

Economic Sectors

1.1 Introduction

The EU Marine Strategy Framework Directive calls for the assessment of pressures and impacts on the marine environment and an economic and social analysis of the use of marine waters as part of the assessment of the environmental status of marine waters. While the Directive does not stipulate a list of economic sectors or human activities to be assessed, the Commission Staff Working Paper¹ indicates that the MSFD Initial Assessment would benefit from an explicit description of economic sectors and human activities. Knowledge and characterisation of human activities would complement the analysis of pressures and impacts and the economic and social analysis as required by Article 8 of the Directive. Therefore the initial assessment would benefit from containing a stand-alone section describing all the economic sectors related to marine waters integrating to the extent possible, a spatial (and temporal) description of uses and possible pressures.

This report includes brief descriptions of the economic sectors deemed relevant to the MSFD Initial Assessment for Malta. The economic sectors considered by this report are based on the list provided by the guidance on the MSFD Economic and Social Analysis and linked to the pressures listed in Table 2 of Annex III to the Directive by the MSFD Commission Staff Working Paper.

The report:

- provides spatial information on the location of the activities associated with the economic sectors where possible;
- links the sectors to potential pressures and impacts on the marine environment; and
- refers to the outcome of the MSFD economic and social analysis where deemed necessary.

This report should be read in conjunction with the MSFD Initial Assessment reports and the Economic and Social Analysis.

¹ Commission Staff Working Paper: Relationship between the initial assessment of marine waters and the criteria for good environmental status. SEC(2011)1255 final

1.2 Aquaculture

1.2.1 General Overview

Aquaculture is defined as the farming of aquatic organisms including fish, molluscs, crustaceans, other invertebrates and aquatic plants². The aquaculture industry in Malta, which involves finfish farming, initiated in the early 1990's with the production of European seabass (*Dicentrarchus labrax*) and Gilt-head seabream (*Sparus aurata*). The market demand to culture sea bass and sea bream in offshore cages increased dramatically in the 1990s, however in 1999, interest in tuna penning started. The first tuna farm was established in 2000 and this led to interest in tuna farming in the following years.

Apart from the Malta Aquaculture Research Centre (MARC), which is the national body for aquaculture research, there are currently six operators³ making use of nine marine sites for the culture of Closed Cycle Species seabass and seabream, a small production of meagre (*Argyrosomus regius*)⁴ and fattening of the Atlantic Bluefin tuna (*Thunnus thynnus thynnus*). The latter is a capture-based aquaculture whereby tuna of various sizes are caught by purse seine fishing nets and fattened for about six months until export⁵.

The list of operators, location of fish farm cages and licensed capacities are included in Table 1 as extracted from Adi Associates Environmental Consultants Ltd. (2012)⁶, while the location of fish farm cages is shown in Figure 1. Cages used for the culture of sea bass, sea bream and meagre are located approximately one kilometre offshore, while tuna farms are situated approximately 2km offshore, with two tuna pens located within the Aquaculture Zone 6km off the south eastern coast of mainland Malta⁷.

The only hatchery present in Malta is that at the Malta Aquaculture Research Centre (MARC) in Marsaxlokk which centre focuses on aquaculture research. This research centre together with a private company, MFF Ltd. (previously known as Malta Fishfarming Ltd.), embarked on a joint venture to study spawning and juvenile rearing methods for the amberjack (*Seriola dumerili*) in 2006. This collaboration was extended for another five years from 2011 to 2016⁸.

² Draft Aquaculture Operations Regulations [Fisheries Conservation and Management Act (CAP. 425) 2004]

³ Adi Associates Environmental Consultants Ltd., 2012. Strategic Environmental Assessment on Malta's Aquaculture Strategy. Environmental Report. San Gwann, November 2012; viii + 110pp +I appendix.

⁴ http://www.fao.org/fishery/countrysector/naso_malta/en

⁵ http://www.fao.org/fishery/countrysector/naso_malta/en

⁶ Adi Associates Environmental Consultants Ltd., 2012. Strategic Environmental Assessment on Malta's Aquaculture Strategy. Environmental Report. San Gwann, November 2012; viii + 110pp +I appendix.

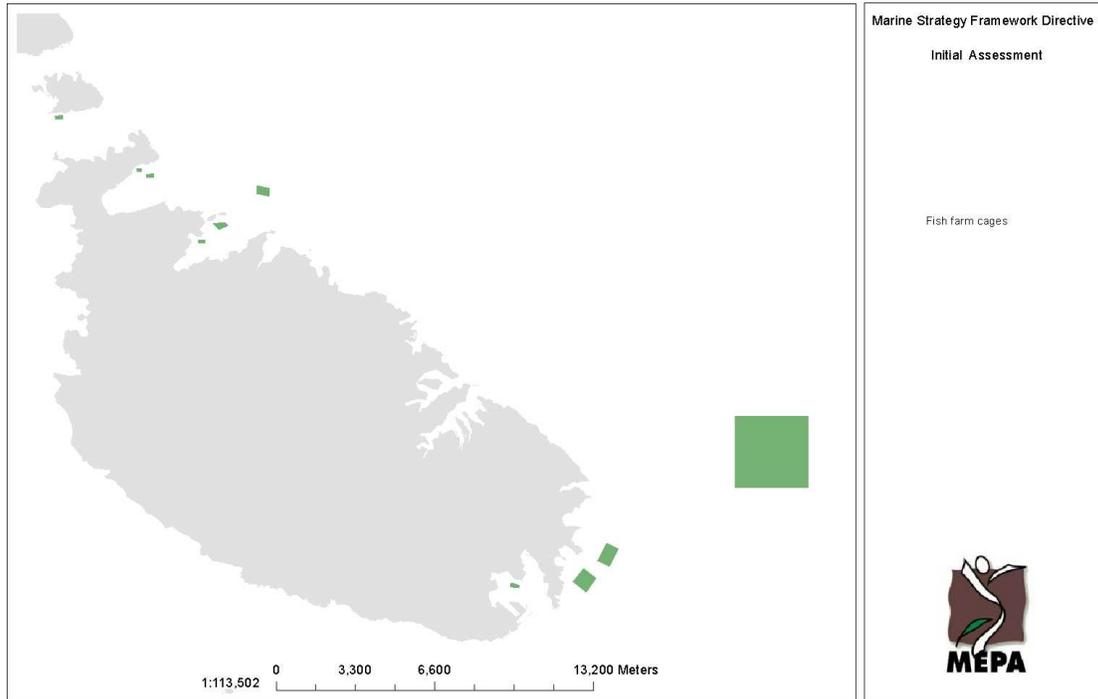
⁷ http://www.fao.org/fishery/countrysector/naso_malta/en

⁸ http://www.fao.org/fishery/countrysector/naso_malta/en

Table 1: Aquaculture operators in Malta, location of fish farm cages and licensed capacities as extracted from Adi Associates Environmental Consultants Ltd. (2012)⁹

Operator	Location	Licensed Capacity
Malta Tuna Trading Ltd. & F&F Ltd.	Off il-Ħofra ż-Żgħira, Marsaxlokk	1,200 (tuna) [MTT Ltd.] 300 (sea bass/sea bream) [F&F]
P2M (Site A)	Mistra Bay	1100 (sea bass/sea bream combined for all three sites)
P2M (Site B)	St. Paul's Islands	
P2M (Site C)	Mellieħa Bay	
MFF Ltd. & Melita Tuna Ltd.	Off Munxar Reef (Marsaskala)	350 (tuna) [MT Ltd.] 150 (seabream) [MFF]
AJD Tuna Ltd.	Sikka l-Bajda (St. Paul's Bay)	1,500 (tuna)
AJD Tuna Ltd.	South Comino Channel	Not operational
MareBlu Ltd.	Aquaculture Zone, SE Malta	1,500 (tuna)
Ta' Mattew	Aquaculture Zone, SE Malta	1,500 (tuna)
National Aquaculture Centre	Marsaxlokk Bay	100

Figure 1: Location of fish farm cages



⁹ Adi Associates Environmental Consultants Ltd., 2012. Strategic Environmental Assessment on Malta's Aquaculture Strategy. Environmental Report. San Gwann, November 2012; viii + 110pp +I appendix.

1.2.2 Economic Valuation

The MSFD Economic and Social Analysis¹⁰ assessed the aquaculture sector together with the Fisheries sector (NACE code 3) (Table 2). The average production value (2006-2012) of these two sectors is €94.6 million, with an employment in full time equivalents of 913 and average gross-value added of €19.6 million (approximately 0.3% of the Maltese Gross Domestic Product).

Since this data would not reflect the aquaculture sector on its own, reference is hereby being made to some trends in economic parameters quoted by the 'Preparatory study and recommendations prepared for the Ministry of Resource and Rural Affairs, Government of Malta'. According to this study, gross industry output (both tuna and Closed Cycle Species) reached a peak of €130 million in 2007 when tuna production reached 6,800 tonnes, with total gross value added (GVA) of €53 million and supported an estimated 964 Full Time Equivalent jobs (direct and indirect). This output was largely attributable to tuna penning. In the two following years however tuna penning made a loss due to increased costs, storm losses, foreign exchange differences, and (in 2009) low prices, and as a result total GVA for the industry as a whole was negative in 2008 and only €18m in 2009.

The 2010 production values for the main cultured species as quoted from the National Statistics Office by the Food and Agriculture Organization of the United Nations are extracted in Table 3.

¹⁰ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 2: Economic indicators for NACE code 3 (Fisheries and Aquaculture) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis¹¹. FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 3							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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>	100%	100%	100%	100%	100%	100%	100%	
	Estimated Economic Activity Dependent on the Marine Environment							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
FTE Employment	845	885	899	959	944	928	928	1.6%
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Table 3: Production of the main cultured species (2012) quoted from the National Statistics Office¹²

Species produced 2010	Quantity Produced (tonnes)	Value million (EUR)
European seabass (<i>Dicentrarchus labrax</i>)	126	14.1 ¹³
Gilthead seabream (<i>Sparus aurata</i>)	2,604	
Atlantic bluefin tuna (<i>Thunnus thynnus thynnus</i>)	3,904	78.9

¹¹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

¹² National Statistics Office – News Release – 18 November 2013

¹³ This is the value quoted for gross output of the aquaculture industry for ‘other fish farming’.

1.2.3 Legislation and Management

Aquaculture operations in Malta are mainly regulated by the Fisheries Conservation and Management Act of 2001, stipulating that the installation and operation of aquaculture establishments should be subject to a permit by the Director responsible for fisheries management.

Development of aquaculture installations is also subject to development permits issued in accordance with planning and development policies and specific environmental issues of aquaculture operations are subject to an environmental permitting mechanism. Aquaculture operations may require different types of environmental assessments. In general, development permits for aquaculture include conditions for monitoring with the aim of assessing any potential adverse environmental effects.

In 1994, the (then) Planning Authority issued Policy and Design Guidance for Fishfarming aimed at ensuring the environmental sustainability of aquaculture development. In 2001 a note on this Policy and Design Guidance document was issued, recognising the fact that the document was in need of revision and indicating that the search areas in the guidance document were unacceptable.

The Fisheries Operational Programme (OP) for Malta 2007-2013, prepared in accordance with EC 1198/2006, identifies and describes the priorities for the development of aquaculture in Malta in line with the objectives of the Common Fisheries Policy (CFP). The Operational Programme is based on Malta's National Strategic Plan for Fisheries 2007-2013 with the main objective for aquaculture being 'To stabilise existing aquaculture production, increase product diversification and improve the value added of the sector'.

In 2012, a draft aquaculture strategy for Malta¹⁴ was issued for public consultation, proposing four broad strategic objectives:

- Improved regulation: streamlined regulatory environment under one MRRA Directorate, with a clear policy on site locations, minimal conflict with other users and standard conditions for all operators
- Improved operation: Efficient, profitable farms operating according to the principles of best management practice, complying with their operating consents causing no nuisance to other coastal users and with a positive public image.
- Improved environmental monitoring: a system that recognises the link between biomass and impacts, specifies limits to what constitutes adverse impact (Environmental Quality Standard – EQS), over what areas such impacts are acceptable i.e. the Allowable Zone of Effect (AZE), and is proportionate, practical and cost effective
- Better Innovation: Facilities, funding and human resources to allow high quality applied research for the benefit of all industry operators.

¹⁴ Ministry of Resource and Rural Affairs: An Aquaculture Strategy for Malta – Final Draft Report

The strategy also identifies a number of production capacity scenarios and different sites for aquaculture production, and puts forward overall recommendations.

1.2.4 Pressures and Impacts

Aquaculture operations may exert pressures on both water column and benthic habitat types, mainly as a result of increased input of nutrients and organic matter from fish waste and uneaten fish feed.

A case study on the impacts of fish farms in shallow waters on benthic habitats follows from the establishment of fish farm cages in 1991 at a depth of 12-16m. The fish farm in question, which has now ceased operation, pre-dated current permitting systems. This fish farm led to reduced plant growth and increased mortality in *Posidonia oceanica* beds located directly beneath the cages and in the vicinity¹⁵. These changes were attributed to the elevated nutrient levels and high sedimentation rates near the cages. Borg *et al.* (2006) however imply recovery of *P. oceanica* meadows following cessation of fish farm operation through a significant increase in shoot density¹⁶. Current permitting processes are geared towards preventing the impacts, particularly on *Posidonia oceanica* meadows, as identified through the case study.

Monitoring of the impact of tuna penning farms, which has been ongoing since 2000, indicate that adverse impacts on the water column are generally limited to the area in close proximity to the cages, with changes in monitored parameters (lower levels of oxygen, reduced water transparency and elevated nutrient levels) reported to occur during the farming season between July to December. Water quality studies, however, have not shown any consistent trend in the levels of monitored variables¹⁷.

Benthic impacts on the other hand were found to be more significant but localized to the area directly beneath the cages¹⁸. Adverse impacts were mainly related to uneaten fish feed which accumulate on the seabed towards the end of each penning season (autumn), resulting in changes to the physical and biological characteristics of the seabed. . In the case

¹⁵ Dimech, M., Borg, J.A., and Schembri, P.J. 2002. Changes in the structure of a *Posidonia oceanica* meadow and in the diversity of associated decapods, mollusks and echinoderm assemblages resulting from inputs of waste from a marine fish farm (Malta, Central Mediterranean), Bulletin of Marine Science 71 (3): 1309-1321 in Mazik, K., Burdon, D., and Elliott, M. 2005. Seafood waste disposal at sea - a scientific review. Institute of estuarine and coastal studies, University of Hull, pp.70.

¹⁶ Borg J. A., Micallef M. A, & Schembri P. J., 2006. Spatio-temporal variation in the structure of a deep water *Posidonia oceanica* meadow assessed using non-destructive techniques. Marine Ecology 27: 320 - 327.

¹⁷ Borg, J.A. and Schembri, P.J. 2006. Environmental monitoring of aquaculture activities in the Maltese Islands. Presentation at seminar 'Aquaculture and the environment' organized by the Cleaner Technology Centre, Malta and the Regional Activity Centre for Cleaner Production (UNEP Mediterranean Action Plan); Valletta, Malta, 16 November 2007.

¹⁸ Borg, J.A. and Schembri, P.J. 2006. Environmental monitoring of tuna-penning activities in Malta. Presentation at international conference on 'Offshore Mariculture 2006' organized by the Society for underwater Technology and the Greenwich Forum; Malta 11-13 October 2006 (Abstract 3pp).

of tuna farming, the fish are not usually kept much longer than 6 months after which the sites lie fallow for the rest of the year before re-stocking. It is foreseen that existing regulations should be reinforced by a COGP and by Area Management Agreements (AMAs) between all the operators in a zone. Such AMAs could include agreement on fallowing practices and disease treatment strategies, as is the case in the Scottish salmon farming industry for example.

1.2.5 Forward Look

While increased competitive and regularity pressures are expected, aquaculture in Malta is expected to experience growth in the next ten years following continued investment in R&D in the farming of new species, the investment in new spawning and hatching facility and the implementation of the aquaculture strategy for Malta.

Malta's draft aquaculture strategy puts forward recommendations for the aquaculture sector. The following are deemed to be the most pertinent to the MSFD:

- Future Capture Based farms should be located in sites with more than 50m depth and more than 1nm from shore to limit impacts;
- Consideration should be given to restricting the feeding of baitfish to tuna cages during onshore wind conditions in the summer tourist season if alternative solutions are not found;
- The main emphasis with regard to development of alternative species should be on amberjack;
- A hatchery and spawning facility for amberjack, bluefin tuna and other species should be established at the earliest opportunity;
- Additional marine sites will be needed for future expansion of the industry in both nearshore and offshore areas¹⁹;
- The present process by which farms are monitored and enforcement instigated should be reviewed and strengthened;
- The introduction of conditions regarding methods of feeding baitfish to tuna should be considered;
- It is recommended that a review of environmental monitoring methodology is carried out by an independent international authority with relevant expertise and that procedures are brought in line with guidance under development within the GFCM workshops;
- A commitment to the development of the aquaculture industry is needed to ensure potential future gains in economic impact are realised;

¹⁹ It should be noted that the strategy is also proposing the development of a second aquaculture zone off the Northern coast of Malta.

1.3 Underwater Pipelines and Cables

1.3.1 General Overview

Underwater pipelines in Malta are associated with potable water distribution, disposal of treated urban wastewater and transfer of fuels from ship to land based installations. The latter is a result of the fact that no fuel pipelines yet connect to Malta and all fuels required to meet local demand are imported by ship. Vessels transporting fuels berth or moor at designated locations that are equipped with the necessary infrastructure for transfer of fuels, which in some cases includes underwater pipelines. Within this context, underwater pipelines in Malta are localised and concentrated in inshore waters. The only offshore pipeline passing on Malta's continental shelf is the gas pipeline connecting Libya and Sicily.

Underwater cables are utilised for power transmission and telecommunications between Malta and mainland Europe, as well as within the Maltese Islands.

The location of underwater pipelines and cables in Malta is indicated in Figure 2 and Figure 5 respectively and a brief description of the use of such infrastructure is given in the sections below.

1.3.1.1 Underwater Pipelines

Fuel Industry

Underwater pipelines supporting the gas and fuel industry are currently only present in Marsaxlokk harbour, and are used for the transfer of fuel from designated points within the bay to a number of land based installations.

