Code: 92   |         |           |           |           |           |           |                |
|--|---|---------|-----------|-----------|-----------|-----------|-----------|----------------|
|  | 2006  | 2007    | 2008      | 2009      | 2010      | 2011      | 2012      | Average Growth |
| FTE Employment   | 1,464   | 2,177   | 3,704     | 4,751     | 5,236     | 5,524     | 5,713     | 25.5%          |
| Output   | 554,050   | 900,718 | 1,310,310 | 1,374,581 | 1,566,043 | 1,657,786 | 1,791,754 | 21.6%          |
| Intermediate Consumption   | 411,667   | 621,717 | 867,059   | 972,915   | 1,113,072 | 1,172,595 | 1,270,102 | 20.7%          |
| Gross Value Added  | 142,383   | 279,001 | 443,251   | 401,665   | 452,971   | 485,191   | 521,653   | 24.2%          |
| Gross Operating Surplus  | 104,891   | 236,466 | 382,336   | 392,463   | 375,213   | 403,545   | 436,281   | 26.8%          |
| Compensation to Employees  | 37,403  | 42,395  | 60,725    | 71,973    | 77,470    | 81,318    | 85,167    | 14.7%          |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 35%   | 35%     | 35%       | 35%       | 35%       | 35%       | 35%       |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |         |           |           |           |           |           |                |
|  | 2006  | 2007    | 2008      | 2009      | 2010      | 2011      | 2012      | Average Growth |
| FTE Employment   | 512   | 762     | 1,296     | 1,663     | 1,833     | 1,933     | 2,000     | 25.5%          |
| Output   | 193,918   | 315,251 | 458,609   | 481,103   | 548,115   | 580,225   | 627,114   | 21.6%          |
| Intermediate Consumption   | 144,083   | 217,601 | 303,471   | 340,520   | 389,575   | 410,408   | 444,536   | 20.7%          |
| Gross Value Added  | 49,834  | 97,650  | 155,138   | 140,583   | 158,540   | 169,817   | 182,579   | 24.2%          |
| Gross Operating Surplus  | 36,712  | 82,763  | 133,818   | 137,362   | 131,325   | 141,241   | 152,698   | 26.8%          |
| Compensation to Employees  | 13,091  | 14,838  | 21,254    | 25,191    | 27,115    | 28,461    | 29,808    | 14.7%          |

FTE employment is measured in number of persons. Other variables are in €000s

As in the Telecoms sector (NACE 61), this sector is heavily dependent on underwater cables for its operation. Following consultations with key experts in the field, the use of underwater cables is estimated to amount to 35% of the total, reflecting the dependence on *the marine environment* for this sector's service provision.

Table 33: NACE 93 - Sports activities and amusement and recreation activities

|  | NACE Code: 93   |            |            |            |            |            |            | Average Growth |
|--|---|------------|------------|------------|------------|------------|------------|----------------|
|  | 2006  | 2007       | 2008       | 2009       | 2010       | 2011       | 2012       |                |
| FTE Employment   | 1,498   | 1,557      | 1,615      | 1,652      | 1,705      | 1,797      | 1,969      | 4.7%           |
| Output   | 35,009  | 48,648     | 37,469     | 37,945     | 41,210     | 47,332     | 51,243     | 6.6%           |
| Intermediate Consumption   | 13,426  | 17,691     | 16,044     | 15,993     | 17,833     | 20,356     | 21,032     | 7.8%           |
| Gross Value Added  | 21,583  | 30,957     | 21,425     | 21,952     | 23,377     | 26,976     | 30,211     | 5.8%           |
| Gross Operating Surplus  | 10,863  | 19,750     | 9,976      | 10,925     | 11,162     | 14,122     | 16,065     | 6.7%           |
| Compensation to Employees  | 10,503  | 11,002     | 11,218     | 10,749     | 11,843     | 12,569     | 13,958     | 4.9%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | <i>10%</i>  | <i>10%</i> | <i>10%</i> | <i>10%</i> | <i>10%</i> | <i>10%</i> | <i>10%</i> |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |            |            |            |            |            |            |                |
|  | 2006  | 2007       | 2008       | 2009       | 2010       | 2011       | 2012       | Average Growth |
| FTE Employment   | 150   | 156        | 161        | 165        | 170        | 180        | 197        | 4.7%           |
| Output   | 3,501   | 4,865      | 3,747      | 3,794      | 4,121      | 4,733      | 5,124      | 6.6%           |
| Intermediate Consumption   | 1,343   | 1,769      | 1,604      | 1,599      | 1,783      | 2,036      | 2,103      | 7.8%           |
| Gross Value Added  | 2,158   | 3,096      | 2,143      | 2,195      | 2,338      | 2,698      | 3,021      | 5.8%           |
| Gross Operating Surplus  | 1,086   | 1,975      | 998        | 1,092      | 1,116      | 1,412      | 1,607      | 6.7%           |
| Compensation to Employees  | 1,050   | 1,100      | 1,122      | 1,075      | 1,184      | 1,257      | 1,396      | 4.9%           |

FTE employment is measured in number of persons. Other variables are in €000s

Given that Malta is an island state, a number of sports and recreational activities are necessarily linked to the sea. As a result, a prudent 10% of this sector's activities are estimated, in collaboration with NSO, to directly use the marine environment as an *input into its service provision*.

Table 34: NACE 94 – Activities of membership organisations

|  | NACE Code: 94   |        |        |        |        |        |        |                |
|--|---|--------|--------|--------|--------|--------|--------|----------------|
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 3,063   | 3,058  | 3,097  | 3,133  | 3,171  | 3,177  | 3,156  | 0.5%           |
| Output   | 30,443  | 32,370 | 32,821 | 33,752 | 35,561 | 36,488 | 36,648 | 3.1%           |
| Intermediate Consumption   | 11,796  | 12,931 | 13,383 | 14,172 | 14,373 | 14,492 | 14,732 | 3.8%           |
| Gross Value Added  | 18,647  | 19,439 | 19,438 | 19,580 | 21,188 | 21,996 | 21,916 | 2.7%           |
| Gross Operating Surplus  | 3,598   | 3,957  | 3,452  | 3,198  | 3,802  | 4,432  | 4,496  | 3.8%           |
| Compensation to Employees  | 14,844  | 15,291 | 15,787 | 16,156 | 17,146 | 17,329 | 17,264 | 2.5%           |
| <i>Proportion of Sector Activity Depending on Marine Environment</i> | 3%  | 3%     | 3%     | 3%     | 3%     | 3%     | 3%     |                |
|  | Estimated Economic Activity Dependent on the Marine Environment |        |        |        |        |        |        |                |
|  | 2006  | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average Growth |
| FTE Employment   | 92  | 92     | 93     | 94     | 95     | 95     | 95     | 0.5%           |
| Output   | 913   | 971    | 985    | 1,013  | 1,067  | 1,095  | 1,099  | 3.1%           |
| Intermediate Consumption   | 354   | 388    | 401    | 425    | 431    | 435    | 442    | 3.8%           |
| Gross Value Added  | 559   | 583    | 583    | 587    | 636    | 660    | 657    | 2.7%           |
| Gross Operating Surplus  | 108   | 119    | 104    | 96     | 114    | 133    | 135    | 3.8%           |
| Compensation to Employees  | 445   | 459    | 474    | 485    | 514    | 520    | 518    | 2.5%           |

FTE employment is measured in number of persons. Other variables are in €000s

A number of Non-Governmental Organisations (NGOs) are also estimated to owe their existence to the marine environment. Particular reference in this regard is made to BICREF<sup>65</sup> Malta which is estimated to amount to 3% of the sector's activities (estimated in collaboration with experts and the NSO).

#### *The dependence of the Maltese Economy on the Marine Environment*

The dependence of the Maltese economy on the marine environment is calculated with respect to the six variables mentioned earlier, namely:

- Full-Time Equivalent (FTE) employment;
- Output;
- Intermediate consumption;
- Gross Value Added;
- Gross Operating Surplus;
- Compensation to Employees.

<sup>65</sup> The Biological Conservation Research Foundation

Two assessments are hereby undertaken; firstly, an estimate of the dependence on the marine environment is undertaken for the sectors that make use of, in one way or another, the marine waters as described above. Secondly, the dependence on the marine environment will be estimated for the Maltese economy as a whole.

Table 35: Total dependence of marine-related sectors on the marine environment

|                           | TOTAL marine-related sectors |           |           |           |           |           |           | Average Growth |
|---------------------------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|
|                           | 2006                         | 2007      | 2008      | 2009      | 2010      | 2011      | 2012      |                |
| FTE Employment            | 83,876                       | 85,656    | 86,474    | 86,666    | 87,579    | 89,543    | 90,899    | 1.3%           |
| Output                    | 5,093,138                    | 5,739,337 | 6,552,902 | 6,452,288 | 6,951,706 | 7,282,125 | 7,755,512 | 7.3%           |
| Intermediate Consumption  | 2,893,935                    | 3,321,105 | 3,828,030 | 3,783,814 | 4,161,306 | 4,424,311 | 4,820,266 | 8.9%           |
| Gross Value Added         | 2,199,204                    | 2,418,233 | 2,724,872 | 2,668,473 | 2,790,400 | 2,857,815 | 2,935,245 | 4.9%           |
| Gross Operating Surplus   | 1,220,027                    | 1,367,355 | 1,574,217 | 1,578,219 | 1,637,440 | 1,904,175 | 1,688,158 | 5.6%           |
| Compensation to Employees | 1,012,713                    | 1,079,227 | 1,166,987 | 1,167,002 | 1,171,016 | 967,312   | 1,257,895 | 3.7%           |

|                           | Estimated Economic Activity Dependent on the Marine Environment (of marine-related sectors) |           |           |           |           |           |           | Average Growth |
|---------------------------|---|-----------|-----------|-----------|-----------|-----------|-----------|----------------|
|                           | 2006  | 2007      | 2008      | 2009      | 2010      | 2011      | 2012      |                |
| FTE Employment            | 25,133  | 24,931    | 26,800    | 24,947    | 25,053    | 25,950    | 25,886    | 0.5%           |
| Output                    | 1,971,096   | 2,254,697 | 2,743,069 | 2,503,298 | 2,707,164 | 2,878,934 | 3,134,387 | 8.0%           |
| Intermediate Consumption  | 1,302,276   | 1,507,732 | 1,857,022 | 1,683,814 | 1,855,203 | 2,032,892 | 2,279,710 | 9.8%           |
| Gross Value Added         | 668,821   | 746,966   | 886,048   | 819,482   | 851,961   | 846,042   | 854,677   | 4.2%           |
| Gross Operating Surplus   | 359,477   | 418,722   | 471,545   | 477,667   | 501,567   | 491,796   | 485,562   | 5.1%           |
| Compensation to Employees | 337,541   | 351,399   | 428,768   | 377,734   | 365,282   | 367,303   | 379,220   | 2.0%           |

|                           | Proportions of Economy Depending on Marine Environment to Sectors with a Marine Dimension |      |      |      |      |      |      | Average Growth |
|---------------------------|---|------|------|------|------|------|------|----------------|
|                           | 2006  | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |                |
| FTE Employment            | 30%   | 29%  | 31%  | 29%  | 29%  | 29%  | 28%  | -0.2%          |
| Output                    | 39%   | 39%  | 42%  | 39%  | 39%  | 40%  | 40%  | 0.3%           |
| Intermediate Consumption  | 45%   | 45%  | 49%  | 45%  | 45%  | 46%  | 47%  | 0.4%           |
| Gross Value Added         | 30%   | 31%  | 33%  | 31%  | 31%  | 30%  | 29%  | -0.2%          |
| Gross Operating Surplus   | 29%   | 31%  | 30%  | 30%  | 31%  | 26%  | 29%  | -0.1%          |
| Compensation to Employees | 33%   | 33%  | 37%  | 32%  | 31%  | 38%  | 30%  | -0.5%          |

FTE employment is measured in number of persons. Other variables are in €000s

The proportion of each sector that relates to the marine environment is related to the total of each variable for those sectors with a marine dimension in order to gauge how relevant the marine environment is to the sectors under scrutiny. This dependence changes according to the variable assessed. For 2012, these are:

- 28% in terms of FTE employment;
- 40% in terms of Output;
- 47% in terms of Intermediate consumption;
- 29% in terms of Gross Value Added;
- 29% in terms of Gross Operating Surplus;
- 30% in terms of Compensation to Employees.

The GVA of these sectors as a proportion of total economy GVA amounts to 49.5%. This implies that approximately half of the economic sectors in Malta make use of the marine environment for 29% of their activities.

Though the assessment above is interesting to note, it may be more important to assess the marine-dependent element of marine sectors within the total economy. Therefore, in order to gauge how relevant the marine environment is to Malta's economy and how important it is to safeguard, the same exercise is undertaken with respect to all economic sectors in Malta. Table 36 below illustrates Malta's dependence on the marine environment for 2006-2012. For 2012, the following rates apply:

- 14% in terms of FTE employment;
- 22% in terms of Output;
- 27% in terms of Intermediate consumption;
- 14% in terms of Gross Value Added;
- 17% in terms of Gross Operating Surplus;
- 13% in terms of Compensation to Employees.

