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CURRENT AND FUTURE IMPACTS ON THE MARINE ENVIRONMENT: THE CHALLENGE TO ACHIEVE GOOD ENVIRONMENTAL STATUS

Malta Report

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CURRENT AND FUTURE IMPACTS ON THE MARINE ENVIRONMENT:

THE CHALLENGE TO ACHIEVE GOOD ENVIRONMENTAL STATUS

Malta Report

Nature Trust (Malta)

With the contribution of Charles Galdies and Marvic Refalo

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I. EXECUTIVE SUMMARY

This report constitutes an analysis of the economic sectors that are direct users of the local marine and coastal resources. It examines a number of indicators that have the ability to characterise the sectors' current and future pressures on the marine environment.

The analysis is based on geo-localised data related to economic sectors and their pressures on the local marine environment, together with quantitative and qualitative (not geo-localised) data that provided important information on the current and future trends of these sectors and on their pressures.

The report also illustrates the current and future potential interactions between sectors at the national (and occasionally regional) scale by means of thematic maps to help demonstrate the spatial extent and nature of the recognised risks and hotspots. A visual representation of the current and potential future impacts affecting Good Environmental Status (GES) is presented for each economic sector to underline key future trends conflicts at the national level.

In this report Nature Trust (Malta) presents a number of important viewpoints and recommendations (both general and specific) in order to assist national authorities towards achieving GES of the local marine environment by 2020.

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F'dan ir-rapport, Nature Trust (Malta) tispjega kif ċertu setturi ekonomiċi jisfruttaw ekosistemi tal-kosta u l-ibħra Maltin, u kif wieħed jista' jiżen l-impatt li dawn is-setturi qed iħallu preżentament u fil-futur qarib. Għal dan l-istudju intużat informazzjoni li hija ġeo-lokalizzata, kif ukoll informazzjoni kwantitattiva u kwalitattiva.

Permezz ta' mapep speċjali, dan ir-rapport jispjega b'mod ċar l-impatti ta' ċertu attivitajiet relatati mal-baħar u l-kosta, kemm fuq skala nazzjonali, kif ukoll fuq skala reġjonali. Wieħed jista' jsib ukoll grafiċi li jispjegaw l-effett li dawn is-setturi ekonomiċi qegħdin jew jistgħu jħallu fuq l-integrità tal-ambjent marittimu.

Permezz ta' dan ir-rapport, Nature Trust (Malta) qed toffri numru ta' pariri (kemm speċifiċi kif ukoll oħrajn iżjed ġenerali) lill-awtoritajiet nazzjonali bl-iskop illi tgħin sabiex tintlaħaq il-kwalità xierqa tal-ambjent marittimu sas-sena 2020.

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Disclaimer: The conclusions and recommendations of the MedTrends project do not necessarily reflect the views of the people and organizations acknowledged here.

III. TABLE OF ABBREVIATIONS

ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area
AIS	Automatic Identification System
AFM	Armed Forces of Malta
BOD	Biological Oxygen Demand
BQE	Biological Quality Element
C&D	Construction and Demolition
CBD	Convention on Biological Diversity
CFP	Common Fisheries Policy
COD	Chemical Oxygen Demand
DG	Directorate General
DPSIR	Drivers, Pressures, State, Impacts, Responses
DWT	Dead Weight Tonnage
EBSA	Ecologically and Biologically Significant Areas
EC	European Commission
EEA	European Environment Agency
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
FAD	Fish Aggregating Device
FAO	Food Agriculture Organization
FMZ	Fisheries Management Zone
GDP	Gross Domestic Product
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
GIS	Geographic Information System
GT	Gross Tonnage

GVA	Gross Value Added
HAB	Harmful Algal Bloom
HMX	Cyclotetramethylenetetranitramine
HNS	Hazardous and Noxious Substances
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMO	International Maritime Organisation
IMP	Integrated Maritime Policy
IUCN	International Union for Conservation of Nature
LNG	Liquid Natural Gas
MAP	Mediterranean Action Plan
MEDITS	Mediterranean International Bottom Trawl Survey
MEPA	Malta Environment and Planning Authority
MMA	Malta Maritime Authority
MPA	Marine Protected Area
MSFD	Marine Strategic Framework Directive
MSP	Maritime Spatial Planning
MW	Megawatt
kV	kilo Volts
NACE	Statistical Classification of Economic Activities in the European Communities
NIS	Non-Indigenous Species
NM	Nautical Miles
NTM	Nature Trust (Malta)
ODEMM	Options for Delivering Ecosystem-Based Marine Management
ODZ	Outside Development Zone
OPI	Operational Programme I
POPs	Persistent Organic Pollutants
PETN	Pentaerythriol tetranitrate
R&D	Research and Development

RAC/SPA	Regional Activity Centre for Specially Protected Areas
RDX	Cyclotrimethylenetrinitramine
SAC	Special Area of Conservation
SPAMI	Specially Protected Areas of Mediterranean Importance
TEU	Twenty-foot equivalent unit
TNT	Trinitrotoluene
UN	United Nations
UNEP	United Nations Environment Programme
VME	Vulnerable Marine Ecosystem
WFD	Water Framework Directive
WSC	Water Services Corporation
WTP	Wastewater Treatment Plant
WWF	World Wide Fund for Nature

IV. BACKGROUND AND OBJECTIVES

The Mediterranean Sea is increasingly exploited by a range of maritime activities, all of which are predicted to expand substantially over the next 20 years: wind farms, oil extraction, cables, shipping routes, fisheries and other human activities including tourism. The increased demand for the limited space and marine resources, increased conflict between maritime sectors as well as between human use and nature has triggered the European Commission to consider an EU-integrated spatial approach towards EU maritime areas in the form of a Marine Spatial Planning Directive. In July 2014, the European Parliament and the Council adopted legislation to create a common framework for maritime spatial planning in Europe. While each EU country will be free to plan its own maritime activities, local, regional and national planning in shared seas would be made more compatible through a set of minimum common requirements.

The MedTrends project is inspired by WWF's 2010 report "Future trends in the Baltic Sea", which highlights the substantial growth trend expected in the Baltic region over the next 20 years, showing how the Baltic Sea governance framework is clearly ill-equipped to meet oncoming challenges. In a nutshell the MedTrends project has been scoped to illustrate and map the most likely integrated scenarios of marine economic growth at a transnational level in Med-EU countries for the next 20 years. The potential cumulative impacts of human activities at sea will be assessed and put into the perspective of the 10% marine protected areas target set for the Mediterranean.

The project has the scope of carrying out an overall analysis of growth trends and potential cumulative impacts of human activities at sea, with particular reference to both the set Convention on Biological Diversity (CBD) target of 10% of coastal and marine protected areas in the Mediterranean (CBD target 11), as well as to the achievement of the Good Environmental Status (GES) objective set by the European Union's Marine Strategy Framework Directive (MSFD). The over-arching sectors chosen for this exercise include wind energy, shipping, ports, oil and gas exploration and extraction, pipelines and cables, coastal development, sand and gravel extraction, military activity, industrial pollution, tourism and recreation, commercial fishing, aquaculture, agricultural runoff, climate change, coastal chemical plants, desalinization plants. As far as Malta's national reporting is concerned, the following themes were examined on the basis of their local relevance: maritime transport, oil and gas exploration and extraction, pipelines and cables, coastal development, extraction of non-living resources (including dredging and water for potable use), infrastructure, land-based activities, tourism, recreational and commercial fishing, marine aquaculture, safety and security and waste disposal.

This report thus forms part of a collection of other national reports compiled by the MedTrends partners. A transnational report outlining scenarios for the future development is another MedTrends deliverable, meant to outline the future scenario of sectoral development in the Mediterranean. At both the national and transnational levels, advisory committees have been set up to provide advice and assist in the provision of data and information.

V. MATERIALS AND METHODS

The methodology adopted by this report supported the analysis of the sectors that are direct users of the local marine and coastal ecosystems. It examined a number of indicators that have the ability to characterise the sectors' current and future pressures on these ecosystems. It also takes into account relevant legislation that could influence changes in these pressures. It is important to note that the same methodology has been applied by other MedTrends partners to compile their own national reports and therefore it constrains to some extent the type and extent of the analysis made in order to ensure consistency and comprehensiveness of the final project deliverable.

In this regard, the Drivers-Pressures-State-Impact-Response (DPSIR) approach has been used (DG Environment, 2014). This approach expresses a cause-effect chain between human needs (Drivers) that exert Pressures on the environment resulting in a particular State of the marine/coastal environment. The changes in this State may have Impacts on the functioning of ecosystems, thus eliciting a multi-level Response to manage the detrimental effects caused by these pressures (fig. 1).

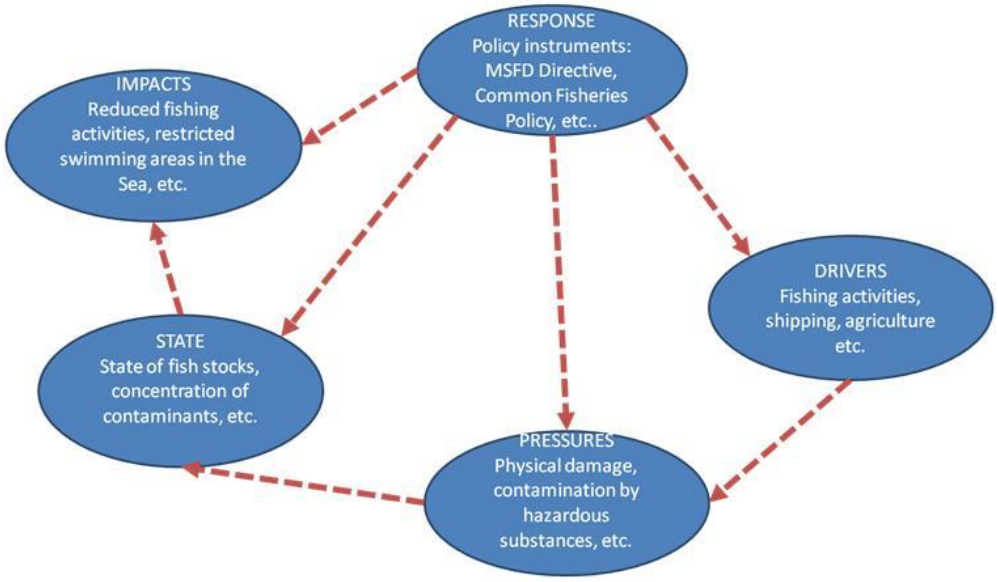

Figure 1. The DPSIR framework applied by the MedTrends project.

For the purpose of this study, the DPSIR approach was fully dependent on the collation of a database consisting of official/published information and supported by the relevant metadata. It made use of a wide range of data types and sources, including published statistical information, geodatabases, reports, policies, strategic documents as well as research articles. Considerable effort was made to locate and collate all relevant information at the national level.

The analysis was based on the following data types:

- **Geo-localised data** related to economic sectors and their pressures on the local marine environment. This data was mapped at various spatial scales[1] using geographical information system (GIS) in order to detect and analyse the spatial impacts and pressures. Such data, in the form of shapefiles (.shp), was converted according to a MedTrends format as per internal guidelines issued by the project

[1] *at both sub-regional (central Mediterranean) and at the local scale (such as within the 12 NM, 25 NM and EEZ) depending on the type of sectors and their extent of pressure on the marine environment.*

coordinator. The source of this geo-located data came from national authorities and from private companies[2] with an expertise on collating and analysing official geospatial data.

- **Quantitative and qualitative (not geo-localised) data** that provided important information to characterise and assess the current and future trends of economic sectors and their pressure on the marine environment. This data was integrated in the reports in the form of figures and tables.

In addition to the analysis of the potential interactions between sectors, risk assessment at the national (and sometimes regional) scale was illustrated by means of thematic maps to help demonstrate the spatial extent and nature of recognised risks. When no map could be developed, those risks of growing conflicts were qualitatively described.

The analysis adopted for this document is primarily based on the MSFD's 11 descriptors as presented by the Malta's initial assessments of the state of ecosystems on a number of characteristics by the Malta Environment and Planning Authority (MEPA, 2012). Thus the importance of an impact analysis leading to GES is provided for each sector through a cross-cutting analysis.

A number of descriptors that are under a high risk of not achieving GES were used as shown in table 1. This table refers to a number of sources for which the list of economic sectors used for the present report is included in table 2.

GES descriptors	Source of risk
Maintenance of marine biodiversity	All sectors
Non-indigenous species	Maritime transport and ports, aquaculture
Commercially exploited species	Commercial fishing, recreational fishing
Marine food webs	All sectors
Nutrient enrichment	Land-based pollution sources
Sea-floor integrity	Land-based pollution sources, coastal development, commercial fishing, oil and gas exploration and extraction, tourism, marine mining
Alteration to hydrographical conditions	Maritime transport and ports
Contaminants	Maritime transport and ports
Contaminants in seafood	Land-based pollution sources
Marine litter	Coastal development, tourism, maritime transport and ports, fishing
Introduction of energy, including underwater noise	Maritime transport and ports, oil and gas exploration and extraction, marine mining, commercial fishing.
Habitats Directive - *Habitats*	All sectors
Habitats Directive - *Species*	All sectors

Table 1. Descriptors that determine the achievement of GES.

[2] *Including NAVAMA GmbH and DrillingInfo (http://info.drillinginfo.com/).*

Economic sectors	
Commercial fisheries.	Land-based activities.
Marine aquaculture.	Infrastructure.
Recreational fisheries.	Extraction of non-living resources.
Oil and gas exploration and extraction.	Safety and Security.
Tourism.	Waste disposal.
Maritime transport.	

Table 2. List of economic sectors analysed in this document.

The analysis of the sectoral trends was based on the current state of the marine environment as well as on existing and emerging policies. These policies included among others, the (1) implementation of the Marine Strategy Framework Directive (MSFD) to attain GES by 2020, (2) regional attainment of 10% coverage of MPAs by 2020 in line with the CBD, (3) progress in the implementation of a Maritime Spatial Planning framework and (4) potential impacts of other existing and future policies.

Relevant legislation, agreements and national strategies that may influence the development of the economic sectors and their pressures were identified and taken into account as much as possible in the compilation of this report. In general, from the data and information collected for this study a qualitative extrapolation of future trends was done and, due to the almost complete lack of any official sectoral future projections, were mainly based on current sectoral performance and their related pressures on the marine environment. In other words, a Business as Usual approach was assumed in the analysis, but at the same time keeping in mind the introduction of future policies and legislation that could potentially skew this approach. A major issue here was not to rely too much on the assumption that the future expansion of an economic sector implied a proportional increase in its pressure. For this task, Nature Trust (Malta) has set up a National Advisory Committee composed of representatives from stakeholders and local authorities to engage in such a discussion. The opinion of the National Advisory Committee members proved valuable in strengthening the final assessment. At the same time, uncertainties are clearly mentioned in this report whenever the case arises.

In addition to future projections, the analysis also entailed a cross-cutting sectoral analysis that was divided into two parts:

- Analysis of the increased conflicts of the use of marine resources, including an analysis of the relative importance of sectors and looking especially on the type of conflicts that might grow by 2020.

- The trends related to the conservation and management of local MPAs in relation to the expected trends of the economic sectors (listed in table 2) so as to identify potential issues for the attainment of the 10% CBD target of MPA coverage by 2020.

These economic sectors were assessed on the basis of their impacts on the marine environment through a series of pressures that interact with each other, including pollution, physical damage, resource depletion, etc. In this context, different types of conflicting interests were identified, including:

- Conflicts regarding the use of space between sectors;
- Negative effects that some activities may have on others, in particular for those which are highly dependent on healthy ecosystem services (such as fishing and tourism), and
- Competing interests resulting from the exploitation of the same marine resources.

A visual representation of the current and future impacts affecting GES was developed for the MedTrends project (based on studies conducted by other groups[3]). This table has the scope of underlining key future trends conflicts at the national level. In addition to this table, a number of thematic maps have been produced highlighting similar results using geographical information system. Thematic maps showing the spatial overlap of competing sectors have been included to show hotspots for space and resource competition. The assessment of these maps focussed on both the consequences of such competition and on a number of recommendations made by Nature Trust (Malta) aimed at conserving the marine environment and achieving GES.

Moreover, a pictorial approach was used to present the relative growing conflicting issues between sectors, based on the model developed by WWF (Sweden) in its report "True Blue" that show the relative size of the marine sectors and their expected growth (WWF, 2014).

Analysis of the cumulative impacts was only carried out from a superficial, qualitative perspective due to lack of information. In this case, the analysis performed at the local and regional level was also presented in order to engage national authorities to consider such impacts at the local level.

[3] *The Vectors Project : http://www.marine-vectors.eu; - Scotland's National Marine Plan: http://www.gov.scot/Publications/2011/03/21114728/12*

VI. LOCAL STATE OF THE MARINE ENVIRONMENT

This chapter introduces this analysis by referring to the state of marine environment at the local scale based on available data related to the main descriptors as defined by the MSFD. In this context, the initial assessment of the state of ecosystems produced by the Malta Environment and Planning Authority (MEPA) in 2011 forms the basis of this analysis.

i) Background

In the Maltese Islands, nature conservation is largely managed through the designation of protected areas which are then governed through specific policies. The MEPA's Environmental Report Indicators 2010 – 2011 (MEPA, 2012) depict that currently, there are 3 nature reserves protecting small islets, 26 bird sanctuaries and 73 areas of ecological and / or sites of scientific importance. It is worth noting that some of these designated areas overlap. There are also two sites designated as Wetlands of International Importance under the UN Ramsar Convention (l-Għadira and is-Simar), and four sites designated as Specially Protected Areas (SPAs) under the Barcelona Convention. In 2007, all beaches and swimming zones in close proximity to urban areas and roads (including 11 specifically named beaches), were given legal protection against hunting.

There are currently 39 Special Areas of Conservation of International Importance (SACs) under the EU Habitats Directive (including marine sites), 32 of which are of international importance and 7 are of national importance. A total of 13 Special Protection Areas have been designated under the EU Birds Directive (these sites also form part of the Natura 2000 network). In some cases, the area of SAC and SPA sites overlap. In 2011 the number of marine protected areas was increased from 2 to 5 sites and from 10.8 km^2 to 190.8 km^2 (MEPA, 2012). The marine SACs now protect a marine area covering approximately 80% of Posidonea meadows (which is an Annex I priority habitat under the Habitats Directive) in Maltese waters. Although 5 species of sea grass have been recorded in the past, it is believed that two species are now extinct. Apart from *Posidonea oceanica*, *Cymodocea nodosa* is another important sea-grass within Maltese waters providing an important habitat for a variety of marine species.

From a recent baseline study (MEPA, 2012) it was concluded that, overall the local *Posidonea oceanica* meadows are in a good state of health (fig. 2). However, other species residing in this type of local habitat include the Noble Pen Shell *Pinna nobilis* which is listed in Annex IV of the Habitats Directive. The data collected thus far indicate that this species is currently on the decline.

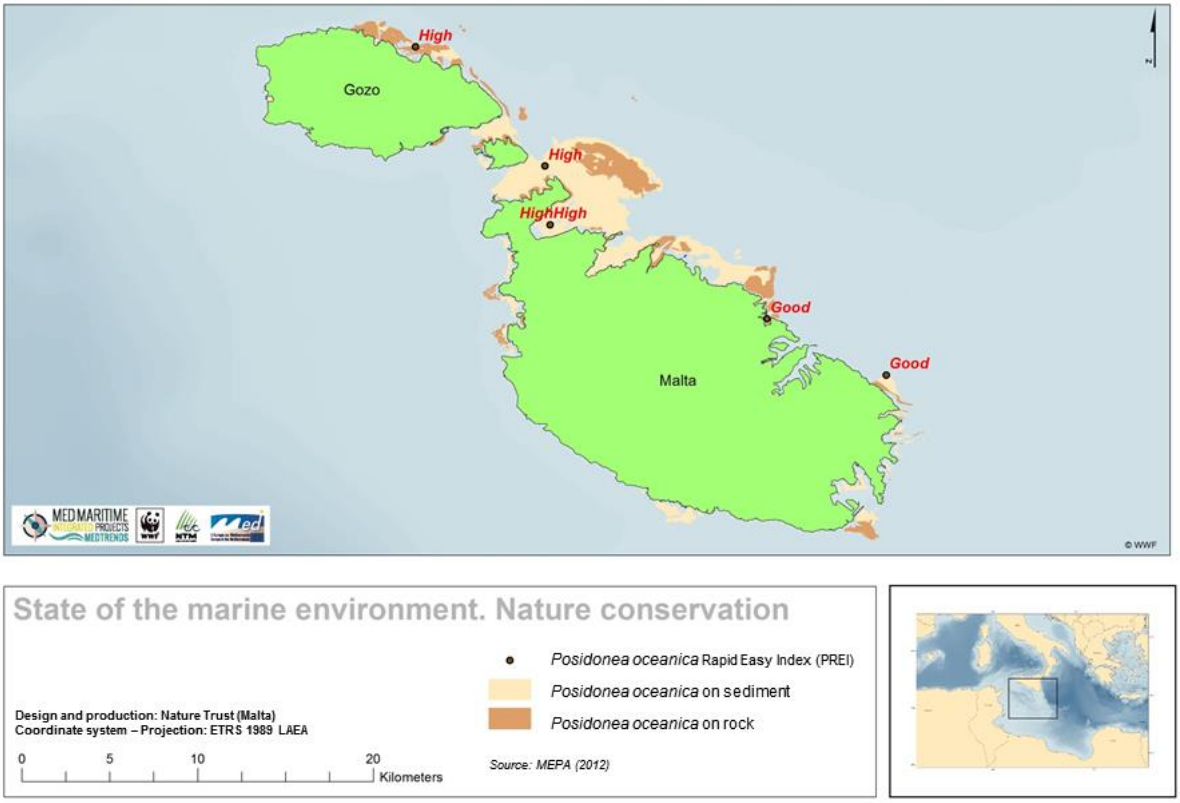

Figure 2. Status of *Posidonea oceanica* along the eastern coast of the Maltese islands.

Other habitats of conservation importance due to the high biodiversity they support include maerl beds and rhodolith assemblages. An extensive maerl ground covering about 20 km^2 is located off the north-eastern coast of Malta and Gozo at a depth of 30-100 m, where to date over 400 species of macrofauna and macroflora associated with this maerl bed have been recorded. Other areas supporting this habitat have been located in Maltese waters including in the area off the south-eastern coast of Malta up to a maximum depth of 85m; off the north-eastern coast of Malta at depths of 45-50 m, area characterised by maerl beds (supporting gorgonian *Eunicella singularis* in places) and associations with rhodoliths; as well as off the south-western coast of Malta between Malta and Filfla. The main rhodolith-forming algae in Maltese maerl beds are *Lithothamnion coralloides*, *Lithothamnion minervae*, and *Phymatolithon calcareum*.

Benthic habitats that can be described in Maltese waters in line with the MSFD Initial Assessment reporting include littoral rock and biogenic reefs, littoral sediment, shallow sublittoral rock and biogenic reefs, shallow sub littoral sediment (including *Posidonea oceanica* meadows), shelf sublittoral rock and biogenic reefs, shelf sublittoral sediment, upper bathyal rock and biogenic reefs, upper bathyal sediment. Table 3 describes their current conservation status, derived largely through expert judgement.

Habitat type	Biological conservation status	Comments
Littoral rock and biogenic reef	Good	*The current range of Cystoseira communities is considered to occupy the whole range of littoral rock (excluding harbours) along the north-eastern coast, while the extent of coastline occupied by Cystoseira communities constitutes approximately 66% of the rocky coastline excluding sandy or shingle beaches. The status of this community is considered to be good overall in terms of habitat distribution and extent.*

Habitat type	Biological conservation status	Comments
Littoral sediment	Poor to Good	*This predominant habitat type along the Maltese coastline is represented by sandy and shingle beaches. The overall status in terms of habitat condition is deemed to be moderate.*
Shallow sublittoral and biogenic reef	Good	*The status of shallow sublittoral rock based on the extrapolated data on photophilic algae and expert judgment is considered to be good.*
Shallow sublittoral sediment	Good	*The data available does not allow distinction amongst communities residing in this habitat type. This suggests that assessment of status reflects that of a composite of benthic communities associated with different grades of sediment that ranges from mud to gravel. Overall, this habitat type is deemed to be of good status.*
***P.oceanica* meadows**	Good to High	*Data collection and analysis revealed high ecological status for three sites within the north-eastern assessment areas and of good ecological status for the remaining two sites (located off Sliema coast and between Valletta and Marsaxlokk).*
Shelf sublittoral rock and biogenic reef	Good (but uncertain)	*The data available is too limited to allow assessment of status. It is assumed that this type of habitat is probably not subject to significant human pressures, and hence is expected to be in good status.*
Shelf sublittoral sediment	Good	*This assessment is based largely on the major maerl bed situated off the north-eastern coast of the Maltese Islands. This habitat is deemed to be in good status.*
Upper bathyal rock and biogenic reefs	Uncertain	*Due to current data limitations, assessment of the status of this habitat type is still pending.*
Upper bathyal sediment	Uncertain	*Due to current data limitations, assessment of the status of this habitat type is still pending.*

Table 3. Conservation status for habitat types (MEPA, 2011).