These pipelines are mainly used for transfer of fuel by Enemalta Petroleum Division and San Lucian Oil Company Ltd. The Enemalta Petroleum Division owns seven submarine pipelines linking its fuel storage facility in Has-Saptan to a dolphin (a platform on concrete pylons) in Marsaxlokk Bay. There are five pipelines for fuel (gas, oil, kerosene and petrol), one for fresh water and one for ballast water, although the latter is no longer in use.

San Lucian Oil Company Ltd., operates three sub-aquatic pipelines (2 of which are looped in one pipeline) for transfer of fuel oil, light cycle oil and gas oil between vessels and its facility in the San Lucian area in Marsaxlokk.

Liquefied Petroleum Gas (LPG) is also transferred via pipeline from supply vessels moored at designated buoys within Marsaxlokk Bay to the nearby plant located on the coast in Qajjenza, Birżebbuġa. The underwater pipelines in recent use comprise a twin pipeline - one for vapour, one for liquid - laid on the seabed and cast together in concrete. These pipelines, which have been in use for approximately the past thirty years, connect to vessels using

flexible hoses connected to a buoy. The LPG plant at Qajjenza is to be dismantled but the underwater pipelines may be left *in situ* since removal may cause additional impacts.

Wastewater Infrastructure

Currently, three urban waste water treatment plants are operating in Malta, two of which (Gozo and Ta' Barkat) discharge treated urban waste water through underwater pipelines.

Prior to construction of the main urban wastewater treatment plant on the North-eastern coast of Malta (Ta' Barkat), raw sewage was discharged into the marine environment from the Wied Għammieq pumping station through a 716m long submarine pipeline at a depth of some 36m off Xgħajra. This pumping station was in operation until 2011, when the Ta' Barkat urban waste water treatment plant became fully operational. However, the pipeline is still present on seabed²⁰.

Potable Water Distribution

In Malta, potable water extracted from groundwater is supplemented by water produced by desalination plants in order to satisfy demand and quality of drinking water. The desalination plants are located on mainland Malta and water supply to Gozo and Comino is provided via underwater pipelines crossing the channels between the islands.

²⁰ Cowiconsult, 1992. Sewerage Master Plan. Ministry for Development of Infrastructure.

Figure 2: Underwater pipelines in Malta

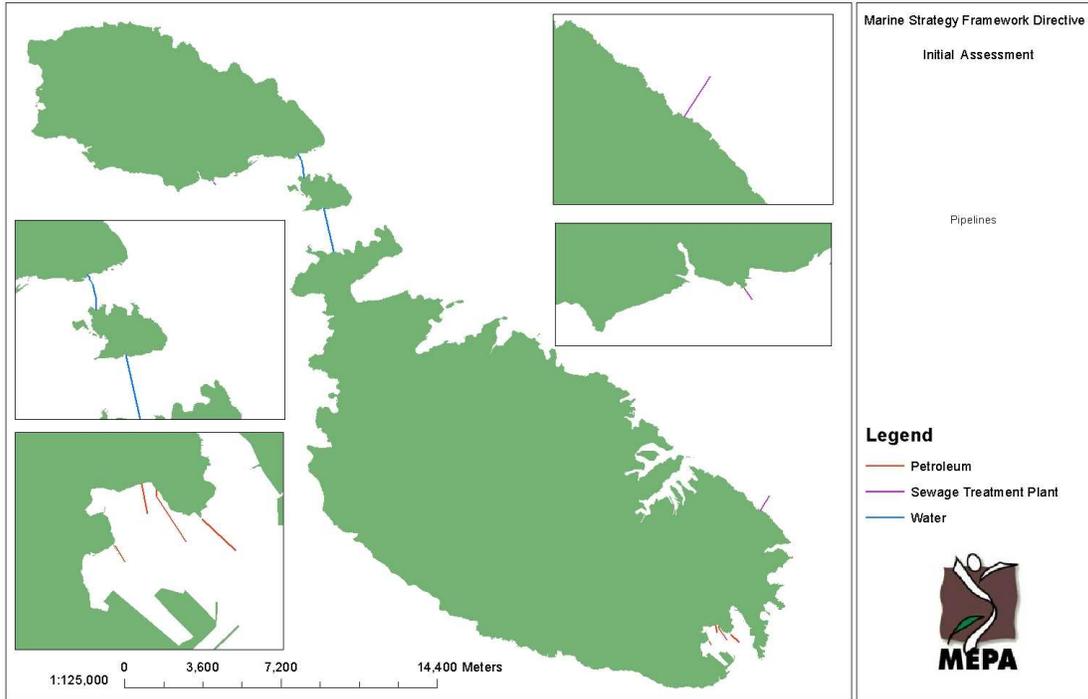
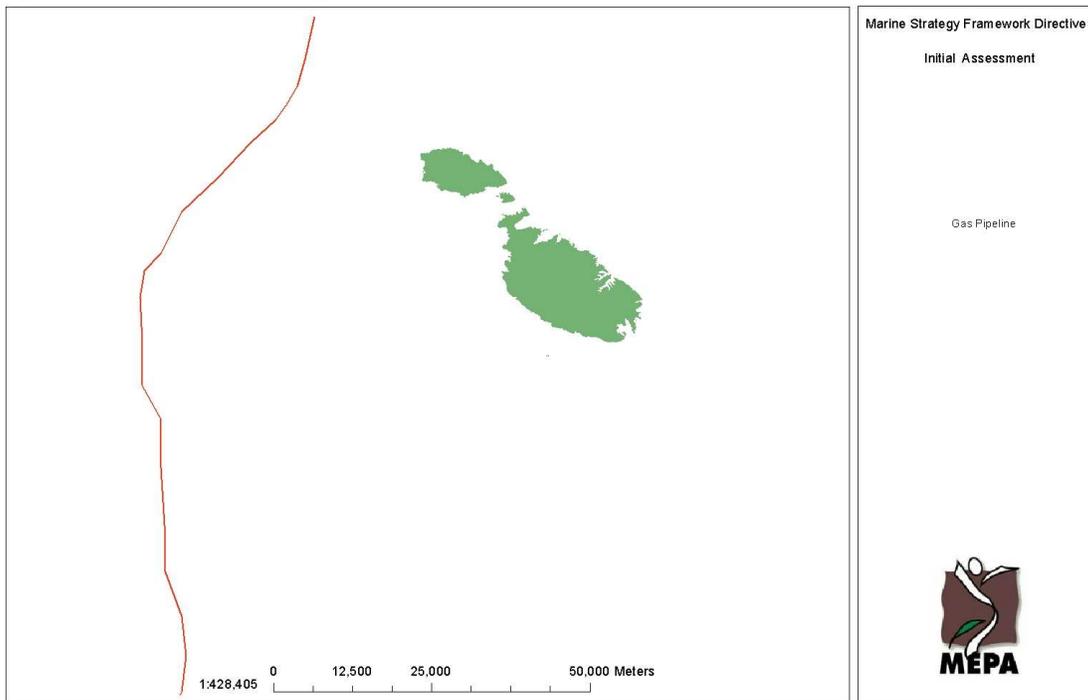


Figure 3: Gas pipeline passing in the vicinity of the Maltese Islands



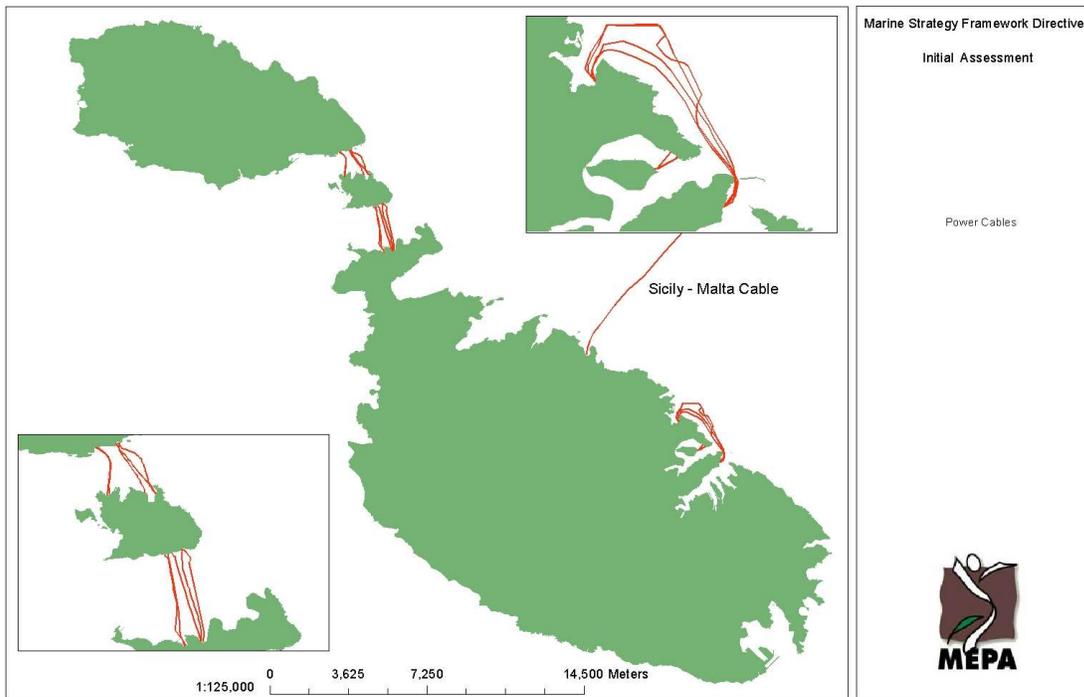
1.3.1.2 Underwater Cables

Power Cables

Electricity generated by the power stations situated on the main island of Malta is distributed throughout the islands of the Maltese archipelago by underwater cables. Power cables are thus laid in each of the two channels between Malta and Comino, Comino and Gozo for electricity supply.

The development of an interconnector between Malta and Sicily to connect the power grid of Malta with the European grid has been granted permission in 2012. This underwater cable will allow Malta to supplement local electricity generation with supplies from mainland Europe. The interconnector will consist of a 95 kilometre 220 kV cable between Qalet Marku, Malta and Marina di Ragusa in Sicily, Italy and will have a capacity of 225MW. This interconnector is expected to be operational in 2014.

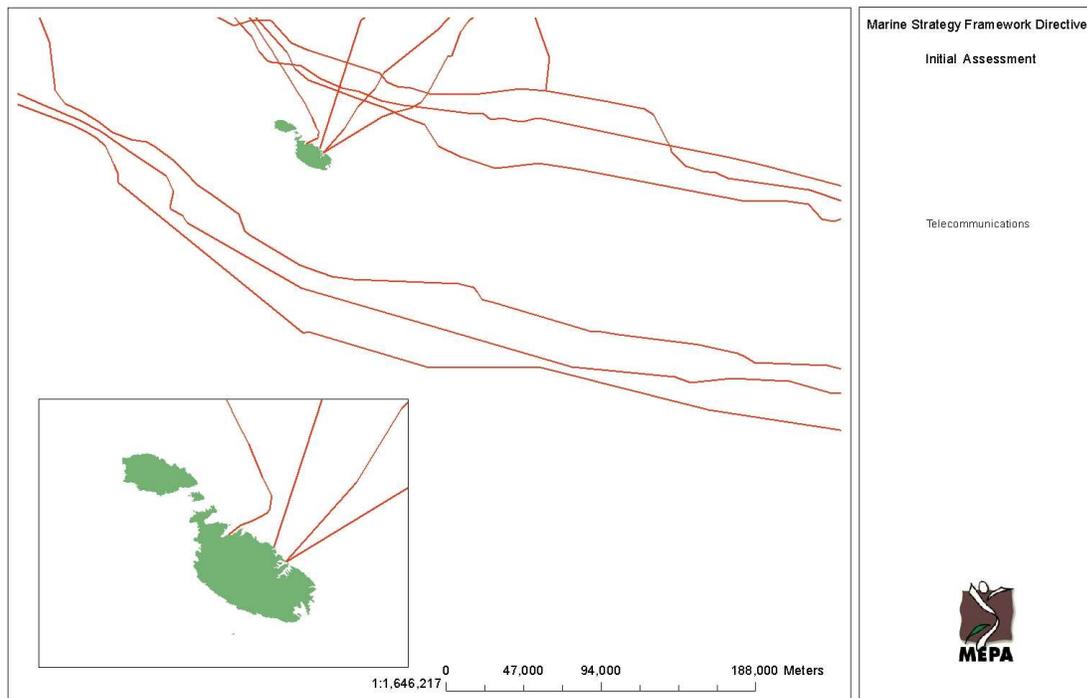
Figure 4: Power cables in Malta



Telecommunication Cables

The three major telecommunications companies in Malta have in recent years laid underwater telecommunications cables linked to Sicily, which developments reflect the increase in demand for telecommunications and the provision of the latest technologies for television, broadband internet, mobile and telephone.

Figure 5: Telecommunication cables in Malta



1.3.2 Economic Valuation

The MSFD Economic and Social Analysis²¹ (ESA) refers to the fact that no fuel pipelines currently connect to Malta. Therefore sectors covered by NACE code 49 (Land transport and transport via pipelines) have no impact on Malta's economic activity. Use of underwater pipelines as described above was covered through other economic sectors. On the other hand, the ESA points out to the fact that this scenario would change if a gas pipeline linking Malta to the European market is developed.

²¹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Underwater cables are considered as part of NACE codes 61 (Telecommunications) and 92 (Gaming). A substantial part of the telecommunication 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 (Table 4). The gaming sector (NACE code 92) is also heavily dependent on underwater cables for its operation (Table 5).

Table 4: Economic indicators for NACE code 61 (Telecommunications) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis²². FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 61							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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%
<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							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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%

Table 5: Economic indicators for NACE code 92 (Gaming) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis²³. FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 92							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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%

²² Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

²³ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

1.3.3 Legislation and Management

The installation of pipelines, cables and similar infrastructure in inshore waters is subject to development permits in line with planning and development policies. Furthermore, the laying or maintenance of offshore underwater pipelines and cables is governed by the Continental Shelf Act of 1966 and are subject to a license to be issued in accordance with Article 8(1) of this Act. Such licences ensure that any laying or maintenance of submarine cables or pipelines under the high seas is regulated and does not interfere with the exploration or exploitation of the continental shelf and its resources.

1.3.4 Pressures and Impacts

The laying down and maintenance of pipelines and cables on the seabed is generally associated with localised and short-term adverse effects. However the nature of the effects also depends on the type of benthic habitats affected. Some benthic habitats, such as macroalgae, generally recover and are able to recolonise the disturbed areas.

Apart from the localised physical loss of habitat and species associated with the footprint of the cables/pipelines, the main impacts are related to physical disturbance of the seabed substrata through resuspension of sediments and increased turbidity. Resuspension of sediments may also occur during the removal of pipelines as a result of damaged or aging pipeline and cable infrastructure.

1.3.5 Forward Look

The main potential change in the future for this sector is related to the possibility for the laying down of a gas pipeline between Sicily and Malta or a connection to the Libya – Italy gas pipeline²⁴. On the basis of this possibility, the MSFD ESA predicts an increase in the use of the marine environment from this sector.

With respect to telecommunications, the MSFD ESA for Malta noted that while the average annual growth in terms of Gross Value Added was negative over the past 6 years for NACE code 61, it has been on the increase since 2009. However it is still difficult to predict future scenarios in view of the volatility in the performance of this sector. The Malta Communications Authority intends to carry out a feasibility study to examine the possibility of an additional submarine cable that would connect Malta to an internet hub, either to mainland Europe (e.g. Marseilles) or to North Africa.

With respect to the gaming industry, which depends on underwater cables (NACE code 92), the MSFD ESA identified a growth in this sector over the past 6 years. However, its dynamism slowed down in more recent years with an average growth of just over 4% p.a. registered between 2008 and 2012. This growth fatigue is expected to be felt in the coming years though growth is still expected to be positive.

²⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0742:FIN:EN:PDF>

1.4 Dredging

1.4.1 General Overview

Dredging in Malta primarily takes place for the maintenance of fairways for the maritime transport sector, however it is also carried out in relation to coastal engineering projects, such as the building of platforms, quays and the development of new marinas.

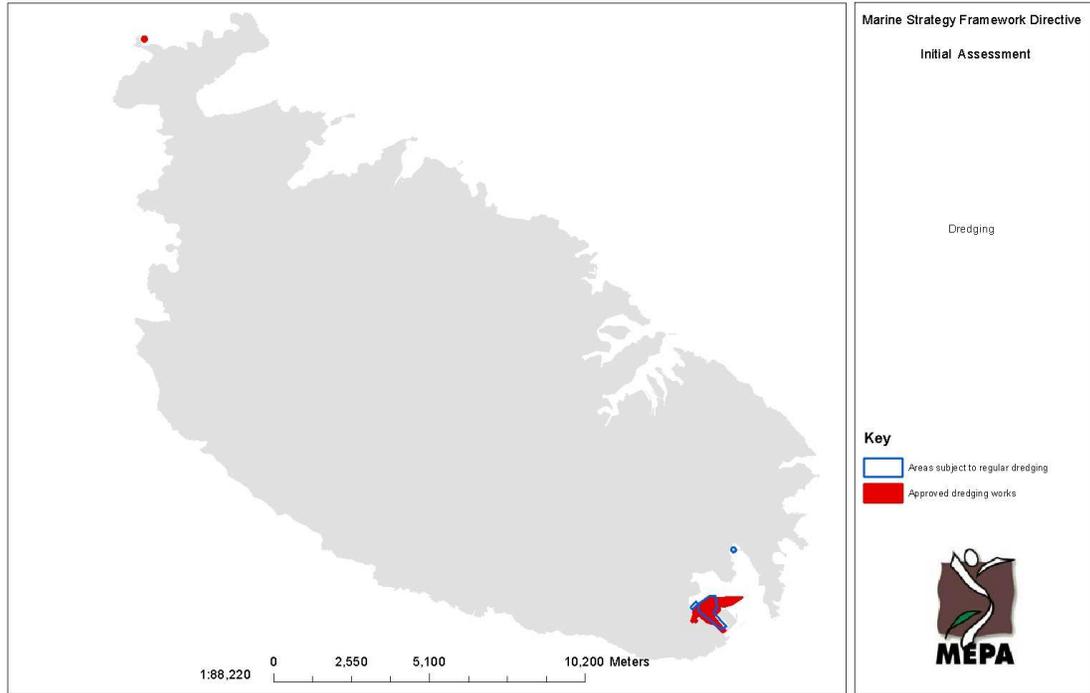
There are no areas designated for regular dredging, although some parts of Marsaxlokk harbour area are dredged every year (Transport Malta – Maritime – personal communication) (Figure 6). A review of ‘Notices to Mariners’ issued for the purposes of navigational safety between 2007-2012 implies that in addition to dredging at Marsaxlokk harbour, some dredging works also take place within the Grand Harbour and Marsamxett harbour. Mariners were informed of dredging works within these harbour areas twice in 2009 and once in 2011²⁵. A preliminary assessment of development proposals submitted in the period 2000-2010, confirm that dredging activities are mainly restricted to harbour areas (Marsaxlokk harbour and Ċirkewwa).