Table 36: Total dependence of marine-related sectors on the marine environment

|                           | TOTAL ECONOMY (including sectors without a marine dimension) |            |            |            |            |            |            |                |
|---------------------------|--|------------|------------|------------|------------|------------|------------|----------------|
|                           | 2006   | 2007       | 2008       | 2009       | 2010       | 2011       | 2012       | Average Growth |
| FTE Employment            | 165,405  | 168,487    | 172,608    | 173,008    | 175,270    | 179,462    | 183,715    | 1.8%           |
| Output                    | 10,526,398   | 11,324,736 | 12,281,151 | 12,071,590 | 13,141,455 | 13,689,128 | 14,489,489 | 5.5%           |
| Intermediate Consumption  | 6,020,794  | 6,486,577  | 7,060,214  | 6,893,571  | 7,625,688  | 7,979,047  | 8,563,312  | 6.0%           |
| Gross Value Added         | 4,505,604  | 4,838,159  | 5,220,937  | 5,178,019  | 5,515,767  | 5,710,082  | 5,926,177  | 4.7%           |
| Gross Operating Surplus   | 2,174,802  | 2,374,045  | 2,576,250  | 2,466,033  | 2,721,147  | 2,807,113  | 2,904,665  | 4.9%           |
| Compensation to Employees | 2,360,157  | 2,486,766  | 2,655,075  | 2,723,008  | 2,804,714  | 2,911,814  | 3,032,849  | 4.3%           |

|                           | Proportions of Economy Depending on Marine Environment to TOTAL ECONOMY |      |      |      |      |      |      |                |
|---------------------------|---|------|------|------|------|------|------|----------------|
|                           | 2006  | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Average Growth |
| FTE Employment            | 15%   | 15%  | 16%  | 14%  | 14%  | 14%  | 14%  | -0.2%          |
| Output                    | 19%   | 20%  | 22%  | 21%  | 21%  | 21%  | 22%  | 0.5%           |
| Intermediate Consumption  | 22%   | 23%  | 26%  | 24%  | 24%  | 25%  | 27%  | 0.8%           |
| Gross Value Added         | 15%   | 15%  | 17%  | 16%  | 15%  | 15%  | 14%  | -0.1%          |
| Gross Operating Surplus   | 17%   | 18%  | 18%  | 19%  | 18%  | 18%  | 17%  | 0.0%           |
| Compensation to Employees | 14%   | 14%  | 16%  | 14%  | 13%  | 13%  | 13%  | -0.3%          |

FTE employment is measured in number of persons. Other variables are in €000s

The local economy's dependence on the marine environment, with respect to employment and GVA as shown in Table 36 above, has experienced a decline over the period 2006-2012. The annual decline in marine-dependent employment averaged 0.2% since 2006 (also

reflected in a reduction in compensation to employees) whereas marine-dependent GVA contracted by 0.1% p.a.

Though a decline in Malta's dependence on the marine environment has occurred over the past six years, as seen in Table 36, the GVA of the marine-dependent portions of the sectors of economic activity under review actually grew by an average of 4.2% p.a. However, since total economic activity increased by 4.7% p.a. over the same period, the dependence on the marine environment is seen to have declined. This assessment is made in Table 37 below. The table also shows that the growth in employment of marine-dependent sectors (in proportion to their dependence on the marine environment) grew by 0.5% p.a. compared to 1.3% p.a. of total employment. This also reflects the drop in dependence on the marine environment (with respect to GVA and employment) in 2012 from 14% compared to the average for the period 2006-2012 which amounted to approximately 15%. This could be due to a shift to services that make use of the marine environment to a lesser extent than primary and secondary sectoral activities<sup>66</sup>. This trend could in future be reversed as a result of specific economic growth strategies which focus more directly on the use of the marine environment including transport, land reclamation and energy investments as well as potential research and development based and knowledge creation activities.

---

<sup>66</sup> A notable exception to this has been the shift in recent years towards gaming whose activity is partly dependent on the marine environment as a result of its extensive use of underwater cables.

Table 37: Average use and growth of the marine-dependent sectors (2006-2012<sup>67</sup>)

| Sectors   | NACE codes                         | Marine-dependent GVA/Total economy GVA | Marine-dependent employment/Total economy employment | Growth in Marine dependent GVA | Growth in Marine dependent employment |
|---|------------------------------------|--|--|--------------------------------|---------------------------------------|
| Aquaculture, mariculture and fisheries  | 3                                  | 0.4%                                   | 0.5%   | -8.5%                          | 1.6%                                  |
| Shipping construction and transport   | 30 & 33                            | 0.6%                                   | 0.7%   | 2.0%                           | -26.7%                                |
| Defence - Military  | 84                                 | 0.3%                                   | 0.4%   | 1.4%                           | -2.4%                                 |
| Tourism   | 47, 55, 56, 68, 79                 | 4.4%                                   | 6.6%   | 4.6%                           | 2.2%                                  |
| Mining (gravel, sand and shell extraction)  | 8 & 9                              | 0.0%                                   | 0.0%   | -9.0%                          | -7.6%                                 |
| Oil, Gas, Water Abstraction, Waste and Wastewater                                 | 35, 36, 37, 39                     | 1.2%                                   | 1.4%   | -                              | -3.4%                                 |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors) | 49, 61, 92                         | 3.4%                                   | 1.2%   | 14.4%                          | 12.4%                                 |
| Water transport   | 50 & 52                            | 3.8%                                   | 2.1%   | 6.1%                           | 2.1%                                  |
| Supporting infrastructure (e.g. ports, marinas, navigation aids)                  | 42 & 43                            | 0.2%                                   | 0.3%   | 6.9%                           | 5.1%                                  |
| Agriculture   | 1                                  | 0.1%                                   | 0.3%   | -0.1%                          | 0.6%                                  |
| Food and Beverage Manufacturing   | 10 & 11                            | 0.8%                                   | 0.8%   | 2.6%                           | -0.8%                                 |
| Others  | 65, 69, 71, 72, 75, 90, 91, 93, 94 | 0.2%                                   | 0.3%   | 10.2%                          | 8.3%                                  |
| <b>Total</b>  |                                    | <b>15.4%</b>                           | <b>14.7%</b>   | <b>4.2%</b>                    | <b>0.5%</b>                           |

When assessing the average dependence on the marine-environment by sector (over the period 2006-2012), as outlined in the MSFD, the tourism sector is considered to be that with the highest dependence (based on GVA and FTE employment), followed by water transport and cables/telecoms<sup>68</sup>. This, however, also reflects the size of these sectors in the local economy and not strictly their dependence. According to Table 37 above, in fact, the aquaculture/fisheries sector is considered

<sup>67</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>68</sup> The % of FTE employees in the marine-dependent activities of the Oil, Gas, Water abstraction, Waste and Wastewater exceed those in the Cables sectors though the latter is larger in terms of GVA.

to be the 7<sup>th</sup> most marine-dependent sector in the Maltese economy notwithstanding its 100% dependence on the marine environment as opposed to the 3<sup>rd</sup> ranked cables/telecoms sectors that are assumed to use the marine environment for 35% of their total economic activity.

(ii) “Direct use – other”

#### *Benefits of compliance with the EU environmental acquis*

The environment is an important resource used in the production of goods or services as well as for recreational purposes. In addition, it provides benefits to health, for instance, that are often not accounted for. As a result, the need to protect it and ensure that its use is sustained in the future is vital.

ECOTEC et al (2001) estimated the environmental, economic and social benefits that are likely to arise from the full implementation of the EU environmental legislation in the candidate countries<sup>69</sup>. It assesses the hidden costs to the economy caused by lower environmental standards through a loss of output and inefficient production. This assessment, therefore, does not estimate the costs of implementing the EU environmental legislation but quantifies the benefits of doing so.

This study explored the benefits of compliance, in three steps:

Type of benefits: What type of benefits arise from implementing the acquis and some examples of these benefits in the candidate countries – e.g. health impacts, impacts on agriculture, buildings.

Extent of benefits: What is the extent of the benefits – e.g. how much are emissions reduced and how many cases of respiratory diseases are avoided?

Value of benefits: What is the economic value of the avoided costs – e.g. how much would the reduced emissions and damages avoided by implementing EU directives be worth?

Though this study is interesting to assess, it is important to keep in mind that it is not always possible to clearly evaluate the impacts of an EU Directive and, where it is possible, there is always considerable uncertainty in doing so. The value of benefits reaped represent the level of income people would be willing to give up for a specific

---

<sup>69</sup> These include: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia and Turkey.

benefit, for instance clean drinking water or avoiding illness, and the value to the society as a whole of avoiding a number of cases of premature death. They are not a measure of increased national wealth or GDP. Nevertheless, assessing what the benefits are worth is a useful tool for understanding the implications of implementing EU directives or of delaying their implementation.

The types of benefits assessed are illustrated in Table 38.

*Table 38: Types of Benefits*

| <b>Type of Benefit</b>   | <b>Air</b>   | <b>Water</b>  | <b>Waste</b>  | <b>Nature</b>               |
|--------------------------|--|---|---|-----------------------------|
| <b>Health Benefits</b>   | Avoided respiratory illnesses and premature deaths | Households access to cleaner drinking water           | Reduced risk of poisoning and accidents due to methane leakage from landfills | None assessed               |
| <b>Resource Benefits</b> | Avoided damage to buildings and crops              | Cleaner bathing water and cleaner water for companies | Reduced input of primary material   | None assessed               |
| <b>Eco-systems</b>       | Avoided global warming from CO2 emissions          | Improved river water quality                          | Avoided global warming from methane emissions                                 | Protected areas and species |

Since the aim of this report is to assess the use of the marine environment, the benefits derived from implementing the various directives aimed at improving the water quality will be assessed<sup>70</sup>.

The implementation of the EU directives in the candidate countries will reduce the pressures on the environment through a reduction in pollution emissions and deposition and, subsequently, diminish their negative impact, for example on public health.

In the case of water, the study has assessed the extent and value of the following benefits:

Benefits from the availability of drinking water and its improved quality.

---

<sup>70</sup> These include the proposed Water Quality Framework, the Dangerous Substances to Aquatic Environment, Urban Waste Water, Nitrates from Agricultural Sources, Bathing Water, Drinking Water, Surface Water for Drinking, Ground water, Fish water, and Shellfish Water.

Recreational benefits from cleaner coasts, lakes and rivers for bathing.

Benefits to eco-systems from less pollution into water as well as benefits from improved quality of water resources that are used for commercial purposes.

Transboundary benefits are reflected to a certain extent, given that all candidate countries are included in the analysis.

The *total value* of the benefits from implementing EU water directives across the **candidate countries** is estimated to lie in the range of **€5 to 14 billion**<sup>71</sup>:

New connections and cleaner *drinking water* resulting from EU water directives has an estimated value of €500 million to 8.7 billion. The demand in Turkey accounts for around a third of the total value.

The benefits from better quality of *bathing water* are estimated at around €2.5 billion.

The willingness to pay for an improvement of *river* quality from 'poor' to 'fair' and from 'fair' to 'good' is estimated at €2 billion. This estimate excludes the benefits from direct use, for instance for recreation. The Czech Republic accounts for more than half of this sum.

When assessing the annual benefits **Malta** is expected to derive from full compliance with the EU's water related directives (by 2010), this is estimated to be in the range of **€13 and 47 million**. This value relates to the full benefits both from own action as well as the result of other candidate countries implementing the EU directives. Particular health benefits of implementing the water-related directives, particularly the Urban Waste Water Treatment Directive, include fewer cases of gastric illness and irritations to skin caused by poor water quality and high concentrations of contaminants in coasts. This is particularly beneficial where coastlines are of significant recreational value as in the case for Malta.

#### *The cost of not implementing the EU environmental acquis*<sup>72</sup>

In 2011 the EC commissioned a report that assesses the costs that arise from less than full implementation of the EU environmental acquis in the

---

<sup>71</sup> The lower and upper bounds reflect the bounds of confidence in the results given methodological uncertainties.

<sup>72</sup> EC (2011)

EU27 member states (MSs), thereby updating the ECOTEC (2001) report and extending it to all prevailing member states. The study aims to provide an overview of the implementation gaps and the associated costs by identification of the most important costs elements.

The focus in this study is on the "missed" benefits and the "friction costs", i.e. the results from not full implementation of the environmental acquis. Thus, the study looks at missed environmental and health benefits in cases of non-compliance and at missed positive spill-over effects to other policy areas including missed EU Single Market benefits. With regard to friction costs, these relate to, for example, the costs of infringements. Therefore, the main costs of not implementing the environmental acquis are the environmental benefits of the legislation that have not been realised.

The cost elements are organised in the following way:

- Environmental and health costs;
- Uncertainty, innovation and competition costs;
- Spill-over effects;
- Administrative costs to industry;
- Litigation costs.

The study assessed the implementation gaps focusing on the following environmental sectors:

- Waste;
- Biodiversity and nature;
- Water;
- Air;
- Chemicals and noise.

For the purpose of this assessment, the directives that aim to improve the quality of water will be analysed. The directives assessed in this regard are listed in table 39.

*Table 39: List of relevant legislation*

| <b>Directives</b>                     | <b>Comments</b>   |
|---------------------------------------|---|
| Water Framework Directive (WFD)       | Main compliance by the 2015 deadline but further time derogations possible.                               |
| Drinking Water Directive (DWD)        | Most MS in compliance with regard to larger water supplies; small water supplies often not in compliance. |
| Urban Waste Water Treatment Directive | Most old member states in compliance; several southern EU member states not in compliance; new MSs have   |

|                         |   |
|-------------------------|---|
| (UWWTD)                 | time derogations.   |
| Nitrates Directive      | Varying degree of compliance; most MS are formally in compliance though the effect on total nitrogen loads might be insufficient to reach good water quality. |
| Bathing Water Directive | Compliance is relatively high, i.e. above 90%.  |
| Other water legislation | New initiatives on marine waters and flooding – no deadlines passed yet.  |

The EC (2011) report estimates the total cost of not implementing these directives to range between **€5 and 20 billion per annum** for the EU27 member states. This estimate is based on the Willingness to Pay (WTP) for “good ecological status” from a few MSs. The spill-over effects on bio-diversity and nature are, however, not included. These as well as the Flooding and Marine Directives could add to the costs.

It is important to reiterate that this study is focusing only on the costs of not implementing the legislation. Full implementation would also create additional costs for Member States (typically additional enforcement costs) and for industries that have to invest in the necessary compliance measures.

The consulted studies seem to suggest that for most sectors the monetised cost of not implementing is significantly higher than the cost of implementation, meaning that the benefits of the legislation are much higher than the costs.

*The contribution of the marine environment to the production of potable water in Malta*

This section evaluates the direct use contribution of the marine environment to the production of potable water in Malta by considering the cost of replacing water production techniques based on the desalination of sea water with storm-water harvesting.

The starting point of this analysis is to establish a baseline water resource balance for the Maltese Islands, depicting average annual patterns of water demand and supply. This would allow an analysis of the extent to which the system is dependent on sea-water input.

Table 40 below provides an estimate of the demand and supply patterns for water resources in Malta. These estimates are based on available information sources including MRA (2010), FAO (2006), NSO (2009) and take into account expected developments in economic

growth, consumption, and possible sectoral economic growth trends over the period to 2020. The principal assumptions are:

- a relatively stable level of household demand for water, on account of moderate consumption growth and efforts at minimising water use especially in view of the polluter-pays approach to water charges recently enacted in Malta;
- a similar development in tourism and industrial users, which sectors are expected to increasingly give way to tertiary service activities as the main engines of economic growth, and to seek increased efficiencies in the use of water resources;
- a stable demand by Government;
- minimal growth, around 2% per annum on average, by the commercial sector, which is however not intensive in its water use;
- a moderate decline in use by the agricultural sector, reflecting its downsizing over time and better management of water resources.