In the marine environment, Habitats Directive Annex II species as well as Annex I Birds Directive species are currently being studied in the Maltese Islands. There are a number of species of conservation interest under the Habitats and Birds Directives of note that have been studied or for which studies are on-going, with an aim to developing species conservation action plans and/or to develop conservation measures for inclusion in area management plans. These include *Caretta caretta, Tursiops truncatus, Calonectris diomedea, Puffinus yelkouan* (Malta supports approximately 10% of the global population) and *Hydrobates pelagicus* (Malta supports the largest breeding population in the Mediterranean).

Long-term monitoring data has been collected for the three species of breeding sea-birds and is related to breeding pairs as well as ecology and identification of sites of importance. The cliffs have been found to support nesting areas whereas the marine environment close to the land-based nesting sites provides important resting and rafting areas. Trend data indicate that all three species are on the decline although population numbers remain viable (MEPA, 2011).

ii) Pressures on MPAs and species of conservation interest

Pressures on marine habitats and their species include habitat conversion, introduction of invasive species, impacts of climate change and pollution (Fourth National Report to the Convention on Biodiversity, 2010). The distribution of designated marine protected areas is shown in fig. 3. However, in the absence of management plans including their implementation, the ability for these sites to effectively ensure that conservation objectives are identified and achieved and that the sites, therefore, are managed sustainably is considered to be significantly reduced.

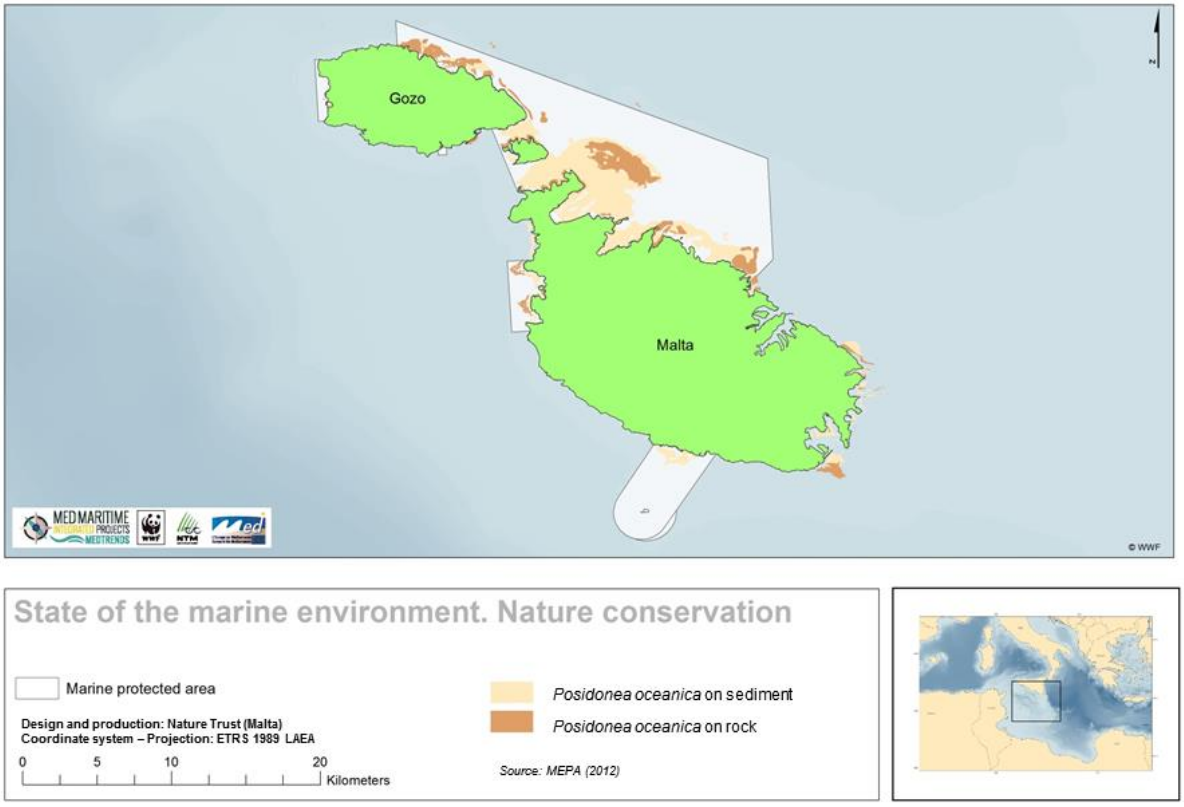

Figure 3. Benthic habitats and their occurrence in marine protected areas.

Impacts of economic sectors on the marine habitat include the following:

- direct loss and abrasion as a result of submarine pipelines and cables;
- moorings of recreational and bunkering vessels and trawling;
- use of limestone slabs in fish aggregating devices for certain traditional fisheries such as *lampuki*;
- vessel scuttling for the diving industry;
- dredging (which can also result in changes to hydrological processes);
- nutrient enrichment from discharge points (fig. 4) and aquaculture facilities;
- siltation (from ports);
- suspended sediments, contamination with hazardous substances and turbidity as a result of activities such as dredging, aquaculture and discharges to the marine environment (figs. 5 & 6);
- dumping of inert waste at the official spoil ground located 2.5 NM north-east of Valletta; changes in hydrological processes as a result of construction on the coast;
- changes in temperature (e.g. as a result of discharge of cooling water from the power station);
- changes in salinity (discharges from wastewater treatment plants), and

- threats from non-indigenous species entering into Maltese waters largely through shipping and other vectors.

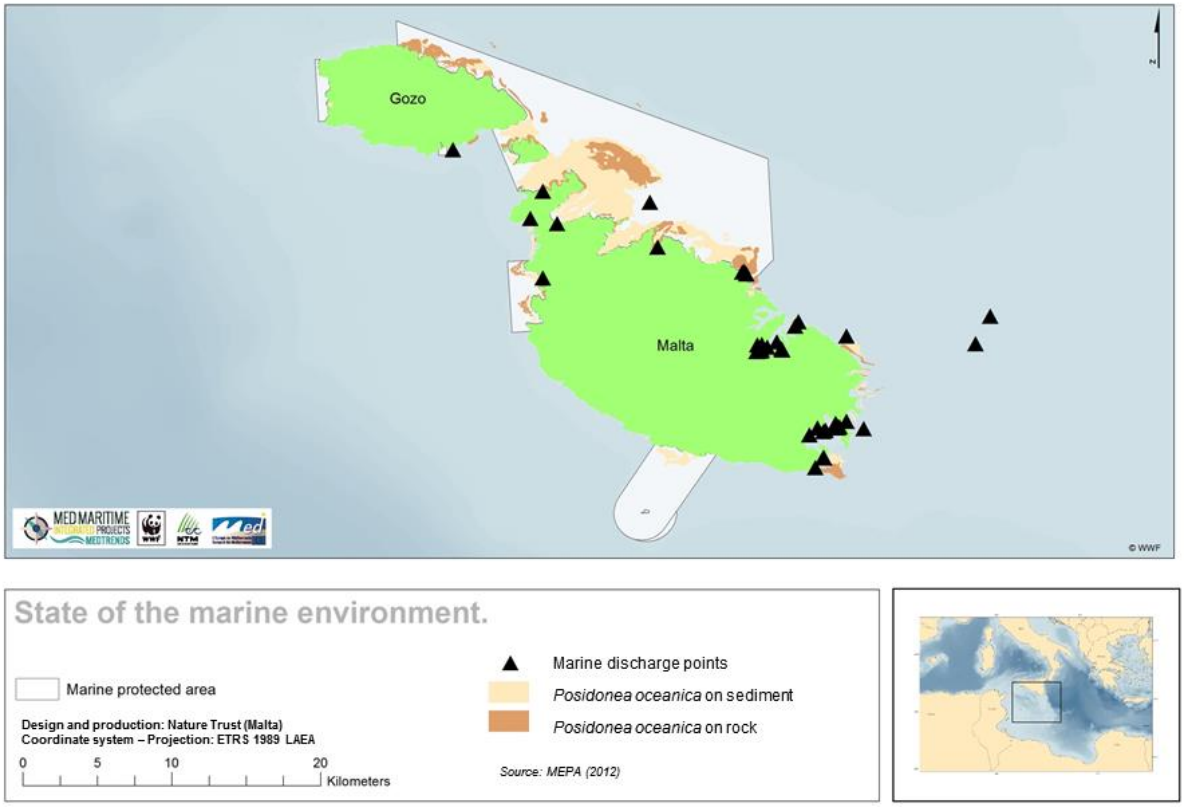

Figure 4. Marine discharge points in relation to benthic habitats of conservation importance.

Breeding seabirds are vulnerable to pressures including development on the coast. The breeding populations on the southwest coast have declined due to nest abandonment as a result of increased development and associated light pollution in the area. *Calonectris diomedea* is particularly vulnerable to cliff fishing as well as (offshore) long-line fishing. Other pressures include from night boat activities, poaching, ferreting, and taking of live specimens. The erosion of Filfla, which supports the largest breeding population of *Hydrabates pelagicus*, is resulting in habitat loss for this species. Predation by *Larus michahellis* on Filfla is also a threat to the conservation status of *Hydrabates pelagicus* breeding population on the islet.

Cetaceans and turtles are vulnerable to a number of pressures. These include underwater noise due to coastal and port construction as well as by seismic surveys, bycatch, ingestion of hooks, lines and plastics, ghost fishing, collisions, pollution, and harassment by leisure boats.

Figure 5. Detected levels of nitrate along the Maltese coastline, including within marine protected areas.

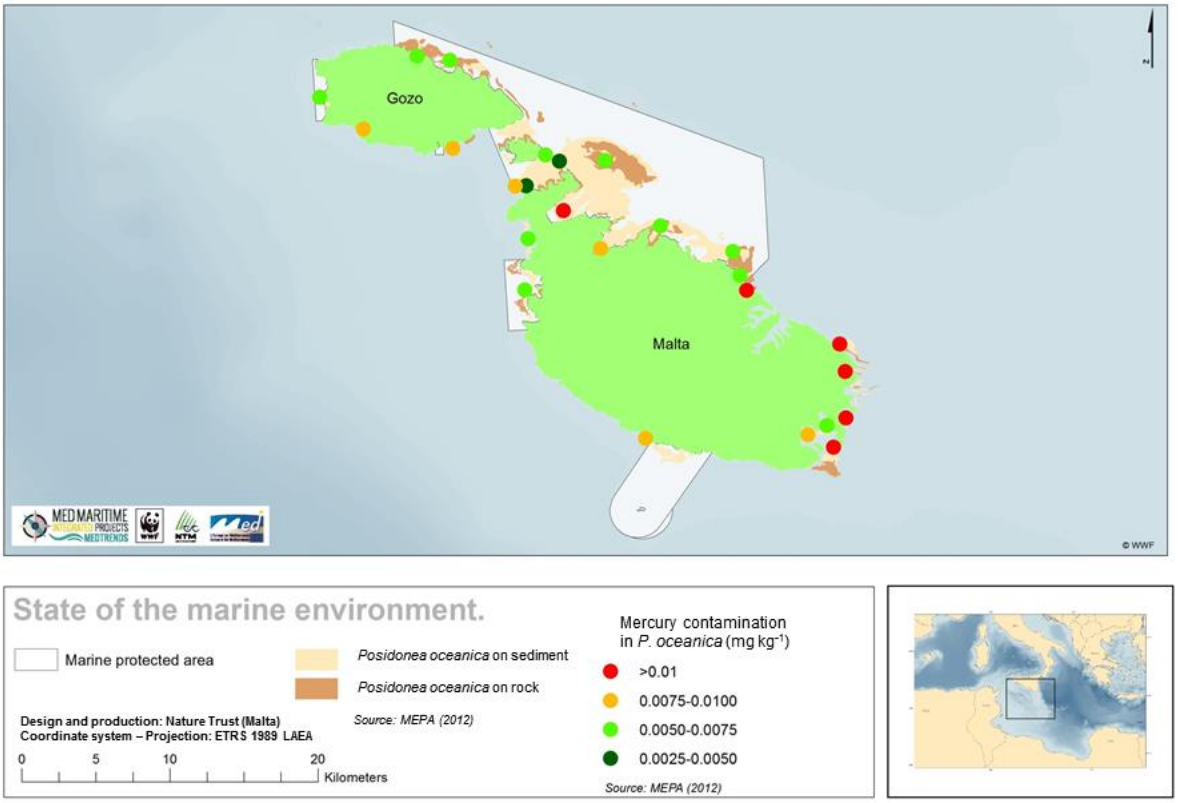

Figure 6. Detected levels of mercury in *P. oceanica* (mg kg^{-1} wet weight) along the Maltese coastline, including within marine protected areas.

iii) Future trends

EU member states are expected not only to designate marine protected areas but also to be responsible for their management (MEPA, 2014). The maintenance of and/or the restoration to a favourable conservation status are the main objectives of these sites. Malta's National Biodiversity Strategy and Action Plan 2012-2020 (Ministry for Tourism, Culture and the Environment, 2012) identified a specific measure whereby conservation objectives and management plans will be drawn up for Natura 2000 sites that are supported by sectoral policies and planning instruments to ensure an integrated ecosystem approach. The importance to integrate economic sectors into site conservation practices is hereby emphasized, especially when there are particular cultural and social ties to these sites. This guarantees the coexistence of both man and nature (European Commission, 2014). It also seeks to ensure that all management plans are climate proofed and in the marine environment, the goal is to ensure that GES of the marine environment is achieved.

Malta's National Environmental Policy 2012 (Ministry for Tourism, the Environment and Agriculture, 2012) seeks to manage coastal and marine areas in an environmentally-sustainable manner through proper maritime spatial planning and integrated coastal zone management. It also specifically identifies the need for further designation of protected sites in the marine environment, including designation of marine SPAs that are important for seabirds and that management requirements are in place by 2017.

As long as suitable management measures and species action plans are drawn up and implemented, the conservation status for habitats and species can be improved within these marine Natura 2000 sites.

One should not forget that the economic potential of marine protected areas is increasingly being appreciated, based on the demand coming from recreational- and tourism-based activities to access and exploit allocated resources at these sites. It is thus becoming increasingly important and urgent to 'cost' the use of these resources and introduce financial mechanisms intended to assist in the conservation or improvement of such natural ecosystems. These mechanisms must be operated in tandem with proven management practices aimed at monitoring and evaluating the natural carrying capacity of these sites.

This issue is particularly relevant since there is now a strategic indication to increase the number of marine protected areas in Maltese waters. *LIFE BaĦAR for N2K* (LIFE12 NAT/MT/000845)[4] for example, is an on-going project that aims at extending and identifying new marine sites of community importance for inclusion within the existing Natura 2000 network. Based on this information, the expected trend in marine protected areas in the Maltese Islands seems to be both in terms of improved management as well as spatial increase.

iv) Interactions with other sectors

Cross-sectoral interactions on the marine environment originate from the following sectors:

1. Maritime transport
2. Energy production
3. Land-based activities
4. Coastal development
5. Maritime transport and ports
6. Tourism and recreation
7. Aquaculture and fisheries

It is important to note that the designation of marine Natura 2000 sites does not necessarily exclude other uses within these areas. Fundamentally, the aim is to ensure that the habitats and species of conservation interest as indicated in relation to the Habitats and Birds Directives maintain or improve their conservation status. To this end, therefore, it is necessary to ensure that other activities will not negatively affect the integrity of these sites.

The conservation and management of protected sites must necessarily consider an integrated planning approach that is defined by appropriate measures that ensure the integrity of the site, and where possible the conservation status (of both habitats and species of interest) is improved. Development of management plans must thus include a strong element of stakeholder involvement and consultation, both at the strategic level (to ensure that sectoral plans take into consideration the relevant conservation objectives and management measures), as well as to ensure that anthropogenic activities would not negatively affect the integrity of the protected areas.

Until management plans are developed and implemented, legislation transposing the Habitats Directive will also be fundamental in ensuring protection of these sites.

[4] *http://lifebahar.org.mt/*

VII. ANALYSIS OF ECONOMIC SECTORS AND THEIR IMPACTS

A. Commercial Fisheries

Maltese fisheries are considered to be artisanal and multi-gear, meaning that the main fishing gear is changed according to the season. The social and cultural importance of the Maltese fishing industry far outweighs its modest economic contribution, which is equivalent to about 0.1% of the national GDP (FAO, 2005).

1. Background and current situation

National fisheries activities are aligned along a number of targeted regulations, such as the control of fishing effort, capacity and size[5] of fishing vessels, as well as fishing areas dedicated to certain type of fishing. Examples include the provisions related to the 25 NM of the Fisheries Management Zone (FMZ) around Malta as outlined in Article 26 of the Council Regulation 1967/2006.

i) General Information

By the end of 2013, the national fishing fleet consisted of 2,952 fishing vessels (National Statistics Office, 2013). This shows a slight decrease of 0.6% from the 2,969 fishing vessels listed in the 2012 report.

Professional fishing vessels operating on a full-time basis constitute 13.6% while those operating on part-time basis accounted for 21.5% of the total. The remaining 64.9% registered fishing vessels are non-commercial (or recreational) vessels. As from January 2013, these proportions changed to 399 of full-time vessels and 635 part-time vessels. Out of these vessels 959 (or 92.7%) vessels are below 12 m; the remaining 75 (or 7.3%) vessels are over 12m. This means that large majority of Malta's fishing fleet is below the 12 m size.

In 2006, a national census was carried out in Malta. It showed that the sector employed a total of 1,466 fisher folk, from which 364 were gainfully occupied while 1,102 were registered on a part-time basis. The age-group 45-54 constituted the largest category in terms of number of fisher folk (National Statistics Office, 2006). This is the latest information available with regards to employment issues within this sector.

Current management plans in line with Article 19 of Council regulation 1967/2006 exist for (1) lampara purse[6] seine fishery, (2) bottom otter trawler fishery and (3) dolphinfish Fish Aggregating Device (FAD) fishery.

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[5] *The size of the fishing fleet category allowed to fish in the 25 NM FMZ consists of vessels smaller than 12m. Larger vessels are only allowed to fish in the FMZ by way of derogation, based on a limitation on the number of trawlers and on those vessels fishing for dolphinfish, and those using small pelagic purse seines and longlines.*

[6] *Lampara fishery uses strong lights to attract and catch fish by purse seining. This type of fishing mainly takes place in an area located 11.5km to the Southeast of the Maltese Islands. All lampara vessels are fitted with a tracking system and are obliged to complete a catch logbook in order to better monitor their fishing activity. The fishing capacity and dimension of their gear is not allowed to increase.*

ii) Fishing effort

The main fisheries in Maltese waters, which are mainly operated on a seasonal basis in line with the migratory and biological behaviour of targeted species, are those for Bluefin tuna, dolphinfish, swordfish, demersal and small pelagics.

The annual volume (tonnes) of fish landings at the official market has decreased during the period 2009-2013 (National Statistics Office, 2013). Data shows a total amount of 1,234 tonnes that was registered in 2009, which decreased to 998 tonnes in 2013.

The largest fish landing is attributed to Swordfish (*Xiphias gladius*) catches, which in 2013 amounted to 338 tonnes. The second largest tonnage is dolphinfish (*Coryphaena hippurus*) by 275 tonnes, followed by bluefin tuna (*Thunnus thynnus thynnus*) with 80 tonnes.

iii) Wholesale value

A total of 6,089 million Euros was estimated for the wholesale value of fishing effort in 2013, reflecting the value of the total catch as registered at the official market (National Statistics Office, 2013). Species-wise, by far the highest value is attributed to swordfish catches, with around 2.3 million Euros followed by dolphinfish (*Coryphaena hippurus;* 1.1 million Euros; National Statistics Office, 2013).

iv) Trawling fishing

In 2011, a total of 23 trawlers were licensed to operate on a full-time basis (Department of Fisheries and Aquaculture, 2013). By 2013, the trawler fleet licensed to fish within 25 NM FMZ consisted of 12 trawlers with an overall tonnage of 1,056 GT and 3700 kW engine power. On average, these vessels are 22 m long with average tonnage of 88 GT and 333 kW engine power. The number of trawlers constitutes less than 2% of the total number of registered commercial fishing vessels (Department of Fisheries and Aquaculture, 2013).

As at the end of the 2nd quarter of 2015, the number of trawlers authorised to fish in the FMZ was 7 with a total of 731.88 GT and engine power of 2138.82 kW. The average length is 22 m while the GT and main engine power 105 and 306 kW respectively (Department of Fisheries and Aquaculture, personal communication, 2015).

In 2013, the National Statistics Office published a total of 6.1 million Euros wholesale value of fish landings. The following are the annual wholesale value per species in decreasing order: Swordfish (37.9%), Bluefin tuna (11.0%), Dolphinfish (18.1%), Shrimp (5.3%), Stone bass (1.5%), Dog-fish (1.1%) and Bogue (0.71%). The Office included an additional category named ‘other species’ which was valued at 24.4%.

In terms of fishing effort, an increase in the overall landings from trawling fishing was registered between 2006-2011. However, landing data shows inter-annual fluctuations (National Statistics Office, 2011).

Pressure on the marine environment by trawling fishing

Maltese bottom trawling is operational all year round, and takes place over designated trawling grounds at various depths at particular times of year depending on the biological characteristics of the targeted species. This is in conformity with the obligations of Malta under Article 19 of the Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea. Table 4 - A1 below shows the various trawling activities, the targeted species and vulnerable species.

Fish landing figures collected during the period 2005-2012 show that the biomass of the majority of selected demersal teleost fish within two specific depths show no significant temporal trends. The only species that shows a statistically steady decline is *Gadiculus argenteus* (with a vulnerability deemed to be of low concern) that is fished at 200-800 m depth (MEPA, 2011).

	Target species common name	Target species scientific name	Vulnerability
Deep sea trawling during the day and night; about 13 km off NW Malta	red shrimps	*Aristaeomorpha Foliacea* *Aristeus antennatus*	No data No data
Trawling in depths of around 200 m during the day and close to the land	White shrimps Hake Red mullet Octopus Squid Cuttlefish Bye-catches: dogfish, spotted dogfish, skate and rays Bogue Scad	*Parapenaeus longirostris* *Merluccius merluccius* *Mullus barbatus* *Octopus vulgaris* *Illex coindetti* *Sepia officinalis* *Raja spp.* *Boops boops* *Trachurus trachurus*	No data Vulnerable Least concern No data No data No data Near threatened or endangered (dep. on species) Least concern Least concern
Trawling in depths between 50-150 m during the night; mainly 11.5 km SE of the Maltese islands.	Red mullet Comber Pandora Squid Cuttlefish weaver	*Mullus barbatus* *Serranus cabrilla* *Pagellus spp.* *Illex coindetti* *Sepia spp.* *Trachinus spp.*	Least concern Least concern Least concern No data No data Least concern

Table 4 - A1. Various trawling activities, the targeted species and vulnerability according to the IUCN red data list (IUCN Red List of Threatened Species™ – Regional Assessment, 2011).

In addition, for the period 2009-2012, the species *Helicolenus dactylopterus* (low concern vulnerability) showed a decline in biomass across all length classes. *Merluccius merluccius* (vulnerable) showed a decline in biomass only within the deeper zone[7]. *Spicara flexuosa* (*Spicara spp*. have a low concern status) also showed a decline in biomass, which was

[7] *Interestingly, records over the same period point to an increased biomass when this species was caught in shallower zones.*

reflected in terms of a lower abundance for length distribution during this period (MEPA, 2011).

Results from the annual Mediterranean International Bottom Trawl Survey (MEDITS) during the period 2007-2011 (as reported by MEPA, 2011), show that the biomass index of the vulnerable fish species *Merlucciuis merluccius* showed a considerable decline, while *Mullus barbatus, Mullus surmuletus* and *Parapenaeus longirostris* remained relatively stable, while that of *Arsitaeomorpha folioacea* increased[8].

Studies related to the understanding of differential pressures within and outside of the FMZ were conducted in 2008 by MEDITS. On the basis of the four main assemblages associated with the varying depths strata[9], results possibly highlight differences in fishing pressures on species groups sensitive to trawling, including the common elasmobranchs such as *Raja spp.* (which according to IUCN is considered to be near threatened) within the FMZ and practically absent outside the FMZ. However, the species *R. clavata* is not considered to be threatened within the FMZ (Department of Fisheries and Aquaculture, personal communication, 2015). Data analysis also showed that elasmobranchs were larger in size inside the FMZ, which is a controlled zone.

v) Lampara fishery

According to information published in 2013 by the Department of Fisheries and Aquaculture, the lampara fleet consisted of 18 boats with a total tonnage of 520 GT and 3,236 kW of engine power. This represented less than 2% of the number of vessels registered in the Commercial fishing register. Within this fleet, 17 vessels are around 16 m in length and have an average tonnage of 25 GT and 151 kW engine power.

In 2011, lampara production accounted for 176 tonnes (191,000 Euros in value terms) which represented 9% of total landings. Available landings data for the Maltese lampara fishery contains records of at least 42 different taxa. In terms of species landings, the Chub Mackerel (Scomber japonicas) represented 58% of the total lampara landings, while 28% consisted of the Round Sardinella (*Sardinella aurita*). The rise in total annual landings registered in 2012 is due to increased landings of Chub Mackerel and Round Sardinella.

In 2010, GFCM published Malta's relative contributions to the landings of the main species caught with the lampara in the central Mediterranean. Malta's contribution towards catches of these species are below 10% for the majority of the species except for *Sardinella aurita*[10]. This data shows relatively low pressure on the fish stocks as indicated below and efforts to reduce fishing effort has to be done on a bilateral basis.