Uncontaminated dredged material can be disposed of at sea, at the designated offshore spoil ground, located off the Northeastern coast of mainland Malta. According to Malta’s draft Waste Management Plan²⁶ during the period 2007-2011, approximately 1 million tonnes of waste was disposed at sea. In 2007-2009 the majority of the waste constituted clean geological material originating from construction and demolition projects on land, while in 2010-2011, the majority of the waste disposed at sea constituted dredged material.

²⁵ Notice to Mariners No. 14 of 2009; No. 21 of 2009 and No. 27 of 2011

²⁶ Waste Management Plan for the Maltese Islands: A Resource Management Approach 2013-2020 – Consultation Document October 2013

Figure 6: Areas subject to regular dredging and approved dredging works



1.4.2 Economic Valuation

The MSFD Economic and Social Analysis²⁷ (ESA) considered dredging as ‘marine-related construction’ as part of NACE codes 42 & 43 (Civil Engineering and Specialised Construction activity). Approximately 8.6% 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 (Table 6).

Disposal of construction waste at sea however was not taken into account in computing the extent of the use of the marine environment of these two sectors by the MSFD ESA.

²⁷ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 6: Economic indicators for NACE codes 42 & 43 (Civil Engineering and Specialised Construction activity) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis²⁸. FTE employment is measured in number of persons. Other variables are in €000s

	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							
	2006	2007	2008	2009	2010	2011	2012	Average Growth
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%

1.4.3 Legislation and Management

Dredging related to coastal engineering projects, or ‘capital dredging’, is subject to a development permit issued in line with development and planning policies. Maintenance dredging however is subject to a simplified development control permitting process: the Development Notification Procedure. The Development Notification Order (DNO) Regulations, Legal Notice 115 of 2007, were amended in 2012 through Legal Notice 305 of 2012 to include maintenance dredging as a (Class 2) Minor Operations. However, the only maintenance dredging permitted under Class 2 is that carried out within port areas in order to maintain the previously established water depths within navigable fairways and vessel manoeuvring areas, provided that the capital dredging operation has previously obtained a full development permit. On other cases, a full development permit must be obtained.

Open sea disposal of dredged material is currently regulated through the Waste Consignment Note Procedure, which takes into consideration the obligations under the London Convention²⁹ and the Dumping Protocol to the Barcelona Convention³⁰. Only

²⁸ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

²⁹ Convention on the Preservation of Marine Pollution by Dumping of Wastes and Other Matter

³⁰ The 1976 Protocol to the Barcelona Convention for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircrafts and the 1995 Amendments to the Protocol for the Prevention of Pollution of the

disposal of certain wastes is allowed, and this is subject to meeting given criteria and obtaining the required permits. However, the presence and levels of contaminants in the dredged material, determined following a characterization of the material to be dredged, may be such that open water disposal of the contaminated dredged material is not considered acceptable, and alternative options for disposal must be found.

One of the measures put forward by Malta's Water Catchment Management Plan prepared pursuant to the requirements of the EU Water Framework Directive calls for the development and implementation of a protocol for the disposal or reuse of dredged material from harbours. The protocol should provide clear and consistent standards and criteria for the assessment of dredged material and appropriate disposal methods. It is expected that the protocol will be implemented through the development and environmental permits.

1.4.4 Pressures and Impacts

Dredging activities lead to abrasion resulting in physical loss of or damage to benthic habitats. The resuspension of sediments and the associated dispersion of pollutants result in reduced water quality and smothering of benthic biota. Dredging could also lead to changes in hydrographical conditions through changes in seabed and sediment characteristics. Since dredging in Malta is generally restricted to harbour areas, impacts from such activities are localised. On the other hand, impacts on *Posidonia oceanica* from dredging activities within port areas are known, mainly as a result of sediment resuspension and associated increase in turbidity.

In terms of impacts associated with disposal at sea, a preliminary survey of the seabed at the designated spoil ground and surrounding area³¹ indicates significant alterations to the seabed where spoil has been dumped. The benthic habitats characterising the area were deemed to be impoverished³². Of particular note were also the turbid conditions recorded throughout the surveyed area which conditions were attributed to the presence of fine sediments and other particulate matter originating from the regular spoil dumping activities. Turbid conditions could also lead to physical damage to the benthic habitats.

Mediterranean Sea by Dumping from Ships and Aircraft Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.

³¹ Borg, J.A. & Schembri, P.J. (2008) Report of a survey of the physical and biological characteristics of the seabed at the marine spoil ground and surrounding area, off the Grand Harbour, Malta;

³² Borg, J.A. & Schembri, P.J. (2008) Report of a survey of the physical and biological characteristics of the seabed at the marine spoil ground and surrounding area, off the Grand Harbour, Malta;

1.4.5 Forward Look

The MSFD Economic and Social Analysis³³ (ESA) indicated that between 2006 and 2012, the average annual growth in GVA for NACE codes 42 and 43 amounted to 6.9% p.a. whilst that in employment grew by 5.1% p.a. Though the growth of marine-related activity of these sectors was particularly strong it has been very volatile over the years, often reflecting single projects. Future growth of these sectors is therefore highly uncertain.

³³ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

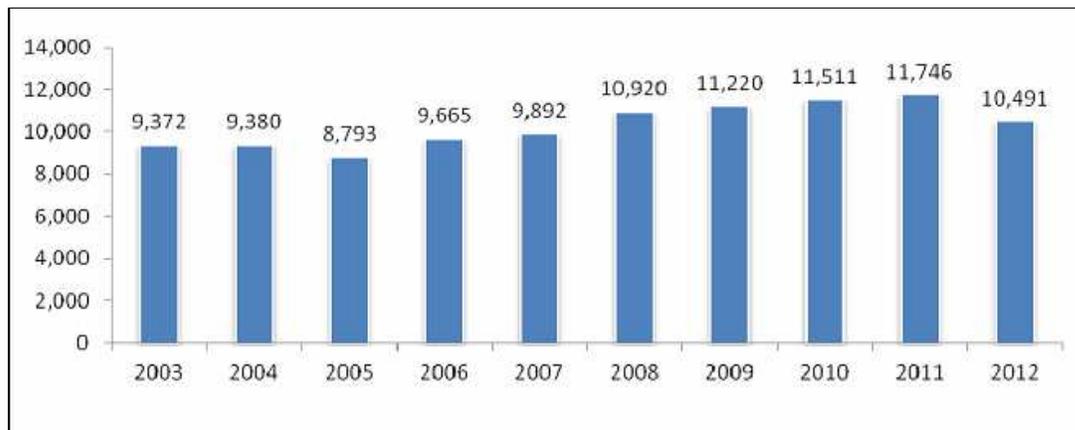
1.5 Maritime Transport (Port Operations and Shipping)

1.5.1 General Overview

As a result of its strategic location in the centre of the Mediterranean region, Malta constitutes an important hub for the shipping industry. Within this context, Malta provides a comprehensive range of maritime services and facilities including a container transshipment terminal (Malta Freeport), oil bunkering facilities and a cruise passenger terminal. Malta is thus an international maritime centre providing the whole range of maritime services and the Maltese flag is a reputable flag of ship registration. As at end of December 2012, the number of ships registered in Malta in accordance with the Merchant Shipping Act exceeds 5,950 with a total gross tonnage exceeding 45.6 million³⁴.

Figure 7 shows the number of vessels arriving in Malta in the period 2013-2012. In 2012, the number of vessels arriving in Malta was 10,491 vessels with a total gross tonnage of 208,145,077³⁵. Transport Malta's annual report (2012) highlights the slightly lower number of vessel arrivals in the year 2012, while indicating increase in volumes of unitised cargo and trailers in the Port of Valletta and an increase in the number of containers handled at Malta Freeport.

Figure 7: Number of vessels arriving in Malta extracted from Transport's Malta Annual Report 2012.



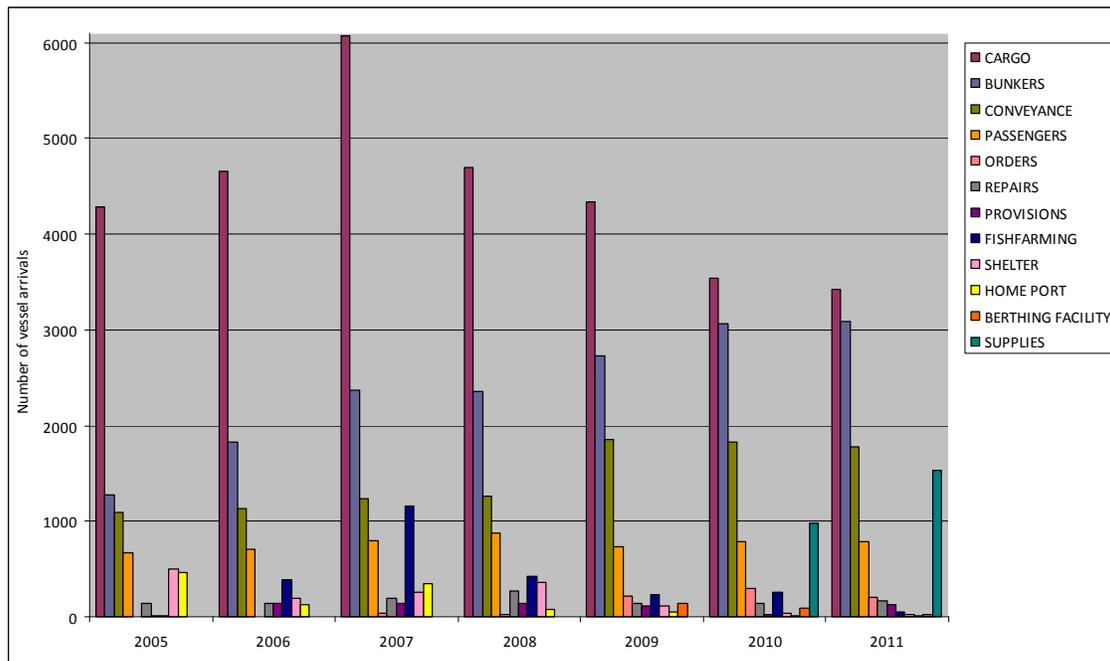
³⁴ Transport Malta – Annual Report (2012)

³⁵ Transport Malta – Annual Report (2012)

Figure 8 indicates the number of vessel arrivals in Maltese ports and marine areas in the period 2005-2011 distinguished by 'purpose of call'. Only the major purposes of calls have been included, however it is clear that vessels arriving in Malta mainly constitute cargo ships, followed by bunkers, conveyance and passenger vessels. Data on supply vessels was only available for 2010 and 2011, however such vessels also constitute an important part of the vessel arrivals in Malta.

Malta is situated along a number of main shipping lanes with over 65,000 vessels estimated to pass within 20 nautical miles of the Maltese Islands. Maritime traffic management is undertaken by the Ports & Yachting Directorate. Such management aims at enhancing the safety and efficiency of port operations and shipping movements in the approaches to the port and to comply with International and EU requirements.

Figure 8: Annual Vessel Arrival in Malta 2005-2011 by purpose of call³⁶



1.5.2 Ports

The Ports and Shipping Act, 1991 declares the following areas as ports or landing places:

- Grand Harbour of Valletta
- Marsamxett Harbour
- Marsaxlokk Harbour
- St. Paul's Bay

³⁶ Data provided by Transport Malta

- Landing places at Ramla tal-Bir and Iċ-Ċirkewwa
- Mgarr, Gozo

Transport Malta's Annual report 2012 provides a description of the main port areas, which description is being reproduced hereunder:

- The Grand Harbour or Valletta Harbour incorporates a range of services to the shipping industry including:
 - cruise and ferry cargo berths
 - cargo handling berths
 - specialised grain and cement silos
 - petroleum installations and bunkering facilities
 - ship building and repair yards
 - super yacht refit centre
 - ship chandelling
 - port reception facilities including tank cleaning
 - marinas
 - warehousing and open storage facilities
 - maritime related support services
- Marsaxlokk harbour incorporates the container transshipment terminal and industrial storage facilities which are operated by the Malta Freeport Terminals as well as a number of fuel terminals.
- The Port of Marsamxett is primarily a leisure port and provides a base from where a number of domestic commercial vessels operate local cruises. It hosts a number of marinas and also a yacht yard.
- The Port of Mgarr, Gozo constitutes a ferry terminal and a fishing port. It also has a marina and several berths for small craft. The port also caters for small cargo vessels and the occasional small cruise liner.
- The Port of Ċirkewwa is primarily a ferry terminal comprising of a passenger and vehicle handling facilities.

A preliminary assessment of development permit applications submitted during the period 2000-2010, implies that development on the Maltese coastline is mainly related to port operations, therefore the port areas mentioned above are subject to more pronounced infrastructural development when compared to other coastal areas in Malta. Port-related development proposed during the period 2000-2010 mainly involved the construction or upgrading of terminals, or refurbishment and upgrading of existing quays within harbour areas. Port areas are also subject to dredging activities for the maintenance of fairways.

1.5.3 Bunkering and Waiting areas

Malta has five offshore areas designated for bunkering and other offshore services outside the ports, and one waiting area for vessels *en route* to Malta, which area is used on a regular basis by vessels waiting to enter the Malta Freeport or Marsaxlokk Harbour for bunkering. These areas are illustrated in Figure 9. Figure 10 provides an indication of the bunkering and

'other' activities taking place in designated bunkering areas in the period 2005-2011. Use of bunkering areas depends on weather conditions, however Area 3 and 4 seem to be more heavily used than the other bunkering areas, and Area 3 in particular seems to be experiencing a steady growth in use for bunkering purposes.

Figure 9: Bunkering and waiting areas

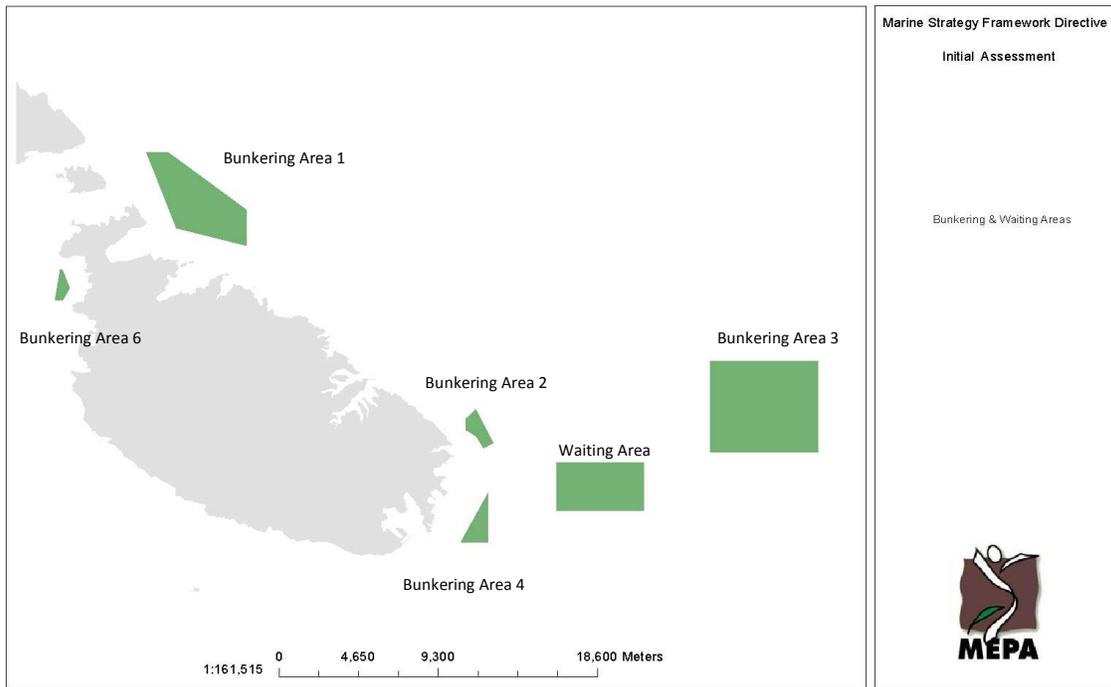
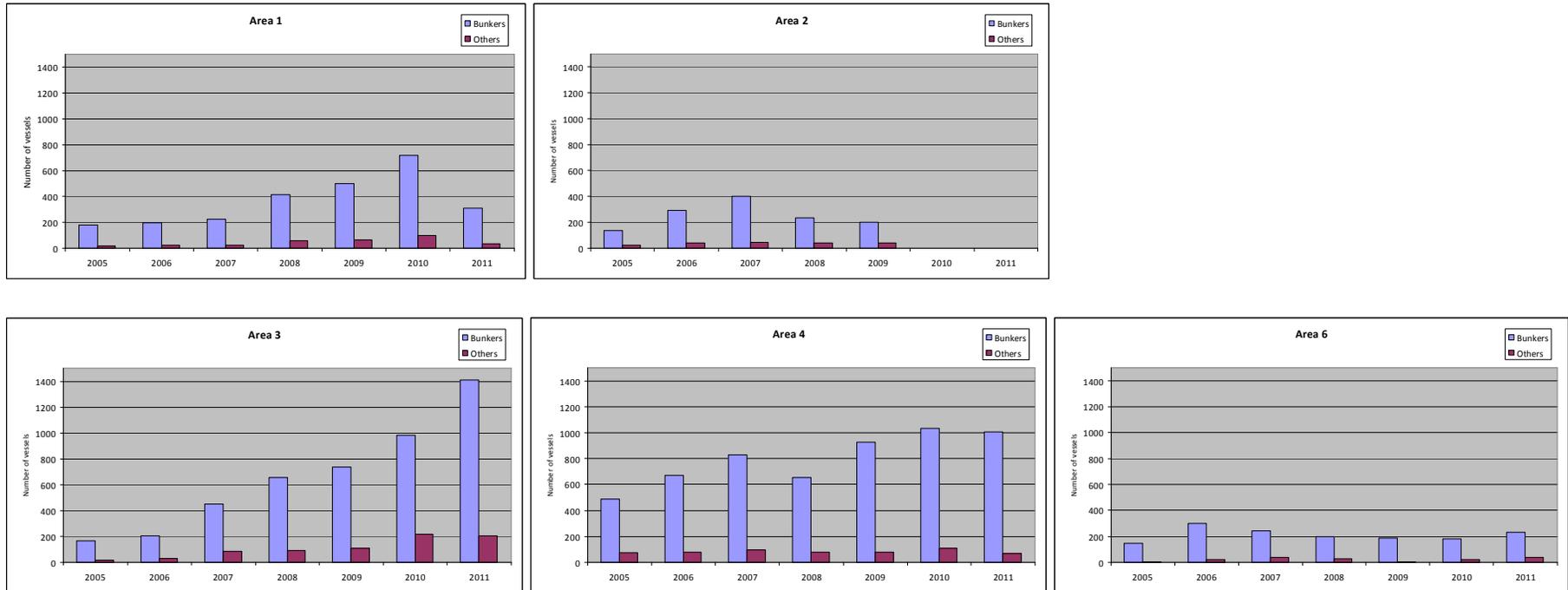


Figure 10: Bunkering activities taking place in the designated bunkering areas during the period 2005-2011 compared to other activities taking place within same areas



1.5.4 Ship Repair Facilities

Shipyards in Malta are located in the Grand Harbour area. Until recently, the most important shipyard in Malta was the Malta Shipyards which was one of the largest ship repairing yards in the Mediterranean. Activity at the Malta Shipyards was reduced significantly during the last decade. However they have been recently privatized and the shipyards are now carrying out various activities related to yacht and ship repair, conversion and building of marine vessels, surface treatment of vessels and general engineering works.