Table 40: The Water Resource Balance

|  | 000s of m <sup>3</sup> /yr | %of total     |
|--|----------------------------|---------------|
| Demand by the economy  | 50,300                     | 91.8%         |
| Network losses   | 4,500                      | 8.2%          |
| <b>Total Demand</b>  | <b>54,800</b>              | <b>100.0%</b> |
| Sources of Supply:   |                            |               |
| Sea-water desalination   | 18,700                     | 34.1%         |
| Run-off harvesting   | 4,000                      | 7.3%          |
| Other*   | 32,100                     | 58.6%         |
| <b>Total supply</b>  | <b>54,800</b>              | <b>100.0%</b> |
| *including groundwater abstraction and treatment of wastewater |                            |               |

On these bases, the demand for water resources is estimated at 54.8 million m<sup>3</sup> per annum. Of this, around 34.1% would, on the basis of the supply infrastructure currently in place, be provided through the desalination of sea water. Run-off harvesting is estimated to account for just over 7% of total demand.

There is the possibility of the further development of storm water harvesting infrastructure towards implementing a greater capture and storage of storm water and ultimate use (after necessary treatment) to meet water demand<sup>73</sup>.

The possibility of re-using storm water requires storage capacity to be constructed. The total cost for the construction of major tunnels that are primarily intended for storage are found in the *Final Draft Report – Initial Version of the Consultancy for the Formulation of a Storm Water Master Plan for the Maltese Islands*.<sup>74</sup> In addition to storage and treatment costs a provision for the distribution of the reuse water to the end consumer must also be included. The actual costs of distribution will depend on tunnel location and that of the end consumer.

In deriving the infrastructural plan and associated costs, the report furthermore considers issues related to the seasonality of storm water for agricultural use, spatial considerations and technical losses. The preferred option which meets all the constraints involves a **capital cost of €259.6 million**, over a 10-year life equivalent, to make available 3.7 million m<sup>3</sup> of water per annum<sup>75</sup>. These costs are considered to be

<sup>73</sup> This section draws on the 2008 JASPERS report

<sup>74</sup>Table 10.2 of Part C of the Masterplan, especially with respect to cost estimates of the storm water infrastructure.

<sup>75</sup> As considered in the study

incremental to the comparison between the provision of this volume of water through rain-water harvesting and through the continued supply through desalination. This incremental cost of storm water re-use is mostly (at least 75%) caused by the high cost of storage and distribution.

Table 41 provides an estimate of the replacement cost contribution of the marine environment which results from this analysis. It shows that the use of desalination technology based on sea-water input avoids a potential infrastructural cost of €259.6 million to harvest 3.7million m<sup>3</sup> of rain-water per annum. The latter is equivalent to 28.6 million m<sup>3</sup> of water over the 10-year equivalent life of the infrastructural cost estimate, using an economic discount rate of 5.5%.

*Table 41: Estimate of Contribution of Marine Environment to Potable Water Production in Malta*

|  |       |
|--|-------|
| Incremental infrastructural cost of storm water harvesting (euro m)  | 259.6 |
| Present value of 3.7m m <sup>3</sup> of water over a 10-year equivalent life of infrastructure (m <sup>3</sup> ) | 28.6  |
| Levelised incremental infrastructural cost per m <sup>3</sup> of water   | 9.1   |
| Annual provision of water through desalination (millions of m <sup>3</sup> )                                     | 18.7  |
| desalination compared to rain-water harvesting (euro m)  | 169.9 |

In turn, this implies a levelised **incremental cost of rainwater-harvesting** infrastructure equal to €9.1 per m<sup>3</sup>. Extending this cost to the 18.7 million m<sup>3</sup> of water per annum produced through desalination would yield an estimate of the avoided cost of almost **€170 million per year**. This can be considered as an estimate, however partial, of the value which the marine resource provides to the production of water in Malta.

The fact that the bulk of this cost emanates from the need for storage and associated distribution facilities is significant. This is because the need for such storage emanates mainly from the seasonality of rainfall in Malta, whereas the marine resource is available all year round. Even so, making allowance for the fact that the costs of storage are around 75% of the total, a more prudent estimate of the contribution of the marine resource to water production in Malta is derived on the basis of 75% of the result shown in Table 41. This would imply a contribution of **€127.4 million per annum**.

*An evaluation of the contribution of the marine environment to non-market recreational activities in Malta*

An important use of environmental resources for consumption purposes obtained outside market arrangements relates to the utilisation, free of charge, of environmental assets for the purposes of recreation. In Malta, these relate in good part, though by no means exclusively, to bathing sites, other coastal areas and country-side locations. Two dissertations carried out at a post graduate level at the University of Malta attempted to value the beaches at Pretty Bay in Birzebbuga<sup>76</sup> and Ramla Bay in Gozo<sup>77</sup>, in part by means of survey exercises aimed at deriving the willingness of respondents to pay for the use of the beaches. These studies, which are based on a sample of 100 visitors to each beach during the peak summer period, found that respondents were on average willing to pay €1.40 (at 2004 valuations/prices) per visit to Pretty Bay and €1.60 (at 2005 valuations/prices) per visit to Ramla Bay. The same studies report the number of annual visits to Pretty Bay and Ramla Bay at around 285,000 and 265,000 respectively.

Adjusted for the effects of inflation since the reference periods of these studies to report values at 2012 prices, these results entail that the annual value created out of the willingness to pay to visit Pretty Bay and Ramla Bay during the summer period only amounts to around €475,000 and €490,000 respectively per annum. It is important to bear in mind that the relatively small size of the sample may result in a high margin of error. Therefore, the results from these studies and the resultant calculations need to be interpreted with caution bearing in mind the high degree of sampling error.

Considering the shore length of each of these two beaches in relation to the total shore length used for bathing in Malta, and taking into account the limitations and assumptions above, the total annual value generated by **the willingness to pay to visit bathing areas in the country would be estimated at around €7 million<sup>78</sup> per annum**. This estimate is subject to the assumption that valuations for Pretty Bay and Ramla Bay can be extended to other bathing sites in Malta, and is also subject to the same limitations arising from the potentially high sampling errors in estimating the values of Pretty Bay and Ramla Bay. Furthermore,

---

<sup>76</sup> Caruana, C. (2005)

<sup>77</sup> Camilleri Rolls, C. (2006)

<sup>78</sup> This estimate reflects the fact that the shorelines of Ramla Bay and Pretty Bay constitute 14% of the total shoreline length of bathing areas in Malta (source: MEPA).

Ramla Bay and Pretty Bay are in different geographical areas and are both sandy beaches and may therefore not be representatives of other sandy beaches or indeed rocky sites.

## **10. An international comparison of the use of the marine environment**

The EU is one of the richest regions in terms of marine resources with 23 of its 28 member states having a coastline. The EU's total coastline amounts to seven times the length of that in the US and four times that of Russia. Almost half of all the EU population resides in maritime regions and these regions account for almost half of its GDP. In terms of surface area, there is more sea than land under the jurisdiction of EU countries with the EU having the world's largest maritime territory, when including its outlying regions<sup>79</sup>.

---

<sup>79</sup> European Atlas of the Seas: [http://ec.europa.eu/maritimeaffairs/index\\_en.html](http://ec.europa.eu/maritimeaffairs/index_en.html);  
[http://ec.europa.eu/maritimeaffairs/documentation/facts\\_and\\_figures/index\\_en.htm](http://ec.europa.eu/maritimeaffairs/documentation/facts_and_figures/index_en.htm)

Table 42: The EU's turnover of maritime sectors excluding tourism

| 2004                      | World value<br>in € Mio | European value<br>in € Mio | European value<br>in percentage of<br>the world value |
|---------------------------|-------------------------|----------------------------|---|
| Shipping & Transport      | 342 743                 | 151 137                    | 44.1%   |
| Marine Tourism Activities | 168 189                 | 71 812                     | 42.7%   |
| Offshore Oil & Gas        | 91 146                  | 19 112                     | 20.9%   |
| Fish/Seafood Processing   | 79 859                  | 8 241                      | 10.3%   |
| Marine Equipment          | 72 871                  | 16 675                     | 22.9%   |
| Fishing                   | 55 983                  | 4 758                      | 8.5%  |
| Shipbuilding              | 37 746                  | 13 143                     | 34.8%   |
| Ports                     | 25 017                  | 10 478                     | 41.9%   |
| Marine Aquaculture        | 23 876                  | 3 483                      | 14.6%   |
| Cruise Industry           | 12 000                  | 2 365                      | 19.7%   |
| Research & Development    | 10 629                  | 3 273                      | 30.8%   |
| Seaweed                   | 5 988                   | n/a*                       | n/a   |
| Marine Commerce           | 6 840                   | 2 736                      | 40.0%   |
| Marine IT                 | 3 570                   | 1 382                      | 38.7%   |
| Minerals & Aggregates     | 2 741                   | 1 344                      | 49.0%   |
| Renewable Energy          | 128                     | 121                        | 94.5%   |
| Marine Biotechnology      | 2 190                   | n/a                        | n/a   |
| Submarine Telecoms        | 1 126                   | 185                        | 16.4%   |
| Ocean Survey              | 2 013                   | 538                        | 26.7%   |
| Education & Training      | 1 537                   | n/a                        | n/a   |

\*n/a: non applicable.

Source: Marine Industries Global Market Analysis. Irish Marine Institute, 2005.

Marine policy at the European level has been driving the collection of data pertaining to marine related economic activity by the EU Commission and individual member states. In a report commissioned by the EC<sup>80</sup>, it is estimated that between 3 and 5% of Europe's GDP in 2004 was generated from sea-related industries and services. This figure, however, does not include the value of raw materials such as oil, fish or gas.

The aim of this section is to carry out an international comparison of the use of the marine waters of EU and non-EU member states when compared to Malta. International comparisons are, however, extremely difficult to make since the 'marine/ocean' sector does not formally exist in most national accounts and figures currently available from European Member States and other countries are rarely directly

<sup>80</sup> Maritime Facts and Figures (2007) European Commission

<https://infoeuropa.euocid.pt/files/database/000038001-000039000/000038583.pdf>

comparable. Therefore, the comparison is extracted from a 2010 study of Ireland's ocean economy<sup>81</sup> which estimates the percentage use of the marine environment. In general it is found that coastal tourism and marine transportation are the largest marine sectors in terms of both economic value and employment.

Table 43: International Comparison

| Country       | Year | Marine Sector GVA<br>Value in €billion | % National GDP | Indicative Employment<br>Source: European Atlas of the Seas<br>Country Profiles |
|---------------|------|--|----------------|---|
| UK*           | 2006 | €67                                    | 4.2%           | 548,674   |
| Germany**     | 2009 | €50                                    | 2.1%           | 200,192   |
| Norway†**     | 2009 | €30+                                   | 1.2%           | -   |
| France*       | 2007 | €28                                    | 1.5%           | 395,223   |
| Ireland*      | 2007 | €1.4                                   | 1%             | 17,000  |
| Iceland†**    | 2008 | €1+                                    | 8.0%           | -   |
| Belgium**     | 2006 | -                                      | 9.5%           | 50,219  |
| Denmark**     | -    | -                                      | -              | 163,290   |
| Netherlands** | -    | €8.8                                   | 1.5%           | 113,319   |
| Portugal**    | 2006 | €2.3                                   | 2.0%           | 99,406  |
| Spain**       | -    | -                                      | 3.2%           | 1,645,959   |
| USA*          | 2004 | €113                                   | 1.2%           | -   |
| Canada*       | 2000 | €16                                    | 1.5%           | -   |
| Australia*    | 2003 | €15                                    | 3.6%           | -   |
| New Zealand*  | 2002 | €2                                     | 2.9%           | -   |

\*Figures from official national reports

\*\* Figures from communications with national representatives

†. Data for Norway and Iceland is only for the fisheries sector

A dash indicates data not available

In absolute terms, the UK is viewed to be the member state that reaps most economic benefit from the marine environment out of the countries assessed in Table 43. However, Belgium is the country with greatest dependence on the marine sector with 9.5% of its nation's GDP coming from marine-related activities. This is considerably lower than that for Malta whose estimated use of the marine environment in terms of its GVA amounted to 14% in 2012<sup>82</sup>.

This greater dependence of Malta on the marine environment is, however, not surprising. The fact that Malta is an island, naturally lends itself to a greater extent to marine-related activities. Apart from the use of beaches and other sea-related activities for recreation and tourism, Malta requires the "services" of the sea for other activities to a greater extent than in other countries and for activities that are not so

<sup>81</sup> SEMRU (2010)

<sup>82</sup> See Table 36

widespread elsewhere. These include, among others, accessibility in the form of sea transportation (for passenger, goods, as well as resource transportation<sup>83</sup>), as well as underwater cables used for communication services<sup>84</sup>.

In addition, the fact that Malta is a small island state implies that (i) the proportion of coastal area to total land area increases<sup>85</sup>; and (ii) the possibility for diversification into a variety of activities is more restrictive, implying that Malta's dependence on the marine environment would naturally be greater. Therefore other larger islands, such as the United Kingdom, would depend to a much lesser extent on marine-related activities than Malta.

## **11. Assessing the pressures and impacts of these activities on the marine environment**

As described earlier in the DPSIR framework, the activities of various economic sectors (driving forces) cause environmental pressures. These can lead to a change in the state of the environment and, therefore, have an impact on human well-being. This section aims to assess what pressures and impacts are being caused by the sectors which have been highlighted in the ESA as being dependent, to various degrees, on the marine environment. A more in depth analysis of what these impacts could mean to the local economy, particularly with respect to a monetary quantification of the loss in value added, will be provided later when estimating the costs of degradation.

Annex III of the Marine Strategy Framework Directive<sup>86</sup> provides an indicative list of the pressures and impacts on the marine environment. These are clearly illustrated in Table 44.

---

<sup>83</sup> Oil and gas are currently transported by sea

<sup>84</sup> The creation of an electricity interconnector between Malta and Sicily as well as a gas pipeline is currently being considered.