The lampara fishery targets fish stocks that shared with Sicily due to the population distribution over the Malta Bank. The main target species are listed in table 5 - A2, together with their vulnerability with respect to the IUCN red data list (2011).

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[8] *This information is based on bottom trawl data captured from 45 stations within MEDITS sub-area 15. This limited sampling may reflect a partial understanding of the current state of fishing pressures as well as to fish population characteristics, including their distribution. Additional limitations include (1) coverage of sampling points with respect to areas occupied by the different life stages of the species in question, and (2) the highly restricted time of sampling (summer).*

[9] *Demersal teleosts: 50m-200m and 200-800m; Elasmobranchs: 50m-200m and 200-800m.*

[10] *The slightly higher percentage is due to grouping of clupeoids under one name as it appears in Maltese landings statistics.*

Common name	Species	Mediterranean IUCN Red List
Mackerel and Mackerel-like fish	*Scomber japonicus, Trachurus spp., Sarda sarda*	Least concern
Sardinella	*Sardinella aurita*	Least concern
Anchovy	*Engraulis encrasicolus*	Least concern
Bogue	*Boops boops*	Least concern
Ardine	*Sardina pilchardus*	Least concern
Barracuda	*Sphyraena sphyraena*	Least concern

Table 5 - A2. Vulnerability of target species captured by the lampara fishery according to the IUCN red data list (IUCN Red List of Threatened Species™ – Regional Assessment, 2011).

vi) Lampuki fish aggregating fishery

This fishing activity targets dolphinfish (*Coryphaena hippurus)* by using fish aggregating devices. This activity opens in mid-August and extends up till the end of December or even into January in case of bad weather conditions during the fishing activity. Fishing licensing for a maximum of 130 vessels are given based on a set of FAD trajectory per vessel on an annual basis in accordance with Council Regulation 1967/2006 and Article 12 of Regulation (EU) No 1343/2011 of the European Parliament and of the Council. Figure 7- A1 shows the annual volume of dolphinfish landings at the official market.

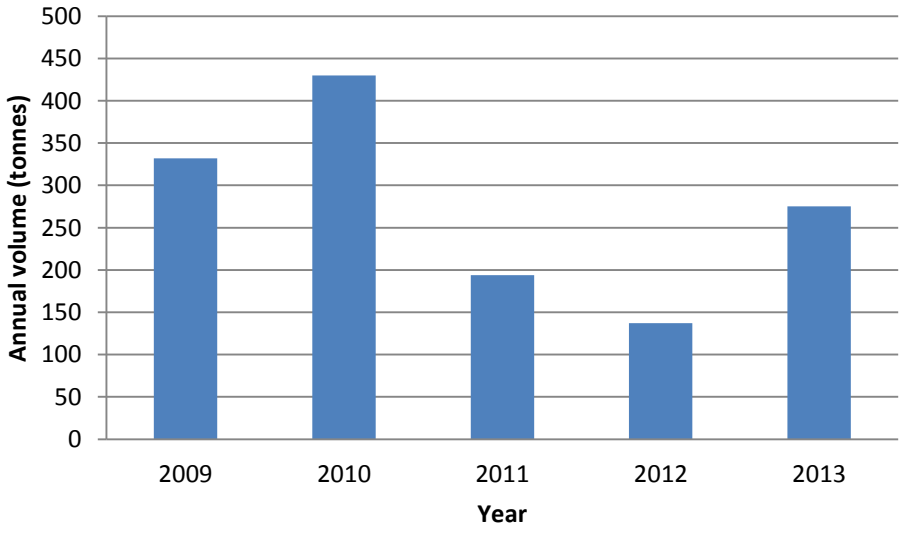

Figure 7 - A1. Annual volume (tonnes) of dolphin fish landings at the official market (National Statistics Office, 2013).

vii) Longlining fishery

This type of fishing practice employs longlines, consisting of connected lines set at the bottom or drifting, each bearing a large number of baited hooks. The main target species is bluefin tuna (*Thunnus thynnus thynnus*), swordfish (*Xiphias gladius* – which according to IUCN is a

near threatened species) and some bottom dwelling species. According to ICCAT, the stock status of T*. thynnus* is overfished (ICCAT, 2012).

The Maltese tuna season has a short duration (2 to 3 months) and may be closed once the quota assigned to the fleet is reached. It is important to note that other EU Member States may extend their fishing season for longer periods for their vessels below 24 m.

Swordfish fishery is carried throughout the year except during October, November and March (closed season). Figure 8 - A2 below show the annual volume and annual wholesale value of swordfish landings at the official market as reported by the National Statistics Office (2012).

During the winter months, bottom longlining targeting high quality fish such as the common sea bream (*Pagrus pagrus* – data deficient in terms of vulnerability) and groupers (*Epinephelus spp.* – considered to be among the endangered list of species) is the main activity.

2. Pressures and impacts

This sector is a source of pressures and impacts on the marine environment, which include disruption of the seabed by some fishing activities such as trawling and the depletion of both target species population and other species which are incidentally caught by fisheries (by-catch).

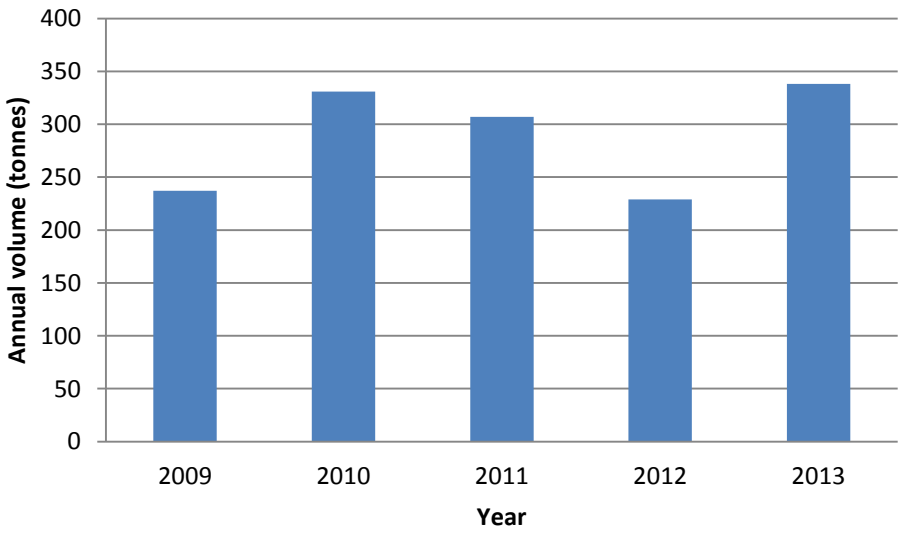

Figure 8 - A2. Annual volume (tonnes) of swordfish landings at the official market (National Statistics Office, 2013).

Figures 9 - A3 and 10 - A4 show the general presence of fishing vessels within the Maltese fisheries management zone and further offshore. Automatic Identification System (AIS) tracking data[11] captured during 2014 revealed slow moving trawlers at a speed of 1 to 5 knots

[11] *The data made available by NAVAMA GmbH was categorised according to ship type. However, the gear type source as well as AIS transmissions may have errors (typo in vessels name or call sign, unknown or changing character encoding, etc). Due to these errors the exclusion of false results cannot be completely ruled out. However, in general, the AIS signal density provides a good overview of the general situation.*

within designated trawling zones (fig. 9 - A3), where trawl fishers tend to keep to the same familiar zones[12] so as to avoid tearing their nets. Practically the fishing effort in terms of the number of hours and the fishing speed each vessel spent engaged in fishing behaviour during 2014 can be calculated and mapped[13]. AIS density mapping also shows the general occurrence of trawlers *outside* permitted trawling zones[14] and within areas (such as demersal priority area – fig 9 - A3; pelagic priority area – fig. 10 - A4). de Juan & Lleonart (2010) considered these priority areas as ecologically rich habitats that deserve special protection since they are currently being threatened by fishing activities, including bottom trawling, gillnets and demersal and pelagic long-lines. These vulnerable habitats are deemed to require urgent protection through the establishment of a network of Marine Protected Areas coordinated by all countries involved and controlled by strict surveillance.

Discards generated by the bottom otter trawl fishery are primarily made up of commercial species[15] which are either below marketable size or too degraded to be sold (MEPA, 2011). From the total catches registered in 2009, the percentage of discards of such species ranged between 3.1 to 9.6%.

National authorities consider discards of by-catch generated as not significant. However, it needs to be highlighted that such data is only partial with regards to bottom trawling of target demersal species and drifting long lines that target large pelagic fish.

The majority of the non-target by-catch of tuna longline fishery constitutes loggerhead turtles (*Caretta caretta*). The true impact of incidental capture on marine turtles is still unknown although studies are on-going[16]. This non-target by-catch species is released in accordance with legislation. Any landings of marine turtles take place for rehabilitation reasons.

3. Future trends

i) Trawling fishery

National authorities plan to implement a reduction in the fishing effort and capacity that is based on forecasted socio-economic and environmental aspects. Based on a regional stock assessment, the best measure deemed to conserve fish stocks is one that leads to the reduction of the fishing capacity by 20% (which is equivalent to 2 vessels), coupled with a further 30% permanent cessation (Department of Fisheries and Aquaculture, personal communication, 2015).

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[12] *The presence of slow moving trawlers is also seen to extend somewhat outside the designated areas, such as areas 'm' and 'h'.*

[13] *See Globalfishingwatch.org*

[14] *It is worthwhile noting that the presence of slow-moving trawlers outside trawling zone does not represent clear proof that trawling activities are occurring. Fishers may be retrieving their nets at the end of a haul, or cleaning them. The use of VMS data, in addition to AIS data should offer better data concerning fishing efforts.*

[15] *These being Aristaeomorpha foliacea, Parapenaeus longirotris, Nephrops norvegicus, and Merluccius merluccius.*

[16] *The on-going LIFE Migrate Project (LIFE11 NAT/MT/1070) aims at studying the status of the population of the loggerhead turtle in Maltese waters. This project commenced on the 1st October 2012 and will run till April 2016 and is expected to provide further data regarding incidental capture of marine turtles.*

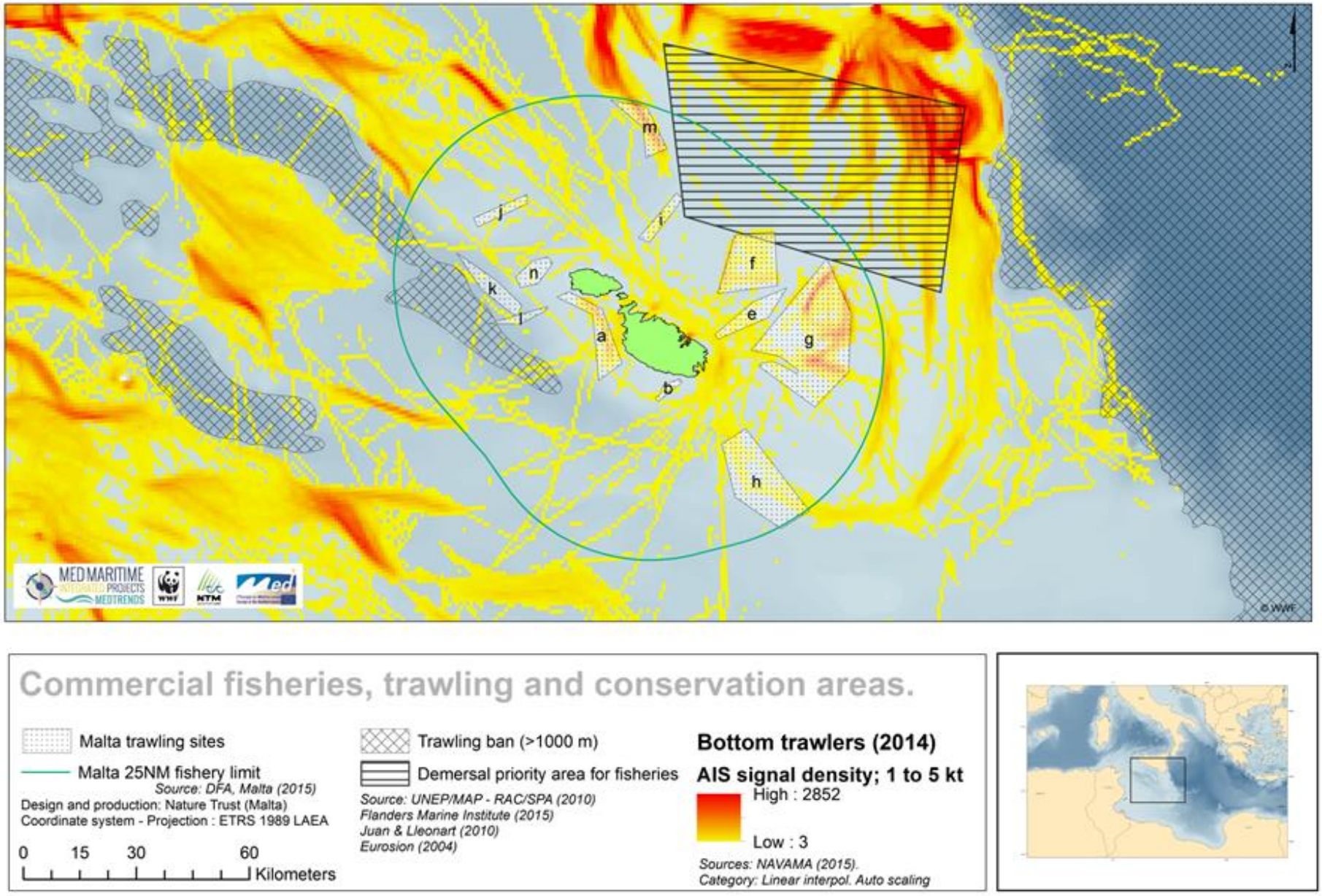

Figure 9 - A3. Density of the occurrence of slow-moving trawlers (ranging from 1 to 5 knots), which apart from signifying fishing effort also includes vessels in transit and other activities. Scarring of the seabed due to trawling leads to the degradation of benthic habitats, depletion of vulnerable target species population and other species caught by fisheries listed down as by-catch.

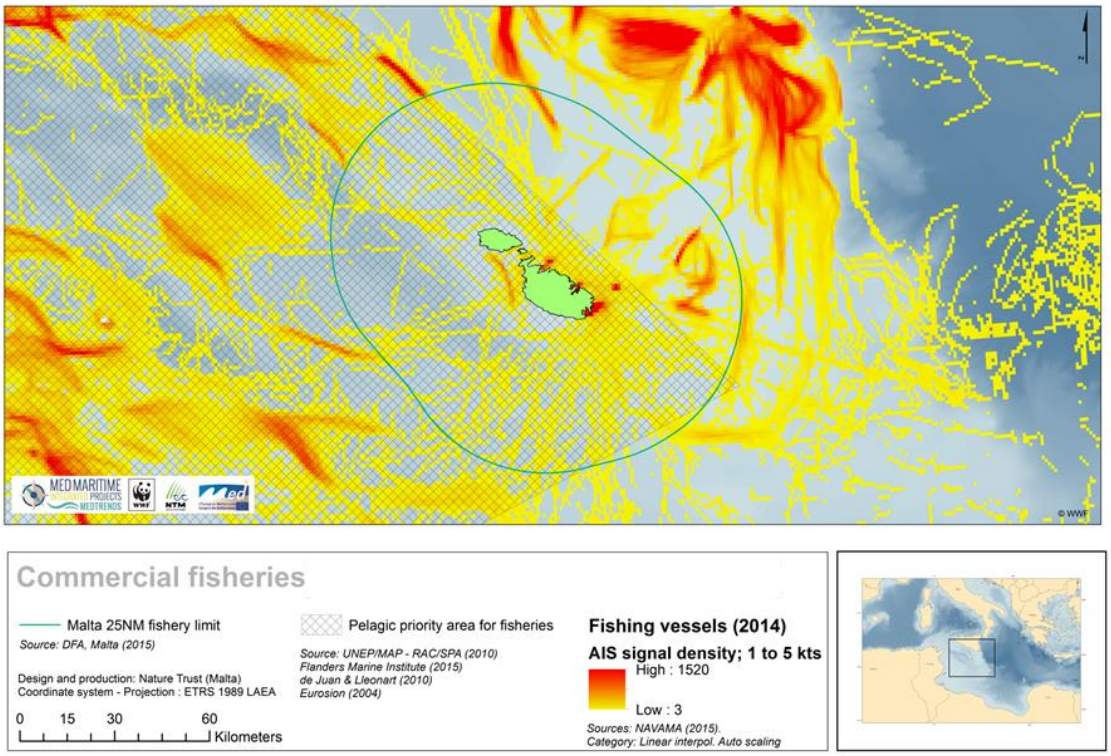

Figure 10 - A4. Density of occurrence of slow moving fishing boats (ranging from 1 to 5 knots) during 2014, determined on the basis of AIS signals (Namava, 2015). Intensive fishing occurs in the high seas.

With regards to the closure of two areas that reside within the 3 NM of the FMZ containing maerl (thus prohibiting trawling activities in line with 1967/2006 Council Regulation and Article 12 of Regulation (EU) No 1343/2011 of the European Parliament and of the Council), Maltese authorities considered other tools to relocate part of the licensed trawling areas. The implementation of this measure had to start 2014 and will continue for the next three years. A review of this management measure is expected to be carried out in 2016.

This measure is deemed by some to be somewhat 'excessive' to the local industry with little impact on the overall mortality of those stocks that are shared with Sicilian fishing activities. Based on Malta's share of total landings from trawlers (operating within and outside Malta's FMZ), as well as on Malta's location, size, the geographical distribution of commercially exploited fish stocks and fishing grounds, and its small scale fishery, effective harvest control rules can only be reached through bilateral management plans.

ii) Lampara fishery

Recent information shows that the level of pelagic fishing is not threatening the conservation of the target fish stock (MEPA, 2011). The catch per unit effort is still going strong which is indicative that the catch is still below the maximum sustainable yield. However, more information is needed in order to ascertain the conservation status of targeted fish stocks.

In accordance with Article 19 of Council regulation 1967/2006, three management plans have been developed for the main fishing activities (i.e. lampara purse seine fishery and bottom otter trawling fishery). Such plans take into account a set of objectives related to socio-

economic and ecological aspects, and must be implemented for those vessels licensed to fish within the 25 NM FMZ.

The proposed management tools consider a number of measures, including freezing and/or reducing the current fishing capacity, restrict the fishing gear size, reducing the landing sizes, designating areas in which fishing is prohibited, designating national fishing seasons, and restricting the total allowable catch by means of quotas.

Based on simulation of a number of future scenarios and trends, the Department of Fisheries and Aquaculture has proposed a management plan based on the freezing of the fishing capacity/effort until the necessary data is made available to sustain future plans and initiatives. The Department is in favour of a *reduction in fishing capacity by 20%.* This is equivalent to the reduction of the lampara fishing fleet by 3 vessels (equivalent to 104,44 kW and 4.90 GT by end of 2015). This measure, which is in line with short-term precautionary principle, will be revised once better and more reliable biological data is obtained.

4. Impacts on GES

Table 6 - A3 below summarizes the main impacts of professional fisheries on GES.

MSFD Descriptor	Impacts of commercial fisheries on GES	Future trends
D1 – Maintenance of biological diversity	Scarring of the seabed leads to the degradation of benthic habitats, depletion of vulnerable target species population and other species caught by fisheries listed down as by-catch. Shifts in benthic community structure resulting from depletion of by-catch species can negatively impact the trophic groups within the communities.	→
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	Data shows a decrease in registered capture between 2009 and 2012. MEDITS bottom trawl survey data (2007-2011) show varied results. The 2017 management plan has been proposed to freeze the fishing capacity/effort until the necessary data is made available to sustain future plans and initiatives.	↘
D4 – Marine food webs	No data.	unknown
D5 – Nutrient enrichment	National nutrient standards have as yet not been set for any of the nutrient parameters making up national monitoring programme. Eutrophication can be highly localised, very close to aquaculture cages as well as agricultural and industrial discharge points along the coastline.	→
D6 - Sea-floor integrity	Localised.	→
D7 – Alteration of hydrographical conditions	No data.	unknown
D8 – Concentrations of contaminants	No data.	unknown
D9 - Contaminants in seafood	No data.	unknown

MSFD Descriptor	Impacts of commercial fisheries on GES	Future trends
D10 - Marine litter	No dedicated monitoring regime for 'marine litter' is active, hence the current situation is poorly known. Data gaps for all types of marine litter addressed by the MSFD criteria and indicators are significant, particularly in relation to sources.	unknown
D11 – Introduction of energy, including underwater noise	No data.	unknown

Future trend

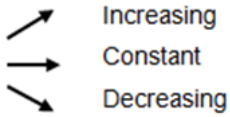

Table 6 - A3. Influence of the commercial fisheries sector on GES.

5. Interaction with other sectors

Cross-sectoral pressures could result from (1) interferences with hydrological processes due to maritime activities and which could potentially affect spawning, breeding and feeding grounds as well as fish migration routes, (2) generation of marine litter, and (3) generation of continuous underwater noise. These effects are however poorly documented at the local scale.

Interactions (competitive use of resources and space) between commercial fisheries and other economic sectors include:

1. Land-based activities;
2. Coastal development;
3. Maritime transport and ports operations, and
4. Recreational tourism/fisheries.

6. Nature Trust (Malta) recommendations

The main recommendation that is being proposed by Nature Trust (Malta) is the continued preservation and enforcement of the 25 NM FMZ. This is deemed to be essential since this area is purposely exposed to a limited fishing effort and capacity by means of a restriction in the size and engine power of fishing vessels. Thus only vessels smaller than 12m and which practise small scale coastal fishing are allowed to fish within this zone in order to reduce the harm to the marine environment.

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B. Marine Aquaculture

Aquaculture in Malta is marine-based and consists of the capture-based culture of the Atlantic bluefin tuna (*Thunnus tyhnnus thynnus*), as well as the culture of European seabass (*Dicentrarchus labrax*) and Gilthead sea bream (*Sparus aurata*).

The main export destination of Atlantic Bluefin tuna is Japan, while the marine culture of seabass and seabream are directed to European markets, primarily Italy.

Aquaculture of European seabass and Gilthead seabream is marine-based using floating cages situated some 1 km offshore. For Bluefin tuna, three farms are situated approximately 2 km offshore whilst other two operators utilise an aquaculture zone situated 6 km off the south-eastern coast.

Present farming systems are made up of floating cages. Currently there are 6 farms operating from 9 sites. Four farms produce only captured based species, one farm produces only closed-cycle species while the remaining farm produces both.

In 2010, European seabass and Gilthead seabream production accounted to 1,857 tonnes whilst the Atlantic Bluefin tuna production was 5,035 tonnes (National Statistics Office, 2012).

The Maltese aquaculture sector is highly competitive for space and resources due to the small territory. A long-term aquaculture strategy for Malta has been published for the assessment of the current and future situation of aquaculture in Malta. This is further elaborated below.

1. Background and current situation

i) Cultured species

The species cultured are the European sea bass (*Dicentrarchus labrax*), the Gilthead sea bream (*Sparus aurata*) and the meagre (*Argyrosomus regius*).

The fattening of Atlantic bluefin tuna (*Thunnus thynnus thynnus*) is based on a capture-based aquaculture for which tuna of various sizes are caught by purse seine fishing nets on the basis of strict control measures and country-specific quotas. Tuna caught from the wild are then fattened for about 6 months until they are ready for export. Large cages approximately 50 m wide and 30 m deep are used for this type of aquaculture and are, moored in coastal waters some 50-60 m deep and 1-2 km away from the coastline.

ii) Socio-economic value

The Maltese aquaculture industry has considerable socio-economic value and future potential. It contributes the following to the national economy:

1. Enhances the overall diversification of the primary food production in Malta and abroad;

2. Contributes to the generation of unskilled and skilled employment[17];
3. Provides fish products to local retail and food services sectors;
4. Contributes valuable export earnings with a turnover of about 128 million Euros (Applied Economics Consulting Ltd., 2009), and
5. Reduces the EU trade deficit for fisheries products.

The industry is governed by different regulations. Since the introduction of aquaculture locally the regulatory framework has evolved and adapted at a reactionary pace with its development. The greatest emphasis was given to spatial demands and environmental implications, with less attention to the role and performance of the sector as a food production activity.

Experience has showed that the existence of a relatively larger maritime space favours the installation of offshore marine facilities.

iii) Productivity

Figures 11 - B1 and 12 - B2 show the value added and its trend between the periods 2009 till 2013.

According to the National Statistics Office (2013), the gross industry output (both tuna and closed cycle species) reached a value added of 98.1 million Euros in 2013 during which the tuna production reached 92.8 million Euros, while other fish farming constituted 14.1 million Euros during the same year. In 2013, Malta produced 6.1 million kg of Atlantic bluefin tuna (National Statistics Office, 2013).