1.5.5 Economic Valuation

Maritime transport, including shipping and port operations, were considered by the MSFD Economic and Social Analysis³⁷ (ESA), as the economic sectors represented by NACE codes 30 (Manufacture of transport equipment), 33 (Repair and installation of machinery and equipment), 50 (Water Transport) and 52 (warehousing and support activities for transportation).

The ESA indicates that approximately 56% of the activities of firms within NACE codes 30 and 33, the latter including the shipyards, make direct use of the marine waters in their product and service provision. Between 2006 and 2012, these sectors showed an average decline in employment that amounted to 26.7% p.a. albeit registering average annual growth in GVA of 2.0% p.a. This reflected in the privatisation of the Malta Shipyards, which led to a downsizing of its economic activity.

NACE code 52 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. Between 2006 and 2012, NACE codes 50 and 52 had an average annual growth in GVA amounted to 6.1% p.a. whilst the growth in employment was 2.1% p.a.

The outcome of the economic analysis is reproduced in Table 8 - Table 9.

³⁷ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 7: Economic indicators for NACE codes 30 & 33 (Manufacture of other Transport Equipment, and Repair and Installation of Machinery Equipment) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis³⁸. FTE employment is measured in number of persons. Other variables are in €000s

	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%
Proportion of Sector Activity Depending on Marine Environment								
	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%

Table 8: Economic indicators for NACE code 50 (Water Transport) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis³⁹. FTE employment is measured in number of persons. Other variables are in €000s

	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%
Proportion of Sector Activity Depending on Marine Environment								
	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%

³⁸ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

³⁹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

Table 9: Economic indicators for NACE code 52 (Warehousing and support activities for transportation) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁴⁰. FTE employment is measured in number of persons. Other variables are in €000s

	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%

1.5.6 Legislation and Management

International Maritime Organisation

The International Maritime Organisation (IMO) undertakes the development and preservation of the comprehensive regulatory framework for shipping including safety, environmental concerns, legal matters and maritime security.

The main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes, established within the IMO framework, is the MARPOL⁴¹ Convention. This Convention was established in recognition of the need to control and minimise the deliberate, negligent or accidental release of oil and other harmful substances from ships into the marine environment. The Convention includes six technical annexes addressing the release of oil and noxious substances in liquid and packaged form into the marine environment as well as pollution by sewage, garbage and air pollution from ships.

The London Convention⁴² also aims at protecting the marine environment by promoting effective control of all sources of marine pollution and to take all practicable steps to prevent pollution by dumping of wastes and other matter. In

⁴⁰ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁴¹ Convention for the Prevention of Pollution from Ships (MARPOL) and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78).

⁴² Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972

1996, the "London Protocol" was agreed to further modernize the Convention and, eventually, replace it. Under the Protocol all dumping is prohibited, except for possibly acceptable wastes on the so-called "reverse list".

Other IMO Conventions to which Malta has acceded include:

- International Convention on Civil Liability for Oil Pollution Damage, 1969 and 1992 Protocol;
- International Convention on the Establishment of an International Fund for compensation for Oil Pollution Damage, 1971 and 1992 Protocol;
- International Convention for the Safety of Life at Sea 1974, 1978 Protocol and 1988 Protocol;
- International Convention of Load Lines, 1988 Protocol;
- International Convention on Maritime Search and Rescue, 1979;
- International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990;
- Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000;
- International Convention on Standards of Training, Certification Watch keeping for Seafarers 1978;
- International Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation, 1988;
- Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms located on the Continental Shelf, 1988;
- International Convention on Tonnage Measurement of Ships, 1969;
- Convention on Facilitation of International Maritime Traffic, 1965;
- Convention on the International Regulations for Preventing Collisions at Sea, 1972;
- Convention on the International Mobile Satellite Organisation;
- Protocol of 1996 to amend the Convention on Limitation of Liability for Maritime Claims, 1976.

The Barcelona Convention for the Protection of the Mediterranean Sea against Pollution.

The Barcelona Convention, established with the UNEP framework, places *inter alia* an obligation on the contracting parties to individually or jointly take all appropriate measures to prevent, abate and combat pollution of the Mediterranean Sea area and to protect and enhance the marine environment in that area.

Seven protocols addressing specific aspects of Mediterranean environmental conservation have been developed under the Barcelona Convention. The following protocols are of particular relevance to shipping:

- Protocol for the Prevention and Elimination of Pollution in the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea (Dumping Protocol)

- Protocol Concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea (Prevention and Emergency Protocol)
- Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (Hazardous Waste Protocol)

National Legislation

The following is a list of national legislation relevant to Maritime Transport:

- *Authority for Transport in Malta Act XV, 2009* establishing the Authority for Transport in Malta;
- *Merchant Shipping Act (1973)* empowering the Minister for Shipping to make regulations as necessary to give effect to international conventions and agreements that have been ratified, acceded to, or accepted by the Government of Malta;
- *Ports and Shipping Act, 1991*, provided for the establishment of ports in Malta, for the registration and licensing of boats and ships and the regulation of their use within the territorial waters of Malta.
- *Territorial Waters and Contiguous Zone Act (Act XXXII of 1971, as amended by Acts: XLVI of 1975, XXIV of 1978, XXVIII of 1981, I of 2002 and X of 2005)*: this Act empowers the Maltese maritime authorities to take appropriate action if a vessel within the contiguous zone is suspected or considered to have acted in contravention of national law in matters that include actions prejudicial to the conservation of the living resources of the sea and/or the preservation of the environment and the prevention, reduction and control of pollution.
- *Dangerous Cargo Ships, Marine Terminals and Facilities and Bunkering Regulations (Legal Notice 1 of 1996, as amended)* regulates “the movement, transfer, storage, and handling of dangerous cargoes, bunkers, ballast and tank cleaning operations on all ships and at all marine terminals and facilities within or connected to the internal and territorial waters of Malta.” The prime obligations stemming from these regulations are the “the safety of life, the prevention of pollution to the marine environment, the effective and efficient control of such pollution and the protection of the property of others”.
- *Vessel Traffic Monitoring and Reporting Requirements Regulations*, establishing, in accordance with the provisions of the EU Directive 2002/59/EC, a vessel traffic monitoring and information system with a view to enhancing the safety and efficiency of maritime traffic, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships.
- *Ports Security Regulations (Legal Notice 484 of 2004)* The purpose of these regulations is to enable Malta to enhance ship and port security by meeting its obligations under the International Convention for the Safety of Life at Sea (SOLAS) with respect to the implementation of the International Code for the Security of Ships and of Port Facilities (ISPS).

- *Port Reception Facilities Regulations (Legal Notice 278 of 2004)* target the reduction of discharges of ship-generated waste and cargo residues into the sea. Within this context, the port or terminal operator shall ensure that adequate authorised port reception facilities are available to meet the needs of ships normally using the port or terminal in question. The regulations also call for the preparation of a waste management plan with respect to the provision and use of port reception facilities.

Flag State and Port State control systems

The Merchant Shipping Directorate within Transport Malta implements a system of Flag State Control and of Port State Control. As part of the Flag State Control system, Malta conducts random inspections of ships flying the Maltese flag worldwide aimed at ensuring high quality performance of the Maltese fleet. In 2012, 867 inspections were carried out in 238 ports in 46 different countries worldwide⁴³.

The Port State Control System is aimed at ensuring that, as much as possible, ships leaving Maltese waters on international voyages, irrespective of flag, are being maintained in line with the required international standards⁴⁴. In 2012, 183 foreign flagged ships were inspected constituting nearly 22% of the total number of foreign merchant ships entering Maltese ports.

Other relevant management tools

The Malta Environment and Planning Authority published General Binding Rules for hull cleaning. These General Binding Rules apply to tankers, ferries and passenger vessels, Ro-Ro vessels, container vessels, dry cargo vessels, reefer vessels, bulk carriers, yachts >50m and Fishing vessels >30m. Vessels covered in this list should abide with the conditions set out in this GBR to minimise the environmental impacts of hull cleaning.

1.5.7 Pressures and Impacts

Pressures associated with maritime transport and ancillary activities are wide-ranging and include:

- contamination by hazardous substances, which does not only occur through operational discharges/spills and chronic release of chemicals from the vessels, but also through oil spills and loss of cargo in cases of major incidents at sea.
- introduction of non-indigenous species, mainly associated with discharge of ballast waters and fouling of ships' hulls.
- Increase in underwater noise generated by ship movements;
- Introduction of sewage and marine litter;

⁴³ Transport Malta – Annual Report (2012)

⁴⁴ Transport Malta – Annual Report (2012)

- Physical loss and damage to marine habitats occurring as a result of construction of the necessary infrastructure and ancillary facilities and anchoring (dredging for the maintenance of fairways is discussed separately in previous sections of this report).

1.5.8 Forward Look

The activities of the Maritime Transport sector, mainly represented by NACE codes 50 (Water Transport) and 52 (warehousing and support activities for transportation), broadly follow the general trends in economic activity, particularly those in export growth in recent years. The uncertainty in the global economic outlook makes the future of this sector's performance unknown. However, expected performance of NACE 52 (warehousing and support activities for transportation) is high. Growth in this sector's activities was particularly strong also reflecting, in part, the growth in the number of cruise-liners that needed to be serviced in Malta.

NACE codes 30 (Manufacture of transport equipment) is made up of a few operators that are expected to maintain the same rate of growth while the marine sectors covered by NACE code 33 (Repair and installation of machinery and equipment) are expected to stabilise over the coming years, particularly following the privatisation of the Malta Shipyards.

1.6 Leisure and Recreation

1.6.1 General Overview

Marine waters in Malta are subject to a wide range of leisure and recreational activities constituting both market and non-market use of the marine environment. Non-market activities involve the utilisation, free of charge, of the marine environment for the purpose of recreation, which in Malta are mostly related, although not exclusively, to bathing sites. Market leisure and recreational activities are generally associated with the tourism sector, which markets Malta as a sea and sun destination⁴⁵. A substantial part of tourism activity in Malta entails sea-based entertainment, however 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 when the sea is accessible and visible⁴⁶.

This section provides a brief overview of the main market and non-market leisure and recreational activities taking place in Malta.

1.6.1.1 Cruise Liners

The cruise liner and ferry passenger terminal in Valletta started operating in 2001. This terminal attracted a number of major cruise operators to the Maltese Islands: the number of calls and passengers in the period 2002-2012 are indicated in Figure 11. A steady increase in the number of cruise liner calls and cruise passengers is evident during the more recent period (2009-2012).

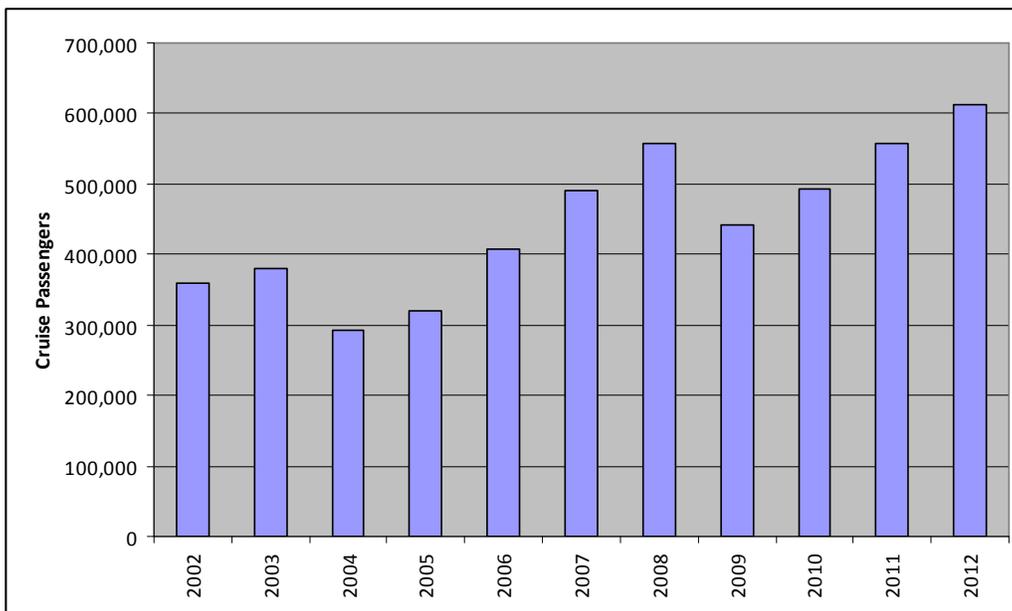
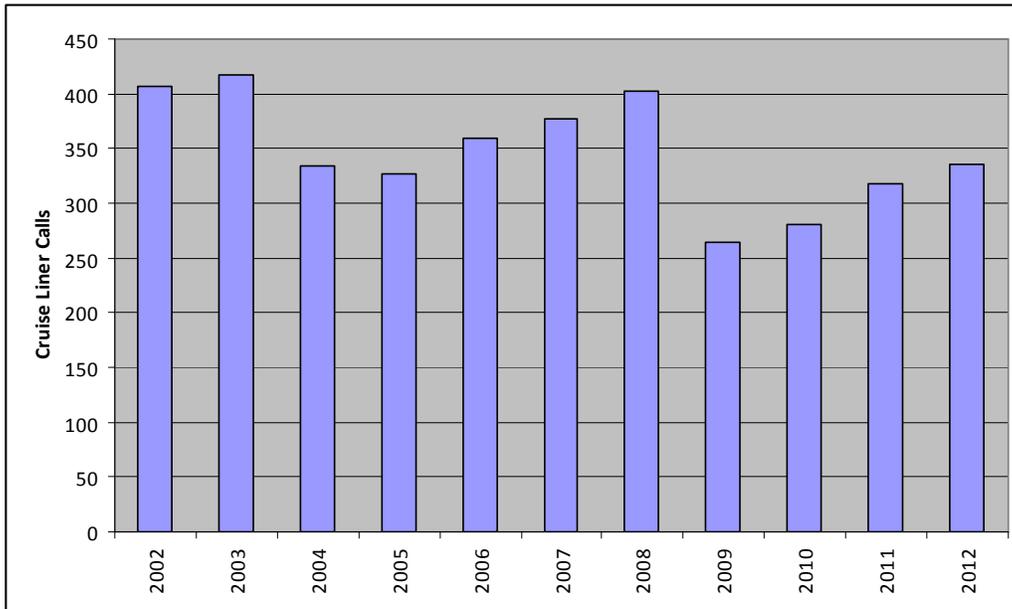
Such increase in cruise liner calls is expected to be maintained in the future and there was thus the need to extend the Valletta Cruise Liner Terminal with a view to provide the necessary infrastructure and berthing space to satisfy the demands of the cruise industry. This extension has resulted in a continuous 308m berth with a total quay length of 1,383 metres⁴⁷. This quay can accommodate larger vessels thus catering for the demand of the industry.

⁴⁵ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁴⁶ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁴⁷ <http://www.vallettawaterfront.com/>

Figure 11: Annual Cruise liner calls and number of passengers⁴⁸



⁴⁸ Data provided by Transport Malta (Maritime); Transport Malta – Annual Report (2012)

1.6.1.2 Yachting

Malta is a popular destination for visiting yachts, mainly as a result of its location in the central Mediterranean, a location en-route to the main cruising grounds, but also because it provides a number of high end marinas. Within this context, yachting constitutes an important sector for the National economy since it brings benefits to a range of economic sectors, particularly the tourism sector.

As at end of December 2012, 337 yachts >24m and 2596 yachts <24m were registered under the Maltese Flag. In 2012, the registration of superyachts (i.e. yachts >24m) showed an increase of 15.7% over the previous years. The number of requests for local berthing has also been increasing during the past years, as a result of which there is growing demand for additional berthing spaces, which need to cater for both locally registered and visiting yachts. The number of visiting foreign yachts at marinas during 2012 amounted to 1,972⁴⁹.

The berthing demand, without considering any visiting summer yachts exceeds supply and the limited berthing spaces coupled to limited hard standing facilities limit the potential growth of the yachting sector in Malta.

Malta currently offers six permanent marinas at Msida, Ta' Xbiex, Mgarr (Gozo), Portomaso, Manoel Islands and the Grand Harbour, some of which are capable of accommodating large super yachts. The berthing spaces have increased during the past years (Figure 12). However, Malta is seeking the growth of the yachting industry through the possible development of new permanent marinas and establishment of temporary marinas, to address the need of additional berths in Malta.

The most recent report on this matter was compiled in 2009 by the Malta Maritime Authority (now Transport Malta – Maritime): *Development of Yachting Facilities in Malta: Identification of Potential Sites for All-Weather Marinas and Temporary Marinas*. This report identifies sites that can be considered for new permanent yacht marinas and sites for seasonal or temporary marinas. The latter would involve the installation of pontoons accommodating between 50-100 boats in the summer season, which pontoons would be stored away on land during the winter months. Existing and planned marinas are indicated in Figure 13.