<sup>85</sup> The length of the Maltese shoreline is 136.8 km, whereas it's total surface area amounts to 315.6 km<sup>2</sup> (Source: [http://staff.um.edu.mt/csav1/srg/intro\\_geog.pdf](http://staff.um.edu.mt/csav1/srg/intro_geog.pdf). The coastline of the UK amounts to 12,429 km (source: CIA factbook) with a total surface area of 241,930 km<sup>2</sup> (source: <http://data.worldbank.org/indicator/AG.LND.TOTL.K2>)

<sup>86</sup> Directive 2008/56/EC of the European Parliament and of the Council, of 17 June 2008, establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), Annex III Table 2 "Pressures and Impacts".

Table 44: Pressures and Impacts - MSFD

| <b>Impacts</b>                                      | <b>Pressures</b>  |
|---|---|
| Physical loss                                       | <ul style="list-style-type: none"> <li>— Smothering (e.g. by man-made structures, disposal of dredge spoil),</li> <li>— Sealing (e.g. by permanent constructions).</li> </ul>   |
| Physical damage                                     | <ul style="list-style-type: none"> <li>— Changes in siltation (e.g. by outfalls, increased run-off, dredging/disposal of dredge spoil),</li> <li>— Abrasion (e.g. impact on the seabed of commercial fishing, boating, anchoring),</li> <li>— Selective extraction (e.g. exploration and exploitation of living and non-living resources on seabed and subsoil).</li> </ul>   |
| Other physical disturbance                          | <ul style="list-style-type: none"> <li>— Underwater noise (e.g. from shipping, underwater acoustic equipment),</li> <li>— Marine litter.</li> </ul>   |
| Interference with hydrological processes            | <ul style="list-style-type: none"> <li>— Significant changes in thermal regime (e.g. by outfalls from power stations),</li> <li>— Significant changes in salinity regime (e.g. by constructions impeding water movements, water abstraction).</li> </ul>  |
| Contamination by hazardous substances               | <ul style="list-style-type: none"> <li>— Introduction of synthetic compounds (e.g. priority substances under Directive 2000/60/EC which are relevant for the marine environment such as pesticides, antifoulants, pharmaceuticals, resulting, for example, from losses from diffuse sources, pollution by ships, atmospheric deposition and biologically active substances),</li> <li>— Introduction of non-synthetic substances and compounds (e.g. heavy metals, hydrocarbons, resulting, for example, from pollution by ships and oil, gas and mineral exploration and exploitation, atmospheric deposition, riverine inputs),</li> <li>— Introduction of radio-nuclides.</li> </ul> |
| Systematic and/or intentional release of substances | <ul style="list-style-type: none"> <li>— Introduction of other substances, whether solid, liquid or gas, in marine waters, resulting from their systematic and/or intentional release into the marine environment, as permitted in accordance with other Community legislation and/or international conventions.</li> </ul>   |
| Nutrient and organic matter enrichment              | <ul style="list-style-type: none"> <li>— Inputs of fertilisers and other nitrogen — and phosphorus-rich substances (e.g. from point and diffuse sources, including agriculture, aquaculture, atmospheric deposition),</li> <li>— Inputs of organic matter (e.g. sewers, mariculture, riverine inputs).</li> </ul>   |
| Biological disturbance                              | <ul style="list-style-type: none"> <li>— Introduction of microbial pathogens,</li> <li>— Introduction of non-indigenous species and translocations,</li> <li>— Selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing).</li> </ul>   |

Table 44 above will allow for a qualitative assessment of the impacts caused by the marine-dependent sectors in Malta. The description will be limited to those sectors outlined in the directive as requiring

particular attention and not the full list assessed in the ESA. A more detailed assessment, that will include all sectors outlined in the ESA as having an impact on the marine environment, will be provided later when estimating the costs of degradation.

Table 45: Pressures and Impacts on the marine environment caused by economic activity in Malta<sup>87</sup>

| Sector  | Pressures/Impacts (as per Annex III of the Directive)  |
|---|--|
| Aquaculture   | Biological Disturbance<br>Contamination by hazardous substances<br>Nutrient and organic matter enrichment<br>Physical damage   |
| Fisheries   | Biological Disturbance<br>Other physical disturbance<br>Physical damage<br>Physical loss   |
| Maritime Transport (including port operations included as part of man-made structures in Annex 4 of the Commission Staff Working Paper) | Biological disturbance<br>Contamination by hazardous substances<br>Interference with hydrological processes<br>Other physical disturbance<br>Physical damage<br>Physical loss<br>Systematic and/or intentional release of substances |
| Oil Exploration & Hydrocarbon extraction  | Other physical disturbance (this refers exclusively to exploration activities as no hydrocarbon extraction is being undertaken)  |
| Renewable Energy  | Biological Disturbance<br>Interference with hydrological processes<br>Other physical disturbance<br>Physical Loss<br>Physical Damage   |
| Cables  | Other physical disturbance<br>Physical damage  |
| Leisure and recreation (including yachting)   | Biological Disturbance<br>Contamination by hazardous substances<br>Other physical disturbance<br>Physical Damage<br>Physical loss  |
| Waste Disposal (including solid waste disposal)   | Contamination by hazardous substances<br>Interference with hydrological processes<br>Nutrient and Organic Enrichment<br>Physical damage<br>Physical Loss<br>Systematic and/or intentional release of substances                      |

<sup>87</sup> Reference is made to Annex III of the MSFD. The information in this Annex is supplemented by an assessment of the pressures and impacts exerted by the individual sectors in the marine environment as per MSFD Initial Assessment.

|                                  |   |
|----------------------------------|---|
| Coastal defence                  | Interference with hydrological process<br>Physical damage<br>Physical loss  |
| Military Defence                 | Contamination by hazardous substances<br>Physical Damage<br>Other physical disturbance  |
| Water abstraction & desalination | Interference with hydrological process<br>Systemic and/or intentional release of substances   |
| Dredging                         | Biological disturbance<br>Contamination by hazardous substances<br>Interference with hydrological processes<br>Other physical disturbance<br>Physical damage<br>Physical loss |

Source: MEPA

### CO<sub>2</sub> emissions

In addition to the qualitative assessment carried out, a quantitative estimation of some of the impacts affecting the marine environment will be undertaken. The main focus of this will be on CO<sub>2</sub> emissions, which have been singled out for two reasons, namely: (i) it has been used as an example in the framework guidance document; (ii) it is generally simple to determine since data is readily available. Although the value of CO<sub>2</sub> emissions is often easily quantifiable and found in national accounts (since a market usually exists for this type of by-product), CO<sub>2</sub> emissions are not marketable as yet in Malta and, as a result, this value cannot be quantified so simply. Instead, the value of CO<sub>2</sub> emissions will be estimated using shadow prices for some of these sectors.

Table 46: CO<sub>2</sub> emissions

|               | <b>2011<br/>(000 tonnes of<br/>CO<sub>2</sub><br/>equivalent)<sup>88</sup></b> | <b>Dependence<br/>on marine<br/>environment</b> | <b>Estimated<br/>emissions from<br/>marine related<br/>activities<br/>(000 tonnes of CO<sub>2</sub><br/>equivalent)<sup>89</sup></b> | <b>Shadow Cost<br/>(€m) of marine<br/>related activities<br/>(at €25 per<br/>tonne)<sup>90</sup></b> |
|---------------|--|---|--|--|
| Net Emissions | 3021.19  | 63%   | 1,897.28   | 47.43  |
| Power         | 2049.03  | 90%   | 1,844.13   | 46.10  |
| Transport     | 623.62   | 5%  | 32.29  | 0.81   |

<sup>88</sup> Source: National Greenhouse Gas Emissions for Malta, 2013, Malta Resources Authority

<sup>89</sup> Source: National Greenhouse Gas Emissions for Malta, 2013, Malta Resources Authority

<sup>90</sup> Source: Handbook of Shadow Prices

|             |        |     |       |      |
|-------------|--------|-----|-------|------|
| Industry    | 141.88 | 10% | 14.13 | 0.35 |
| Agriculture | 70.90  | 10% | 6.74  | 0.17 |
| Waste       | 126.76 | 0%  | -     | -    |

The ESA presented in this report estimated that the marine environment contributes approximately 15.4% to Malta's Gross Value Added (GVA)<sup>91</sup>. Though this is true, the sectors that are most dependent on the marine environment are also those causing greatest CO<sub>2</sub> emissions. These sectors are estimated to contribute approximately 63% of total emissions (as shown in Table 46), valued at a shadow cost of some €47 million, which amounts to approximately 8% of Malta's GVA in 2011.

---

<sup>91</sup> Average 2006-2012

## COST OF DEGRADATION

### 12. Chosen approach for Malta

As for the ESA, the choice of methodology to be adopted in estimating the costs of degradation of the marine environment was undertaken with the help of a matrix assessing a number of relevant criteria. This section will describe these criteria and the reasons for choosing one approach over another.

The criteria chosen, though similar in most respects to the assessment undertaken for the ESA, include two additional elements, namely:

- adaptability of methodology to overcome data constraints; as well as
- reliability.

The first of the two new criteria was deemed important since none of the three approaches could be adopted strictly the way it was described in the Marine Strategy Framework Directive (MSFD). As a result, it was also deemed important to assess which of the approaches could be slightly modified so as to overcome these data constraints. With respect to the “reliability” indicator, much of this deals with the subjectivity that is required with respect to some of the approaches described and which may, therefore, lead to unreliable conclusions.

Table 47: Matrix criteria for the Cost of Degradation approach

|   | <b>Ecosystem Approach</b> | <b>Thematic Approach</b> | <b>Cost-Based Approach</b> |
|---|---------------------------|--------------------------|----------------------------|
| Data availability   | xx                        | x                        | x                          |
| Simplicity  | xx                        | x                        | xxx                        |
| Adaptability of methodology to overcome data constraints  | xxx                       |                          | x                          |
| Human resource availability   | x                         | x                        | x                          |
| Time constraints  | xx                        |                          | x                          |
| Consistent with DPSIR framework   | xx                        | xxx                      | x                          |
| Ability to update assessment with relative ease (replicability)   | xx                        |                          | x                          |
| Flexible enough to reflect key priorities and changes over time (incl. sectors carrying greatest burden in protecting the marine environment) | x                         |                          | xx                         |
| Level of detail   | xx                        | xxx                      | x                          |
| Reliability   | x                         | xx                       | xxx                        |
| <b>Total</b>  | <b>18</b>                 | <b>11</b>                | <b>15</b>                  |

Scores between 0 and 3 were awarded to each criterion under each approach so as to gauge which methodology is best suited to the requirements and resources present in Malta. The Ecosystem Approach scored highest with a total of 18 points, followed by the Cost-Based Approach (15) and lastly the Thematic Approach (11).

Data availability is scarce with respect to all three approaches. Having said this, however, given the fact that the Ecosystem approach can be adapted, in the same way adopted by Greece and Cyprus, this approach gives rise to greater possibilities for data collection than the other two. The Cost-Based Approach, though considered to be the simplest to introduce (given that no forecasts and targets are to be set), is still not easily quantifiable since data that quantifies the costs to the public and private sectors of adhering to all legislation that protects the marine environment is not available. As a result, the modified Ecosystem Approach may prove to be more time efficient since it makes use of published national accounts information, much like that available for the Marine Waters Accounts approach to drawing up the Economic and Social Analysis. This also implies that the Ecosystem Approach is the one that can be most easily updated when new data is published.

With respect to flexibility in reporting changes over time, the most efficient of the three approaches would be the Cost-Based Approach since costs accruing to each sector to address new legislation would clearly indicate changes to the burden of protecting the marine environment. The modified Ecosystem approach, as adopted by Greece and Cyprus, would also provide flexibility in determining revised weights to the economy when making use of published national accounts.

With respect to the level of detail, the Thematic approach may be considered to be the most exhaustive since it assesses each degradation theme against a reference value by considering four types of costs. Having said this, however, the Ecosystem approach is the only forward-looking one of the three approaches, making it most able to capture the true nature of the cost of degradation. Though this is true, the very existence of forecasts and reference values (the latter in both the Ecosystem and Thematic approaches) give rise to elements of subjectivity that can question the reliability of these approaches.

Lastly, though all approaches follow the DPSIR framework, the Thematic approach is considered to be that which will ultimately provide the

most exhaustive assessment of quantifiable impacts generated by the degradation of the environment caused by the pressures presented earlier.

### **13. Methodology and data sources**

Two approaches are being suggested in order to estimate the costs of degradation of the marine environment. In both cases, due to constraints in data availability, the approaches will be slightly modified with respect to the description in the MSFD. It is important to note that the results from the two approaches will not be summed up but will provide two separate valuations of the costs of degradation of the marine environment for the Maltese islands given the difficulty in quantifying this.

#### *(i) The Ecosystem approach*

The *Ecosystem approach* is the first approach being proposed. However, since knowledge with respect to ecosystem services for Malta is limited, the methodology for this approach will follow that adopted by Greece and Cyprus. Therefore, this simplified Ecosystem approach will focus on the sectors identified in the Economic and Social Analysis (under the Marine Waters Accounts approach).

The costs of degradation under this methodology will be equal to the Gross Value Added foregone by the sectors making use of the marine environment as a result of its degradation. The data to be used for the completion of this approach mirrors that used for the ESA and provided by the National Statistics Office (NSO).

Following the assessment of a Business as Usual (BAU) scenario (wherein the degradation of the marine environment will follow the current expected trends), a number of scenarios will be considered in order to (i) gauge the effects on sectoral and economy GVA of changes to the level of environmental degradation, as reflected by one or more of the impact indicators assessed, and (ii) determine the impact on the quality of the marine environment if investment is undertaken to ensure technological and environmental management improvements so as to achieve a 10% level reduction in environmental degradation or if targeted policy and/or better technology would lessen the responsiveness of the marine environment's degradation to economic activity.

*(ii) The Cost-Based Approach*

Under the *Cost-Based approach*, the following sources will be used to estimate the cost of implementing legislation that protects the marine environment, namely:

Costs of implementing the EU's Water Framework Directive (WFD) in Malta:

- Estimate: MEPA (2011), "The Water Catchment Management Plan for the Maltese Islands 2011", Marsa, Malta; and
- Actual 2010-June 2013: MEPA's internal calculations (unpublished).

Costs involved in coastal management including monitoring the cleanliness of the marine environment:

- MEPA's estimates (unpublished).

The analysis of these sources will give an estimate of the costs of degradation of the marine environment under the *Cost-Based approach*.