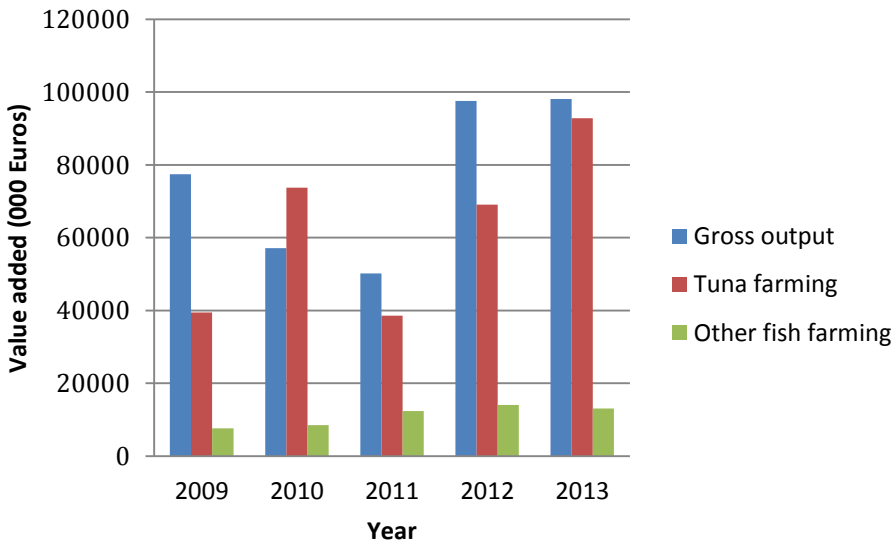

Figure 11 - B1. Value added of the aquaculture industry (National Statistics Office, 2012; 2013).

[17] *In 2009, this sector generated a total of 964 full-time equivalent jobs (FTE), comprising of 197 FTE in the aquaculture sector itself and an additional 767 FTE jobs generated by way of indirect and induced economic impacts (which included the wholesale and retail trade, transport and communication, financial intermediation and manufacturing sectors). Source: Applied Economics Consulting Ltd., 2009.*

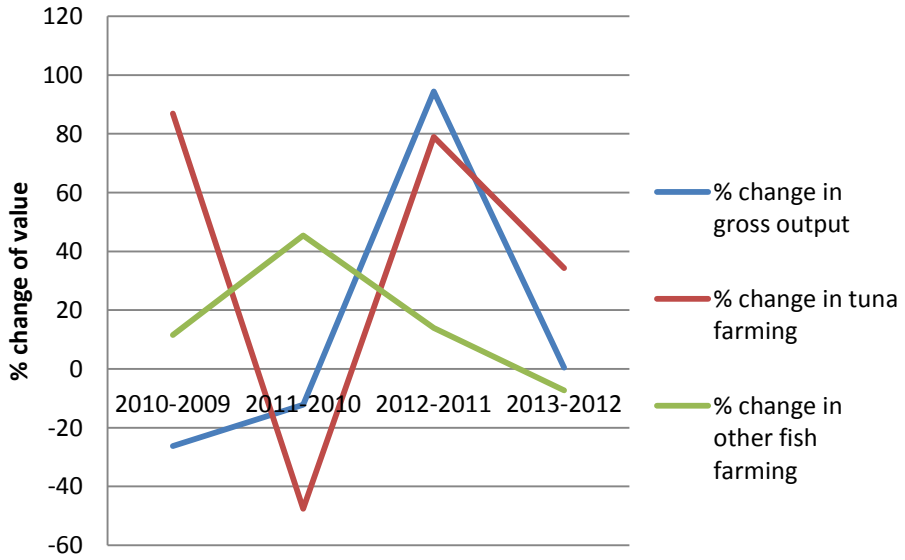

Figure 12 - B2. Percentage change of value added by the aquaculture industry for the period 2009-2013 (National Statistics Office, 2012; 2013).

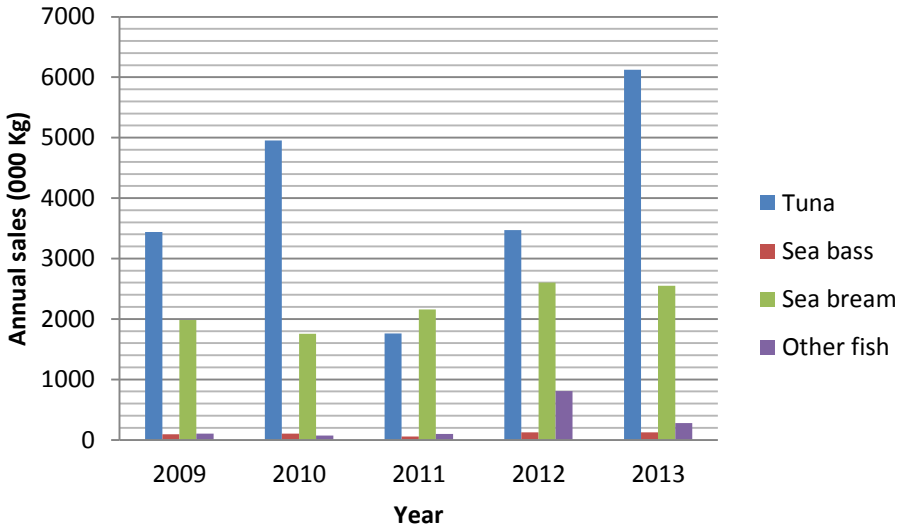

Figure 13 - B3. Annual sales of aquacultured fish for the period 2009-2013. (National Statistics Office, 2012; 2013).

Species	Quantity (tonnes)	Value (000 Euros)
Atlantic bluefin tuna (*Thunnus thynnus thynnus)*	4,955	73,705
European seabass (*Dicentrarchus labrax*)	102	819
Gilthead seabream (*Sparus aurata)*	1,755	7,053

Table 7 - B1. Tonnage and value produced by the aquaculture sector in 2010 (National Statistics Office, 2013).

iv) Distribution and characteristics

All aquaculture facilities are located in approved maritime spaces that have been selected in order to minimise user conflicts.

Present farming systems are made of floating cages. Currently there are 6 farms operating from 9 sites (fig. 14 - B4).

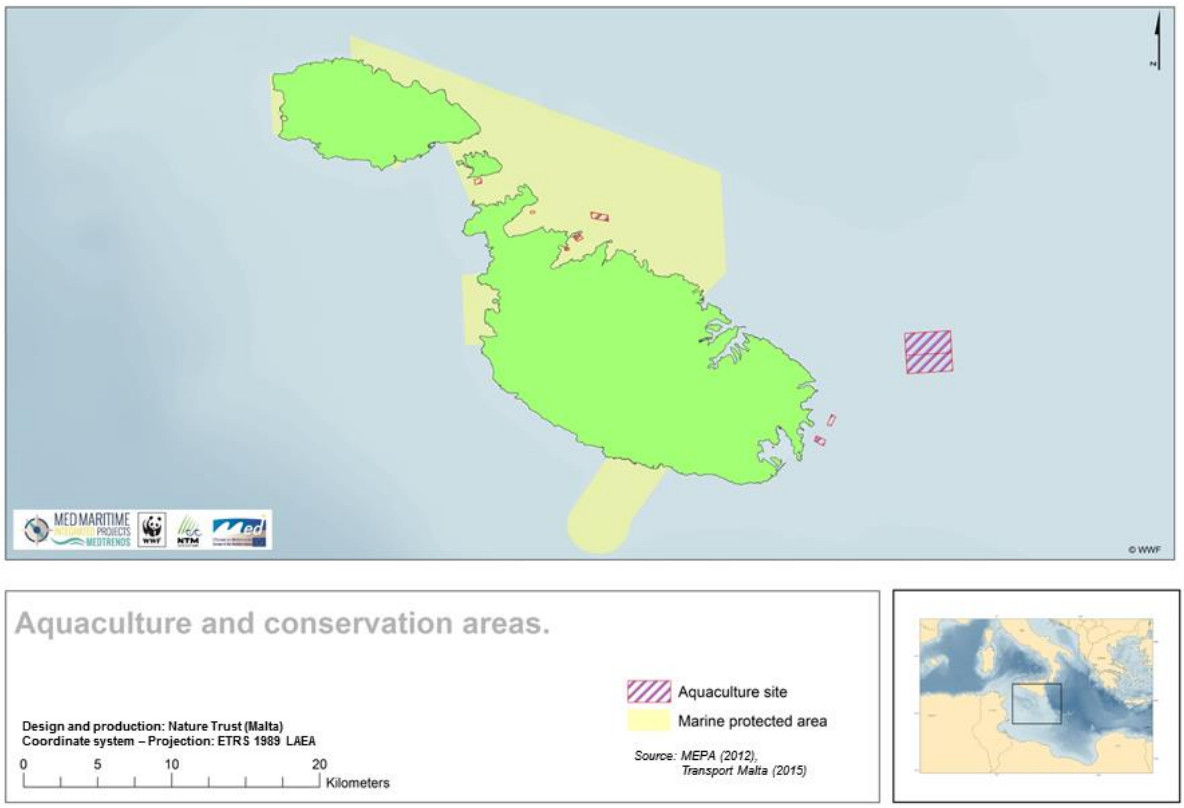

Figure 14 - B4. Location of fish farms and principal marine protected areas in Maltese coastal waters.

The location of fish farm cages, licensed capacities and number of operators is shown in table 8 - B2.

Location	Total Licensed capacity	Number of Operators
Off il-Ħofra ż-Żgħira, Marsaxlokk	1,200 (tuna); 300 (sea bass/sea bream)	2
Mistra Bay, St Paul's Islands, Mellieħa Bay	1100 sea bass/sea bream	1
Off Munxar Reef (Marsaskala)	350 (tuna); 150 (sea bream)	2
Sikka l-Bajda (St Paul's Bay)	1500 tuna	1
South Comino Channel	Not operational	1
Aquaculture Zone, SE Malta	1,500 tuna	1
Aquaculture Zone, SE Malta	1,500 tuna	1
Marsaxlokk Bay	100 (type not qualified)	1

Table 8 - B2. Location of fish farm cages, licensed capacities and number of operators (Adi Associates Environmental Consultants Ltd, 2012).

One of these farms has produced only closed cycle species since the late 1980s, which is prior to the implementation of the current planning process. The remaining farms have been permitted through a rigorous development planning process which included the conduction of environmental impact assessments (EIAs) in order to evaluate the potential impacts with other land and maritime uses to reduce conflicts. All operational farms are subjected to regular environmental monitoring.

Two out of the six farms have inshore nursery sites for juvenile seabream, seabass, meagre and amberjacks. The tuna farms are situated offshore some 1-2 km off the coast towards the north and on the southeast side of the main island having a depth of around 50 m. Two tuna farms are situated 6 km off the southeast coast having a depth of 90 m.

At the Malta Aquaculture Research Centre there is a pilot hatchery on land, which produces seabream, seabass, meagre and amberjack juveniles through research trials.

2. Pressures and impacts

This sector presents particular challenges due to conflicts with traditional coastal and maritime activities, including tourism and maritime transport, as well as with natural conservation of marine habitats.

There is a strong competition for space and resources due to the small size of Malta. Under such circumstances, environmental issues take priority and an EIA is required before any aquaculture development is initiated.

A number of impacts are associated with aquaculture activities. The various pressures on the marine environment arising from this economic sector include:

1. **nutrient loading** and **organic matter from fish waste** and **uneaten feed** in both water column and benthic habitat types in close proximity to and directly beneath the cages; degradation is especially pronounced during the farming season;

2. **localised changes to the physical and biological characteristics of the seabed** underneath tuna penning cages;

3. reversible **deterioration of *Posidonea oceanica* meadows** in the vicinity of fish cages. The issuing of permits for new sites are strongly dependent on the minimisation/prevention of these impacts, particularly on *P. oceanica* meadows;

4. **changes in oxygen levels in the water column, reduced water transparency** and elevated nutrient levels during the farming season between July to December[18];

5. enhanced **eutrophication** in the vicinity of fish farms, depending on the nutrient dispersion where fish farms are located;

6. **low species richness of macrofaunal assemblages** within the zone directly beneath the cages and 30m around the farm.

7. **succession of grazers and deposit feeders** are the most dominant trophic groups as a result of high sediment nutrients from the organic matter present in the area; appearance of high population densities of detritus-feeding and scavenging macro-

[18] *however, the observed changes in the monitored attributes were sporadic and not statistically significant.*

invertebrates (such as the ophiuroid *Ophiura texturata*, the crab *Inachus spp*., and fish *Gobius spp.);*

8. **disappearance of some megafaunal species** such as the sea urchin (*Spatangus purpureus*) and the crinoid (*Antedon mediterranea*), and

9. **Emission of wastewater effluents** from land-based aquaculture installations; however, the significance of marine contamination from this process is considered to be low.

3. Future trends

The aquaculture sector in Malta is expected to experience growth in the next ten years. This will be sustained by the (1) implementation of an Aquaculture Strategy for Malta, (2) research and development in the farming of new fish species, and (3) research and development in new spawning and hatching facilities within designated areas.

The Maltese Government has published a long-term Aquaculture Strategy that looks at the future state of this sector for the period 2014-2025. The strategy focuses on 5 important areas:

1. Enhanced importance as a maritime sector;
2. Increased, sustainable growth;
3. Clearer regulatory measures and improved environmental management;
4. Enhanced aquaculture zones, and
5. Promotion of innovation to increase competitiveness

The expected growth targets by 2020 include an increase of the workforce to 1185 full-time equivalent direct and indirect jobs, together with a potential gross value-added of more than 70 million Euros. The targeted scenario will:

1. Produce an annual 5000 tons of closed cycle species;
2. Maintain current levels of capture based species (depended on future tuna capture quotas), and
3. Ensure a stronger emphasis on research and development, including a hatchery.

The Malta Aquaculture Research Centre has a joint venture agreement till 2016 with Malta Fish Farming (MFF) Ltd. to research and develop spawning and juvenile rearing methods for Greater Amberjack (*Seriola dumerili)*. The production of Amberjack will be the main thrust in terms of R&D due to the local's expertise on breeding techniques of this species. If successful, there will be a diversification of fish farmed products, which could also mean additional pressure on the coastal marine environment.

There is also reference to the development of a hatchery and spawning facility for bluefin tuna and other species.

Other plans related to product diversification include the development and testing of alternative tuna feeds that could reduce reliance on the provision of baitfish, with the scope of reducing operational costs and improve competitiveness.

Regarding the allocation of coastal maritime spaces to aquaculture zones, the Maltese Government plans to:

1. Allocate all aquaculture operations within designated aquaculture zones;
2. Designate all existing sites, including nurseries as aquaculture zones which will be subjected to regulatory measures;
3. Regulate all aquaculture zones based on improved methods[19] that monitor and ensure the balance between biomass and resulting environmental impacts;
4. Introduce area management agreements between the different operators sharing a common aquaculture zones, and
5. Consider restriction of the feeding of baitfish to tuna cages during onshore wind conditions in the summer tourist season if alternative solutions are not found.

Such management is expected to result in a more effective, efficient and controlled aquaculture activity in the coming years. The national strategy recognises the need to relocate the operations of capture-based species activities to offshore waters, primarily to reduce the negative impact on the marine environment and neighbouring bathing areas.

In addition, some of the above-mentioned proposed future plans to promote further growth of this sector, such as (1) restricting sea-based installations of fish fattening facilities, (2) expansion of aquaculture zones in both inshore and offshore areas, and (3) re-locating future farming of capture-based species (such as tuna penning) at water depths of 50 m or more, could potentially lead to additional pressures on the marine environment.

4. Impacts on GES

Table 9 - B3 provides an assessment on the evolution of the pressures exerted by the aquaculture, based on a set of established indicators.

MSFD Descriptor	Impacts of marine aquaculture on GES	Future trends
D1 – Maintenance of biological diversity	Biodiversity is expected to be affected negatively within aquaculture zones.	↘
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited marine species	Constant, depending on designated quotas for farmed capture species.	→
D4 – Marine food webs	Ecosystems linked to aquaculture environment are expected to be negatively affected.	↗
D5 – Nutrient enrichment	Constant, depending on hydrological characteristics and new and efficient feeding techniques.	→
D6 - Sea-floor integrity	Biodiversity is expected to be negatively influenced, with anomalous successions of grazers and deposit feeders	↗
D7 – Alteration of hydrographical conditions	Constant pressure is expected, although information on past trends is not available.	→

[19] *It is being 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.*

MSFD Descriptor	Impacts of marine aquaculture on GES	Future trends
D8 – Concentrations of contaminants	Increased contamination for land-based farming installations.	↗
D9 - Contaminants in seafood	Constant pressure is expected, although information on past trends is not available.	→
D10 - Marine litter	Constant pressure is expected, although information on past trends is not available.	→
D11 - Introduction of energy, including underwater noise	Constant pressure is expected, although information on past trends is not available.	→

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 9 - B3. Influence of the marine aquaculture sector on GES.

5. Interaction with other sectors

Fish farms are generally associated with nutrient enrichment, leading to changes in sediment characteristics and with the disturbance of such sediments through cage moorings. This leads to negative interactions with other sectors including tourism, living resources and other maritime activities. As mentioned above, land-based farms are a significant source of discharge of suspended solids in coastal waters, with potential detriment to other competing sectors, including tourism, recreation and conservation (MEPA, 2011; 2013).

Figure 15 - B5 below shows the current location of operational fish farms in close proximity to protected benthic habitats and, and where a number of cages reside in protected areas. This is one example where fish farms are exerting their pressures on competing sectors, including tourism, recreational and transport sectors.

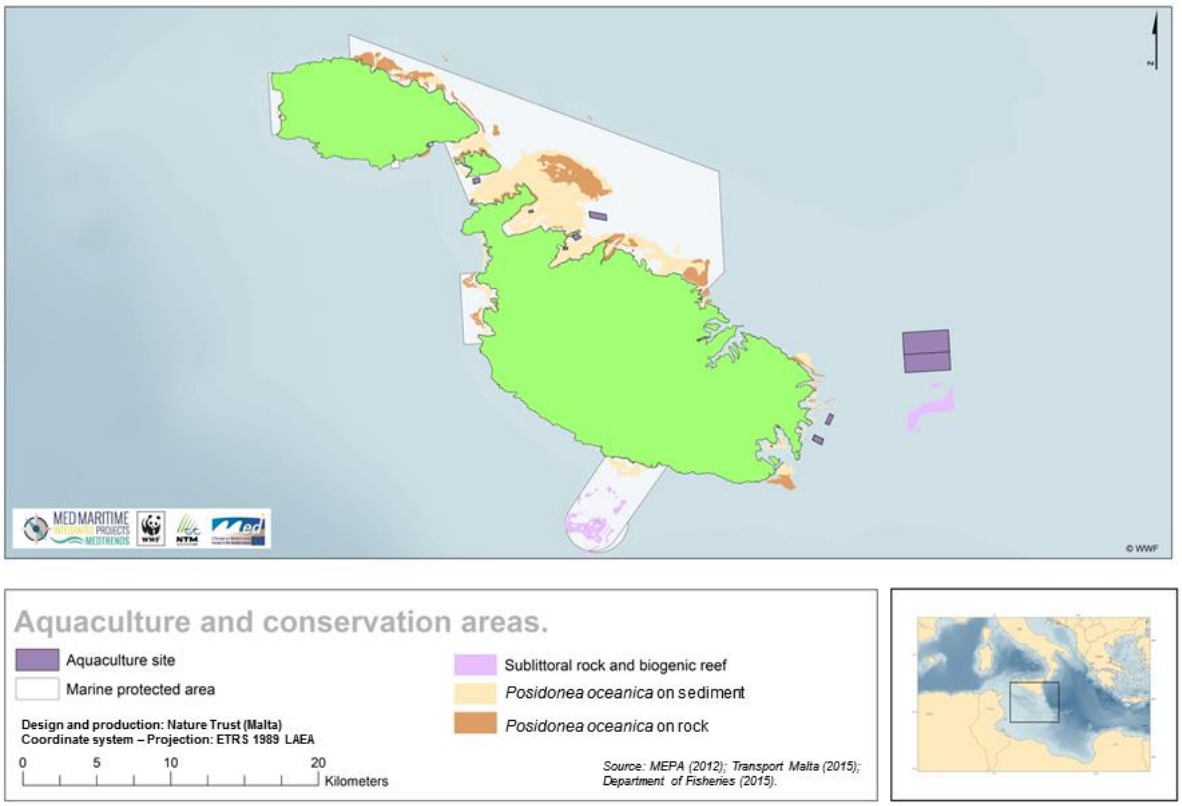

Figure 15 - B5. Map showing distribution of fish farms, including those within conservation areas.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) is highly concerned about the impact of marine aquaculture on both the coastal and the offshore marine ecosystems, especially near fish cages and related installations. In most cases, these cages and facilities are found located very close to the shore.

Nature Trust (Malta) is recommending to move marine aquaculture facilities to areas that are less sensitive to the localised impacts of aquaculture installations. These include popular embayments such as those situated in the South east of Malta. Furthermore, it is being proposed that more research is put into place to try and shift current practices in tuna farming that can start from egg hatchlings rather than being dependent on wild populations.

As a privileged partner of WWF, Nature Trust (Malta) notes that more countries are joining the call on a trade ban for the bluefin tuna. It welcomes the initiatives being taken by various European countries to safeguard this species through quotas that are assisting in the slow recovery of bluefin tuna. Furthermore, it also wishes to remind the competent authorities that the Government's primary responsibility where the selling of tuna is concerned should be towards the local consumers of tuna, who often end up paying excessive prices for the fish – if they manage to find it on sale at all – on account of the large volume of tuna export activity coupled with dwindling stocks. Hence, a restriction on such exports would seem to be in order even from a socio-economic perspective.

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C. Recreational Fisheries

Recreational fisheries are one of Malta's popular pastimes. In 2012 the total number of recreational boats amounted to 65% of the Maltese fleet (National Statistics Office, 2012). This number is expected to increase due to strong initiatives being taken by local authorities to diversify the local touristic market. A number of new proposed marinas have been submitted in 2009, and recently in 2015 for consideration by the national authorities. With increasing fishing pressure and environmental changes, it is clear that better management is required so as to ensure the proper conservation of the marine environment, especially close to shore. With more than 196.8 km of coastline, specific areas, species and different types of fishing activity occur which require monitoring. Pressures include marine contamination, eutrophication, disruption of food webs and reduced water clarity.

1. Background and current situation

Recreational fishing is a popular activity in Malta. This is reflected by the number of vessels registered under this category, of which number constitute the highest proportion of registered vessels. 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, sailfish, swordfish and amberjack.

As of 2013, the total number of recreational boats (Category C-MFC: Non-Commercial Fishing Vessels) was 1,929 vessels (65.3%) of the Maltese fleet (National Statistics Office, 2013).

There is no information available with regards to the fishing efforts or related capacity by recreational boats.

i) Marinas

The location of some of the existing and proposed marinas is shown in fig.16 - C1. Malta currently offers 6 permanent marinas, located in Msida, Ta' Xbiex, Mġarr (Gozo), Portomaso, around Manoel Island and Grand Harbour.

In April 2009, a report entitled 'Development of Yachting Facilities in Malta: Identification of Potential Sites for All-Weather Marinas and Temporary Marinas' was compiled by the Malta Maritime Authority (now part of Malta Transport) and the then Ministry for Transport and Communications (MITC), based on the Government's vision to establish Malta as a centre of excellence in maritime services by 2015. The yachting industry (and in this respect the berthing infrastructure) has been identified as one of the major sectors that have potential to offer such services. In this context, the provision of an enlarged infrastructure within the yachting industry is being considered within the short-term to fulfil this vision.

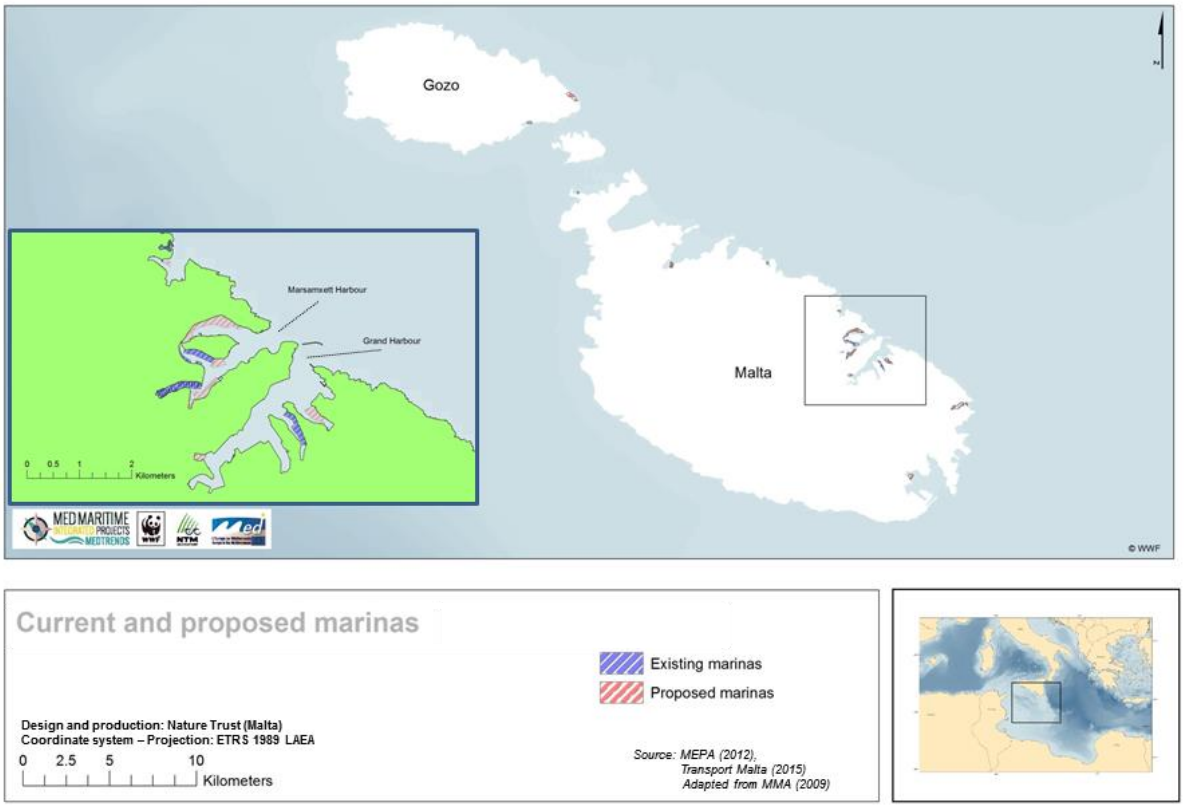

Figure 16 - C1. Location of existing and proposed marinas. Inset shows their location within Marsamxett and Grand harbours as well as St Julian's area.