⁴⁹ Transport Malta – Annual Report (2012)

Figure 12: Berthing Capacity in permanent and seasonal marinas/mooring areas for the period 2009-2011, and as projected for the 2012⁵⁰

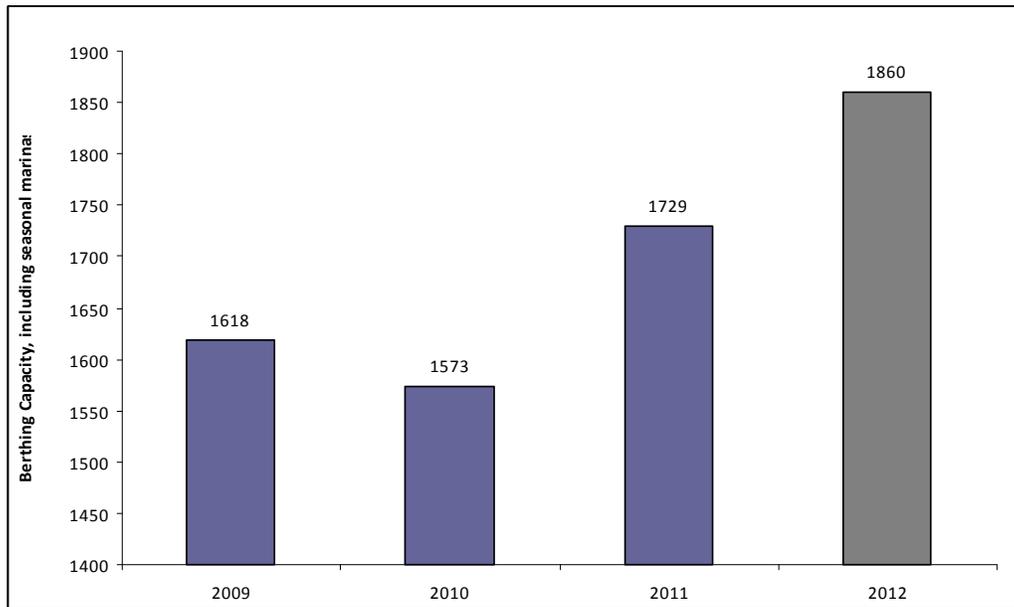
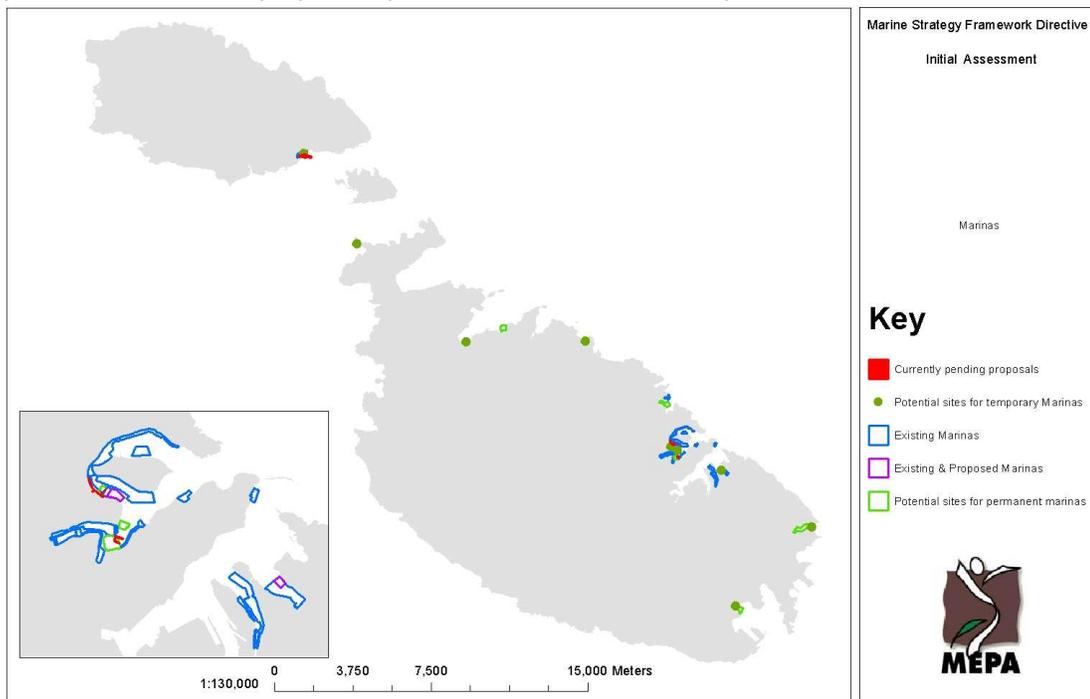


Figure 13: Existing and planned marinas, together with potential sites for temporary and permanent marinas as proposed by the Malta Maritime Authority in 2009



⁵⁰ Data provided by Transport Malta (Maritime)

1.6.1.3 Scuba Diving

Scuba diving constitutes both a market and non-market recreational use of the marine environment. As a market use, this activity contributes mainly to the tourism sector. Such contribution is deemed to have increased due to the popularity of Maltese waters with both local and foreign divers, which popularity is mainly attributed to the warm waters, good visibility and underwater scenery⁵¹. Since the 1970s the number of dive schools in Malta has increased from 5 to 34 on mainland Malta and another 12 in Gozo.

Table 10 as extracted from the draft diving master plan for Malta submitted to the Malta Tourism Authority, indicates trends in tourist trips to Malta of which sole purpose was scuba diving. According to a survey carried out by the Malta Tourism Authority, 5.3% of tourists visiting Malta in 2012 have engaged in scuba diving⁵². These values confirm the importance of the contribution of scuba diving to the tourism sector.

The draft diving master plan for Malta submitted to the Malta Tourism Authority, one of the aims of which was to develop a strategy for the diving sector for mainland Malta, describes the dive sites on the island. This Master Plan states that there are 29 popular shore dives spread throughout the island, served by 21 access points and 15 popular boat dives. Shore dive attractions vary from wrecks to unusual and spectacular features of the marine topography. Boat dives are still located close to shore with main attractions constituting specific morphological features, such as overhangs and arches, and boat wrecks, which have either been scuttled in recent years for diving purposes or constitute historic wrecks.

Table 10: Trends in dive trips to Malta

	Apr-Dec	Jan-Dec					Jan-May
	2005	2006	2007	2008	2009	2010	2011
Scuba diving	2,177	1,990	1,902	2,901	3,468	5,171	1,331
Total Tourists	1,170,608	1,124,232	1,243,506	1,290,856	1,182,490	1,332,086	481,762

⁵¹ Adi Associates Environmental Consultants Ltd, 2011. Master Plan to Support a Sustainable Diving Industry for Malta. Version 2. San Gwann, June 2011; vi + 66pp + 2 Appendices.

⁵² MTA (2012) Market Profile Analysis Year 2012, Research unit, Market Support and Development as quoted by Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

1.6.1.4 Recreational Boating and Recreational Fishing

Recreational boating activities in Malta are quite intense, particularly during the summer months. Table 11 provides an indication of the number of recreational craft registered with Transport Malta (Maritime) as at 2012. The popularity of recreational boating is deemed to be on the rise, with highly intense activity taking place during the summer months, particularly in enclosed bays. In view of potential conflicts between the use of bays by bathers and boaters, swimming zones are designated on an annual basis (refer to section 1.6.1.6). However, with the exception of one anchoring zone designated on a yearly basis in Comino (

Figure 14), there is no official designation of anchoring zones or no-anchoring zones in the rest of Malta.

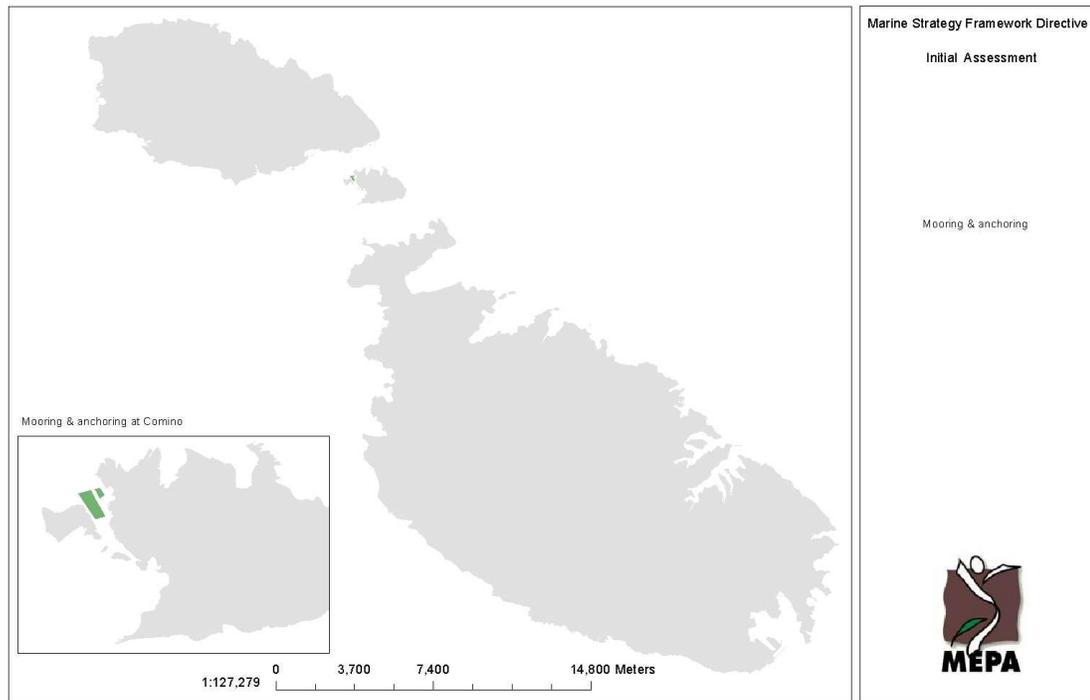
Local cruises and boat trips to popular coastal areas are very popular with both tourists and local population. Few companies in Malta are licensed to provide such services with a total of 228 licensed boats constituting a total of 6,924 passengers.

Table 11: Active registered recreational boats by length (2012)⁵³

Length	Number of registered boats
<5m	12,509
5m-7m	2,054
7m-12m	282
12m-24m	7
>24m	0

⁵³ Transport Malta (Maritime) – personal communication

Figure 14: Designated anchoring zone off Comino



1.6.1.5 Recreational Fishing

Recreational or non-commercial fishing vessels, registered in Category C⁵⁴, constitute the largest percentage of registered fishing vessels. As of 2012, such registered vessels amount to 1936 vessels, equivalent to 64.2% of the Maltese fleet. Recreational fishing practices include coastal fishing such as bottom lining, surface trolling and jigging from small boats, as well as shore fishing. Offshore recreational fishing generally targets fish such as albacore, swordfish, sailfish and amberjack.

1.6.1.6 Bathing

Swimming zones in Malta are designated on a yearly basis by Transport Malta (Maritime). Such zones are reserved for swimmers and are delineated by marker buoys and ropes. No boats, seacraft or objects which may endanger the safety of bathers shall be used within these delineated areas. The swimming zones delineated in 2012 are indicated in Figure 15. The delineation of the swimming zones is revisited on an annual basis.

In addition to swimming zones designated by Transport Malta (Maritime), 87 coastal bathing waters are monitored as part of the requirements of the Bathing Waters Directive. The coastal bathing waters in Malta are indicated in Figure 16.

⁵⁴ These categories are stipulated in L.N. 407 of 2004, as amended by Legal Notice 426 of 2007

Figure 15 : Swimming zones designated in 2012 through Notice to Mariners 31 of 2012

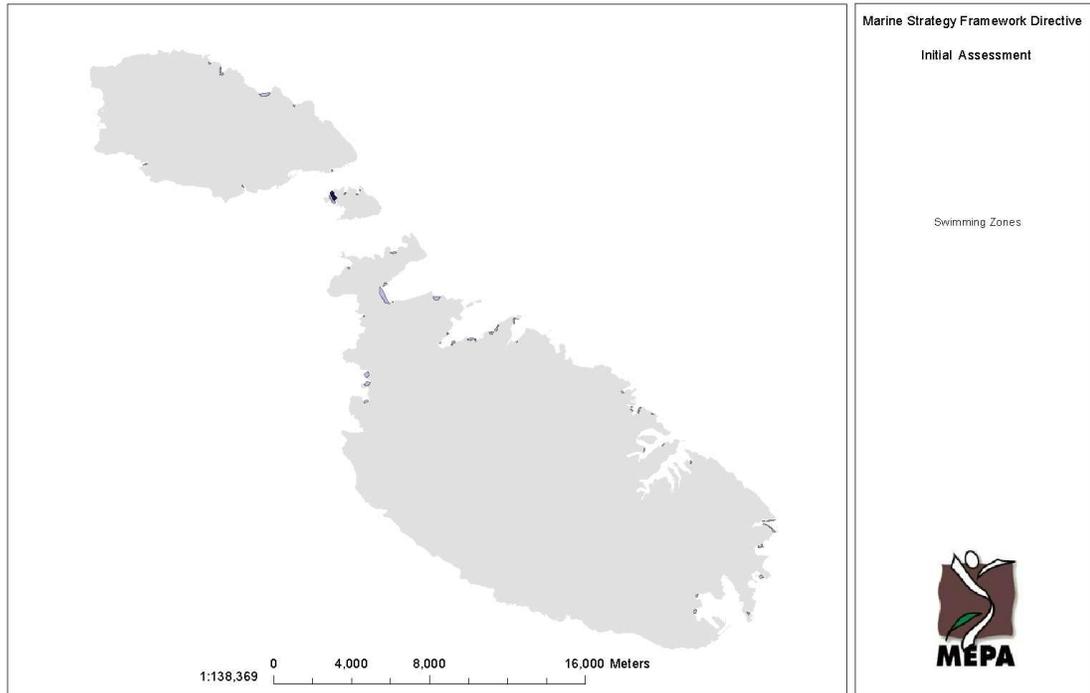
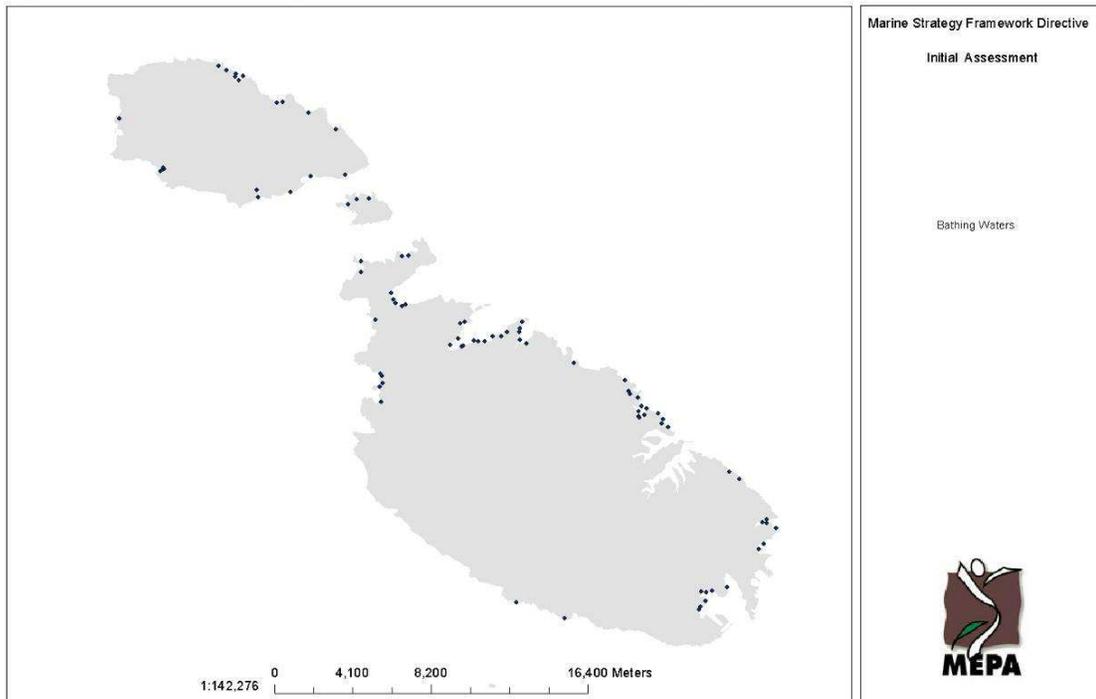


Figure 16 : Coastal bathing waters in Malta under the Bathing Water Directive



1.6.2 Economic Valuation

The MSFD Economic and Social Analysis⁵⁵ (ESA) assessed market sectors of relevance to leisure and recreation. The majority of these sectors pertain to the tourism sector, taking into consideration that 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.

The direct use of the sea by tourism is mainly reflected in the activities of tour operators (NACE code 79) and accommodation (NACE code 55). It must be acknowledged however that an 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.

Other economic sectors of relevance to Leisure and Recreation which were considered by the ESA include:

- NACE code 47 (Retail trade): A proportion of retail trade is sold to tourists; Therefore, indirectly, the sea is used as an input in the provision of this service. 6.6% p.a. of retail trade was considered to be dependent on the marine environment.
- NACE code 93 (sports activities, amusement & recreation activities): As an island state, a number of sports and recreational activities in Malta are linked to the sea. 10% of this sector's activities were estimated to directly use the marine environment as an input into its service provision.

The outcome of the economic analysis with respect the above-mentioned NACE codes is provided in Table 12 - Table 15.