## **14. Assessing the costs of degradation of the marine environment for the Maltese economy**

### *(i) The Ecosystem Approach*

The ESA sheds light on the fact that when considering the direct use of the marine waters by economic sector, approximately 15%<sup>92</sup> of the Maltese economy depends on the marine environment. Various uses are suggested including (i) the sea as providing resources (directly and as an intermediate consumption), (ii) the sea as an input into the product or service provided (directly and indirectly), and (iii) the marine waters used as a sink. The pressures caused by the use of the marine waters by these sectors results in impacts that can have detrimental effects on the marine environment.

The use of the marine environment to the economy can be reduced, or lost completely, for two main reasons, namely:

- The desire to move to the “Good Environmental Status (GES)” which would lead to a loss of its use (directly/indirectly) as well as its sink function in the short term, though it may lead to gains in the very long term<sup>93</sup>.
- Its degradation, either:
  - o Exogenously – as a process taking place on its own steam;
  - o Endogenously – as a process which is in itself being generated by economic activity.

Therefore the discussion on the cost of degradation will follow two routes:

- (i) As the marine environment were to be degraded, which economic activities would be affected?
- (ii) In order to preserve the environment (and move to GES), which economic activities must be focussed upon in a priority manner for technological and environmental management improvements with respect to their impact on the marine environment and the associated level of costs which would be justifiable?

---

<sup>92</sup> This considers the average dependence of the Maltese economy on the marine environment between 2006 and 2012.

<sup>93</sup> This, however, will not be assessed here since the GES targets are not yet articulated.

This section, therefore, aims to estimate the cost of degradation in two manners:

- (i) From impacts to economic sectors: assessing how the loss of the marine environment (magnitudes of environmental impacts) would affect the marine dependent economy and, as a result, the economy in its entirety;
- (ii) From economic sectors to impacts: assessing how certain economic activity is causing degradation of the marine environment and, therefore, the justifiable costs (in terms of additional investment) that the country would be willing to entail in order to ensure technological and environmental management improvements that would limit damage so as to preserve the marine environment and possibly reach “good environmental status” of the marine waters.

The impacts assessed are those described in Table 44 in section 11 whereas the economic sectors are grouped together in line with the MSFD list as described in Table 4 in section 8<sup>94</sup>. The implications of one on the other (as described in (i) and (ii) above) will be assessed by inputting values of 0, 1 and 2 within the cells that would map each of these relationships. 0 is assumed to imply an inelastic relationship, 1 implies that the relationship is unitary elastic, and 2 implies that the relationship is elastic<sup>95</sup>. These values were decided upon following consultation with key experts as well as unpublished MEPA reports.

For (i) above, a value of 0 implies that for a 1% deterioration in one of the impacts assessed, the reduction in GVA of a particular sector would amount to less than 1%; a value of 1 implies that a 1% deterioration in the environmental impact assessed would reduce a sector’s GVA by 1%; whereas a value of 2 implies that a 1% deterioration in environmental quality (as reflected by the impact assessed) would cause a reduction in a sector’s GVA of more than 1%.

For (ii) above, a value of 0 implies that for a 1% increase in a particular sector’s economic activity (as seen by its GVA), a particular

---

<sup>94</sup> The only discrepancy is that the agricultural sector as well as the food and beverages sectors will also be analysed separately due to their relatively high use of the marine environment in Malta.

<sup>95</sup> A value of 0 implies an elasticity of 0.5, a value of 1 implies an elasticity of 1 and a value of 2 implies an elasticity of 2. For some cells, a value of 0\_0 was inputted which would imply a non-elastic (0) rather than an inelastic relationship (0.5). An example of this was the impact of the Telecoms (NACE 61) and Gaming (NACE 92) sectors on the marine’s hydrological process, its nutrient and organic matter enrichment, biological disturbance as well as the contamination by these sectors of hazardous substances and/or intentional release of substances into the marine waters.

environmental impact would deteriorate by less than 1%; a value of 1 implies that for a 1% increase in a sector's economic activity, the environmental impact assessed would deteriorate by 1% (causing environmental degradation of the same magnitude); a value of 2 implies that for a 1% increase in a sector's economic activity, a particular environmental impact would deteriorate by more than 1% (therefore causing proportionately more environmental damage than economic benefit).

A number of scenarios will be considered under each approach, each with varying degrees of impacts caused on the marine environment. The scenarios can be construed to reflect different configurations of the Political, Economic, Social and Technological (PEST) drivers which would impinge on the marine environment in future years. Under both approaches, the best outcome is assumed to be that with the best improvement, or least harm, to the marine environment.

For (i):

Scenario 1: The Business as Usual (BAU) scenario will portray a situation where the degradation of the marine environment will follow current trends (assuming a level deterioration in each of the impact indicators of 5%).

Scenario 2: The scenario analysis will assess the effects on sectoral and total economy's GVA of a 10% level deterioration of just one of the environmental impact indicators at a time.

For (ii):

Scenario 1: The Business as Usual (BAU) scenario will show the impact on environmental degradation of the share of the marine-dependent economy (average 2006-2012).

Scenario 2 will assess the additional investment required to ensure technological and environmental management improvements that would achieve a 10% level reduction <sup>96</sup> in environmental degradation:

1. The assessment will first consider the investment required in those sectors that cause most environmental degradation in total, namely (a) water transport, (b) oil, gas <sup>97</sup>, water abstraction, waste and wastewater, and (c) tourism;
2. The required investment expenditure in those sectors that are less environmentally-harmful will then be considered.

Scenario 3 will estimate the improvement in environmental degradation as a result of a 10% reduction in the responsiveness of environmental impact indicators with respect to the economic activity of those sectors that currently cause most harm to the marine environment (for instance due to technological improvement).

a. From impacts to economic sectors

*Scenario 1: The BAU scenario*

---

<sup>96</sup> This report identifies changes in the level of degradation without assigning a time dimension. As more information becomes available, this analysis will be able to include this time element.

<sup>97</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

In collaboration with expertise from MEPA, MRA, Adi associates and Ecoserv, and in the absence of better information, it is assumed that the degradation of the marine environment, as reflected by the worsening of the 8 impact indicators under review, would deteriorate as follows<sup>98</sup>:

- i) Physical loss – 5%;
- ii) Physical damage – 5%;
- iii) Other physical disturbance – 5%;
- iv) Interference with hydrological processes – 5%;
- v) Contamination by hazardous substances – 5%;
- vi) Systematic and/or intentional release of substances – 5%;
- vii) Nutrient and organic enrichment – 5%;
- viii) Biological disturbance – 5%.

After multiplying each of these with the corresponding elasticity<sup>99</sup> and summing these up for each sector, one can determine the effect of environmental degradation on sectoral value added. A summary of the broad effects of this is provided in Table 48 below<sup>100</sup>.

---

<sup>98</sup> Apart from the drawback of not yet being able to assign a time dimension to environmental degradation, lack of information also precludes the inputting of different % deteriorations for each of these impacts indicators that would allow for a more accurate analysis.

<sup>99</sup> This shows the effect of environmental degradation, caused by one of the impact indicators (assumed to be a 5% level deterioration), on sectoral economic activity as a result of the impact that this deterioration has on a sector's GVA (reflected by the elasticity).

<sup>100</sup> The sector groupings considered within the Cost of Degradation assessment are in line with the MSFD recommended list with the exception of agriculture and the production of food and beverages in Malta that are also being considered separately.

Table 48: Effect of environmental degradation on sectoral value added (by unit of activity)<sup>101</sup>

| MSFD list   | NACE code                          | Elasticity | Rank |
|---|------------------------------------|------------|------|
| Aquaculture, mariculture and fisheries  | 3                                  | 1.63       | 1    |
| Shipping construction and transport   | 30 & 33                            | 0.06       | 10   |
| Defence - Military  | 84                                 | 0.00       | 12   |
| Tourism   | 47, 55, 56, 68 & 79                | 0.94       | 2    |
| Mining (gravel, sand and shell extraction)  | 8 & 9                              | 0.13       | 8    |
| Oil, Gas, Water Abstraction, Waste and Wastewater                                 | 35, 36, 37 & 39                    | 0.81       | 3    |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors) | 41, 61 & 92                        | 0.13       | 8    |
| Water transport   | 50 & 52                            | 0.06       | 10   |
| Supporting infrastructure (e.g. ports, marinas, navigation aids)                  | 42 & 43                            | 0.50       | 5    |
| Agriculture   | 1                                  | 0.50       | 5    |
| Food and beverage production  | 10 & 11                            | 0.59       | 4    |
| Others  | 61, 65, 71, 72, 75, 90, 91, 93, 94 | 0.49       | 7    |

By unit of economic activity<sup>102</sup>, environmental degradation is seen to be most harmful to the fishing and aquaculture sector followed by tourism and the group that aggregates oil, gas<sup>103</sup>, water abstraction, waste and wastewater activities<sup>104</sup>. In the case of fishing, it is not surprising that poor quality of the marine environment could damage this sector's activities by possibly resulting in reduced quantities of fish in sea waters and their suitability for human consumption. Malta's tourism industry is also highly dependent on the quality of the sea given that

<sup>101</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>102</sup> This implies that the sector's size (its GVA compared to total economy GVA) was not yet taken into account but merely assesses how responsive that sector's activity is to environmental degradation (its elasticity). When considering the size of the sector, one would then assess the implications of that responsiveness to total economy GVA.

<sup>103</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>104</sup> This is indicated by the rank column

the majority of tourists come to Malta to engage in sea-related activities. Lastly, poor sea water quality would mean that water would require greater treatment in order to be made fit for human consumption.

Though it is interesting to note the effect on individual sectors, it is also important to assess the impact of environmental degradation on the economy at large. This is affected by the size of the sectors harmed whereby, for instance, tourism would have a greater weighting than fishing and aquaculture. The cost of degradation to the total economy can be estimated by multiplying the expected percentage change in value added by economic sector (as reflected by the elasticities in Table 48 above) with the marine-dependent value added of each sector (as estimated in the ESA). The sum total of these gives an expected cost of degradation to the entire economy (in terms of loss of level of economic value added) of **0.4%**.

#### *Scenario 2: 10% deterioration in the impact indicators*

In addition to the assessment above, one could also infer the effect on the economy's GVA if just one of the impact indicators were to worsen by 10%, whilst keeping all others constant. This assessment is carried out in Table 49 and shows the impact indicators that have a stronger effect on overall economic activity.

This table illustrates that the strongest effect on GVA comes from an increased contamination of marine waters by hazardous substances followed by other physical disturbance (including noise pollution and marine litter), and the systematic and intentional release of substances.

Table 49: Loss in GVA due to a 10% deterioration in one of the Impact Indicators

| 10% deterioration in terms of:                      | Loss in GVA | Rank |
|---|-------------|------|
| Physical Loss                                       | 0.07%       | 6    |
| Physical Damage                                     | 0.11%       | 4    |
| Other Physical Disturbance                          | 0.14%       | 2    |
| Interference with Hydrological Processes            | 0.07%       | 7    |
| Contamination by hazardous substances               | 0.15%       | 1    |
| Systematic and/or intentional release of substances | 0.12%       | 3    |
| Nutrient and Organic Matter Enrichment              | 0.06%       | 8    |
| Biological Disturbance                              | 0.07%       | 5    |

The sectors contributing most to the loss in GVA, both due to the impact suffered as well as their size in proportion to the rest of the Maltese economy relate in the most part to tourism, while oil, gas<sup>105</sup>, water abstraction, waste and wastewater as well as the food and beverage industry are also affected mainly when contamination of water is concerned. The fishing and aquaculture sector is also a main cause for the decline in economy GVA where environmental degradation is caused by the physical loss, nutrient and organic enrichment as well as biological disturbance impact indicators.

As mentioned earlier, it is not surprising to see that tourism and water abstraction are particularly affected by the degradation of the marine environment. What is perhaps more surprising is that, notwithstanding the small size of the fishing and aquaculture sector in Malta, it also features in the contribution to the overall decline in economy GVA when a number of the impact indicators assessed experience a deterioration.

---

<sup>105</sup> As in footnote 9, the term “oil and gas” does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

b. From economic sectors to impacts

*Scenario 1: The BAU scenario*

When considering the effects that economic activity has on the marine environment, it is estimated that the activities of 15.4% of the economy (i.e. the marine-dependent economy) cause approximately 11.7% level deterioration in the marine environment. As a result, if the marine-dependent economy were not operating, the environmental indicators would be expected to improve by approximately 11.7%.

The sectors that are considered to be causing most harm (also due to their size) are (i) Water transport, (ii) Tourism, and (iii) Oil Transportation, Gas Transportation, Water Abstraction, Waste and Wastewater. If one were to eliminate the size of the sector and assess the effect on environmental degradation by unit of activity<sup>106</sup> then, apart from water transport and oil, gas<sup>107</sup>, water abstraction, waste and wastewater, the sectors that cause greatest environmental degradation also include shipping construction and transport, supporting infrastructures and fishing and aquaculture. By unit of economic activity tourism is not considered to be causing particular damage to the marine environment. However when considering its size, it is one of the sectors that is posing most strain on the marine waters. This is summarised in table 50.

---

<sup>106</sup> This assessment shows the responsiveness of environmental degradation to a sector's economic activity (its elasticity). It does not consider the size of that sector in relation to the economy's GVA and, therefore, does not assess its effective degradation of the marine environment. It is interesting to assess this in order to gauge how the marine environment would be affected if those sectors that cause greatest harm (by unit of activity) were to grow.

<sup>107</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

Table 50: Average impact on environmental degradation by economic sector<sup>108</sup>

| MSFD list   | NACE code                              | Ranking - Overall average impact on environmental degradation | Ranking - Average impact on environmental degradation by unit of activity |
|---|--|---|---|
| Aquaculture, mariculture and fisheries  | 3                                      | 6   | 5   |
| Shipping construction and transport   | 30 & 33                                | 5   | 3   |
| Defence - Military  | 84                                     | 7   | 8   |
| Tourism   | 47, 55, 56 & 79                        | 2   | 10  |
| Mining (gravel, sand and shell extraction)  | 8 & 9                                  | 12  | 7   |
| Oil, Gas, Water Abstraction, Waste and Wastewater                                 | 35, 36, 37 & 39                        | 3   | 1   |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors) | 41, 61 & 92                            | 4   | 11  |
| Water transport   | 50 & 52                                | 1   | 1   |
| Supporting infrastructure (e.g. ports, marinas, navigation aids)                  | 42 & 43                                | 10  | 3   |
| Agriculture   | 1                                      | 11  | 6   |
| Food and beverage production  | 10 & 11                                | 8   | 11  |
| Others  | 65, 68, 61, 71, 72, 75, 90, 91, 93, 94 | 9   | 9   |

Total environmental degradation, amounting to 11.7%, reflects the effects that marine-dependent economic activity has on the individual impact indicators. The environmental impacts that are being most affected by this economic activity in Malta are (i) physical damage, (ii) other physical disturbance, and (iii) contamination by hazardous substances as indicated by table 51<sup>109</sup>.