The document identified new sites within existing harbour areas (MMA, 2009). Such selection is based on a number of constraints that take into account the protection of the natural marine environment as well as construction costs, especially where the waters are deep. Two types of marinas have been identified: (1) temporary marinas, which would consist of temporary pontoons accommodating between 50-100 boats in the summer period, which pontoons would be stored away on land during the winter months, and (2) permanent (all weather) marinas which are able to offer the usual, high standard berthing amenities.

On June 26, 2015, the local media reported that Marina Di Valletta Consortium has been selected by Transport Malta for the development, operation and management of an all-weather marina at Sa Maison.

Such a development is continuously adding new berthing space over the short-term, with a consequent potential negative impact on the marine environment in terms of increased recreational fishing, not to mention the contamination of the marine environment connected to these new berthing facilities. However, potential cumulative impacts at the various proposed sites would need to be assessed should the installation of such marinas be considered further.

2. Future trends

In general, recreational fisheries are tightly linked to non-commercial fishing activities from recreational boats (and yachts). In this regard, the Government's vision to expand the berthing infrastructure should also lead to an increased facility and popularity for recreational boats and related activities.

i) The coastal environment

The 2009 communication of the Government's policy with regards to the establishment of new marinas specified that such development should not be accompanied by large real estate projects that will impact the coastal zones, including the coastal marine waters.

In 2013 the central Government announced its intention to proceed with the award of a concession whereby it will be granting a suitable site(s) for the Design, Build and Operation of a Cruise Liner Terminal and Berthing Facilities and a Yacht Marina in the Island of Gozo[20]. This opportunity is being seen as an alternative scenario for economic growth and a potential diversification of coastal and marine tourism in Gozo, referring in particular to the "benefit from private sector capital investment and on-going upgrading and modernisation, thus enhancing their competitive stature within the respective sector". Unlike the 2009 communication, the 2013 call implies further artificialisation of the coastal zone. At the same time, the Government clarifies that this development has to in line with the EU's Integrated Maritime Policy, including *interalia*, the Marine Strategy Framework Directive, the Protocol on Integrated Coastal Zone Management in the Mediterranean and the Directive of the European Parliament and of the Council, establishing a framework for Maritime Spatial Planning and Integrated Coastal Management, among other strategies.

ii) Coastal marine waters

A number of significant constraints limit the selection of potential new sites of marinas, including benthic flora (such as the presence of *Posidonea oceanica* meadows) and water depth (which could lead to high constructional costs). Within this framework, the proposed location of new permanent marinas in 2009 had to be directed to take place within existing harbours. Nevertheless, a proposal has recently been submitted by a Consortium to develop a mixed-use marina project in Gozo along a coastline that is adjacent to a marine protected area containing protected marine flora and fauna.

iii) Increased number of berthing

Currently, the berthing demand exceeds supply and the limited berthing spaces coupled to limited hard standing facilities limit the potential growth of the yachting sector.

The April 2009 document specified a current demand for berthing space of 2,050 over and above the available berthing space. It also specified that such a demand was projected to 2,800 by 2015. Specific areas were thus identified to cater for such an increased demand in berthing (table 10 - C1).

Recommended areas	Number of berths
St Paul's Bay (Fekruna)	275
St Paul's Bay (Veċċja)	173
Marsaskala	380
Birżebbuġia marina	263

Table 10 - C1. Recommended areas for the citing of permanent marinas and associated increased berthing space (MMA, 2009).

[20] *http://privatisation.gov.mt/en/current-projects/Pages/Cruise-Liner-Terminal.aspx*

In addition, a number of temporary marinas have been proposed at the following locations:

- Mġarr Harbour
- Ċirkewwa
- Veċċja
- Qalet Marku
- St Julian's
- Marsaskala
- Birżebbuġia
- Ta' Xbiex
- Pietà, Sa Maison
- Kalkara

The total number of berths supplied by the proposed temporary marinas amounts to 1,059. To date, no information is available regarding the berthing capacity of the proposed new marina in Gozo.

iv) Future trends of additional impacts

The development of additional berthing space would result in an associated increase of chronic input of contaminants in coastal waters and to a reduction in water quality (fig. 17 - C2). No projected data is available in this respect and further studies are recommended in order to quantify a realistic, resultant impact on the marine environment.

The construction of new marinas would require dredging in localised areas as part of coastal engineering works, including building of platforms and quays. This would lead to increased turbidity, thus negatively impacting the water quality.

Increased recreational fishing is thus expected to increase proportionately with the availability of berthing facilities. Data show that marinas and fisheries berthing areas are associated with chronic input of contaminants (Biemann et al., 2014) in coastal waters as well as to a reduction in water quality (MEPA, 2011).

v) Impacts on water quality and benthic communities

Vulnerable communities occurring on shallow sublittoral rock such as *Cladocara caespitosa* colonies can become increasingly threatened by mechanical damage from both anchorage and fishing gears used by recreational boats. The extent of such pressures on shallow sub-littoral rock is currently not known.

3. Impacts on GES

The evolution of the pressures exerted by the sector, based on MedTrends indicators is shown in table 11 - C2.

MSFD Descriptor	Impacts of recreational fisheries on GES	Future trends
D1 – Maintenance of biological diversity	Incomplete data.	unknown
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	Undeclared fishing of commercial species expected to increase.	
D4 – Marine food webs	Negative impacts of contaminants in marine food webs are expected to increase.	
D5 – Nutrient enrichment	Mainly due to recreational boating and related amenities and service.	
D6 - Sea-floor integrity	Mainly due to recreational boating and related amenities and services.	
D7 – Alteration of hydrographical conditions	Mainly due to recreational boating and related amenities and services.	
D8 – Concentrations of contaminants	Negative impacts of contaminants in the marine environment is expected to increase.	
D9 - Contaminants in seafood	No data.	unknown
D10 - Marine litter	Unless controlled, this type of pollution is expected to increase with increasing number of recreational boating and related activities.	
D11 – Introduction of energy, including underwater noise	No data.	unknown

Future trend

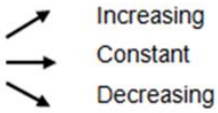

Table 11 - C2. Influence of the recreational fisheries sector on GES.

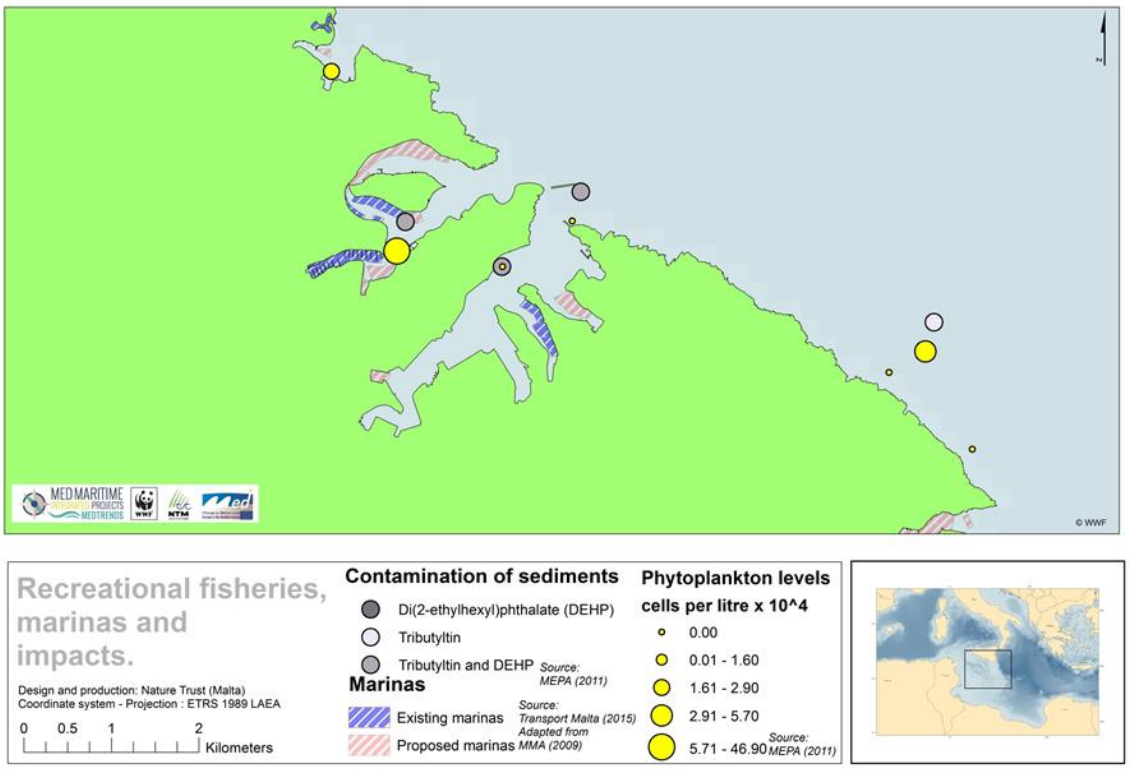

Figure 17 - C2. Negative impacts of existing marinas on the marine environment in terms of toxic contamination in sediments and increased phytoplankton levels.

4. Interaction with other sectors

There is very little information arising from official documents related to recreational fisheries. In general, any increased activities in the future could well lead to a local deterioration of the marine environment and increased competition for resources, as partly indicated by table 11 - C2 and fig. 18 - C3[21]. The current drive to establish new marinas around the Maltese coastline should lead to such a scenario in the long term. It is envisaged that the main sectors that would strongly interact with recreational fisheries include extraction of non-living resources, port infrastructure, marine transportation, tourism and related recreational activities.

[21] *According to Malta's Code of Practice for the Safety of Commercial Vessels (11th edition, June 2011), the following vessels are to be fitted with an AIS: 1) Passenger ships of 300 gross tonnage and over; 2) All tankers and bunker barges, irrespective of size; and 3) Any other type of vessel of 300 gross tonnage and over.*

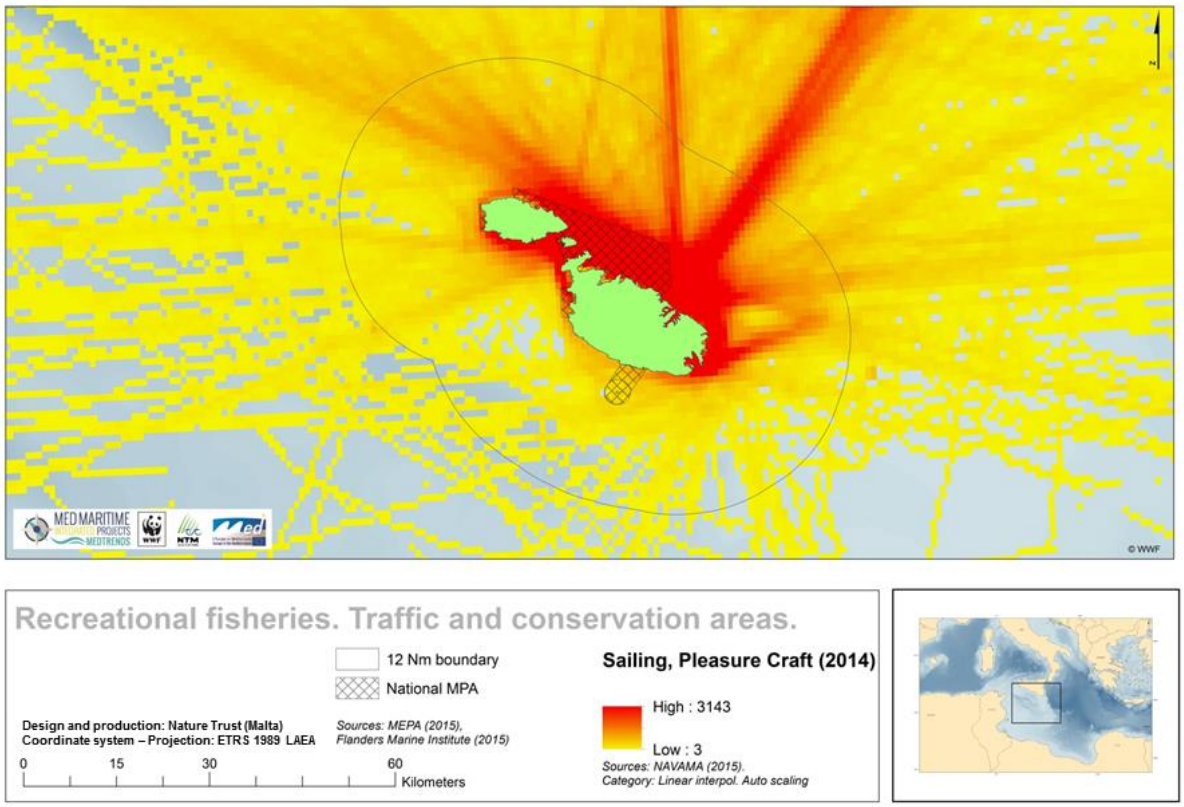

Figure 18 - C3. Density of occurrence of sailing and pleasure crafts (AIS categories 36 & 37; no speed limit or sorting) in territorial waters, with particular reference to marine protected areas. This high density traffic could lead to negative impacts. Scarring of the seabed due to uncontrolled anchorage leads to degradation of benthic habitats and possible depletion of vulnerable target species.

5. Nature Trust (Malta) recommendations

Nature Trust (Malta) urges national authorities to promote environmentally sustainable and socially responsible management of recreational fisheries. Policy and institutional frameworks, recreational fisheries management actions and strategies and sustainable practices should be promoted. Moreover, more research is recommended in this area.

It is hoped that adherence to such guidelines will enable policy-makers, managers and the entire recreational fisheries sector to orient recreational fisheries towards maintaining or achieving sustainability.

An example of such policies is Nature Trust's recommendation in favour of seasonal closures of recreational fishing. Such an action should provide protection for fish species that are vulnerable during times when they aggregate (group together) to reproduce. Moreover, it recommends the continued enforcement of the prohibition of illegal nets.

In addition, Nature Trust is in favour of regulating fishing practices aimed at minimising the loss of fishing gear (such as longlines, gill nets, entangling nets, trammel nets, traps and pots, etc.) and thus giving rise to ghost-fishing. This is environmentally detrimental and the fish caught is wasted.

Concerning the proposed temporary mooring solutions along coastal areas of the Maltese islands, Nature Trust (Malta) recommends that these options should be properly assed in order to mitigate or altogether remove any negative impacts to benthic habitats resulting from boat anchorage.

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D. Oil and Gas Exploration and Extraction

Malta's continental shelf is the largest and highly valuable asset of Malta. With respect to oil extraction, however, the exploration activities conducted so far did not result in any commercially significant expression of oil or gas.

At the same time, the exploration and extraction of oil and gas poses a number of significant risks (in terms of investments, accidental spills and increased risk of spillage due to active seismicity on the region). Current pressures and impacts mainly originate from noise (such as pulsive, semi- or continuous noise), for which there is currently no baseline information. Any future prospective discovery of oil could lead to serious contamination from accidental spills from drilling/extraction activities resulting in the degradation of the marine environment.

1. Background and current situation

The position of the Maltese islands and its proximity to commercial oil and gas fields in Italy, Tunisia and Libya, highlight the potential of Malta's continental shelf in this sector. From a legal and regulatory aspect, oil exploration activity in Malta is regulated by the Petroleum Act (1958), by the Continental Shelf Act (2014) and by the Petroleum regulations (2001). This legal framework enables the Government to issue and regulate exploration and production licenses under production sharing contracts and exploration study agreements. Under the present legislation, an environmental impact study must be submitted by the contractor prior to the commencement of exploration activities. The Petroleum Act, for example, endows the Government of Malta the right to search, drill and own any petroleum existing in the Maltese territory.

The first exploration license, which was limited to inshore oil exploration, was granted in 1954. Following the enactment of the Continental Shelf Act in 1966, offshore oil exploration activities commenced in the early 1970's and 4 offshore exploratory wells were drilled by Aquitaine, Home Oil and Shell. Over the years, a total of 11 offshore exploration wells were drilled and several thousand kilometers of seismic and other geophysical data were collected as part of these exploration studies.

Some of these wells encountered oil and gas, whereas one well tested light oil and another tested gas. The following wells showed oil and/or gas[22]: Block 3, Area 3 (1972, Home Oil, Home 1), Block 8, Area 3 (1982, IEOC-Agip, Alexia 2), Block 3, Area 4 (1993, Amoco, Tama 1), Onshore Gozo (1999, Government, Madonna taż-Żejt 1) and Block 2, Area 3 (2002, ENI, Lampuka 1).

[22] *https://mticms.gov.mt/en/Pages/Continental%20Shelf/Oil-Exploration-Unit.aspx*

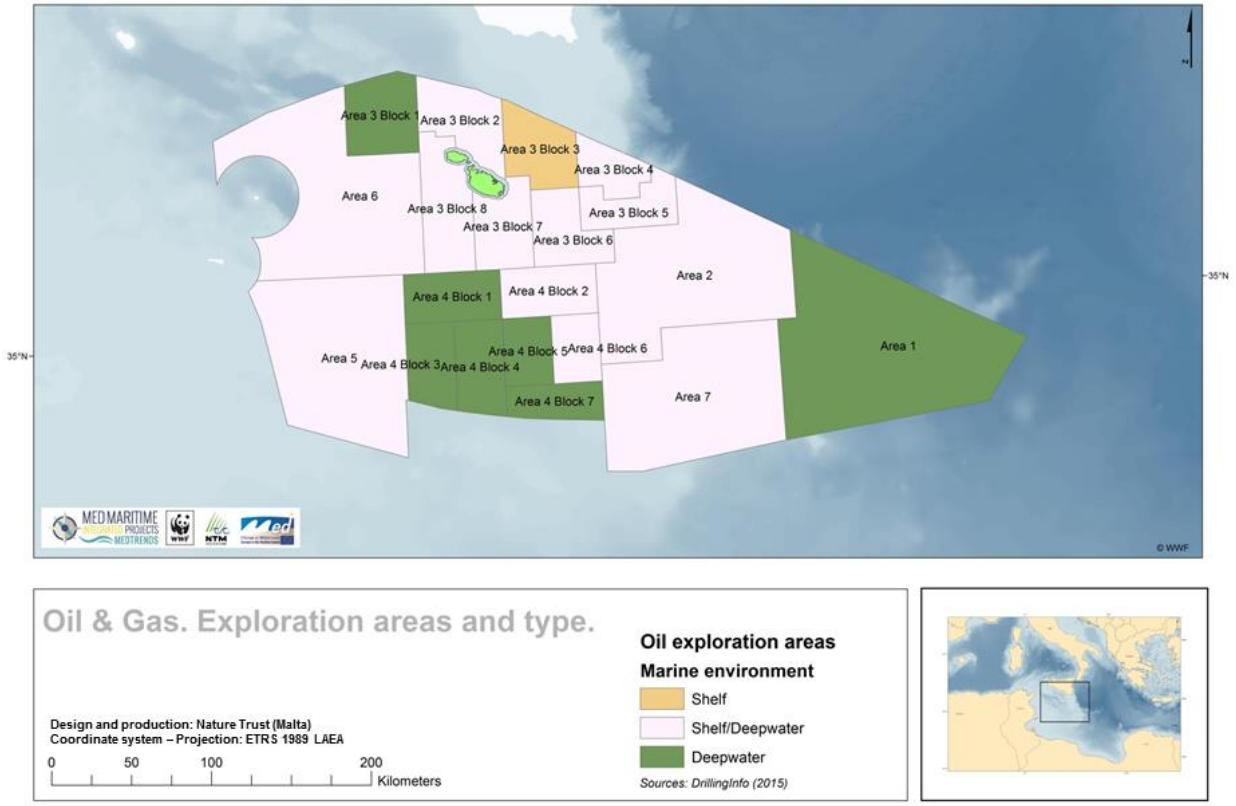

Figure 19 - D1. Exploration areas and related marine environment in Malta's EEZ (DrillingInfo, 2015).

Distribution of gas pipelines

According to local media sources, the current national plan to supply Malta with gas is based on the intention of the Electro Gas Malta consortium to invest in a physical connection with the Italy-Libya gas pipeline. This supply of gas would enhance the needed availability for the new gas-powered station at Delimara.

At the same time, on June 18, 2015 the Sustainable Energy and Water Conservation Unit within the Ministry for Energy issued an international call for tender for an 18-month study on a pipeline for natural gas between Malta and Gela in Sicily[23]. According to Government sources, this pipeline is expected to cost around 290 million Euros[24].

[23] *http://www.timesofmalta.com/articles/view/20150618/local/call-for-tender-for-gas-pipeline-study.573087*
[24] *http://www.timesofmalta.com/articles/view/20130215/local/-Pipeline-to-cost-290m-.457699*

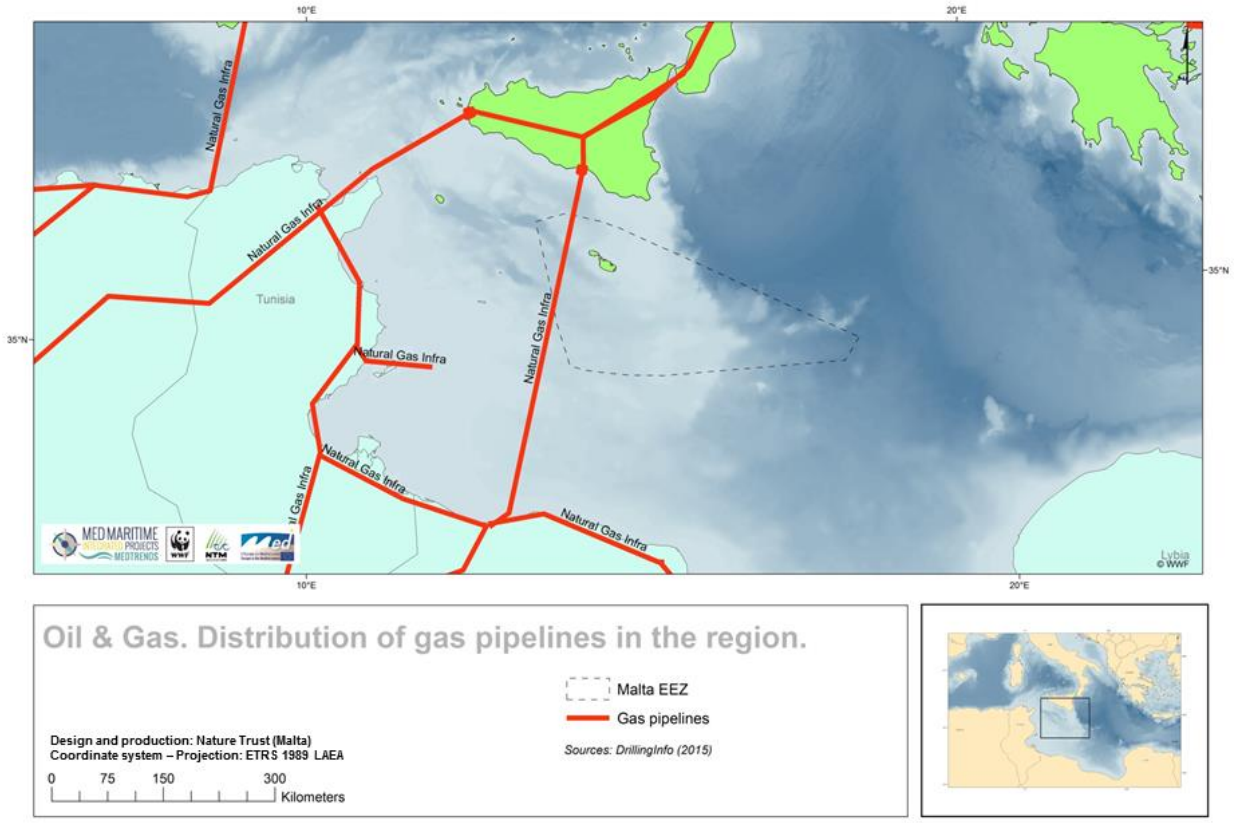

Figure 20 - D2. Distribution of gas pipelines in the central Mediterranean region (DrillingInfo, 2015) [25]**.**

2. Future trends

The Government of Malta is currently promoting Malta's petroleum exploration opportunities through various campaigns. Local oil exploration activity is expected to increase in the near future.