⁵⁵ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 12: Economic indicators for NACE code 47 (Retail trade, except of motor vehicles and motorcycles) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁵⁶. FTE employment is measured in number of persons. Other variables are in €000s

	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%
Proportion of Sector Activity Depending on Marine Environment								
	5.6%	6.4%	6.1%	5.5%	6.8%	7.6%	8.2%	
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%

Table 13: Economic indicators for NACE code 55 (Accommodation) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁵⁷. FTE employment is measured in number of persons. Other variables are in €000s

	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%
Proportion of Sector Activity Depending on Marine Environment								
	62.30%	62.30%	62.30%	62.30%	62.30%	62.30%	62.30%	
Estimated Economic Activity Dependent on the Marine Environment								
	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%

⁵⁶ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁵⁷ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

Table 14: Economic indicators for NACE code 79 (Travel Agency, tour operator and other reservation service and related activities) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁵⁸. FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 79							
	2006	2007	2008	2009	2010	2011	2012	Average Growth
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%
<i>Proportion of Sector Activity Depending on Marine Environment</i>	62.3%	62.3%	62.3%	62.3%	62.3%	62.3%	62.3%	
	Estimated Economic Activity Dependent on the Marine Environment							
	2006	2007	2008	2009	2010	2011	2012	Average Growth
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%

Table 15: Economic indicators for NACE code 93 (sports activities, amusement & recreation activities) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁵⁹. FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 93							
	2006	2007	2008	2009	2010	2011	2012	Average Growth
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>	10%	10%	10%	10%	10%	10%	10%	
	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%

⁵⁸ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁵⁹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

1.6.3 Legislation and Management

This section includes the legislation or other initiatives which are deemed relevant to 'Leisure & Recreation':

- On the basis of the Port Reception Facilities Regulations (refer to section 1.5.6), a port or terminal operator, including marinas, should prepare a waste management plan with respect to the provision and use of port reception facilities in consultation with all stake holders.
- The Recreational Diving Services Regulations⁶⁰ establish the licence and other requirements for service providers in the field of recreational scuba diving with a view to ensure that the highest possible safety standards are maintained by service providers. In accordance with these regulations, the provision of recreational diving services is to be considered a tourism operation.
- Malta's Water Catchment Management Plan⁶¹ identifies a series of measures aimed at achieving the goals of the WFD for the identified water bodies. One of these measures is related to recreational boating aiming at the regulation of recreational boating in coastal waters in order to reduce its impacts on the marine environment.
- The Bathing Waters Directive transposed into national law via the Management of Bathing Water Quality Regulations, 2008 published as Legal Notice 125 of 2008, as amended by Legal Notice 237 of 2011⁶². This Directive requires Member States to every year:
 - identify the bathing waters in their territory and define the length of the bathing season monitor;
 - monitor at the location most used by bathers or where the risk of pollution⁶³ is greatest, and assess water quality on the basis of data defined according to the parameters as per Annex I of the Directive;
 - classify, according to the criteria set out in Annex II of the Directive, the bathing water quality of the areas concerned;
 - take adequate measures to prevent, reduce or eliminate the causes of pollution;
 - keep the public informed, and
 - communicate the results of monitoring to the Commission with a description of the water quality management measures.

⁶⁰ <http://justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=10626&l=1>

⁶¹ <http://www.mepa.org.mt/topic-wcmp>

⁶² <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11866&l=1>

⁶³ Defined as "the presence of microbiological contamination or other organisms or waste affecting bathing water quality and presenting a risk to bathers' health"

1.6.4 Pressures and Impacts

The use of the marine resources for leisure and recreational purposes results in a range of pressures and impacts on the marine environment. The following constitutes a list of the most relevant pressures caused by such activities:

- Anchoring from pleasure crafts may lead to physical damage to the seabed. Although such impact would be generally restricted to enclosed inlets and bays, the extent of the pressure/impact from anchoring and/or moorings cannot be quantified at this stage, especially since anchoring or no-anchoring zones have as yet been designated in Malta. Marine ecosystems which are mostly at risk from such pressure are those located in inshore waters.
- Temporary marinas, fisheries berthing areas and boating activities in general are associated with a chronic input of contaminants in coastal waters, thus leading to a reduction in water quality.
- SCUBA diving is considered to be the main source of pressures on the submerged portion of emergent sea caves and underwater caves. Diving may cause both mechanical damage to erect sessile forms growing in caves, and death of the biota on the ceiling due to trapped air bubbles from diving cylinders⁶⁴.
- Recreational activities constitute the major threat to sandy beaches in Malta, although the effects of anthropogenic disturbance on beaches is unknown at this stage. In view of their recreational use, beaches are regularly cleaned. Although the degree of impact of such activity is largely dependent on the mechanisms used, it is considered to be a potential source of disturbance to the beach fauna.

1.6.5 Forward Look

The MSFD ESA⁶⁵ grouped NACE codes 47 (Retail trade), 55 (Accommodation), 56 (Food and beverages service activities), 68 (Real Estate), and 79 (Tour Operators) together when assessing economic trends. In general tourism is expected to increase since tourist arrivals have been on the increase in recent years. The increased accessibility (both by air through low cost airlines as well as increased cruise liner arrivals) are the main reasons for this growth which is expected to continue to increase in the medium-term as new air connections are established and cruise liner terminals are developed.

With respect to NACE code 93 (sports activities, amusement & recreation activities), this sector was also grouped with other sectors rendering the evaluation of future trends difficult.

⁶⁴ Schembri, P.J. (1995): Threatened habitats as a criterion for selecting coastal protected areas in the Maltese Islands. Rapport du Congrès de la Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée 34: 128

⁶⁵ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

1.7 Hydrocarbon Exploration and Exploitation

1.7.1 General Overview

Oil and gas exploration in Malta was initiated in 1954 when D'Arcy Exploration was granted an onshore permit to start methodical prospecting. The company completed the deep well Naxxar 2 in 1959 but without economic success.

In the 1970s attention turned towards offshore exploration. In all, ten offshore wells were drilled and several thousand kilometres of seismic data as well as other geophysical data were acquired. The location of the offshore oil wells drilled to date is indicated in Figure 17.

The interest in oil exploration and drilling in Malta has gained significant momentum in recent years. The area designated for hydrocarbon exploration and exploitation in Malta is made up of seven areas, two of which are further subdivided into 'blocks'. The acreage presently licensed is as follows:

- Area 2 and Area 7 are licensed under a Production Sharing Contract with Heritage Oil;
- Blocks 4, 5, 6 & 7 of Area 4 are licensed under a Production Sharing Contract with Phoenicia Energy Company Ltd and Melita Exploration Company Ltd.,
- Blocks 1, 2 & 3 of Area 3 are licensed under an Exploration Study Agreement with Capricorn Malta Ltd and Melita Exploration Company Ltd.

The areas licensed for oil exploration are indicated in Figure 18.

Figure 17: Location of exploratory wells drilled offshore Malta

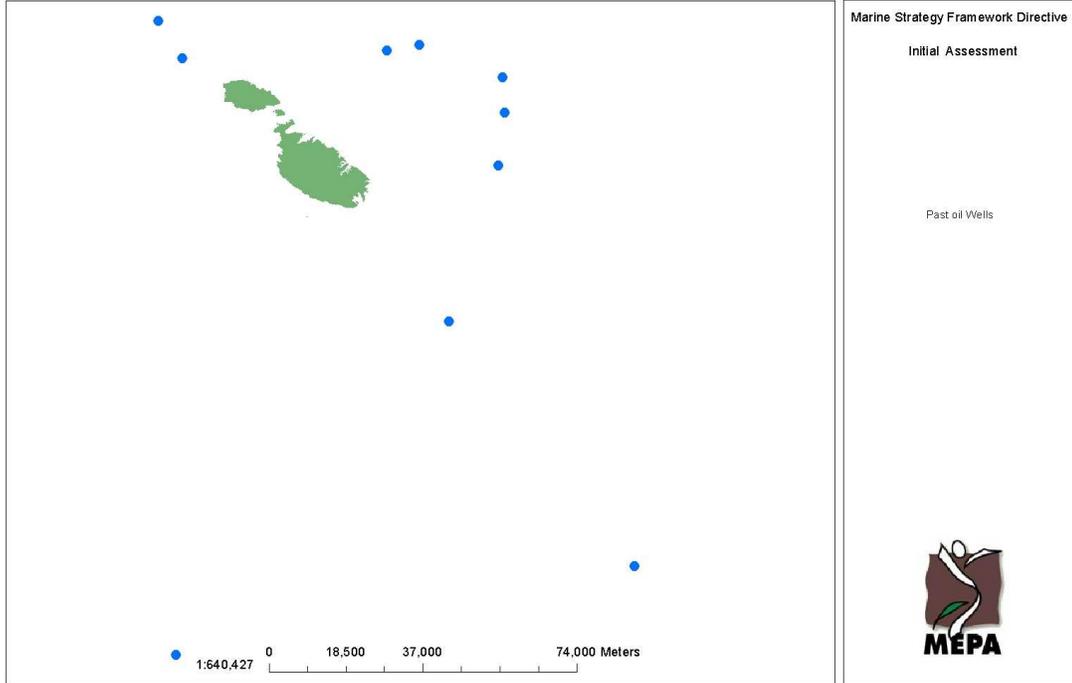
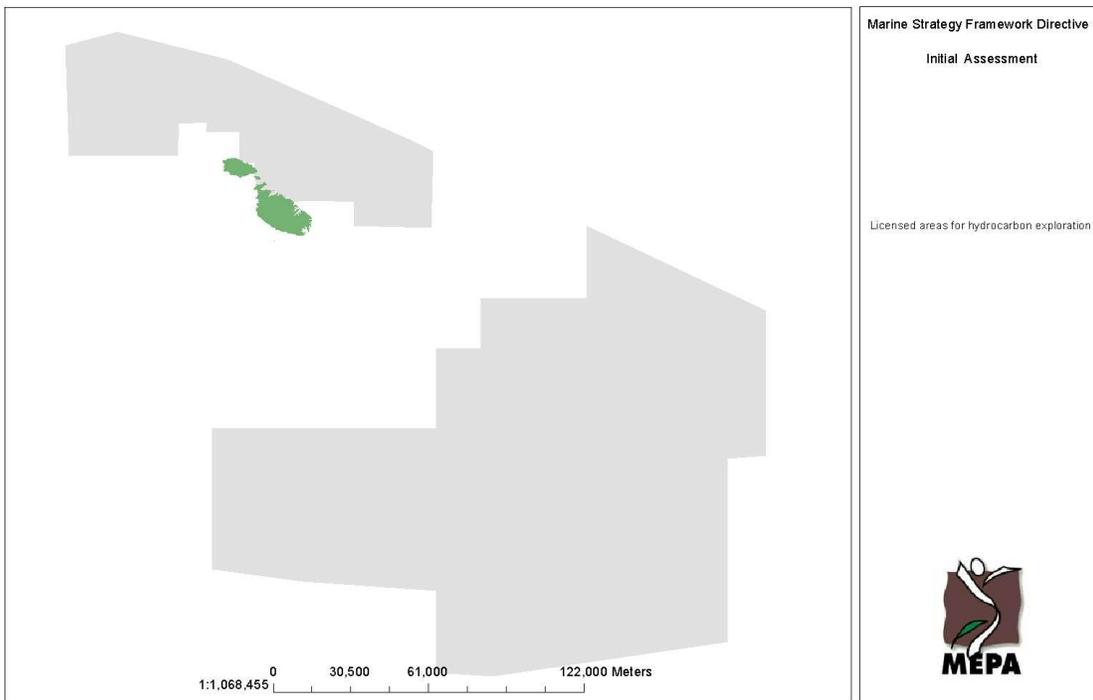


Figure 18: Areas presently licensed for oil exploration⁶⁶



⁶⁶ <https://mticms.gov.mt/en/Pages/Continental%20Shelf/Continental-Shelf.aspx>

1.7.2 Economic Valuation

Although oil exploration activities are undertaken in Malta, no commercial oil/gas has yet been extracted. For this reason, the MSFD Economic and Social Analysis⁶⁷ (ESA) considered this sector in terms of the sectors servicing the oil exploration activities, therefore as part of NACE codes 8 & 9 (Other mining and quarrying, and mining support service activities) (Table 16). Oil extraction would feature under NACE code 6, however this sector cannot be evaluated at this stage.

Table 16: Economic indicators for NACE codes 8 & 9 (Other mining and quarrying, and mining support service activities) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁶⁸. FTE employment is measured in number of persons. Other variables are in €000s

	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%

1.7.3 Management and Legislation

1.7.3.1 Main legislation

Oil exploration activity in Malta is regulated by the Petroleum (Production) Act (1958), the Continental Shelf Act (1966) and the Petroleum (Production) Regulations (2001). This legislation provides for Government to issue and regulate exploration and production licences under Production Sharing Contracts and Exploration Study Agreements.

⁶⁷ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

⁶⁸ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

The Petroleum (Production) Act vests in the Government of Malta the property of any petroleum in its natural condition or in strata existing in the Maltese territory. The right of searching and boring for and getting such petroleum is subject to a licence granted under the provisions of this Act. Under present legislation, an environmental impact study is required to be submitted by the contractor prior to the commencement of hydrocarbon exploitation activities.

1.7.3.2 Other relevant policies

The Barcelona Convention for the Protection against Pollution in the Mediterranean Sea is a regional convention to prevent and abate pollution from ships, aircraft and land based sources in the Mediterranean Sea. The Offshore Protocol issued within the framework of the Barcelona Convention aims to complement the Convention as regards exploration and exploitation of offshore oil and gas activities. So far the Offshore Protocol has been ratified by six countries (Albania, Cyprus, Libya, Tunisia and Morocco and Syria).

The Protocol covers a wide range of exploration and exploitation activities and touches upon permit requirements, the removal of abandoned or disused installations, the use and removal of harmful substances, and safety, contingency planning and monitoring. The European Union has recently acceded to the Protocol following the adoption of Council Decision 2013/5/EU of 17 December 2012 on the accession of the European Union to the Offshore Protocol. The EU has also published a Directive on Offshore Safety (2013/30/EU) which will come into effect in 2015. This directive establishes minimum requirements for preventing major accidents in offshore oil and gas operations and limiting the consequences of such accidents.

1.7.4 Pressures and Impacts

This section lists key pressures and impacts associated with oil and gas extraction currently active in the Maltese Islands. As discussed, at present the Maltese areas are solely subject to seismic and well exploration. There are plans for drilling of oil wells in the near future.

- Noise from seismic exploration activities may have potential impacts on noise sensitive species. Noise sources from seismic exploration are impulsive, however the extent and nature of the impacts of such impulsive noise on marine biota is not known for Malta.
- Noise (semi-continuous or continuous) from drilling rigs may have impacts on noise sensitive species. As discussed, drilling activities on the islands are minimal. In view of this, mitigation measures have thus far been unnecessary and have not been developed.

- Oil contamination from accidental spills during drilling/extraction resulting in contamination of the marine environment. Given that no oil has been extracted to date, no such spills have occurred in Malta.

1.7.5 Forward Look

The Government of Malta intends to promote Malta's petroleum exploration opportunities through various promotional campaigns. Phoenicia Energy Company Limited and Melita Exploration Company Limited intend to start drilling their first exploration well in Area 4 while Heritage Oil is actively looking to contract a rig to drill in southeast offshore Malta. Oil activity in the islands is thus bound to increase over the coming years.

1.8 Coastal Defence

1.8.1 General Overview

Coastal defence structures in Malta mainly constitute 'breakwaters' constructed for the provision of shelter to harbour areas or marinas. In the light of the fact that the existing marinas are located within harbour areas, coastal defence structures are concentrated within the main harbour areas, namely the Grand Harbour⁶⁹, Marsamxett Harbour, Marsaxlokk harbour, Ċirkewwa and Mġarr harbour in Gozo.

This does not exclude the presence of artificial coastline outside harbour areas. However, development of artificial coastline outside harbour areas is not necessarily related to 'coastal defence'. A review of development permit applications submitted in the period 2000-2010 indicates that construction works strictly related to coastal defence were limited during this period and were requested at two locations: Marsalforn in Gozo where the development of coastal defences against wave incidence was being sought and St. Paul's Bay in Malta where the restoration of the seawall was granted permission. Another request for the development of a protection berm to retain a sandy beach in the area was associated with the Freeport area in Marsaxlokk harbour (Figure 19).

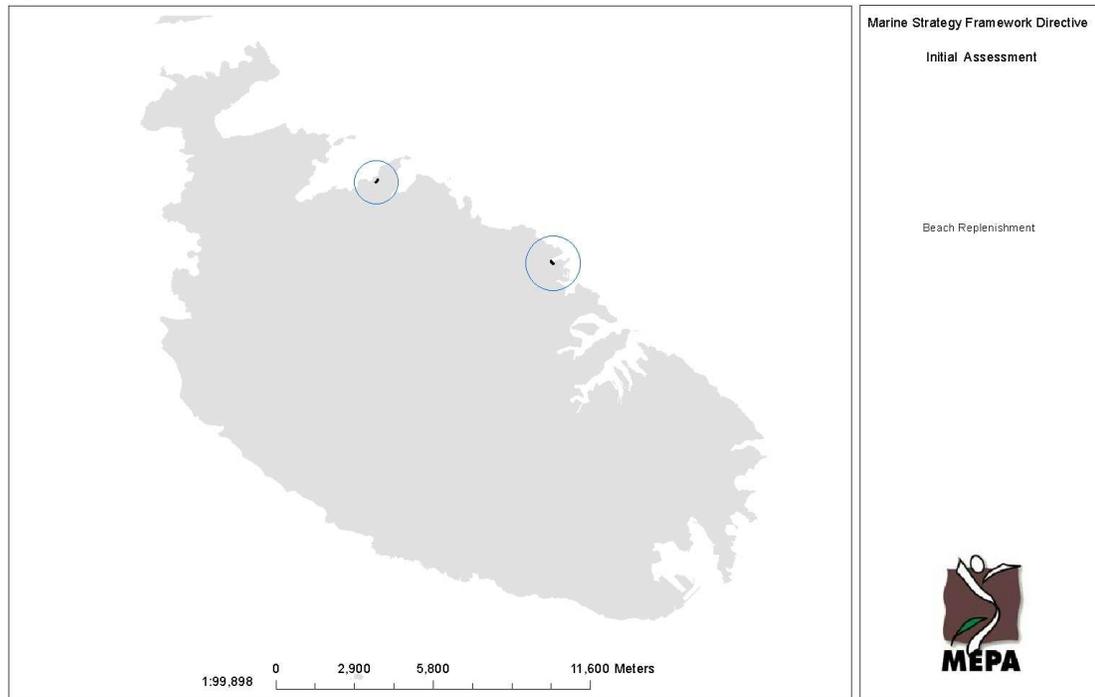
Two beach replenishment projects have also been undertaken to date. These interventions were once again not related to coastal defence, but were carried out for tourism or recreational purposes (Figure 20).

⁶⁹ It should be noted that the nature of the Grand Harbour is closely linked with the history of Malta since this harbour served as a location for battles in the past. For this reason, the Grand Harbour is lined by fortifications which are of high historical value.