<sup>108</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>109</sup> This is assessed by multiplying each sector's marine-dependent share of total economic activity (average 2006-2012) with the elasticities inputted.

Table 51: Ranking of impact indicators most harmed by economic activity

| Impact  | Effect on Indicator | Ranking |
|---|---------------------|---------|
| Physical Loss                                       | 10.1%               | 4       |
| Physical Damage                                     | 19.6%               | 1       |
| Other Physical Disturbance                          | 15.8%               | 2       |
| Interference with Hydrological Processes            | 7.1%                | 7       |
| Contamination by hazardous substances               | 15.3%               | 3       |
| Systematic and/or intentional release of substances | 9.2%                | 6       |
| Nutrient and Organic Matter Enrichment              | 6.8%                | 8       |
| Biological Disturbance                              | 10.0%               | 5       |

Physical damage is mostly caused by the extensive occurrence of boating in Malta as well as dredge spoil occasionally disposed of at sea. Other physical disturbance mainly reflects noise pollution (caused by boating as well as other activities including oil exploration) and marine litter. Lastly a number of activities are seen to pollute by way of hazardous substances including, among others, water transport, waste as well as agriculture. A more detailed description of the sectors affecting each impact indicator is provided in table 52.

Table 52: The effect of economic activity on the impact indicators

| Impact indicator | Economic activity causing most environmental degradation   |
|------------------|--|
| Physical loss    | <p><i>Total:</i></p> <p>(i) Water transport<sup>110</sup>,<br/>                     (ii) Tourism<sup>111</sup>,<br/>                     (iii) Cables<sup>112</sup>;</p> <p><i>By unit of activity:</i></p> <p>The supporting infrastructure activities are considered to be causing most harm.</p> <p><i>Effect:</i></p> <p>Physical loss caused by man-made structures (as in the case of cables) result in localised effects though those that involve disposal of dredge spoil (as in the case of construction incl. supporting infrastructures) may be shifted away from the source as a result of material movement.</p>   |
| Physical damage  | <p><i>Total:</i></p> <p>(i) Water transport<sup>113</sup>,<br/>                     (ii) Cables<sup>114</sup>,<br/>                     (iii) Tourism<sup>115</sup>.</p> <p><i>By unit of activity</i></p> <p>Various others, including fishing &amp; aquaculture, shipping construction, water transport, oil exploration, electricity, water &amp; waste, as well as the construction of supporting infrastructure, are all considered to have an elastic relationship.</p> <p><i>Effect:</i></p> <p>Depending on the activity undertaken, the damage caused could be localised or otherwise. For instance in the case of oil exploration, in the absence of oil spills, the effects of this sector's activities are localised. Others however, including construction (waste) and boating activities, may cause damage of a more widespread nature.</p> |

<sup>110</sup> This includes maintenance to port infrastructure that can lead to dredging and hence physical loss.

<sup>111</sup> Physical loss would be mainly attributed to coastal development and marinas.

<sup>112</sup> Physical loss through the laying down of cables is generally localised, and the MSFD Initial Assessment on benthic habitats indicates that some benthic habitats might be able to recover from such impacts.

<sup>113</sup> Physical damage is mainly due to anchoring, dredging etc.

<sup>114</sup> Physical damage mainly due to scouring.

<sup>115</sup> Physical damage mainly due to boating.

| Impact indicator                         | Economic activity causing most environmental degradation   |
|--|--|
| Other physical disturbance               | <p><i>Total:</i></p> <ul style="list-style-type: none"> <li>(i) Water transport<sup>116</sup>,</li> <li>(ii) Tourism<sup>117</sup>,</li> <li>(iii) Oil, Gas<sup>118</sup>, Water Abstraction, Waste and Wastewater<sup>119</sup>.</li> </ul> <p><i>By unit of activity:</i></p> <p>The shipping construction and water transport, among others, are considered to be causing most harm.</p> <p><i>Effects:</i></p> <p>The effects of these activities on the degradation of the marine environment could be localised, particularly when considering noise pollution, or more widespread, in the case of marine litter.</p>  |
| Interference with hydrological processes | <p><i>Total:</i></p> <ul style="list-style-type: none"> <li>(i) Tourism<sup>120</sup>,</li> <li>(ii) Water transport<sup>121</sup>,</li> <li>(iii) Oil, Gas<sup>122</sup>, Water Abstraction, Waste and Wastewater<sup>123</sup>.</li> </ul> <p><i>By unit of activity:</i></p> <p>Construction of supporting infrastructures is considered to be impacting on this indicator though, due to its small sectoral size, not to a great extent.</p> <p><i>Effects:</i></p> <p>The effects of this impact are rather localised both when considering changes in thermal regimes by, for instance, outfalls from power stations, as well as in changes in salinity regimes resulting from constructions impeding water movements (incl. breakwaters). Expert judgement also considered the fact that oil, gas, water abstraction, waste and wastewater activities are undertaken by a small number of regulated operators and their activities are relatively well monitored. Tourism and water transport are characterised by a relatively larger number of less-regulated and -monitored activities and hence subject to attendant risks.</p> |

<sup>116</sup> Shipping is associated with both underwater noise and marine litter.

<sup>117</sup> Tourism is a source of marine litter.

<sup>118</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>119</sup> This relates to waste water discharge as well as underwater noise resulting from power-stations.

<sup>120</sup> This mainly relates to marinas and coastal development which would lead to changes in currents.

<sup>121</sup> This includes maintenance to port infrastructure that can lead to dredging.

<sup>122</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

| Impact indicator                                    | Economic activity causing most environmental degradation  |
|---|---|
| Contamination by hazardous substances               | <p><i>Total:</i></p> <ul style="list-style-type: none"> <li>(i) Water transport<sup>124</sup>,</li> <li>(ii) Oil, Gas<sup>125</sup>, Water Abstraction, Waste and Wastewater<sup>126</sup>,</li> <li>(iii) Tourism<sup>127</sup>.</li> </ul> <p><i>By unit of activity:</i></p> <p>Other sectors include agriculture, shipping construction and transport as well as other recreational and sports (water-based) activities.</p> <p><i>Effects:</i></p> <p>This type of marine environmental degradation can have widespread effects since hazardous substances may extend to zones outside the disposal area as a result of material movement.</p> |
| Systematic and/or intentional release of substances | <p><i>Total</i><sup>128</sup>:</p> <ul style="list-style-type: none"> <li>(i) Water transport,</li> <li>(ii) Oil, Gas<sup>129</sup>, Water Abstraction, Waste and Wastewater,</li> <li>(iii) Tourism.</li> </ul> <p><i>Effects:</i></p> <p>As in the "contamination by hazardous substances" indicator, this type of marine environmental degradation can have widespread effects since the release of synthetic and non-synthetic substances may extend to zones outside the disposal area as a result of material movement.</p>   |

<sup>123</sup> This mainly refers to cooling waters and discharge of brine, although usually such pressures are localised.

<sup>124</sup> This includes pollution resulting from oil spills, loss of cargo, antifoulants, etc) as well as possible discharge of ballast waters,

<sup>125</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>126</sup> Including, among others, industrial discharges & emissions of synthetic and non-synthetic substances, storm run off incl. sediments, road litter, chemicals, and other pollutants, as well as contamination from landfills run off.

<sup>127</sup> Pollutants mainly from boating activities.

<sup>128</sup> Similar reasons provided for "Contamination by hazardous substances"

<sup>129</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

**Impact indicator      Economic activity causing most environmental degradation**

|   |  |
|---|--|
| <p>Nutrient and organic matter enrichment</p> | <p><i>Total:</i></p> <ul style="list-style-type: none"> <li>(i) Water transport<sup>130</sup>,</li> <li>(ii) Tourism<sup>131</sup>,</li> <li>(iii) Oil, Gas<sup>132</sup>, Water Abstraction, Waste and Wastewater<sup>133</sup>.</li> </ul> <p><i>By unit of activity:</i></p> <p>Agriculture and aquaculture are also considered to be causing particular damage with respect to this impact indicator.</p> <p><i>Effects:</i></p> <p>Sewage is considered to be the greatest cause of nutrient enrichment of the marine waters. However, since 2011 all waste water discharged to the marine environment is treated, significantly reducing the nutrient load contribution from waste water discharge. Untreated sewage effluents, however, can also reach the marine environment through sewage overflows (in emergency situations, particularly during heavy rainfall events). Nevertheless, such overflows are rigorously controlled by Malta's Water Services Corporation and the influx of raw sewage into the marine environment from sewage overflows is deemed to be localised and of short duration. Water transport and tourism (particularly due to discharges from boats and pleasure crafts) can also cause nutrient enrichment which may be less localised due to the mobility of the vessels. With respect to other activities, for instance aquaculture, benthic impacts are found to be significant in Malta but localised to the area directly beneath the cages.</p> |
|---|--|

<sup>130</sup> Mainly due to the discharge of sewage from large vessels as well as others such as food waste.

<sup>131</sup> Also, mainly due to sewage discharge from boating excursions.

<sup>132</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>133</sup> Possible sewage overflows in emergency situations, particularly during heavy rainfall events.

Biological disturbance

*Total:*

- (i) Water transport<sup>134</sup>,
- (ii) Tourism<sup>135</sup>,
- (iii) Oil, Gas<sup>136</sup>, Water Abstraction, Waste and Wastewater<sup>137</sup>.

*By unit of activity:*

Fishing & aquaculture, construction as well as water-sports (including diving) are considered to be causing particular harm as captured by this impact indicator.

*Effects:*

Water transport is considered to be the main source of non-indigenous species with its effect being relatively widespread. In addition, microbial pathogens can result from sewage effluent discharge, though as described above, much of this effect is localised.

*Scenario 2: Estimating the required investment that the country would be willing to entail in order to ensure technological and environmental management improvements that would result in a 10% level reduction in environmental degradation*

1. Investment in those sectors that cause most environmental degradation

The sectors that are considered to cause most damage to the marine environment<sup>138</sup> include:

- (a) Water transport,
- (b) Oil, gas<sup>139</sup>, water abstraction, waste and wastewater, and
- (c) Tourism.

If just these sectors were targeted in order to achieve a reduction in environmental degradation of 10%<sup>140</sup>, then the required investment expenditure would amount to 12.9% of the sectors' value added. This is equivalent to 1.2 percentage points of the total marine-dependent GVA.

---

<sup>134</sup> Due to non-indigenous species

<sup>135</sup> Due to extraction of species and/or introduction of microbial pathogens

<sup>136</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>137</sup> Microbial pathogens from wastewaters

<sup>138</sup> resulting from their total marine-dependent activity and not per unit of activity

<sup>139</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>140</sup> This would imply total environmental degradation of 10.6% instead of 11.7%.

2. The required investment in the less environmentally-harmful sectors

If, on the other hand, investment is undertaken in those sectors that cause less damage to the marine environment, then the required investment expenditure would amount to 43.1% of their value added. This is equivalent to 4.1 percentage points of total marine-dependent GVA.

The willingness to pay for investment, in terms of annualised capital outlay values, in improvement in technology and management with respect to the impact of sectors on the marine environment can be established at the level of the foregone value added which would have to take place to achieve equivalent environmental results should this investment not materialise. With present patterns of degradation, the output foregone in the more damaging sectors (1.2 percentage points) would be lower than that in the less intensive sectors (4.1 percentage points) such that an investment of 12.9% is estimated to be equivalent to 43.1% in the less intensive sectors. Therefore, in order to achieve an improvement in the quality of the marine environment, it would be more effective to target those sectors that are causing greatest impact on the marine waters.

*Scenario 3: Estimating the improvement in environmental degradation as a result of a 10% reduction in the responsiveness of environmental impact indicators with respect to the economic activity of those sectors that currently cause most harm to the marine environment (for instance due to technological improvement).*

A reduction in the responsiveness of environmental impact indicators to economic activity could come about through policy affecting the activities of these sectors as well as cleaner technology. The sectors that are being considered for this scenario are those that are found to cause most harm to the marine environment. As mentioned earlier these include:

- (a) Water transport;
- (b) Oil, gas<sup>141</sup>, water abstraction, waste and wastewater, and
- (c) Tourism.

Reducing the effect that economic activity has on the degradation of the marine environment by 10%, would imply that the 15.4% marine-dependent economic activity would cause a 10.8% level deterioration of the marine environment (compared to the original 11.7%). Therefore, the impact indicators would show an improvement of 8% over the business as usual scenario<sup>142</sup>.

### *(ii) The Cost-Based Approach*

#### *The costs of implementing measures in line with the Water Framework Directive*

- (i) Source: MEPA (2011), "The Water Catchment Management Plan for the Maltese Islands 2011", Marsa, Malta

The Water Catchment Management Plan for the Maltese Island (2011) provides an indication of the costs of implementing the actions required by the Water Framework Directive (WFD) by 2015. These are divided into two sets of measures, namely:

The basic measures that refer to the actions required by the WFD and other EU directives, including the Nitrates Directive, the

---

<sup>141</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>142</sup> A reduction in level deterioration of the marine environment from 11.7% to 10.8% implies an improvement of 8%.

Urban Waste Water Treatment Directive, the Bathing Water Directive, the Drinking Water Directive, among others<sup>143</sup>;

A number of supplementary measures which are meant to enable the achievement of good status required by the WFD<sup>144</sup>.

With respect to the basic measures, the implementation of the above-mentioned water-related EU directives would result in a total investment cost of approximately €165 million as well as annual operational costs of €14 million. The projected total investment and annual operational costs of the supplementary measures are estimated to amount to approximately €67 million and €8.5 million respectively. Therefore, the total investment and annual operational costs for Malta amount to approximately **€186.8 million**<sup>145</sup> and **€22.3 million** respectively.