According to local reports, Malta has been in discussions with the Italian Government on joint exploration bids. Very little information is available from official Governmental information sources.

Further activities with regards to pipeline connections for natural gas are expected to increase in the near future.

3. Impacts on GES

A study conducted by the US National Research Council in 2013 showed that the fluid injection and withdrawal activities related to oil and gas development may have the potential for inducing significant seismic events (National Research Council, 2013). Induced seismicity

[25] *The planned GALSI pipeline between Algeria with Italy will have a capacity of 8 billion cubic meters a year and is expected to go on stream in 2018.*

associated with fluid injection or withdrawal is caused in most cases by change in pore fluid pressure and/or change in stress in the subsurface in the presence of faults with specific properties and orientations and a critical state of stress in the rocks. Such seismicity can reach M > 4.0. The Research Council identifies current gaps in knowledge and research concerning option for steps towards best practices with regard to energy development and their induced seismicity potential.

The Seismic Monitoring and Research Unit of the University of Malta shows that the central Mediterranean Sea is an area of high seismic risk (fig. 21 - D3; http://seismic.research.um.edu.mt/). National regulatory agencies must therefore take into account the extent of this risk on deep sea oil exploration and consequential potential impacts on the marine environment, with a special regard to the areas of high biological sensitivity (see figs. 9 - A3 and 10 - A4).

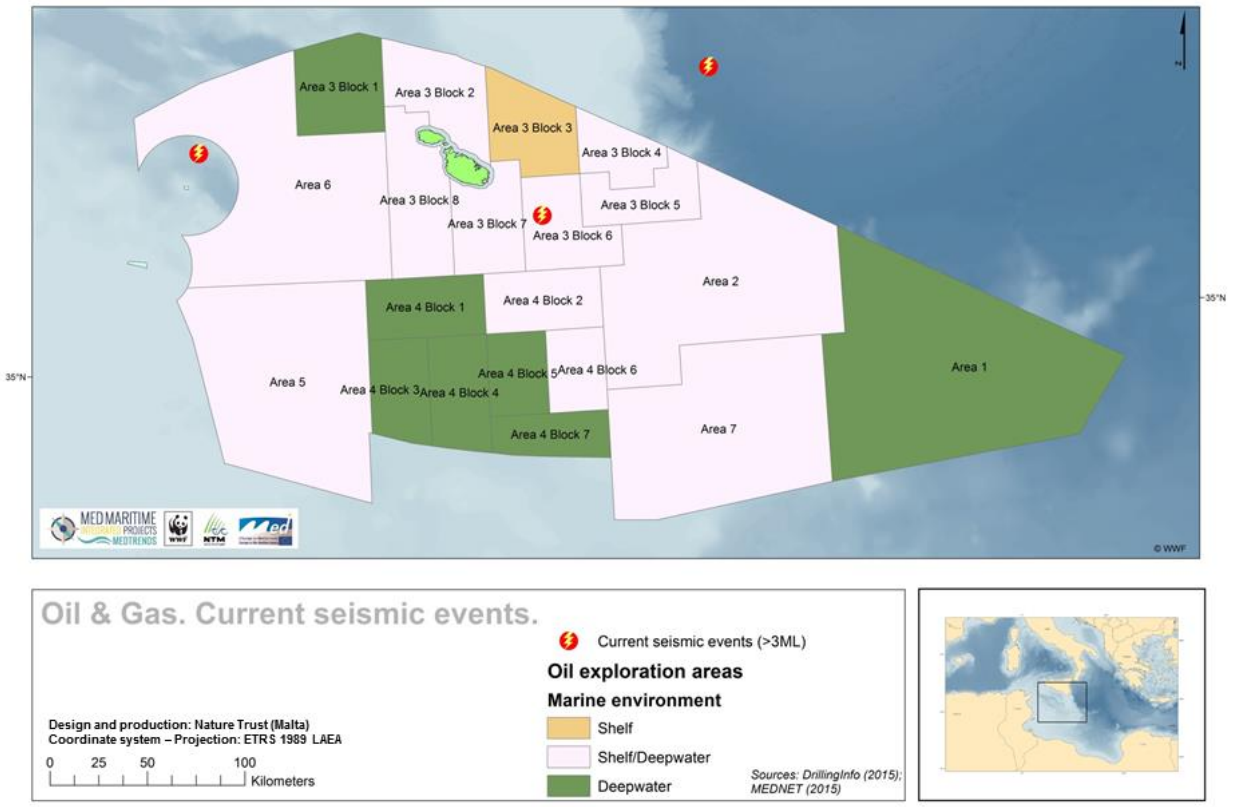

Figure 21 - D3. Location of seismic risks in the vicinity of local oil and gas exploration fields (DrillingInfo, 2015; Seismic Monitoring & Research Unit, University of Malta, 2015).

Additional impacts originating from oil and gas exploration on the marine environment include those that could potentially affect other sectors such as coastal tourism, biodiversity, conservation and sustainability. Being highly dependent on seawater for its potable water supply, Malta could be indirectly affected by a major oil spill that could hit its coastline. Moreover, Malta is economically dependent on tourism, and such spills would deter tourists from visiting the island for its sun and the sea. Additionally, oil exploration tends to divert the focus away from the current drive towards the generation and use of renewable energy (MEPA, 2011).

Much progress has been made in the understanding of the effects of oil on marine organisms and their biological processes (Galdies, 2008). Direct impacts include lethal and long-term chronic effects on living organisms, air pollution by chemicals from controlled burning of superficial oil, toxicity due to oil dispersants, which could also affect marine and terrestrial food

webs and entire ecosystems. The evolution of the pressures exerted by the sector, based on available information is shown in table 12 - D1.

MSFD Descriptor	Impacts of oil and gas exploration and extraction on GES	Future trends
D1 – Maintenance of biological diversity	Introduction of toxic substances, whether solid, liquid or gas.	↘
D2 - Non-indigenous species	Introduction of non-indigenous species and translocations.	↗
D3 - Commercial species	Potential impacts through contaminants and released polluted water; underwater noise.	↗
D4 – Marine food webs	Potential impacts through contaminants and released polluted water.	↗
D5 – Nutrient enrichment	No information available.	unknown
D6 - Sea-floor integrity	Physical damages; increased seismicity.	↗
D7 – Alteration of hydrographical conditions	No information available.	unknown
D8 – Concentrations of contaminants	Introduction of toxic substances, whether solid, liquid or gas.	↗
D9 - Contaminants in seafood	No information available.	unknown
D10 - Marine litter	No information available.	unknown
D11 – Introduction of energy, including underwater noise	Underwater noise is expected to increase, with significant consequences to marine life.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 12 - D1. Impacts of the oil and gas exploration and extraction sector on GES.

4. Interaction with other sectors

In the medium to long-term perspective, the national oil and gas sector could well become a prevalent maritime industry, and this is being demonstrated by the attention given by local authorities to conduct exploration studies.

The industry could well interact, albeit with unknown consequences, with the touristic, professional fisheries, marine conservation and transportation sector. Coastal infrastructure and desalination plants could also be affected leading to over-arching detrimental consequences to local inhabitants.

5. Nature Trust (Malta) recommendations

Nature Trust (Malta) recommends the total prohibition of offshore oil exploration in the Mediterranean. Regulatory agencies should not issue the lease or exploration (i) in areas of high seismic risk, relatively untested deep-water, or remote areas; or (ii) within the boundary of a proposed/established marine sanctuary, and/or within or near the boundary of areas of high biological sensitivity; or (iii) utilizing new or unusual drilling/exploration technology. In the case of such explorations, unhindered publication of comprehensive risk maps of the targeted seabed before the commencement of such activities must be conducted and made available to the public.

Nature Trust is aware of the drilling operations in the Sicilian Channel, as part the 145 km^2 "Offshore Ibleo" project located off the coast of the provinces of Caltanissetta, Agrigento and Ragusa, for a duration of 20 years. This project shall include eight wells (two of which are exploratory), a platform and several pipelines, with the work targeted to start in 2015. Oil pollution has no boundaries, and this intensive activity in the vicinity of Malta's EEZ can pose detrimental risks to the maintenance of a GES in the region.

Proper transport management of oil tankers through the Malta Channel (which accounts for some 25% of the global oil tanker traffic) should be improved so as to minimise the high risk of oil spillage in the area arising from such intense traffic.

Another important recommendation is the need to have an effective national oil spill emergency response and containment strategy in place. Such a strategy should also comprise of regular drills and related exercises so as to maintain an efficient and effective national response.

6. References

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E. Tourism

1. Background and current situation

Tourism is the main contributor of all the market service sectors in the Maltese Islands. The Maltese Islands attract approximately 1.6 million tourists per year. According to the draft Tourism Policy (2015-2020) the annual average number of visitors has increased by approximately 5% each year over the past seven years with the largest number of tourists visiting the islands during the summer months (Ministry for Tourism, 2015).

i) Cruise liner tourism

Between 2006 and 2013 the cruise liner tourism saw an average annual growth rate of 1.2%. However, 2013 saw a decline of 23.3% in cruise passengers visiting the Maltese Islands. This was due to two cruise liners choosing to no longer visit the Islands due to fuel costs. One of the liners has since resumed service to the Maltese Islands. Figure 22 - E1 illustrates the number of cruise liners visiting the Maltese Islands between 2003 and 2013 as taken from Transport Malta's 2013 annual report.

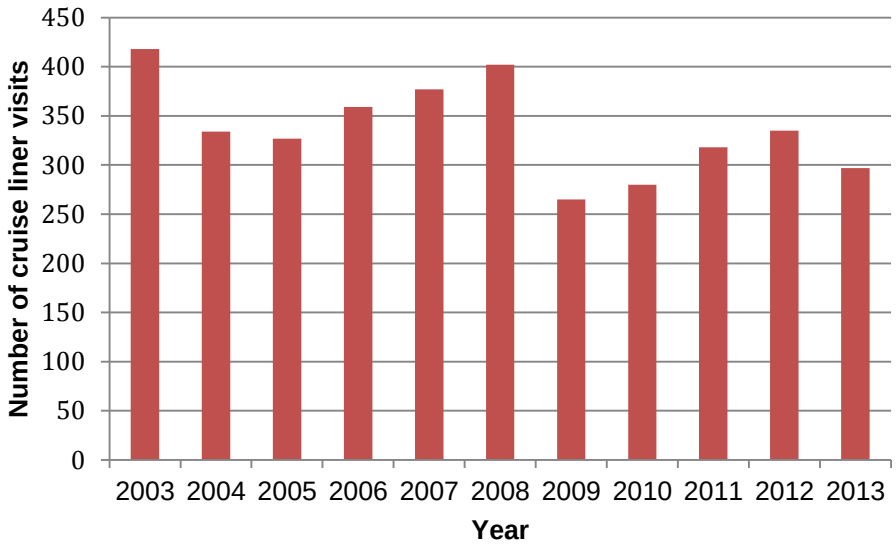

Figure 22 - E1. Number of cruise liners visiting Malta (Transport Malta, 2013).

ii) Yachting and Recreational Boating

Another important aspect of the tourism maritime sector includes yachting and recreational boating. Yachting is well established in Malta; there are currently ten yacht marinas in the Maltese Islands as illustrated in fig. 16 - C1 catering for yachts ranging from 8 m to 100 m in length. As at the end of December 2012, 337 yachts >24 m and 2596 yachts <24 m were registered under the Maltese flag. At the same time, super yachts showed an increase of 15.7% over the previous years.

iii) SCUBA Diving

The diving segment of the tourism industry has gained in importance over the years since the 1970s. The Master Plan to Support a Sustainable Diving Industry in the Maltese Islands (Adi Associates, 2011; also referred to as 'the Diving Master Plan') launched by the Malta Tourism Authority and the Ministry for Tourism, Culture and the Environment describes a market both for 'fanatic' divers (i.e. tourists who travel to a destination with the sole or main purpose to dive) as well as leisure divers (i.e. visitors for which diving is one of a number of activities in which they will participate during their visit). Table 13 - E1 illustrates the number of divers visiting the Maltese Islands between 2005 and 2011 with the targeted aim to dive whilst visiting the country, as reported by Adi Associates (2011) from data provided by the National Statistics Office.

Purpose of Trip	2005 (April-Dec)	2006 (Jan-Dec)	2007 (Jan-Dec)	2008 (Jan-Dec)	2009 (Jan-Dec)	2010 (Jan-Dec)	2011 (Jan-May)
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

Table 13 - E1. Number of 'fanatic' divers visiting the Maltese Islands between 2005 and 2011 (Adi Associates, 2011).

The values shown in table 13 - E1 illustrate that the number of divers coming to Malta to dive has substantially increased. Adi Associates (2011) describe that the highest number of tourists diving are those on a family or group holiday.

In support of this industry, over a number of years, eleven wrecks have been scuttled in the Maltese Islands, not all of which have become popular diving sites.

Figures 23 - E2 and 24 - E3 illustrate the most popular shore and boat dives, respectively (data up to 2011).

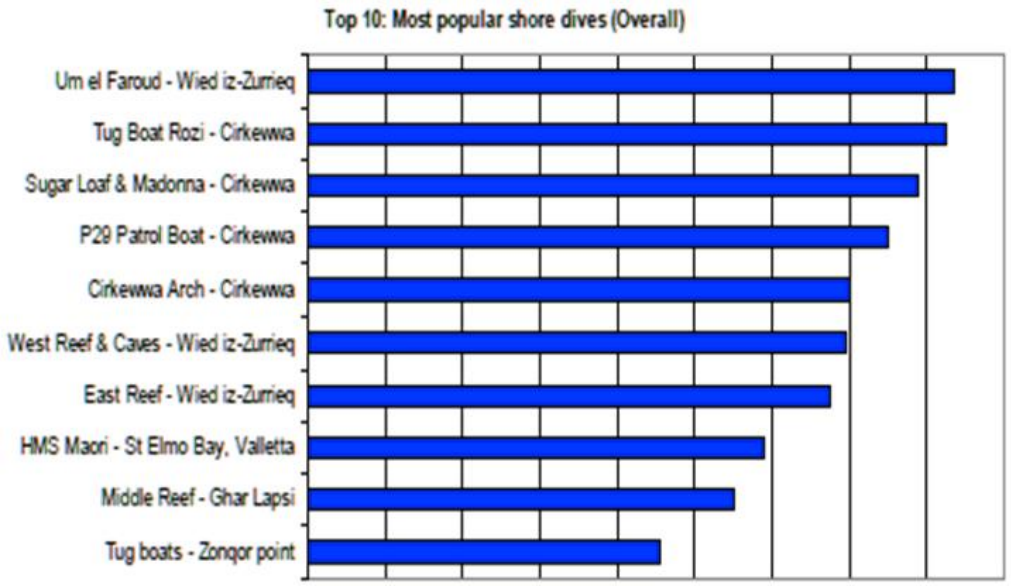

Figure 23 - E2. Most popular shore dives (Adi Associates, 2011).

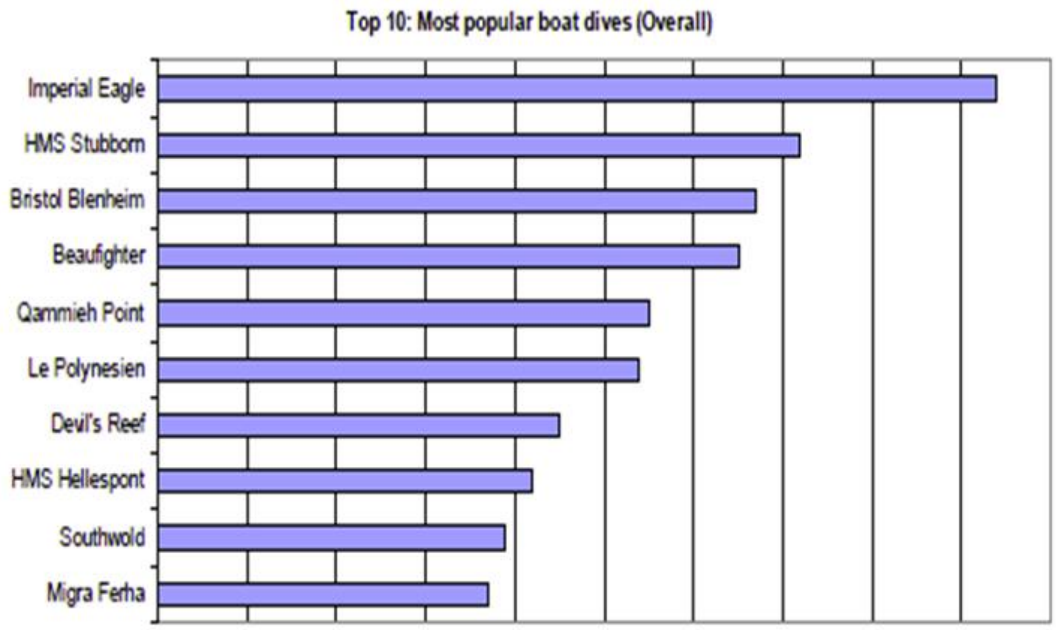

Figure 24 - E3. Most popular boat dives (Adi Associates, 2011).

iv) Beaches

There are a number of sandy beaches in the Maltese Islands, the most popular ones include Mellieħa Bay, Għajn Tuffieħa and Golden Bay, located on Malta; and Ramla l-Ħamra on Gozo, all of which lie within Natura 2000 sites.

Many sandy beaches in the Maltese Islands were supported by sand dune systems, however, most of these have since been lost and those that remain are in a degraded state as a result of anthropogenic activities (Schembri, 1997) such as the construction of obstructing structures such as roads or recreational facilities that do not allow for natural beach replenishment. As a result of this alteration to beach dynamics, a number of beaches have eroded away over the years. This has resulted in a number of beaches diminishing in size, and in some cases, eroding away almost completely, for example, at Xemxija Bay. Given the importance of beach space to supply the increasing number of tourists visiting the Maltese Islands, way back in 2003 the Malta Tourism Authority (MTA) studied the possibility of artificial beach nourishment in the Maltese Islands. The study led the MTA to take the decision to go down the route of beach replenishment. In 2004, in order to improve and safeguard an important part of the tourism product, the MTA replenished St George's Bay in St Julian's, importing coarse sediment of terrestrial origin from overseas and depositing it at the head of the bay to create an artificial beach. Following further studies, in 2006, the perched beach in Qawra was developed. Both beaches have been awarded the Blue Flag.

v) Coastal Tourism Development

Most coastal tourism development has been focused on the northwestern coast of Malta. Tourist accommodation consists of a wide variety of hotels and self-catering apartments. Many of these are located within Sliema, Mellieħa and Buġibba. The Sliema-St Julian's – Paceville area is the largest of the three and includes a relatively large number of restaurants and other amenities. The Buġibba-Qawra area has grown significantly over the last few decades.

2. Pressures and impacts

i) Cruise liner tourism

Cruise ships generate a number of waste streams that can result in discharges to the marine environment, including sewage, grey water, hazardous wastes, oily bilge water, ballast water, and solid waste (Butt, 2007; Brida & Aguirre, 2008). An example of the extent of discharges: black water and grey water (respectively 15,000 to 30,000 and 90,000 to 255,000 gallons per day by a typical large ship with 3000 passengers); solid waste (24% vessel waste worldwide comes from cruise ships); and bilge water (an average of eight metric tons of oily bilge water for each 24 hours of operation); as well as ballast water and air pollution. Moreover, cruise liner waste disposal is largely unregulated. Improper waste disposal can introduce pathogens and toxic substances resulting in impacts on biodiversity including commercial species and important habitats.

ii) Yachting and recreational boating

Anchoring of yachts around the Maltese Islands can negatively impact the benthos. Recreation, including beach use is also a main source of marine litter. Yachting is a source of contaminants in the marine environment releasing tar, lubricating oils, and biocides from anti-fouling paints resulting in reduced water quality.

Cruise liners and yachting (through anchorage) can introduce non-indigenous species potentially resulting in pressure on local biodiversity and food webs. They can also contribute to strikes on larger marine fauna including cetaceans and marine turtles.

iii) SCUBA Diving

SCUBA diving has a direct negative impact on underwater caves. Diving may cause both mechanical damage to erect sessile forms growing in these caves, and death of the biota on the ceiling due to trapped air bubbles from diving cylinders.

Impacts from wreck scuttling include loss of habitat from the footprint and the immediate surrounding area. Therefore, correct siting is important to reduce such impacts as far as possible and potential contamination from remnant paints that may not have been removed. Wrecks act as fish aggregating devices and they are colonised by various species that also grow on the structure thus creating a community and enhancing biodiversity at the site. The Veterinary Regulation and Fisheries Conservation and Control within the Veterinary and Fisheries Affairs Division has set a number of conservation areas around some of these wrecks[26]. It is noted, that the fish that occur at the wreck would not normally be present/resident in, or represent the surrounding environment, therefore there is a degree of artificiality. The recently scuttled vessels are required to undergo environmental monitoring and are considered to be protected areas. Such reports must be submitted to MEPA as per permit conditions.

iv) Beaches

Artificially replenished beaches pose a risk of loss of sand to the marine environment that could result in burying of the benthic habitat. Environmental monitoring for St George's Bay by Borg et al., (2006) indicated that there has not been any significant transport of the sand to

[26] *Notice to Mariners No 5 of 2008*

the sublittoral and overall the development of the beach has not resulted in significant negative impacts on the marine environment.

v) Coastal Tourism Development

Touristic development of the coast can impact the marine environment through changes in hydrodynamics, as well as physical loss depending on the types of interventions. A number of large hotels have their own desalination plants, which discharge brine into the marine environment. Any ancillary developments, e.g. yacht marinas, could potentially result in impacts from dredging, installation of moorings, etc.

3. Future trends

The Draft Tourism Policy 2015-2020 refers to a tourism vision for 2030 that safeguards the positive aspects of the country's attractiveness as a tourism destination for the benefit of visitors and the host population alike. This vision is based on the concept of managing visitor numbers, raising the level of quality across the entire sector and reducing seasonality with a view to achieve improved competitive positioning in the international tourism market. It also makes reference to emerging new services within this sector, such as the film industry, cruise liner industry and English language teaching and other types of teaching tourism.

According to the World Travel and Tourism Council (2014), the overall travel and tourism sector in the Maltese Islands is projected to continue to grow at a rate of 3.6% per annum to 2024 in direct contribution to GDP.

Cruise liner visits are expected to increase as reported in the draft Tourism Policy 2015-2020. Extension of existing facilities as well as the creation of new quays are anticipated in order to improve efficiency of operation if more liners visit the Islands.

In the yachting sector, berthing demand currently exceeds supply. Thus, Malta is seeking the growth of the yachting industry through the provision of new permanent marinas as well as temporary ones, which would be operational during the summer months. In their 2009 report describing *Development of Yachting Facilities in Malta* the then Malta Maritime Authority (MMA) and Ministry for Infrastructure, Transport and Communications (MIRC) carried out a site selection exercise to identify potential suitable locations for new marinas and temporary ones. The site selection criteria included environmental criteria. Applications for the expansion for three of the existing marinas are (at time of writing) pending at MEPA. The Malta Tourism Authority has also submitted an application for an additional marina at Marsamxett Harbour, Sa Maison, Pietà, which is one of the sites identified in the 2009 site selection exercise.

The Diving Master Plan (Adi Associates, 2011) indicates that consideration of scuttling additional vessels is part of the Plan's objective to diversify the product.

The MTA are currently embarking on another beach replenishment project – this time at Xemxija Bay (Adi Associates, 2011). In the long term, assuming consistent success of this type of project, it is considered likely that other beaches will be selected for artificial replenishment, based on the identification of other candidate sites identified by Adi Associates and Sciortino (2003).

Large new tourist accommodation developments are being proposed by the private sector including a site at Għadira, which proposes a seven-storey 5 star hotel.

4. Impacts on GES

Table 14 - E2 illustrates the evolution of the pressures exerted by tourism, based on a set of established indicators.

MSFD Descriptor	Impacts of tourism on GES	Future trends
D1 – Maintenance of biological diversity	Impacts include discharges into the marine environment, introduction of NIS from cruise liners and yachting, burial through scuttling of vessels (localised), and impacts from divers (localised).	↘
D2 - Non-indigenous species	Increased pressure from the increase in the cruise and yachting activities.	↗
D3 – Commercially exploited species	Impacts from cruise liner waste disposal and release of contaminants.	↗
D4 – Marine food webs	Potentially significant if habitats and/or key species supporting important feeding grounds are negatively affected and if invasive NIS are introduced.	↗
D5 – Nutrient enrichment	Increasing berthing space should result in additional boat activity leading to increased eutrophication, marine contamination and turbidity. New marinas require the construction of ancillary structures such as a breakwater, which may further impact water circulation in the harbour areas. Such effects would need to be studied.	↗
D6 - Sea-floor integrity	Scouring from scuttled vessels – localised.	↘
D7 – Alteration of hydrographical conditions	Boating and marine discharges from development on the coast can affect turbidity and salinity.	↗
D8 – Concentration of contaminants	High pressure on the marine environment from cruise liner activity. Other recreational boating also contributes.	↗
D9 - Contaminants in seafood	Whilst mercury has been detected in *Posidonea oceanica*, for example, as part of MEPA's WFD monitoring programme, given that limited data is available, and in the absence of background levels the status of non-synthetics in biota is not being determined at this stage. Determination of status will be carried out once trend data is available.	unknown
D10 - Marine litter	Recreational activities are a source of marine litter with likely increased pressure in the future.	↗
D11 – Introduction of energy, including underwater noise	Recreational boating creates underwater noise potentially affecting marine species, however, the extent of this impact is uncertain.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 14 - E2. Impacts of tourism sector on GES.