Figure 19: Works related to 'coastal defence' on the basis of a review of development permit applications submitted in the period 2000-2010



Figure 20: Beach Replenishment projects in the period 2000-2010



1.8.2 Economic Valuation

Construction of coastal defence structures would fall within NACE codes 42 & 43 (Civil Engineering and Specialised Construction activity) as assessed by the MSFD Economic and Social Analysis⁷⁰ (ESA). The outcome of this analysis is discussed in Section 1.4.2.

1.8.3 Legislation and Management

Legislation relevant to coastal defences depends on the purpose of such structures, however since the majority of coastal defences are associated with harbour management, the most relevant legislation is deemed to be the Authority for Transport in Malta Act XV, 2009. This Act established the Authority for Transport in Malta which assumed the functions previously exercised by the Malta Maritime Authority. All regulations, orders, and instruments brought into force under the Malta Maritime Authority Act, 1991 and Ports and Shipping Act, 1991 continued to have effect as if made under this Act.

The *Malta Maritime Authority Act, 1991* provided for the establishment of the Malta Maritime Authority (MMA) and, *inter alia*, empowered the MMA to exercise overall control in the territorial and inland waters of Malta including ports and their land and sea approaches.

Development permits for coastal defence structures would fall within the scope of the Environment and Development Planning Act. The construction of breakwaters, wave breakers or coastal defences is listed under Schedule IA of the Environmental Impact Assessment Regulations 2007 (Legal Notice 114 of 2007, as amended) which lists projects requiring an Environmental Impact Statement (EIS) or an Environmental Planning Statement (EPS). The requirement for an EIS or EPS is subject to a screening process.

1.8.4 Pressures and Impacts

Coastal defence structures predominantly interfere with hydrological processes and may result in changes to water currents and sediment characteristics.

Malta's main harbour areas were subject to such hydrological changes since historic periods, as a result of which marine ecosystems within harbour areas have been altered from natural conditions. Construction of further breakwaters or coastal defences within such area may give rise to further hydrological changes with potential effects on these altered ecosystems.

⁷⁰ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Changes in water currents may also lead to coastal erosion or interferences with processes related to sand accretion and erosion. Although not necessarily related to coastal defence structures, past development along the coastline coupled to development on land have resulted in a reduction in the extent of a number of sandy beaches.

The construction of coastal defences is also associated with physical loss and physical damage to the seabed.

1.9 Military – Defence

1.9.1 General Overview

Military defence in the Maltese Islands falls under the remit of the Armed Forces of Malta (AFM) who conduct a variety of operational and exercise activities in the marine environment. Military activities in the marine environment include routine patrolling activities conducted for Defence purposes, the interdiction of illicit trafficking of various types, fisheries protection and Search and Rescue. These operational activities are supported by training activities, including live gunnery exercises carried out in three established areas. The AFM also has a supporting role in addressing marine pollution incidents.

AFM operates a fleet of vessels and a number of aircrafts to carry out the military activities described above. The majority of vessels are based at the main AFM maritime facility in the Grand Harbour. This facility provides for the mooring of vessels, logistical support and first-line maintenance. Maintenance activities of removable components are also conducted in shore-based workshop facilities.

In the past, considerable amounts of munitions were disposed of at sea however there are no records of the extent of this practice. Whenever the AFM has munitions or unexploded ordnance to dispose of, this operation is carried out in this location. However such operations are infrequent.

1.9.2 Economic Valuation

The MSFD Economic and Social Analysis⁷¹ (ESA) assessed Military Defence as part of NACE code 84 (Public Administration and Defence; compulsory social security). This NACE code however includes activities related to the Customs Department.

The outcome of the economic analysis is indicated in Table 17. Overall, the activity associated with this NACE code is deemed to have increased between 2006 and 2012 in terms of GVA and declined in terms of employment. With specific reference to the Armed Forces of Malta, the analysis considers this sector to be stable.

⁷¹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 17: Economic indicators for NACE codes 84 (Public Administration and Defence; compulsory social security) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁷². FTE employment is measured in number of persons. Other variables are in €000s

	NACE Code: 84							Average Growth
	2006	2007	2008	2009	2010	2011	2012	
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>	5.4%	5.2%	5.0%	4.9%	4.8%	4.4%	4.4%	
	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%

1.9.3 Legislation and Management

The AFM is regulated by the Subsidiary Legislation 220.02: Designation, Command and Establishment of the AFM Order dated 25th September, 1970; Legal Notice 90 of 1970, as amended by Legal Notices 36 of 1973 and 33 of 1980.

1.9.4 Pressures and Impacts

Routine military activities are not associated with significant pressures/impacts on the marine environment. The AFM confirmed that their fleet fully complies with environmental standards with regards to discharges of pollutants into the marine environment. None of the vessels conducts discharge of oily water or sewage directly into the marine environment. Such discharges are either stored aboard pending discharge into a suitable shore installation or treated aboard to a standard that allows their discharge into the sea. Any required painting, grit blasting or metal-working activities take place during scheduled docking activities which are conducted

⁷² Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

in commercial ship-repair facilities, all of which have appropriate waste-management plans in place.

Furthermore, all maintenance and logistical activities requiring the removal or replenishment of petroleum, oil and lubricant (POL) products are conducted in a manner that ensures that no potential pollutants are released into the environment. All spent lubricants are stored prior to removal by a licensed operator for appropriate disposal. All delivery of POL products is conducted in a controlled manner to ensure that materials are not released to the surrounding environment. AFM maintain a limited counter-pollution capability at its maritime facility as first response to any potential POL spills.

Aircrafts are operated on a routine basis and there may be instances where flares and smoke markers need to be dropped into the sea. However any potential impacts from such practices would be localised and limited.

The dumping of munitions in the marine environment on the other hand can result in the release of contaminants. However such impact still needs to be verified and should it be verified, it is most likely a localised impact.

1.9.5 Forward Look

As indicated in Section 1.9.2, the sector incorporating the Armed Forces of Malta is expected to be stable in the future.

1.10 Renewable Energy

1.10.1 General Overview

The majority of Malta's energy demand is met through importation of fossil fuels. However, during the past decade the use of renewable energy sources has been gaining momentum, also as a result of Malta's EU obligation to meet the renewable energy targets. At present, domestic solar photovoltaic systems and solar heating systems are the main renewable energy sources in Malta.

Offshore wind energy technology has originally been considered as a feasible renewable energy option for Malta⁷³. Studies have been carried out on the offshore wind energy potential and to identify marine sites with a potential to host large scale offshore wind farms⁷⁴. However, Malta is prevalently surrounded by deep waters, hence deep offshore technology suitable for depths exceeding 50m is unlikely to be available on a commercial scale before 2020. Shallow patches are limited and restricted to a few sites.

In July 2012, the Government of Malta presented an Environmental Impact Assessment (EIA) in relation to a planning permit application for the development of an offshore wind farm to be sited at Sikka I-Bajda. With the knowledge available at the time, it was projected that offshore wind production would be the major source contributing towards Malta's 10% RES target amounting to circa 30% of this 10%.

This development permit application is still being processed at the time of writing this report, however the final results of the EIA on the Sikka I-Bajda concluded that the development of offshore wind farm on Sikka I-Bajda shall pose significant environmental impacts in particular residual impacts on two important seabird colonies (namely Yelkouan Shearwater (*Puffinus yelkouan* - *Garnija*) and Cory's Shearwater (*Calonectris diomedea* - *Ċiefa*) within two Special Areas of Conservation (SAC) and Special Protection Areas (SPAs) of EU importance Ramla tat-Torri / Rdum tal-Madonna Area and Kemmuna, Kemmunett, il-Hagriet ta' Bejn il-Kmiemen u l-Iskoll ta' Taħt il-Mazz which in reality cannot be mitigated. The cost of energy from Sikka I-Bajda wind farm was also considered as not-economically feasible given that generation was estimated at about 25 cents/kWh.

⁷³ Mott MacDonald, Malta Resources Authority, 2005, Potential Exploitable Renewable Electricity Study Malta Volume 1: Renewable Electricity Target

⁷⁴ Farrugia, R.N. and Scerri, E. (2000), Offshore Wind Potential of a Central Mediterranean Archipelago as quoted in Farrugia, R.N, Fsadni, M., Yousif, C. The Renewable Energy Potential of the Maltese Islands

Other offshore renewable energy sources were also considered such as the development of floating wind turbine platforms farms. Hexicon AB has submitted a project description statement in this regard. The project involved the development of a 36-turbine floating windfarm at a site 11 nautical miles off the northeast coast of Malta. However the project has not secured funding through the two NER300 calls that were open to all innovative technology proponents 2011 and 2013.

DexaWave Energy Malta launched the 'Blue Ocean Energy' (BOE) project in 2011 in order to measure the feasibility of generating electricity from wave resource surrounding the Maltese islands using prototype testing. Results indicate that the current available technology is not viable for deployment in the Maltese waters and therefore cannot make any contribution towards the 2020 targets.

1.10.2 Economic Valuation

Given that Malta has not yet developed offshore renewable energy installations, this sector could not be assessed as part of the MSFD Economic and Social Analysis⁷⁵.

1.10.3 Legislation and Management

EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources requires each Member State to ensure that the share of energy from renewable sources, in gross final consumption of energy in 2020 is at least its national overall target for the share of energy from renewable sources in that year, as set out in Annex I to the Directive. Such mandatory national overall targets are consistent with a target of at least a 20 % share of energy from renewable sources in the Community's gross final consumption of energy in 2020. Through this Directive, the EU Commission has set Malta a target to achieve 10% of its total energy needs from renewable energy sources by 2020.

The latest Energy Policy for the Maltese islands was issued in 2012 and takes into account the EU mandatory target of Malta's renewable share. This policy sets out measures to enable Malta's transition from total dependency on fossil fuels towards an energy mix scenario to ensure the stability and security of energy supply whilst making use of renewable resources. The targets set for achieving the share of energy generation from renewable sources are indicated in Table 18.

⁷⁵ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 18: Targets for Renewable Energy Share for Malta⁷⁶

Period	Percentage of Share
Starting point (2010)	0%
2011-2012	2%
2013-2014	3%
2015-2016	4.5%
2017-2018	6.5%
2019-2020	10%

1.10.4 Pressures and Impacts

Malta's marine environment is not currently subject to pressures from offshore renewable energy installations. This however does not exclude the fact that the marine waters will be subject to such pressures in the, potentially near, future.

Renewable energy installations are generally associated with impacts resulting from the construction and mooring techniques employed, generally leading to physical loss and damage to the seabed. The extent of such impacts however depends on the methodologies employed. The introduction of platforms on the seabed may also lead to changes in hydrographical conditions.

One of the major impacts associated with offshore wind farms and other energy installations is related to the generation of noise. The construction of the installations, which may require pile driving, could result in the generation of impulsive noise, while the operation of the installations could lead to continuous noise. Both types of noise pollution can have detrimental effects on noise-sensitive species.

1.10.5 Forward Look

Studies to assess feasibility of deep offshore wind technology in the Maltese waters are being carried out, however preliminary indications suggest that deep offshore wind technology is not yet viable and shall not be developed until 2020. Due to continuous technological advances in turbine efficiencies and capital costs, deep offshore wind farms may become a viable option post 2020. Malta intends to fully exploit its solar resource to replace offshore wind farm contribution to reach EU 2020 targets.

⁷⁶ Ministry for Resources and Rural Affairs. 2009.A Proposal for an Energy Policy

1.11 Desalination/Water Abstraction

1.11.1 General Overview

Freshwater resources on the Maltese Islands are scarce and subject to intense pressures from various users. Total freshwater demand is estimated to reach 57 million cubic metres per year, which demand is sourced by extraction of groundwater, desalination, rainwater harvesting and treated effluent.

Although groundwater is the major source of freshwater accounting for more than 50% of the islands' total water production, Malta has significantly invested in desalination plants for the production of potable water. Potable water is abstracted from groundwater and supplemented by water produced from desalination plants at Pembroke, Ċirkewwa and Għar Lapsi (Figure 21). Water produced from the desalination process is blended with groundwater in order to satisfy the demand and quality for drinking water.

During 2011, 29,782,523 cubic metres of potable water were produced by Malta's Water Services Corporation. 16,721,969 cubic metres (56%) of this potable water was produced by the desalination plants. Water production from desalination plants increased very slightly (just over 600,000 m³) over the previous year, but is still very much less than the production peaks of the early 1990s⁷⁷. The output of each desalination plant is provided in Table 19.

On average seawater extracted from shore wells is approximately 40 million m³ per year. Seawater is not abstracted directly and intake takes place through deep wells. Brine discharge amounts to 24 million m³ per year.

⁷⁷ Water Services Corporation, Annual Report 2011

Figure 21: Location of desalination plants in Malta

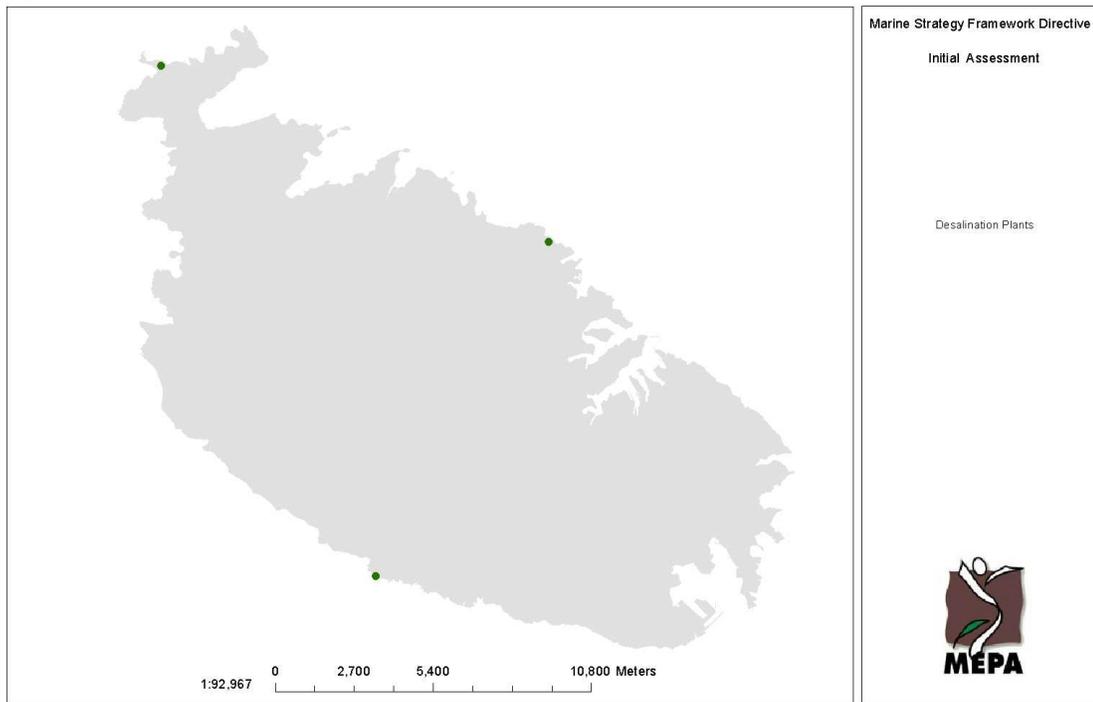


Table 19 : Production of water by each desalination plant. Table extracted from WSC Annual Report 2011

	Production in m ³	Percentage (%)
Lapsi RO plant	5,079,944	30
Cirkewwa RO plant	2,598,739	16
Pembroke RO plant	9,043,286	54
Total Seawater Desalination	16,721,969	100

1.11.2 Economic Valuation

The MSFD Economic and Social Analysis⁷⁸ assessed the use of the marine environment for desalination purposes as part of an aggregation of economic sectors, including:

- NACE code 35 – Electricity production
- NACE code 36 – Water collection, treatment and supply
- NACE code 37 - Sewerage
- NACE code 39 - Remediation activities and other waste management services

⁷⁸ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

When assessed together, these sectors' activity in terms of Gross Value Added has been erratic over the past 6 years and declining in terms of employment. Between 2006 and 2012, the average annual drop in employment amounted to 3.4% p.a. whereas Gross Value Added increased from €73.5 million in 2006 to €101.7 million in 2010 before turning negative in 2012. As a general comment, these three sectors are mainly made up of public sector operators that apart from having an economic concern, also have a social one. As a result, government policy plays an important role in the profitability of these sectors.

Table 20: Economic indicators for NACE codes 35 (Electricity generation), 36 (water collection, treatment and supply), 37 (sewerage) and 39 (Remediation activities and other waste management services) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁷⁹. FTE employment is measured in number of persons. Other variables are in €000s

	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%
<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	2,754	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%

1.11.3 Legislation and Management

Legislation relevant to the production of potable water is mainly related to public safety. This mainly constitutes Council Directive 98/83/EC (Drinking Water Directive) transposed into National Legislation through Legal Notice 17 of 2009 (Water intended for human consumption regulations, 2009 – as amended by LN 242 of 2009). According to these regulations water intended for human consumption⁸⁰ should be free from any micro-organisms and parasites and from any substances

⁷⁹ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁸⁰ water intended for human consumption includes all water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied from a distribution network, from a tanker, or in bottles or containers;

which, in numbers or concentrations, constitute a potential danger to human health. In this regard water should meet the minimum requirements set out in Schedule I, Parts A (microbiological parameters) and B (chemical parameters) of the regulations. These regulations also call for regular monitoring of the quality of water intended for human consumption.

1.11.4 Pressures and Impacts

Environmental impacts from desalination plants are mainly attributed to the discharge of brine which can lead to changes in the salinity regime of the affected marine area. The effects of brine discharges on hydrological processes have not been assessed at a local scale. Nevertheless, the brine discharges from desalination plants are localised and can be considered to be of low significance. This however does not exclude the need for further assessments.

With respect to contamination of the marine environment through brine discharges, Malta's Water Services Corporation indicated that no chemicals are used in the process except for pH adjustment.

Overall pressures and impacts associated with brine discharges still need to be assessed.

1.11.5 Forward Look

As indicated by the Water Services Corporation Annual Report 2011, water production in the 1990s was much higher than that required in more recent years. In the past decade, water production from desalination plants has been more or less stable, implying also stability of the requirements of water production from desalination plants in the future.