Examples of the activities that are covered by this estimate and which are incorporated in plans or programs other than the Water Catchment Plan 2011 include:

- the upgrade of the sewerage infrastructure;
- treatment of all municipal wastewaters;
- reduction of nitrate contamination of groundwater;
- the maintenance and management of valleys to increase their rainwater storage capacity;
- the development of infrastructure to increase water availability to farmers.

The implementation of the WFD and of the programme of measures proposed in the first water catchment plan for Malta will deliver a wide range of *benefits* though these are not quantifiable as yet. A qualitative list is, however, provided below:

Cleaner beaches and coastal waters that benefit the Maltese society through the provision of cleaner recreational areas and a more attractive tourism product. In particular the treatment of all municipal wastewaters prior to discharge into the sea will have an

---

<sup>143</sup> They also include a number of measures, such as water use efficiency and/or water conservation measures which will be promoted at national scale.

<sup>144</sup> These include measures targeting issues related to the improvement of the regulatory framework, water quality, data compilation, evaluation and dissemination. Some also cater for water conservation and efficiency of water use.

<sup>145</sup> The discrepancy between this value and that reported in the document relates to the construction of anaerobic digestion plants to treat municipal and animal waste. This measure has, since then, been discarded.

overall positive health impact as it reduces the risk of harmful microbial contamination in seawater.

Reduction in pollution from agriculture (both nitrates and pesticides) helps improve the habitat of species of conservation importance and of other ecosystems and species that rely on water.

The development and implementation of valley management plans will improve the natural character of valleys, thus improving their recreational and tourism potential.

Better environmental practices for diving and sailing/boating could insure against losses in market segments for these activities.

Measures aimed at reducing leakages and water demand, in both the agriculture and household sectors, will lead to lower production and distribution costs of water. The savings made may be passed on to the consumers in the form of lower water prices.

A decrease in water demand will save energy consumption: every m<sup>3</sup> of desalinated water saved is expected to lead to a saving of 3.5 kWh in energy bills for WSC. This is equivalent to a reduction of 3.05kg of carbon dioxide (CO<sub>2</sub>) emissions. These savings may result in a reduction in the energy bills paid by consumers.

In the medium term, reduction in water demand can also lead to lower reliance on desalination, with comparatively lower needs for future (expensive) renewal of existing infrastructure.

Better groundwater quality, in terms of nitrate levels, means that more groundwater can be used in the production of potable water which will lead to lower costs.

Groundwater reserves of good quality are a contingency for emergency situations where production of potable water from desalination plants ceases. If groundwater reserves are not available Malta would have to rely on the costly importation of potable water.

(ii) Source: Malta Environment and Planning Authority (MEPA) internal calculations (unpublished)

Half way through the implementation of the WFD, MEPA estimated the costs to date of its programme of measures. The estimate relates to those measures that fall within its remit and is, therefore, a partial assessment. This programme includes all basic and supplementary

measures under the WFD and some cost estimates for those measures that were implemented by means of the use of public funds.

Table 53: Basic Measures WFD Article 11-3a

| Basic Measure <sup>146</sup>                  | Description of Measure   | Initial Investment Cost value (€)   | Annual Operational Costs (€)          |
|---|--|---|---------------------------------------|
| Bathing Water Directive                       | Ensuring implementation of the Bathing Water Directive   | Development of Beach profiles:<br>€20,300   | Bathing water monitoring:<br>€102,000 |
| Nature Directives                             | Implementation of the Birds and Habitats Directive   | €400,000 incl. VAT  |                                       |
| Urban Waste Water Treatment Directive (UWWTD) | Treatment of all waste water produced in the Maltese Islands   | Capital investment related to:<br><br>Collecting systems: €20.44 million<br><br>UWWT plants: €67.56 million |                                       |
| Nitrates Directive                            | Implementation of the NAP and monitoring (Farmers to keep a record on the use of organic and inorganic fertilisers and their application to land); (Reduce point source nitrate contamination from livestock Units), (Farmers to draw up and comply with a nutrient management plan) |   | SW monitoring costs: €30,000          |
| <b>TOTAL</b>                                  |  | <b>€88,420,300</b>  | <b>€132,000</b>                       |

<sup>146</sup> The following directives do not fall under the remit of MEPA and, as a result, no estimates are provided: Seveso, EIA, Plant Protection Product, IPPC.

Table 54: Basic Measures WFD Article 11-3b-l

| Basic Measure                                       | Description of Measure  | Initial Investment Cost value (€) | Annual Operational Costs (€) |
|---|---|-----------------------------------|------------------------------|
| 11 (3d)<br>11 (3e)<br>11 (3g)<br>11 (3h)<br>11 (3l) | Adopt a regulatory framework for industrial operational practices   | €1, 632.8                         |                              |
| 11 (3h)   | Set up a database and inventory of industrial sites   | not yet started                   |                              |
| 11 (3g)<br>11 (3k)                                  | Develop tools to link environmental quality standards (chemical) to emission limits for marine discharges                     | €714                              |                              |
| 11 (3g)<br>11 (3k)                                  | Create a pollution abatement programme for priority hazardous substances, priority substances and other substances of concern | €306                              |                              |
| <b>TOTAL</b>  |   | <b>€2,653</b>                     |                              |

The total cost of basic measures implemented to date by MEPA amount to €88.6 million; €88.4 million in investment costs<sup>147</sup> and €132,000 in annual operational costs.

<sup>147</sup> Costs reported in Table 56 relate to officer costs in developing the required guidelines. Therefore, overall initial investment costs are considerably higher.

Table 55: Supplementary Measures<sup>148</sup>

| Measure Title            | Description of Measure   | Initial Investment Cost value (€) | Annual Operational Costs (€) |
|--------------------------|--|-----------------------------------|------------------------------|
| Coastal Water Management | Develop and implement a protocol for the disposal or reuse of dredged material from harbours | €2,246                            |                              |
| Coastal Water Management | Develop environmental Management plans with stakeholders in harbours                         | €5,500                            |                              |

---

<sup>148</sup> Other supplementary measures fall out of remit of MEPA and are, therefore, not accounted for in this table. These include: (i) Monitor dumping operations at the Spoil Ground off Xghajra, (ii) Develop environmental regulations for recreational boating, (iii) Assess the need for ballast water management, monitoring and control, (iv) Complete a comprehensive database of farm holdings and a national nitrate database, (v) Establishment of an advisory Services for the farming community, (vi) Improve the regulatory system for industrial discharges into the public sewerage network, (vii) Farmers required to keep a record of pesticide practices, (viii) Promotion of the use of alternative methods for plant protection other than pesticides, (ix) Creation of a system to collect and treat pesticide packaging and non used products

| <b>Measure Title</b>                | <b>Description of Measure</b>   | <b>Initial Investment Cost value (€)</b> | <b>Annual Operational Costs (€)</b> |
|-------------------------------------|---|--|-------------------------------------|
| Coastal Water Management            | Implement Harbour environmental Management plans with stakeholders  | 0  |                                     |
| Coastal Water Management            | Develop and implement planning and environmental guidance on major coastal engineering works                    | 0  |                                     |
| Coastal Water Management            | Define operational guidance for aquaculture activities  | €755.17                                  |                                     |
| Coastal Water Management            | Implement operational guidance for aquaculture activities   | 0  |                                     |
| Coastal Water Management            | Use of a pipe diffuser for discharge of treated waste water into the coastal environment                        | €800,000                                 |                                     |
| Increasing our knowledge base       | Study the impacts of the national spoil ground off Xghajra  | €704.15                                  |                                     |
| Regulatory Measures                 | Strengthen the existing environmental and planning regulatory process to cater for the objectives of the WFD    | €2,509                                   |                                     |
| Regulatory Measures                 | Set up an interministerial water committee to oversee the implementation of the Water Catchment Management Plan | €1020                                    |                                     |
| Water Quality                       | Set up an environmental emergency response team   | €4811                                    |                                     |
| Managing Water dependent ecosystems | Establish ecological flows within sub-catchments of ecological importance                                       | €80,555                                  |                                     |
| Managing Water dependent            | Carry out a pilot project to promote integrated valley management   | €602                                     |                                     |

|                   |   |                      |  |
|-------------------|---|----------------------|--|
| ecosystems        |   |                      |  |
| Awareness raising | Set up a national water information system                                      | €180,000             |  |
| Awareness raising | Prepare and implement a full information campaign on good agricultural practice | €1,400,000           |  |
| <b>TOTAL</b>      |   | <b>€2,478,702.73</b> |  |

Total supplementary measures implemented by MEPA till June 2013 amount to approximately €2.5 million.

Therefore, the total costs incurred by MEPA in implementing basic and supplementary measures in line with the Water Framework Directive between 2010 and June 2013 amount to **€90.9 million in investment costs and €132,000 in annual operational costs**<sup>149</sup>.

#### *The costs involved in coastal management*

Table 56 provides a rough estimate of the costs of coastal management in Malta. These include investment costs, as well as operational costs, including consultancy fees. Approximately **€800,000** is expected to be spent on coastal management, half of which reflecting a one time investment cost. The remaining half is expected to be spent for each cycle of the Nitrates Directive (NiD) and/or the Water Framework Directive (WFD) cycle. The details of each cost element are described in Table 56.

*Table 56: Coastal Management Costs*

| Description  | Estimated cost per item (€) | No of items | Total Budget (€) | Assumptions   |
|--|-----------------------------|-------------|------------------|---|
| Services for the Monitoring of Nutrient Status and Eutrophication Status of Selected Coastal Areas |                             |             | 30,000           | Running Costs each NiD cycle - Costs related to Nitrate monitoring to be repeated once every four years |

<sup>149</sup> In reality, costs incurred by MEPA are more since some could not be estimated as yet.

| Consultancy for the development of environmental monitoring strategy, design of environmental monitoring programmes and tender specifications | 423.73                             | 656                | 277,966                 | <p>Consultancy rate is based on an average prevalent international senior expert consultancy rate in the environmental sector.</p> <p>Total number of consultancy days is divided amongst 7 Key Experts, approximately as follows: approx. 254 expert/days for air monitoring component; approx. 304 expert/days for water monitoring component; approx. 48 expert/days for soil monitoring component; approx. 50 expert/days for radiation monitoring component. Project management &amp; overheads are included in the estimates.</p> <p>One time investment cost</p> |
|---|------------------------------------|--------------------|-------------------------|---|
| <b>Description</b>  | <b>Estimated cost per item (€)</b> | <b>No of items</b> | <b>Total Budget (€)</b> | <b>Assumptions</b>  |
| Water surveys component - Consultancy & field surveys   | 423.73                             | 810                | 343,219                 | Running costs each WFD cycle  |
| Water surveys component - Charter of vessel & equipment   | 5,000                              | 20                 | 100,000                 | One time investment cost  |
| Water surveys component - Laboratory analysis   | Varied                             | 300+               | 62,820                  | <p>Varied depending on parameters (cost ranges from €50 per sample analysis of priority substances in water to €150 per sample analysis of 3 priority substances in biota). Analysis of over 300 samples (various parameters).</p> <p>Running costs each WFD cycle</p>  |
| <b>TOTAL</b>  |                                    |                    | <b>814,005</b>          |   |

## 15. The GES targets

The Commission Decision on criteria and methodological standards on good environmental status (GES) of marine waters, adopted on 1 September 2010, contains a number of criteria and associated indicators for assessing good environmental status, in relation to the 11 descriptors of good environmental status laid down in Annex I of the MSFD. The criteria build on existing obligations and developments within the EU legislation, covering further relevant elements of the marine environment, not yet addressed in the acting policies. The Decision is a major stepping stone to establish precise objectives for the achievement of GES within the implementation of the MSFD.

The 11 descriptors of good environmental status are the following:

- Descriptor 1: Biological diversity (species and habitats maintained)
- Descriptor 2: Non-indigenous species (levels are minimised)
- Descriptor 3: Population of commercial fish/shellfish (within safe biological limits - healthy stocks)
- Descriptor 4: Elements of marine food webs (all elements at normal abundance and diversity)
- Descriptor 5: Eutrophication (excessive nutrient input from human activities is minimised)
- Descriptor 6: Sea floor integrity (species, habitats and structures and functions are not adversely affected)
- Descriptor 7: Alteration of hydrographical conditions (changes in physical conditions of waters does not affect marine ecosystems)
- Descriptor 8: Contaminants (levels do not give rise to pollution effects)
- Descriptor 9: Contaminants in fish and seafood for human consumption (levels do not exceed standards)
- Descriptor 10: Marine litter (quantities do not cause harm to the environment)
- Descriptor 11: Introduction of energy, including underwater noise (levels do not affect the environment).

The work carried out in this report, both with respect to the description of the pressures and impacts cause by economic activity as well as estimates of the cost of degradation, can assist in the development of the environmental targets for Malta as specified in article 10(1) of the MSFD wherein it is stated that:

*“Member States shall, in respect of each marine region or subregion, establish a comprehensive set of environmental targets and associated indicators for their marine waters so as to guide progress towards achieving good environmental status in the marine environment, taking into account the indicative lists of pressures and impacts set out in Table 2 of Annex III, and of characteristics set out in Annex IV”.*

This is to be done by mapping the eight impacts assessed within the estimates for the costs of degradation<sup>150</sup> to the 11 GES descriptors. It will allow policy makers to assess the implications on economic activity of setting specific targets and ensure their feasibility<sup>151</sup>.

---

<sup>150</sup> And provided in Annex III of the MSFD

<sup>151</sup> The assessment “from impacts to economic sectors” is to be utilised

## CONCLUSION

### 16. Summary

In line with the MSFD requirements, this report aims to provide the necessary tools to be used in setting the GES targets thereby allowing Malta to achieve good environmental status of its marine waters by 2020. For this purpose, an ESA was carried out so as to highlight the use of the marine environment by the local economy as well as the pressures and impacts caused by such activities. In addition, the costs of degradation of the marine environment to the local economy are estimated in terms of foregone GVA.

The Marine Waters Accounts approach was adopted in order to undertake the ESA. Through this approach it is estimated that approximately 15.4% of the Maltese economy (average 2006-2012) makes use of the marine environment either as a provider of resources, as an input into the product or service provided, or as a sink function. This compares to approximately 3-5% of Europe's GDP (in 2004) that is generated from sea-related activities. In addition, the marine environment is used for other non-marketed activities including the use of bathing areas – the value of which is estimated at around €7 million p.a. – the use of the marine water in the production of potable water in Malta – estimated to amount to approximately €127.4 million p.a. – as well as the total benefits accrued from the implementation of the EU's water-related directives (by 2010) – estimated to lie in the range of €13 and €47 million.