5. Interaction with other sectors

Fishing, and in particular, overfishing, conflicts with the diving sector, as each one is competing for the same resource in terms of integral habitats. Particular conflicts are apparent between divers and spear fishers as well as fishing carried out at dive sites and wrecks, which is illegal.

Fish farms located close to dive sites may also create problems for diving activities in terms of water quality.

A reduction in water quality from yachting and cruise liners could negatively affect fish farm operation.

Tourism seasonality adds pressure to marine protected areas and the marine environment in general. A number of popular tourist sites are located within marine protected areas, for example, Comino, which is a Natura 2000 site. This site experiences extreme pressure on the benthic environment, among others, from the number of boats carrying visitors to the islands and other pleasure craft anchoring in the vicinity. Thus successful management of these areas is important to ensure the long-term sustainability of the sector as well as of the marine environment.

Figure 25 - E4 shows an example of an initial scoping exercise identifying potential impacts from proposed development, in this case a marina at Birżebbuġia. It illustrates how part of the proposed site includes *Posidonea oceanica* meadows overlaps over a priority Annex I habitat under the Habitats Directive and therefore potential impacts and mitigation measures (including re-design) will need to be assessed and identified, respectively, at project level through an Appropriate Assessment and an Environmental Impact Assessment.

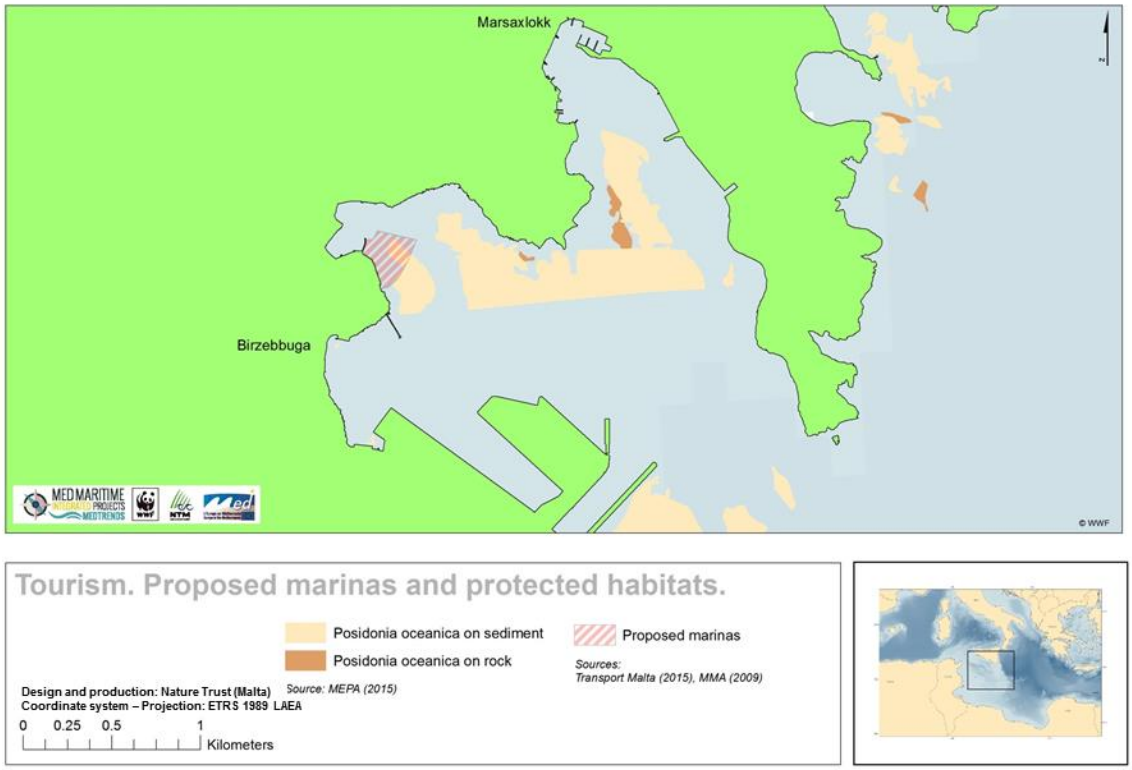

Figure 25 - E4. Example of an initial scoping exercise identifying potential impacts from proposed marina development at Birżebbuġia, Malta.

6. Nature Trust (Malta) recommendations

Current legislation related to development in areas designated as 'outside development' (or ODZ) legitimizes development only if it contributes to the National economy and supported by government initiatives. In this context, Nature Trust (Malta) urges national authorities to exclude further tourism-related development on ODZ along the coastline in order to preserve the coastal and marine environment.

Nature Trust (Malta) is aware of the Diving Master Plan of the Maltese Islands[27] which supports improved management and protection of diving sites. It encourages the Government to uphold the medium and long-term objectives of this Master Plan towards cleaner seas, more environmental awareness and training, and environmental protection through better regulation. It also urges local authorities to establish carrying capacities for each of the established diving sites.

Although not yet developed in the Maltese Islands, the potential exists for the organisation of whale and dolphin-watching activities in Maltese territorial waters. At several Mediterranean harbours, whale- and dolphin watching excursions are becoming popular among tourists. Nature Trust (Malta) therefore recommends that regulations are developed as soon as possible to control the operation of any such activities that might be set up in the future.

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[27] *http://www.mta.com.mt/divingmasterplan*

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F. Maritime Transport

1. Background and current situation

The Mediterranean is a busy maritime traffic region of the world. There are three major routes to and from the Mediterranean, one of which is the Sicilian channel. Malta is situated along a number of important shipping lanes. According to official information, more than 65,000 vessels ship within 20 NM of the Maltese Islands. These vessels have been identified as container (25%), merchant (26%) and tanker (16%) vessels (MMA, 2009).

The level of activity renders the risk of accidental spills and illegal discharges relatively high. In addition, busy routes are also important bunkering areas. The traffic density within the EEZ of Malta is shown in fig. 26 - F1. The Malta-Adriatic Sea, which is the busiest route with 27,600 vessel transits per annum, is the route with the highest bunker volume for vessels above 40,000 DWT (dead weight tonnage) (65% of the traffic in the area). This route accounts for all vessels visiting the main port of Valletta. The Suez-Marsaxlokk route has the second highest total bunker volume (29%) for ships greater than 15,000 DWT. Through this route, around 10,300 vessels transit annually (MEPA, 2011).

The volume of Hazardous and Noxious Substances (HNS) transported within 20 NM of the Maltese Islands is estimated to be 101 million tonnes per year, while 937 million tonnes of hydrocarbons are estimated to be transported over the same period.

Despite heavy traffic and dangerous loads, there have been no major accidents recorded in Maltese waters between 1999 and 2011. Evidence of offshore spillage events has reached Maltese shores in the form of tar balls. The location of known spillage events occurring within and near the EEZ of Malta during the period 1977-2014 is illustrated in fig. 27 - F2. A closer look at the accidents within the 12 NM area of the Maltese islands, a number of ship-related accidents have been reported (fig. 28 - F3).

Malta's geographical position has allowed it to develop a range of maritime services. As at end of December 2012, approximately 6,000 ships with a total gross tonnage exceeding 45.6 million were registered in Malta in accordance with the Merchant Shipping Act.

A ferry service operates between Malta and Sicily, while an inter-island ferry service operates between Malta and Gozo. Water taxis operate between Malta and Comino, Gozo and Comino, Valletta, Cottonera and Sliema.

Cruise liners, yachting and other pleasure crafts are considered in section VII(E) of this report. Readers should also refer to section VII(H) of this report for relevant information on local ports and harbours.

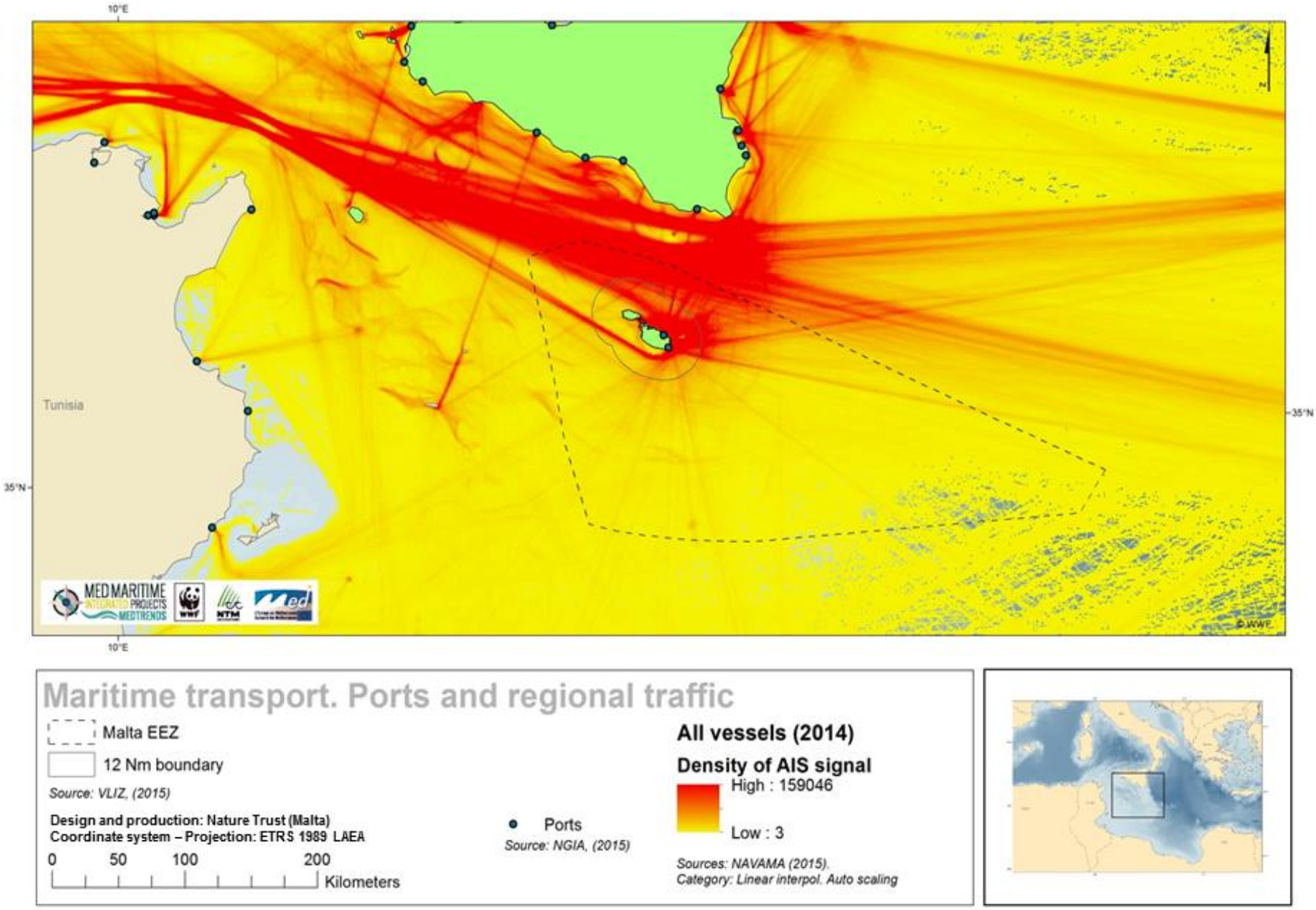

Figure 26 - F1. Traffic density in 2014 in relation to Malta's EEZ.

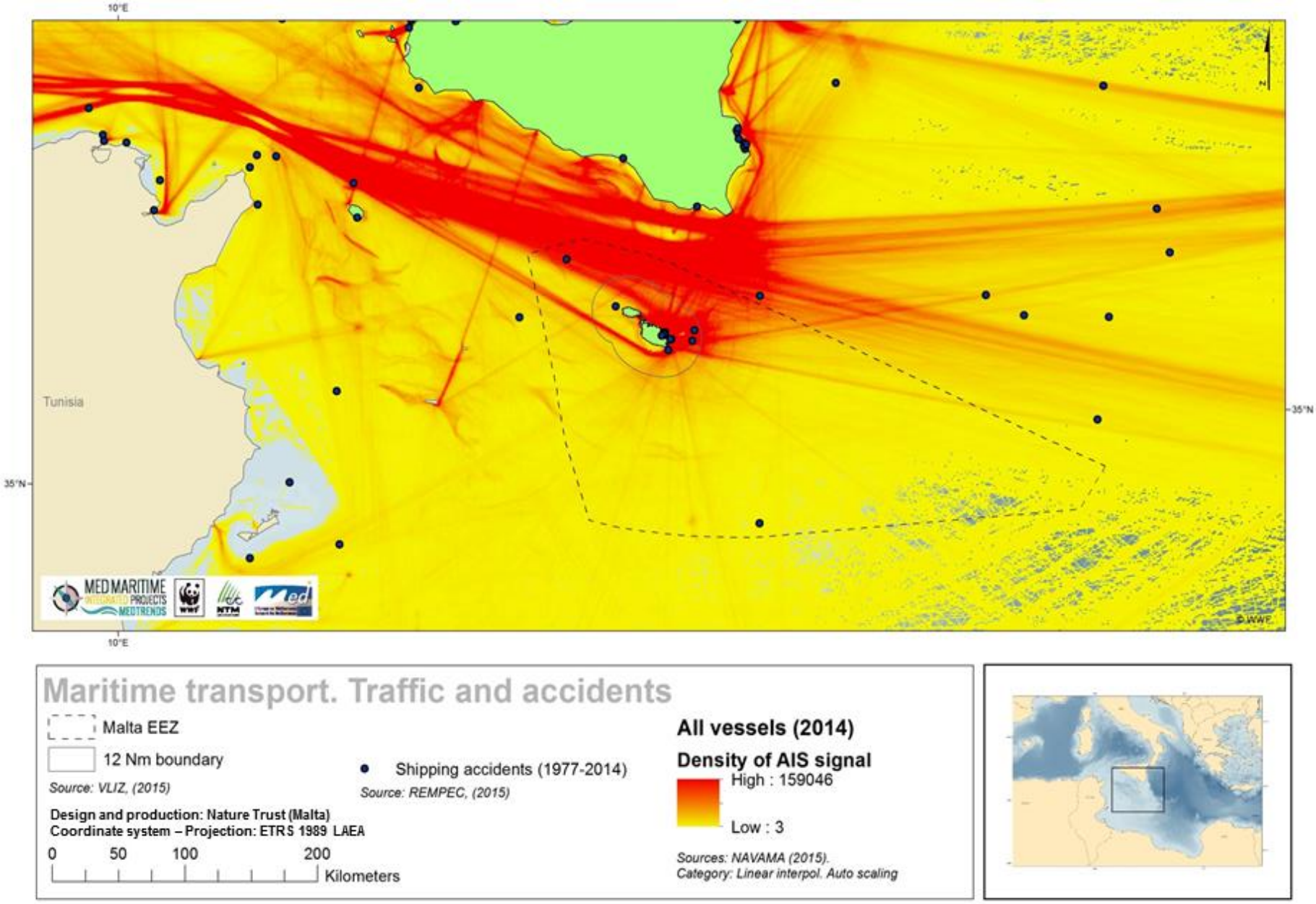

Figure 27 - F2. Traffic density in 2014 and reported shipping accidents (1977-2014) in relation to Malta's EEZ.

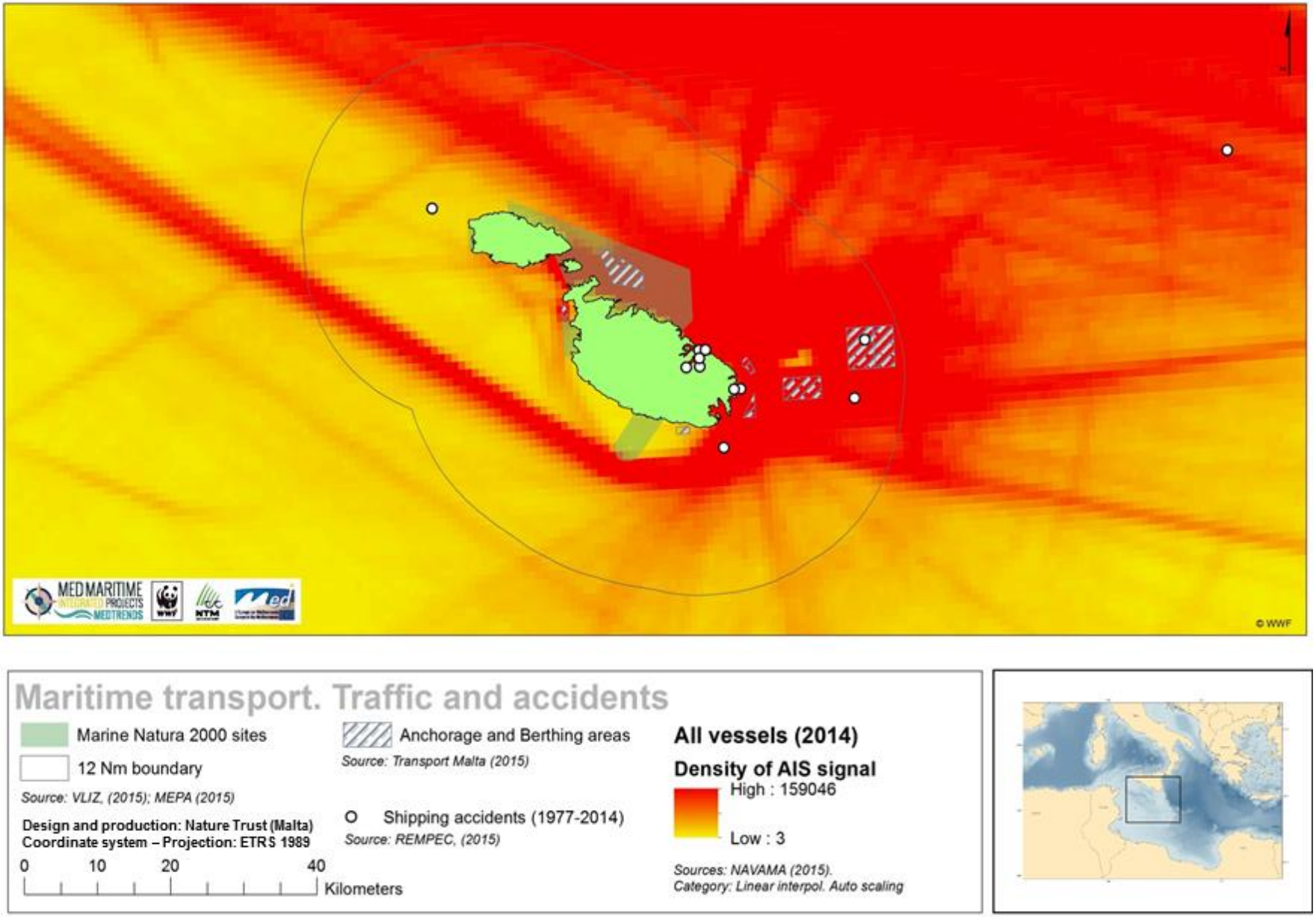

Figure 28 - F3. Reported traffic accidents (1977-2014) within the 12 NM boundary of the Maltese islands.

2. Pressures and impacts

The degree of maritime traffic around the Maltese Islands translates into a relatively high risk from oil spillages, illegal discharges, vessel collision and grounding. Apart from direct negative impacts on the marine environment to be expected from oil spills are the impacts due to the release of contaminants of non-synthetic and synthetic substances on biodiversity, food web structure, water quality, water column habitats, and sediments.

In the unfortunate case of a major oil spill event, the Islands' ability to generate a potable water supply to meet demand would be seriously compromised, thus jeopardising Malta's self-sufficiency in this sector. This can have a cascading effect on other sectors such as tourism. Reference should also be made to section I below of this report in this regard. The effects are likely to be long-term in cases where a major event happens.

In view of a lack of data it is currently not possible to provide information on the level and trend of the pressure from oil spills in the marine environment, namely spatial distribution and concentration of contaminants from significant pollution events.

Although no major pollution events have been described, small and medium scale events can result in significant cumulative negative effects.

Maritime traffic is the main source of introduction of non-indigenous species (NIS) through illegal discharges of ballast waters by maritime traffic.

The busy traffic poses a threat of ship strikes with cetaceans and turtles. Maritime traffic can also generate significant underwater noise that potentially results in negative impacts on cetaceans in particular, potentially resulting in changes in their behaviour and possibly also affecting any critical populations. However, there is little knowledge on the secondary effects resulting from these changes. It is important to note that the Maltese Government is currently carrying out a LIFE Migrate Project (LIFE11 NAT/MT/1070) in order to study the status of cetacean populations in Maltese waters. This project is expected to finish in 2016[28].

A number of anchorage sites are located around the Maltese Islands (fig. 29 - F4). Such an activity will result in direct impacts on the benthic environment including impacts on habitat including physical damage. Sikka l-Bajda, which is one of the bunkering sites shown in fig. 29 - F4, forms part of the largest bunkering site in Malta. In 2009, a total of 563 oil tankers used this site for bunkering.

The Government of Malta is obliged to comply with Annex 1 of the IMO Convention for the Prevention of Pollution from Ships (1973) as modified in 1979 (MARPOL 73/78)[29] . In 2013, the Government granted a 30-year temporary emphyteusis to a private company to operate and manage Malta's waste reception facility and to make the necessary upgrading works to improve the much-needed safety and environmental quality standards of the facility[30], amongst other obligations. For half a century, this facility has been inducing a negative pressure onto the marine environment by discharging its wastewater into the adjacent sea. However, the Planning Directorate is discouraging further investment on this site and instead is recommending relocation[31]. It is thus being understood that there will be a positive trend in the future with regard to the management of this waste as well as substantial improvement in the quality of local coastal waters.

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[28] *http://www.mepa.org.mt/lifemigrate*
[29] *This is to have a facility for the reception and treatment of all dirty ballast and tank washing water from oil tankers and other residues and oil mixtures from all ships.*
[30] *which has been in operation since 1965.*
[31] *http://www.maltatoday.com.mt/news/national/50302/ricasoli_tank_upgrade_in_doubt#.VauscPnzrIW*

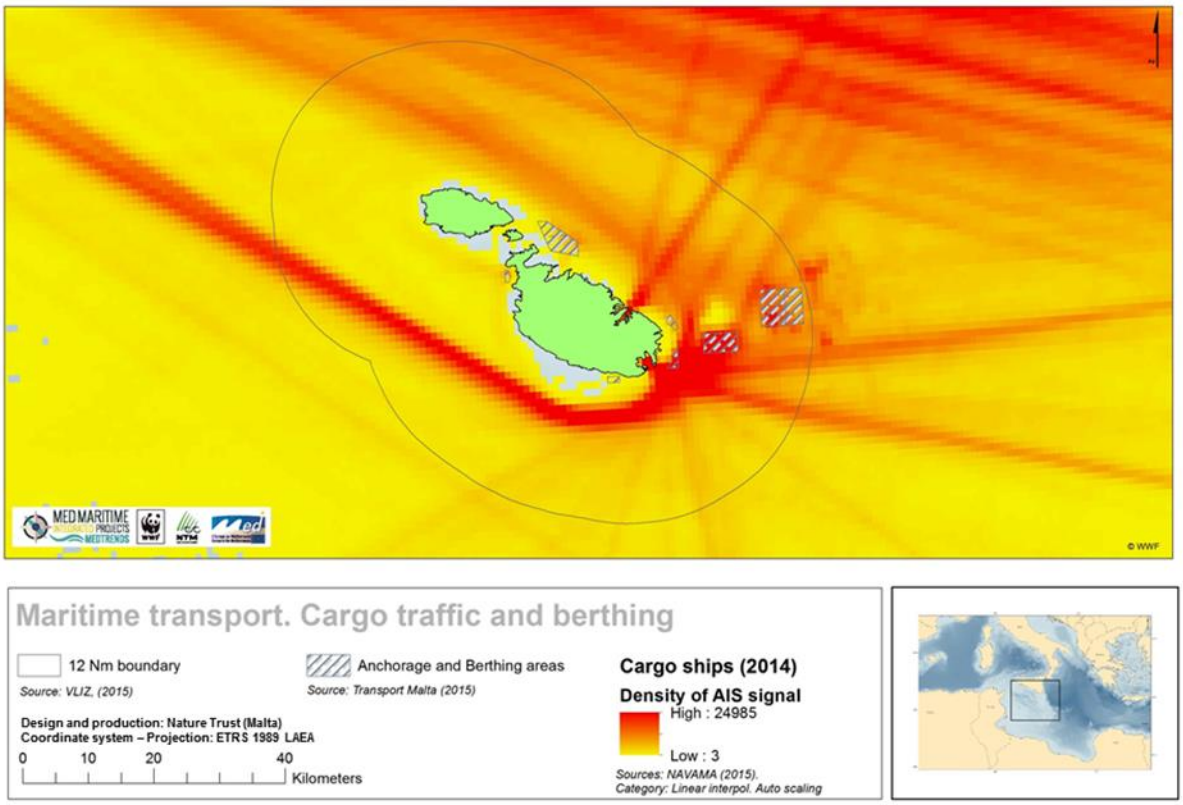

Figure 29 - F4. Cargo traffic density in 2014 and anchorage sites within the 12 NM area.