1.12 Waste Disposal

1.12.1 General Overview

The marine environment is used as a sink for disposal of waste. Such use in Malta is mainly associated with the discharge of liquid waste from land-based installations as well as the disposal of solid inert waste. Given that these activities are closely associated with contamination of the marine environment and disposal of solid waste is further associated with physical loss/damage to the seabed, details on the use of the marine waters for the purposes of waste disposal are provided in the MSFD Initial Assessment reports on 'Contamination by Hazardous Substances' and 'Physical Loss and Physical Damage'. This section extracts relevant information from these MSFD reports.

1.12.1.1 Land-Based Discharges

The location of point marine discharges in Malta is indicated in Figure 22. This spatial information was mainly collated as part of MEPA's environmental permitting process in collaboration with the operators. Within this context, it should be noted that MEPA's environmental permitting system has only recently started being implemented, therefore other marine discharges which are not currently permitted would be present throughout the Maltese Islands.

The main sectors associated with land-based discharges into the marine environment are listed hereunder:

- Electricity Generation (power plants)
- Aquaculture (land-based and offshore installations)
- Hotels and recreational sectors
- Oil and fuel terminals
- Sewage Treatment Plants
- Shipyards
- Desalination Plants.

The sewerage system in Malta collects both domestic and industrial wastes. Historically, discharges of untreated municipal and industrial wastewaters into coastal waters were the most prominent form of pollution. However, discharge of untreated sewage in Malta has been completely replaced by effluents treated to the secondary level. Sewage treatment plants at Ras il-Hobż in Gozo and Iċ-Ċumnija in Malta have been discharging treated effluents from January 2008 and March 2009 respectively. The sewage treatment plant at Ta' Barkat (Northeastern coast of mainland Malta) has replaced the untreated sewage outfall at Wied Għammieq and became operational in June 2011.

Most industries in Malta are located inland and are either connected to the municipal sewerage system or employ specific waste management practices to regulate discharges generated on site. The majority of the installations with direct discharges to the marine environment are located in harbour areas. Such installations include oil storage and treatment facilities (oil and fuel supply terminals), as well as the power stations of Marsa and Delimara. Wastewaters from oil and fuel terminals are generally associated with dewatering of fuels during storage or from oil-water separation of ballast waters, or rainwater runoff. The majority of the oil and fuel terminals are also located within harbour areas as indicated in Figure 23.

Shipyards located in the Grand Harbour area also discharge their waste stream into the marine environment. Until recently, the most important shipyard in Malta was the Malta Shipyards which was one of the largest ship repairing yards in the Mediterranean. Activity at the Malta Shipyards was reduced significantly during the last decade. However they have been recently privatized and the shipyards are now carrying out various activities related to yacht and ship repair, conversion and building of marine vessels, surface treatment of vessels and general engineering works.

Marine-based fish farming is a source of contamination in the marine environment particularly through excess food and fish wastes, potential use of pharmaceuticals and packaging processes. Most of the wastewaters associated with tuna penning operations arise from ship-based sources where tuna processing and packaging takes place. Land-based aquaculture installations are on the other hand associated with wastewater effluents arising from net cleaning, defrosting and frozen bait, fish processing and packaging. However the significance of marine contamination from such discharges is considered low.

Discharges from municipal desalination plants and cumulative discharges from tourist resorts are also considered to be sources of hazardous substances, albeit of a localised nature and hence of low significance. Brine wastewaters, as well as membrane wash waters produced during back-flushing of the membranes are discharged directly into the sea.

Figure 22: Location of discharges per sector

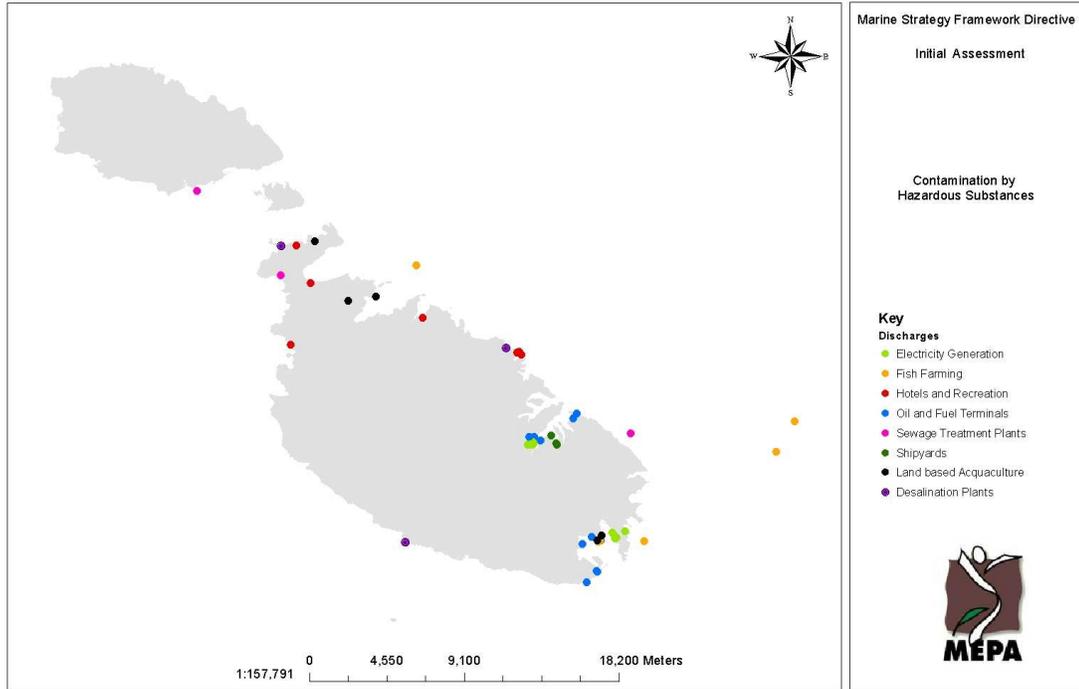
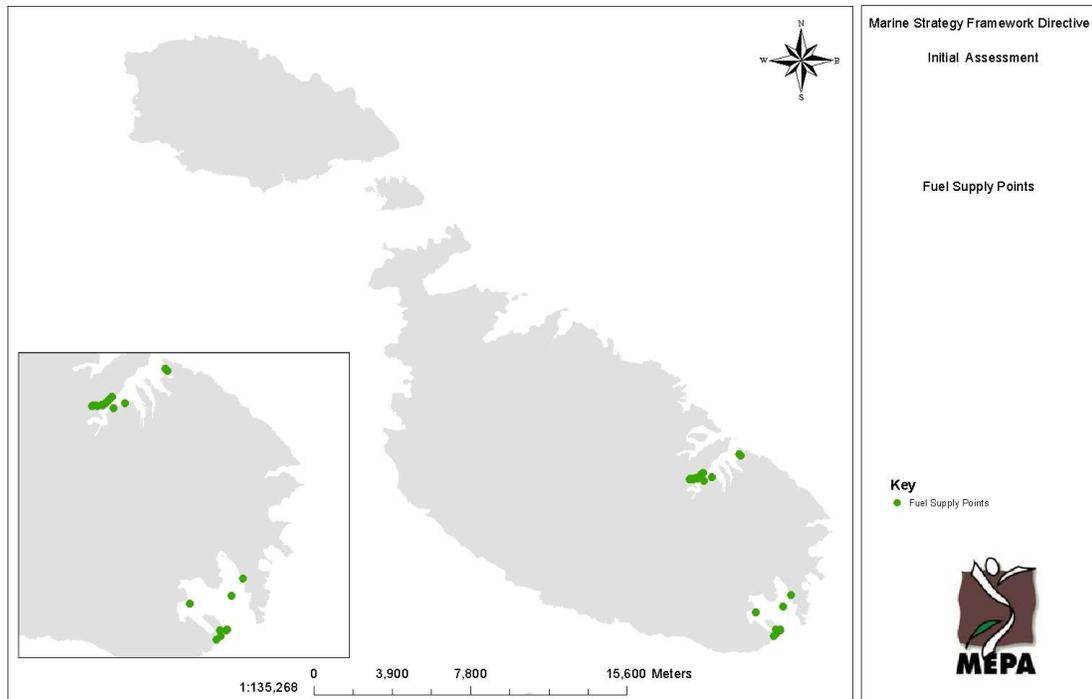


Figure 23: Location fuel supply points associated with the oil and fuel terminals in the Harbour areas

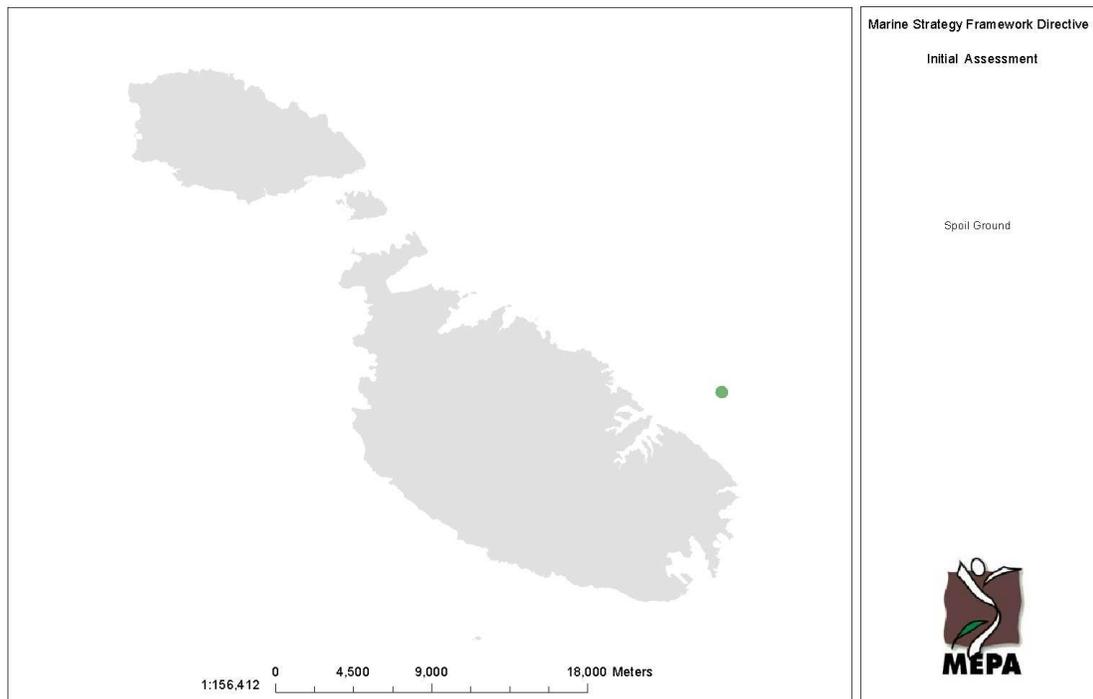


1.12.1.2 Solid Waste Disposal

Disposal at sea in Malta is permitted for specific types of waste streams and within a designated 'spoil ground' (Figure 24). The type of waste which can be disposed at sea includes dredged material, inert geological material and spoilt cargo (considered suitable for disposal at sea). Malta's draft Waste Management Plan⁸¹, which at the time of writing this report was at public consultation stage, indicates that the majority of inert material disposed at sea originates from construction and demolition projects on land. The amount of such waste disposed at sea during the period 2004-2011 is indicated in Table 21.

During the period 2007-2011, approximately 1 million tonnes of waste was disposed at sea. In 2007-2009 the majority of the waste constituted clean geological material originating from construction and demolition projects on land, while in 2010-2011, the majority of the waste disposed at sea constituted dredged material. In 2010, 353 tonnes of spoilt cargo (grain) were also disposed at sea⁸².

Figure 24: Location of spoil ground



⁸¹ Waste Management Plan for the Maltese Islands: A Resource Management Approach 2013-2020 – Consultation Document October 2013

⁸² Waste Management Plan for the Maltese Islands: A Resource Management Approach 2013-2020 – Consultation Document October 2013

Table 21: Amount of waste generated from construction on land disposed at sea⁸³

Year	Amount of inert waste generated by construction on land and disposed at sea (tonnes)
2004	210404
2005	357942
2006	329426
2007	146205
2008	300360
2009	74370
2010	290120
2011	149120

1.12.2 Economic Valuation

As described in Section 1.11.2, the disposal of waste into the marine environment was assessed by the MSFD Economic and Social Analysis⁸⁴ as part of an aggregation of economic sectors, including:

- NACE code 35 – Electricity production
- NACE code 36 – Water collection, treatment and supply
- NACE code 37 - Sewerage
- NACE code 39 - Remediation activities and other waste management services

When assessed together, these sectors' activity in terms of Gross Value Added has been erratic over the past 6 years and declining in terms of employment. Between 2006 and 2012, the average annual drop in employment amounted to 3.4% p.a. whereas Gross Value Added increased from €73.5 million in 2006 to €101.7 million in 2010 before turning negative in 2012. As a general comment, these three sectors are mainly made up of public sector operators that apart from having an economic concern, also have a social one. As a result, government policy plays an important role in the profitability of these sectors.

Specifically for the waste sectors, the ESA noted that the treatment of effluent has improved substantially in recent years with a significant improvement registered in the quality of bathing water. Plans for more adequate pricing of waste collection, separation and treatment (that would improve the operation of this sector) are still unknown.

⁸³ Waste Management Plan for the Maltese Islands: A Resource Management Approach 2013-2020 – Consultation Document October 2013

⁸⁴ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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

Table 22: Economic indicators for NACE codes 35 (Electricity generation), 36 (water collection, treatment and supply), 37 (sewerage) and 39 (Remediation activities and other waste management services) for the period 2006-2012 as extracted from the MSFD Economic and Social Analysis⁸⁵. FTE employment is measured in number of persons. Other variables are in €000s

	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%
<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	2,754	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%
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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%

1.12.3 Legislation and management

There are a number of policies which regulate the discharge of waste into the marine environment.

Legislation or initiatives deemed to be most relevant in this regard is listed hereunder:

- Dangerous Substances Directive (76/464/EEC), Water Framework Directive (2000/60/EC) and Priority Substances Directive (2008/105/EC) with goals for the protection and prevention of further deterioration of the water quality, including from discharges of chemicals. The WFD is in the process of fully repealing the Dangerous Substances Directive;
- Industrial Emissions Directive sets out general principles for IPPC sites⁸⁶ including the requirements that all the appropriate preventive measures are taken against pollution, particularly through application of best available techniques (BAT). The general principles also require specific consideration of waste management and accident prevention. The Directive requires the establishment of Emission Limit Values (hereinafter referred to as 'ELVs') for polluting substances that are likely to be emitted in significant quantities.

⁸⁵ Adi Associates, E-Cubed Consultants & Ecoserv Ltd (AEE Consortium): 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. ERDF156 - Developing national environmental monitoring infrastructure and capacity.

⁸⁶ As per Integrated Pollution Prevention & Control (IPPC) Directive

- The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its protocols aim at reducing pollution in the Mediterranean Sea and protect and improve the marine environment in the area, thereby contributing to its sustainable development:
 - the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities (LBS Protocol) was amended in 1996 and entered into force in June 2008. The Protocol identifies a list of substances of which control should be sought through action plans, programmes and measures;
 - the Hazardous Waste Protocol calls for Contracting Parties to the Barcelona Convention to take all appropriate measures to prevent, abate and eliminate pollution of the Mediterranean region, which can be caused by transboundary movements and disposal of hazardous waste.
- The sewer discharge control regulations (Legal Notice 139 of 2002, as amended by Legal Notice 378 of 2005) establish the need of a 'public sewer discharge permit' for the discharge of effluents into the public sewerage system.
- The Programme of Measures put forward as part of the requirements of the EU Water Framework Directive⁸⁷ includes the following measures aimed at achieving good chemical status of coastal water bodies:
 - Create a pollution abatement programme for priority hazardous substances, priority substances and other substances of concern;
 - Develop tools to link environmental quality standards (chemical) to emission limits for marine discharges;
 - Adopt a regulatory framework for industrial operational practices;
 - Improve the regulatory system for industrial discharges into the public sewerage network.
- Disposal at sea is regulated in terms of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention) and the Convention for the Protection of the Mediterranean Sea Against Pollution, 1976 (Barcelona Convention) and its Protocols. Disposal at sea is subject to a permitting procedure in terms of the Waste Regulations 2011 published by Legal Notice 184 of 2011 (transposing Directive 2008/98/EC on waste and repealing certain Directives).
- The Programme of Measures put forward as part of the requirements of the EU Water Framework Directive⁸⁸ includes two measures related to the monitoring of the disposal of solid waste:
 - Monitor dumping operations at the spoil ground
 - Study the impacts of the national spoil ground off Xgħajra

⁸⁷ <http://www.mepa.org.mt/file.aspx?f=5832>

⁸⁸ <http://www.mepa.org.mt/file.aspx?f=5832>

1.12.4 Pressures and Impacts

Impacts of marine discharges are directly related to contamination of the marine environment, which contamination can have effects on all levels of ecosystem organisation. Knowledge on the effects of contaminants on biota or ecosystems is very limited in Malta.

In terms of impacts associated with disposal at sea, a preliminary survey of the seabed at the designated spoil ground and surrounding area⁸⁹ indicates significant alterations to the seabed where spoil has been dumped.

The seabed in this area is predominantly characterised by soft sediments harbouring impoverished biological assemblages⁹⁰. The natural characteristics of the spoil ground and surrounding areas have been altered and the area is characterised by very large boulders and unconsolidated terrigenous material together with a variety of anthropogenic material. Turbid conditions were also recorded throughout the surveyed area which conditions were attributed to the presence of fine sediments and other particulate matter originating from the regular spoil dumping activities. Such turbid conditions are a result of continuous sedimentation resulting both from fallout during dumping as well as re-suspension of sediment from the bottom. While such conditions are not necessarily associated with physical loss, increase in turbidity would generally result in physical damage to the benthic habitats.

1.12.5 Forward Look

As a result of the treatment of all urban waste water since 2011, the current legislative requirements in place, the measures put forward by Malta's Water Catchment Management Plan aimed at the achievement of Good Surface Water Chemical Status and the emerging Waste Management Plan, waste disposal in the marine environment is expected to be managed in a more sustainable manner in the future. Therefore the outlook for this particular sector is considered favourable from an environmental point of view.

⁸⁹ Borg, J.A. & Schembri, P.J. (2008) Report of a survey of the physical and biological characteristics of the seabed at the marine spoil ground and surrounding area, off the Grand Harbour, Malta;

⁹⁰ Borg, J.A. & Schembri, P.J. (2008) Report of a survey of the physical and biological characteristics of the seabed at the marine spoil ground and surrounding area, off the Grand Harbour, Malta;