A qualitative description of the impacts generated by this economic activity is also provided. In addition, the costs of CO<sub>2</sub> emissions resulting from these marine-dependent sectors are estimated using shadow pricing. These sectors contribute approximately 63% of total emissions, valued at a shadow cost of around €47 million or 8% of Malta's GVA.

A simplified version of the Ecosystem approach is adopted so as to estimate the costs of degradation of the marine environment by assessing the linkages between environmental impacts and the activities of the marine-dependent sectors. Two approaches are adopted in this regard, namely:

- (i) assessing how the loss of the marine environment would affect the marine-dependent economy;

(ii) assessing how much investment would be required by the marine-dependent sectors in order to preserve (or ameliorate) the marine environment.

The cost to the economy is the lost GVA resulting from the degradation of the marine environment or the investment required to preserve it.

For (i) above, the loss in the marine environment (reflected by the 8 impact indicators) is assumed to amount to 5%<sup>152</sup>. It is estimated that this level of degradation would cause a loss of 0.4% of GVA to the Maltese economy mainly as a result of a loss accruing to the fishing and aquaculture sector, tourism as well as the oil, gas<sup>153</sup>, water abstraction, waste and wastewater sectors. Assuming that the degradation of the marine environment emanates from just one of the impact indicators at a time, the strongest decline in total economy GVA would come from an increased contamination of the marine waters by hazardous substances followed by other physical damage, including noise pollution and marine litter, and the systematic and intentional release of substances.

In the case of (ii) above the 15.4% of economic activity in Malta (the marine-dependent portion) is estimated to cause approximately 11.7% level deterioration of the marine environment. The sectors causing most harm (also due to the size of their operations) include water transport, tourism and the oil, gas<sup>154</sup>, water abstraction, waste and wastewater sectors. In order to achieve a 10% level reduction in environmental degradation, either (i) the three sectors causing most environmental degradation would have to undertake an investment equivalent to 12.9% of their value added, equivalent to 1.2 percentage points of total marine-dependent economic activity, or (ii) all other sectors would be required to make an investment equivalent to 43.1% of their value added, equivalent to 4.1 percentage points of total marine-dependent GVA. This implies that in order to obtain an improvement in the quality of the marine environment, it would be more effective to target those sectors that are causing greatest impact on the marine environment.

---

<sup>152</sup> This reflects a deterioration in level terms. In addition, due to lack of data, a time dimension cannot be considered.

<sup>153</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

<sup>154</sup> As in footnote 9, the term "oil and gas" does not include the exploitation of hydrocarbons (which would correspond with NACE 8&9).

In addition, another consideration was made in this regard namely to introduce policy and/or technology that would result in a reduction in the responsiveness of the environmental impact indicators to economic activity<sup>155</sup> by 10%. This would result in the marine-dependent economy causing a 10.8% level deterioration of the marine environment as opposed to 11.7%.

The costs of degradation were also estimated through the Cost Based approach whereby the costs of implementing the actions required by the WFD as well as the costs involved in coastal management were assessed. The estimated total investment costs and annual operational costs of implementing the WFD are estimated to amount to €231.8 million and €22.3 million respectively by 2015 whereas approximately €800,000 is expected to be spent on coastal management.

---

<sup>155</sup> Reflected by the respective elasticities

## 17. Disclaimers

Though economic analysis is one component required by the MSFD, it is important to highlight its limitations. Economic analysis should interact with the other disciplines contributing to implementation of the Directive, and should be regarded as valuable information that informs decisions. As a result, economics is not the only relevant factor and should not be seen as giving the final answer on decisions. However, it is a crucially relevant consideration in assessing the contribution of the marine sector to human development, and in ensuring the justification for and mobilisation of resources towards its sustainable use.

It is also important to highlight the complexity of the tasks involved in the economic reporting and analysis of issues associated with the MSFD. The marine environment is subject to a wide range of uses from a variety of sectors. As new technologies emerge and pressures change, there can be increasing competition between these uses for space and resources, and so economic analysis is an important part of marine management and policy decisions.

The main risks involved in carrying out this assessment relate to the lack of relevant information, in the form of studies and data. With respect to the availability of relevant policy documentation from the EU Commission and other sources, we consider this risk to be minimal. However, with respect to data issues, we consider risks to be of a more significant nature. In order to minimise these types of risks, the best possible use was made of available data, including:

- The use of official published data by the National Statistics Office (NSO) and Malta Environment and Planning Authority (MEPA);
- The use of data which is not published but which was officially requested from these Institutions; and
- Judicious use of information in other studies, including academic theses, papers and reports.

Lastly, the report was prepared in parallel with the setting up of the Good Environmental Status (GES) targets by MEPA. While the interactive process adopted was useful in order for MEPA to become more aware of the feasibility of some of the proposed GES targets, especially pressure-based or impact-based, the lack of these indicators led to difficulties in assessing the true costs of degradation of the marine environment. It may, therefore, be useful to update this

assessment once better knowledge and quantification of the degradation of the marine environment as well as the GES targets become available.

## 18. The way forward

The outcome of result 3B will be used to feed into other reporting obligations, namely result 3C, which aims to streamline the assessment of the EU member states in three reporting sheets, namely:

- 8C01: Human Activities (Economic and social analysis of the use of marine waters);
- 8C02: Ecosystem services and other approaches (Economic and social analysis of the use of marine waters);
- 8C03: Cost of Degradation.

Since the Ecosystem services approach was not adopted for the ESA, reporting sheets 8C01 (Human activities) and 8C03 (Cost of degradation) will be completed for Malta.

With respect to 8C01, the analysis pertaining to economic sectors, as reported in Tables 6-34, will be grouped together in line with the MSFD guidance list to enable a more meaningful assessment. Weighted average data will be reproduced as follows:

*Table 57: Weighted average data utilised for reporting sheet 8C01*

| Sectors   | NACE codes         | Marine-dependent GVA/Total economy GVA | Marine-dependent employment/Total economy employment | Growth in Marine dependent GVA | Growth in Marine dependent employment |
|---|--------------------|--|--|--------------------------------|---------------------------------------|
| Aquaculture, mariculture and fisheries  | 3                  | 0.4%                                   | 0.5%   | -8.5%                          | 1.6%                                  |
| Shipping construction and transport   | 30 & 33            | 0.6%                                   | 0.7%   | 2.0%                           | -26.7%                                |
| Defence - Military  | 84                 | 0.3%                                   | 0.4%   | 1.4%                           | -2.4%                                 |
| Tourism   | 47, 55, 56, 68, 79 | 4.4%                                   | 6.6%   | 4.6%                           | 2.2%                                  |
| Mining (gravel, sand and shell extraction)  | 8 & 9              | 0.0%                                   | 0.0%   | -9.0%                          | -7.6%                                 |
| Oil, Gas, Water Abstraction, Waste and Wastewater                                 | 35, 36, 37, 39     | 1.2%                                   | 1.4%   | -                              | -3.4%                                 |
| Cables (e.g. Power transmission, Telecommunications, Pipelines - interconnectors) | 49, 61, 92         | 3.4%                                   | 1.2%   | 14.4%                          | 12.4%                                 |
| Water transport   | 50 & 52            | 3.8%                                   | 2.1%   | 6.1%                           | 2.1%                                  |
| Supporting infrastructure (e.g. ports, marinas, navigation aids)                  | 42 & 43            | 0.2%                                   | 0.3%   | 6.9%                           | 5.1%                                  |
| Agriculture   | 1                  | 0.1%                                   | 0.3%   | -0.1%                          | 0.6%                                  |

|                                 |                                    |   |   |                                       |  |
|---------------------------------|------------------------------------|---|---|---------------------------------------|--|
| Food and Beverage Manufacturing | 10 & 11                            | 0.8%  | 0.8%  | 2.6%                                  | -0.8%  |
| <b>Sectors</b>                  | <b>NACE codes</b>                  | <b>Marine-dependent GVA/Total economy GVA</b> | <b>Marine-dependent employment/Total economy employment</b> | <b>Growth in Marine dependent GVA</b> | <b>Growth in Marine dependent employment</b> |
| Others                          | 65, 69, 71, 72, 75, 90, 91, 93, 94 | 0.2%  | 0.3%  | 10.2%                                 | 8.3%   |
| <b>Total</b>                    |                                    | <b>15.4%</b>                                  | <b>14.7%</b>  | <b>4.2%</b>                           | <b>0.5%</b>                                  |

In addition, and as mentioned earlier, the work carried out within this report, both with respect to the description of the pressures and impacts caused by economic activity as well as estimates of the cost of degradation, can assist in the development of the GES indicators for Malta. By mapping the eight impacts assessed within the estimates for the costs of degradation to the 11 GES descriptors, policy makers will be able to assess the implications on economic activity of setting specific targets as well as ensure their feasibility.

Lastly, while this assignment is predominantly focused on fulfilling reporting requirements in relation to MSFD, it is understood that the information which will be produced will assist policy decisions in a number of dimensions, including:

- Understanding the economic issues and trade-offs in marine management;
- Supporting cost-effective policy choices, that make best use of scarce financial resources and take into account all costs and benefits (including impacts that are harder to assess, such as indirect impacts on economic activity, and non-market social and environmental impacts), helping achieve well-defined environmental objectives;
- Contribute to determining exceptions, such as those for disproportionality, or overriding public interest;
- Assess the economic impact of the proposed programme of measures; and
- Contributing to the achievement of sustainable marine management.

## REFERENCES

### *Documents*

Camilleri Rolls, C. (2006), "Economic Valuation of Ramla Bay", Unpublished Dissertation, Institute of Islands and Small States Studies, University of Malta.

Caruana, C. (2005), "An Economic Valuation of a Beach on the Island of Malta: Pretty Bay B'Bugia", Unpublished Dissertation, Institute of Islands and Small States Studies, University of Malta

Cordina, G. (2006), Contribution to e-foresee exercise on the use of Marine Resources in Malta conducted by the Malta Council for Science and Technology.

EC (2010), "Economic and Social Analysis for the Initial Assessment for the Marine Strategy Framework Directive: A Guidance Document", Working Group on Economic and Social Assessment, DG Environment, Brussels.

EC (2011), "The costs of not implementing the environmental acquis", DG Environment, Final report ENV.G.1/FRA/2006/0073, Brussels.

ECOTEC et al (2001), "The benefits of compliance with the environmental acquis for the candidate countries", DG Environment, European Commission, Brussels.

EP (2008), Directive 2008/56/EC of the European Parliament and of the Council, of 17 June 2008, establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), Annex III Table 2 "Pressures and Impacts", Brussels.

EP (2010), "What system of burden sharing between member states for the reception of asylum seekers?", DG for Internal Policies, Policy Department C, Citizen's Rights and Constitutional Affairs, European Parliament.

FAO (2006), "Malta Water Resources Review", Food & Agriculture Organisation of the United Nations.

JASPERS (2008) "Preliminary Assessment of the Viability of Options for Stormwater Protection and Re-use for the Birkirkara-Msida Stormwater Project", Joint Assistance to Support Projects in European Regions, European Commission.

MEPA (2011), "The Water Catchment Management Plan for the Maltese Islands 2011", Marsa, Malta.

MRA (2010) "A Proposal for a Water Policy for the Maltese Islands; Public Consultation Document", Malta Resources Authority, Malta.

NSO (2009) "Estimating the Volume of Water Usage for Irrigation in Malta", National Statistic Office, Malta.

Plan Bleu pour l'Environnement et le Développement en Méditerranée (2013), "State of Play of Economic and Social Analysis", EcAp 1<sup>st</sup> meeting of the correspondence group on economic and social analysis, Sophia Antipolis, 11-12 April 2013.

SEMRU (2010), "Ireland's Ocean Economy", SEMRU Socio-Economic Research Unit, National University of Ireland, Galway.

WSC (2010), "Strategic Environmental Assessment of the Storm Water Master Plan for the Maltese Islands", Environmental Report, Malta.

#### *Data*

CIA factbook: <https://www.cia.gov/library/publications/the-world-factbook/>

Delft (2010), "Shadow Prices Handbook: Valuation and weighting of emissions and environmental impacts", CE Delft.

EC (2007), Maritime Facts and Figures: <https://infoeuropa.euroid.pt/files/database/000038001-000039000/000038583.pdf>

MEPA (2013), EU's Water Framework Directive: Actual costs incurred by MEPA January 2010 - June 2013, MEPA's internal calculations

MEPA (2013b), Costs involved in coastal management including monitoring the cleanliness of the marine environment, MEPA's estimates

MEPA (2013c), Catch per Unit Effort (unpublished)

MFSA (2011), "Insurance Principals Statistics 2011 – General Business",  
url:<http://www.mfsa.com.mt/pages/viewcontent.aspx?id=51>

MIA (2012), "2012 Annual Statistical Summary", issued by the Information Management Section, Malta International Airport.

MRA (2013), National Greenhouse Gas Emissions for Malta.

MTA (2012), "Market Profile Analysis Year 2012", Research Unit, Market Support & Development.

NSO: various news releases

*Web links*

[http://www.projectpisces.eu/guide/the\\_msfd\\_and\\_the\\_ecosystem\\_approach/implementing\\_the\\_ecosystem\\_approach\\_through\\_the\\_msfd/](http://www.projectpisces.eu/guide/the_msfd_and_the_ecosystem_approach/implementing_the_ecosystem_approach_through_the_msfd/)

<http://data.worldbank.org/indicator/AG.LND.TOTL.K2>

[http://staff.um.edu.mt/csav1/srg/intro\\_geog.pdf](http://staff.um.edu.mt/csav1/srg/intro_geog.pdf)

European Atlas of the Seas:

[http://ec.europa.eu/maritimeaffairs/index\\_en.html](http://ec.europa.eu/maritimeaffairs/index_en.html);

[http://ec.europa.eu/maritimeaffairs/documentation/facts\\_and\\_figures/index\\_en.htm](http://ec.europa.eu/maritimeaffairs/documentation/facts_and_figures/index_en.htm)

[http://en.wikipedia.org/wiki/List\\_of\\_films\\_shot\\_in\\_Malta](http://en.wikipedia.org/wiki/List_of_films_shot_in_Malta)