3. Future trends

Vessel activity within the Mediterranean has been steadily increasing and is expected to continue to increase, coupled with the deployment of even larger vessels. Deployed maritime transport capacity increased by 50% between 1997 and 2006. This was a result of an increase in ship traffic frequency (15%) and an increase in ship size (reportedly by 30%). Port traffic related to oil transport increased by 6% per annum between 1996 and 2006; oil transport deploys the larger ships (125,000 DWT on average), which size has increased by 26% within 10 years.

Projections are for an increase of 18% in vessel activity over ten years from 2008, with chemical tanker and container vessels showing the highest rates of growth with respect to port callings within the Mediterranean. Transits through the Mediterranean are also expected to increase by 23%. The increase is expected to be most pronounced in the product and crude oil tanker sector.

In terms of local maritime transport, Malta's draft Operational Programme I 2014-2020 identifies Government's commitment to investing in sustainable transport by means of, for example, promoting a modal shift. Although take-up of inter-town use of maritime transport has been low to date, the OP states that this option will continue to be pursued and necessary support will be given. The OP is also considering a fast ferry service between Malta and Gozo. Investment is also considered important for ports and services in line with the ethos behind Motorways of the Sea, which is a concept that aims at introducing new intermodal maritime-based logistics chains in Europe.

Reference is made here to the Government's vision of making Malta a maritime hub[32]. It aims at stimulating further the economy by converting the formerly Marsa shipbuilding site (having an approximate area of 175,000 m^2) into a Maritime Hub. The four main strategic areas of such a hub could include (i) support to oil and gas industry and logistics, or (ii) ship repair, yachting and logistics, or (iii) super yacht refit, offshore energy regional support or (iv) servicing of yachts and related services. Such a plan is seen as compatible with the Government's future economic development plans for the shipping sector.

4. Impacts on GES

The evolution of the pressures exerted by the sector, based on MedTrends indicators is shown in table 15 - F1.

MSFD Descriptor	Impacts of maritime transport on GES	Future trends
D1 – Maintenance of biological diversity	High pressure on benthos, demersal and pelagic species in the case of oil spills. Increased impacts from ship strikes on cetaceans and turtles. Introduction of NIS (see D2 below) poses a threat to the local marine environment	
D2 - Non-indigenous species	Major contributor to the introduction of NIS, with the ever-increasing maritime traffic and bunkering, the impacts are identified as potentially significant.	
D3 – Commercially exploited species	Similar to D1, commercial species are under threat, in particular, from oil spills but also from potential introduction of competitors.	
D4 – Marine food webs	Potentially significant given introduction of NIS (see D2 above). Potential changes in cetacean behaviour may have a cascading event within the ecosystem.	
D5 – Nutrient enrichment	Increased localised impacts in harbours, however, waste management procedures can potentially reduce risk of contribution to this impact.	
D6 - Sea-floor integrity	Could be significantly affected in the case of an oil spill. The risk of this happening is likely to increase given the projected growth in the sector.	
D7 – Alteration to hydrographical conditions	High pressure due to increased maritime activity and future developments of this sector.	
D8 – Concentrations of contaminants	Release of contaminants into the marine environment present in bilge waters, oil spills, and other pollution events can contaminate both the water quality as well as sediments. However, this contamination is expected to diminish in the future.	
D9 - Contaminants in seafood	Potentially during harmful algal blooms resulting from cumulative impacts The future scale of this is unknown.	unknown

[32] *https://privatisation.gov.mt/en/current-projects/Pages/Maritime-Hub.aspx*

MSFD Descriptor	Impacts of maritime transport on GES	Future trends
D10 - Marine litter	Potentially significant from this sector due to the high traffic densities.	↗
D11 – Introduction of energy, including underwater noise	Shipping creates underwater noise potentially affecting marine species; however, the extent of this impact is uncertain.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 15 - F1. Impacts of maritime transportation on GES.

One important emerging issue related particularly to the loss of marine biodiversity concerns collisions between vessels and whales, dolphins and porpoises (cetaceans). Such events are now thought to be happening more frequently than previously due to increased marine traffic. Ship strikes are likely to pose a serious threat to regional populations of some species – such as the genetically isolated sub population of fin whales found in the western Ionian Sea (such as *Balaenoptera physalus*[33]). Historic French and Italian stranding records (such as the ones covering the periods 1972-98 and 1986-97 respectively) cite ship strikes as the known or possible cause of whale deaths for up to 22% of fin whale stranding.

This is backed up by the studies conducted by Pesante et al., (2000) who believe that the reproductive segregation of Mediterranean fin whales from the North Atlantic stocks, and the small population size of the Mediterranean fin whales mean that the level of dead/injured whales resulting from such collisions is a source of concern.

Apart from fatal collisions, non-fatal ones can also cause serious injury and are likely to negatively affect the viability both of the affected animal and also its social group (Dolman et al., 2006). The records of fast ferry whale strikes seem to indicate that many whale species that are struck by other vessels are also struck by fast ferries (Weinrich, 2004).

5. Interaction with other sectors

As already explained, the risks of oil spills could negatively affect the operation of local desalination plants depending on the coastal area affected. Other sectors that are likely to be negatively affected in the case of oil spills include fisheries and aquaculture, tourism and nature conservation.

Figure 30 - F5 illustrates the interaction between the designated anchorages and berthing sites, marine protected areas and underlying marine protected areas. One anchorage site lies directly within the north-eastern protected area, whilst a smaller site off the eastern coast of Gozo lies close to the boundary of the marine protected area.

[33] *http://www.iucnredlist.org/details/2478/0*

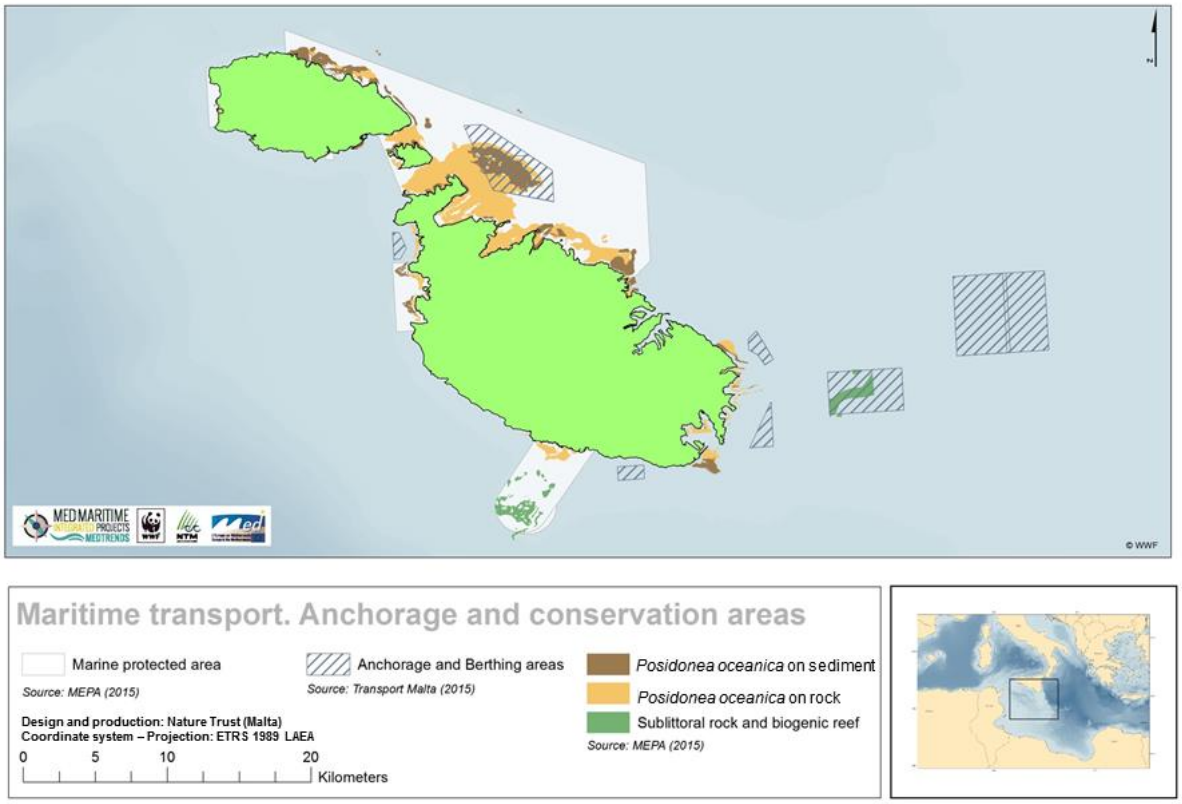

Figure 30 - F5. Anchorage sites in relation to marine Natura 2000 sites and some benthic communities.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) recommends local authorities and other NGOs to adapt a standardised approach in order to quantify the number of whales killed from ship strikes. Nature Trust is aware that reported numbers will never give accurate estimates of the numbers of whales involved and so there is a need for estimates on an understanding of risk and relating this to densities of ships and whales.

The NGO understands that there is no universal solution to the problem of ship strikes but clearly the most effective way to reduce collision risk is to keep whales and ships apart. It is essential that mitigation measures are introduced that would ensure the minimisation of this hazard. Authorities should refer to successful mitigation measures that were carried outside the Mediterranean by looking patterns of whale and vessel distribution as well as practicable alternative shipping routes.

Nature Trust (Malta) recommends the improvement of transport management of oil tankers when passing through the Sicilian Channel so that the high risk of oil spillage in the area that could potentially arise from such intense traffic is minimised.

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G. Land-based Activities

1. Background and current situation

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. Regulated land-based activities that discharge to the marine environment include:

- Sewage treatment facilities;
- Energy generation facilities;
- Desalination plants;
- Shipyards;
- Land-based fish farm activities;
- Oil and fuel terminals; and
- Diffuse land-based sources.

It should be noted that MEPA's environmental permitting system has only recently started to function and therefore, other marine discharges which are not currently permitted are also likely to be present throughout the Maltese Islands.

i) Wastewater Treatment

Before 2008, only a small percentage of sewage was treated prior to discharge to sea, and the bulk of sewage generated in the Maltese Islands was discharged as raw sewage from a number of outfalls, such as San Blas and Wied il-Mielaħ in Gozo, and Iċ-Ċumnija and Wied Għammieq in Malta. Sewage was released into the sea via a submarine pipe that ran perpendicular to the coast. When the submarine outfall was not operating, sewage was discharged near the shoreline. The release of untreated wastewaters resulted in microbiological and nutrient pollution in the coastal waters.

Malta's National Action Plan for the Protection of the Marine Environment from Land-Based Activities (MEPA, 2005) identified sewage as the environmental issue of top priority that needed to be addressed most urgently. Subsequently, the Water Services Corporation commissioned three new wastewater treatment plants: The two urban wastewater treatment plants at Ras il-Ħobż (Gozo) and Iċ-Ċumnija (Malta) were commissioned in November 2007 and October 2008, respectively, whereas the Malta South plant at Ta' Barkat started operating in June 2011. The latter plant treats 80% of sewage produced in Malta. Following installation and operation of all facilities in 2011 the monitoring of waste water nutrient loads showed a significant decline with respect to the values recorded (for parameters such as COD, BOD5, Total Suspended Solids, and nitrogen and phosphorus) during previous years when not all sewage was being treated. Data on the composition of wastewater collected during the period 2008-2011 at key points of the wastewater collection and transmission network indicated detectable contamination by chemicals listed in the Priority Substances Directive (MEPA, 2011).

It is important to note that during certain heavy rainfall periods, sewage effluents can reach the marine environment through sewage overflows. However, such occurrence is deemed to be highly localised and transitory (MEPA, 2011).

Although the treatment of all sewage prior to disposal at sea indicates that Malta is compliant with the Urban Waste Water Treatment Directive in this respect, challenges still remain due to the fact that animal waste from the agriculture sector (mainly pig slurry) is also being disposed of in sewers. A recent report in the Times of Malta daily newspaper (26th February 2015) has highlighted that the Ta' Barkat facility was, at the time of writing this report, undergoing maintenance works and as a result of this work, the plant was instead discharging raw sewage to the sea. Water Services Corporation has indicated that the plant needed to undergo maintenance as a result of animal waste which periodically clogs up the system.

ii) Energy generation

Associated with the operation of the power stations at Marsa and Delimara is the discharge of thermal effluents. Cooling waters from the Delimara power station are discharged into a bay known as Il-Ħofra ż-Żgħira on the eastern side of the Delimara peninsula. In June 2003, waters at Marsa and Il-Ħofra ż-Żgħira, were found to be at 5.4°C and 5.5°C above ambient temperature up to 25-50 m away from the discharge points. In 2010, the discharge rate was 295,000 m^3. The increase in ambient temperature was observed to spread throughout most of the Grand Harbour area, while in the case of Il-Ħofra ż-Żgħira, it extended throughout most of the creek. Reduced oxygen levels, high levels of chlorophyll a and occasional water turbidity were also recorded in these areas.

Cooling waters used by power stations and discharged into aquatic environments may contain traces of toxic chemicals such as antifoulants as well as polyaromatic hydrocarbons (Axiak, 2004). Past annual environmental reports issued in 2011 showed that cooling water discharges from the Marsa (which is now inoperative) and Delimara Power Stations were found to be in conformity within the established limits for such installations.

In line with the Large Scale Combustion Plant Directive, Malta has decommissioned the Marsa Power Station This closure was linked to Enemalta Corporation's extension for an additional 144MW extension to the Delimara Power Station. The Environmental Impact Assessment (EIA) carried out for the plant identified that predominant impacts of the power plant operations at Delimara are those of the thermal effluent at Il-Ħofra ż-Żgħira and the hydrodynamic changes resulting from the quay and breakwater construction along the eastern side of Marsaxlokk Bay. With the plant extension now in place, thermal effects on marine benthic communities at Il-Ħofra ż-Żgħira are predicted to be aggravated in view of higher volumes of thermal effluent being discharged.

iii) Freshwater production

Local discharges of brine are mainly associated with the operation of the three desalination plants. However, brine is also known to be discharged by tourist resorts as part of their water purification system. Brine discharges from public desalination plants amounts up to 24 million m^3 per year (MEPA, 2011). Quantification of brine discharges from other sources is as yet unknown.

iv) Shipyards

Shipyards located in the Grand Harbour area also constitute a source of contaminants in 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.

At these sites, waste streams containing toxic chemicals were mostly discharged directly to sea. These discharges contained a range of organic and heavy metal contaminants of known toxicity (MEPA, 2011). Shipyard-related work at the Malta Shipyards was reduced significantly during the last decade.

v) Land based fish farm activities

Land based aquaculture installations produce effluents resulting from net cleaning, defrosting of frozen bait, and from processing and packaging. The 2003 National Baseline Budget identifies that wastewaters from this sector are expected to include significantly high levels of suspended solids including organic matter.

vi) Oil and fuel terminals

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 most significant contaminants include petroleum hydrocarbons, as well as heavy metals including nickel, lead, boron, zinc and copper. High BOD levels have also been recorded.

vii) Diffuse land-based sources

Contaminants from diffuse land-based sources may ultimately reach coastal waters through surface water run-off transporting such contaminants from water catchments into the marine environment. Such sources encompass a wide spectrum of activities including industrial and agricultural activities. Storm water runoff within urban catchments is generally associated with the transport of debris, litter, traces of oil and sewage as well as particulate matter, (such as soot from vehicular and industrial activities) to the water environment. Agriculture, through an excessive use of fertilisers and pesticides, and animal husbandry activities from the mismanagement of wastes, may also lead to the dispersion of fertilisers, pesticides and nutrients into the marine environment through water run-off (MEPA, 2011). Pesticides pertaining to the group of ‘Persistent Organic Pollutants’ (POPs) have now been banned; however there is no information regarding on-going usage of these chemicals from current stockpiles.

2. Pressures and impacts

Waste discharges into the coastal marine environment from the various land-based facilities described above exert varying types of pressures.

Sewage outfalls and overflows as well as agricultural runoff contribute to nutrient and organic matter enrichment, one of the most significant pressures affecting water column habitat types (MEPA, 2011). Moderate nutrient enrichment can influence the fish assemblage by attracting gregarious and planktivorous fishes. This remains a potentially significant pressure given the current situation whereby animal waste is being sent to the sewage treatment facilities, which

were not designed to accept such a load. Until a feasible alternative is identified and implemented for treatment and management of animal waste, it is likely that raw sewage will continue to end up in the marine environment. Even where treatment is occurring, it cannot be confirmed that the discharge is up to the standard required since the facilities are not operating under optimal conditions.

The impact of cooling water discharge from the Delimara power station was assessed in 2010. Potential impacts to the health of *Posidonea* meadows from significant changes in the water column thermal regime include an increased epiphytic growth, a regression in the extent of seagrass meadows and their replacement by *Cymodocea nodosa* and photophilic algal assemblages. The effects of the discharge of cooling waters on the marine ecosystems in the area will be assessed annually as part of the environmental permit of the power plant.

The significance of marine contamination from land-based aquaculture facilities is to date considered low. However, these activities are also considered to be a source of release of litter into the marine environment.

Discharges from municipal desalination plants and cumulative discharges from tourist resorts are sources of hazardous substances. Brine discharge is expected to affect salinity levels at discharge points. Effects of changes in salinity need to be monitored.

3. Future trends

Under normal operating conditions, the recovery of the marine environment is expected to improve now that all waste water is being treated. The rate of this recovery, however, is yet to be indicated by the on-going monitoring carried out under the Water Framework Directive monitoring programme.

Changes in surface and seabed temperatures as a result of cooling water discharges at il-Ħofra iż-Żgħira were modelled in 2011 with a view to assessing the environmental impacts of additional cooling waters from an extension to the Delimara Power Station. On the basis of a predicted total discharge of cooling waters of 43,000 m^3/hr, the following changes were predicted:

- An increase of up to 8^0C surface temperature inside the bay at the outfall, while surface temperatures just outside the bay would increase up to 2^0C;
- An increase in seabed temperatures inside the bay. Under normal weather conditions, seabed temperatures outside the bay would be unaffected, and
- Under condition of strong wind and wave action, seabed temperature was predicted to increase by 1^0C outside the bay and 1.5^0C in a small area at the mouth of the bay.

An increase in water and seabed temperatures is expected to result in added pressure on marine habitats and communities, potentially affecting their structure and function. This would not be in line with the spirit of the Habitats Directive when considering specific habitat types such as seagrass meadows. As part of the permit requirements, a long term monitoring programme is on-going at the plant.

Further growth is expected in certain economic sectors, such as aquaculture, where the National Strategy describes that there will be investment in the sector, including a new (land-based hatchery). Growth in tourism is also predicted (refer to chapter VII(E) of this report), shipyard operations are expected to remain stable. There is currently not enough evidence to be able to identify whether growth in these sectors can be decoupled from environmental impact such that the potential negative effects identified are minimised despite growth in the sector.

Another significant pressure is coming from the lack of an appropriate waste reception system from the agricultural sector (namely from dairy, poultry and pig farms). This resulted in periodic malfunctions of the major wastewater treatment plant at Ta' Barkat which leads to the direct discharge of some 80% of the total national untreated sewage into coastal waters. These on-going malfunctions are attributed due to the dumping of wastewater from animal farms that clog the treatment plant. According to a recent local media report[34], this practice is causing the Corporation some 4 million Euros annually. Up until February 2015, the management of animal waste streams was still being studied to update the 2008 National Agriculture Waste Management Plan.

4. Impacts on GES

Table 16 - G1 below provides an assessment on the evolution of the pressures exerted by land-based activities, based on a set of established indicators.

MSFD Descriptor	Impacts of land-based activities on GES	Future trends
D1 – Maintenance of biological diversity	Marine discharges pose potential threats to the structure and function of habitats and the species they support. Additional threats include those to Annex I *Posidonea* habitat due to increased water and seabed temperatures as a result of cooling waters originating from the Delimara power plant and brine waters from desalination plants.	
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	Potential changes to fish assemblages in areas of nutrient enrichment expected, however, the impacts are considered to be relatively localised and close to the coast, and the impact on commercial species is considered to be low.	
D4 – Marine food webs	Potentially significant impacts can be accrued if seagrass meadows are replaced as a result of the higher temperatures in the marine environment (due to cooling water discharge).	
D5 – Nutrient enrichment	Expected risk from the overall impact of untreated sewage when it accidentally ends up in the marine environment. However, soil erosion after heavy rainfall can introduce nutrients in coastal waters adjacent to agricultural areas.	
D6 - Sea-floor integrity	No data.	unknown
D7 – Alteration of hydrographical conditions	Increasing trend expected due to increasing demands on land-based activities.	
D8 Concentrations of contaminants	Potential release of contaminants into the marine environment from various land-based facilities including desalination, hotel activities, sewage, power plants and diffuse sources.	
D9 - Contaminants in seafood	Potential release of toxic chemicals into the water column that could result in contamination of marine species through the food chain.	

[34] *http://www.timesofmalta.com/articles/view/20150226/local/Farm-waste-clogs-plant-so-80-of-sewage-going-in-sea.557632*

MSFD Descriptor	Impacts of land-based activities on GES	Future trends
D10 - Marine litter	Activities from land-based aquaculture activities are likely to result in release of litter into the marine environment.	↗
D11 – Introduction of energy, including underwater noise	Construction works generate noise that can impact marine species.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 16 - G1. Impacts of land-based activities on GES.

5. Interaction with other sectors

Discharges into the marine environment from land-based activities pose pressures relating to water quality, altered hydrographical conditions and increased nutrient enrichment. Related discharges into the marine environment can result in significant negative cumulative impacts, depending on the locations of the discharge points.

Such negative effects on water quality can impact a number of economic sectors including aquaculture, fisheries and tourism.

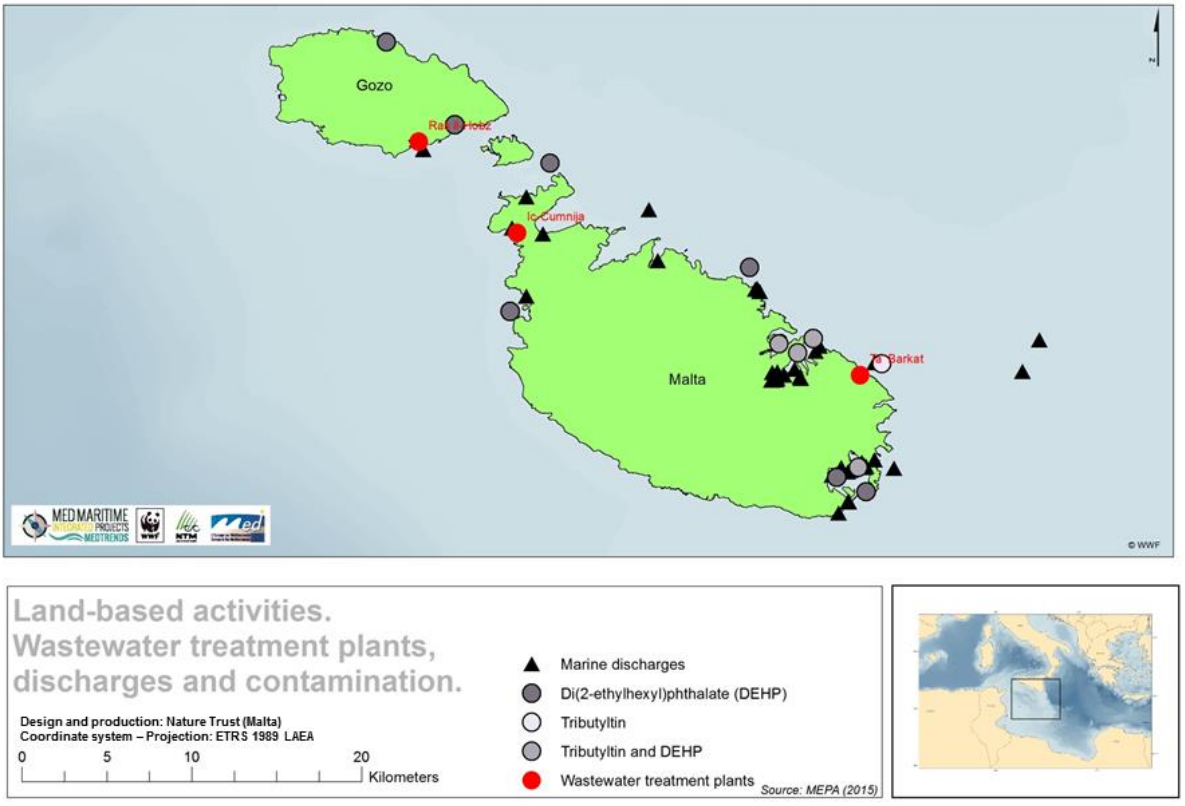

Figure 31 - G1. Location of wastewater treatment plants and marine discharges. The presence of toxic contaminants were identified in benthic sediments.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) strongly encourages local authorities to finalise the National Agricultural Waste Management Plan with particular emphasis on the proper management of animal manure. This is particularly relevant within the context of the need for an alternative practice for the disposal of pig slurry in compliance with EU Directives (such as Waste Framework Directive, or Directive 2008/98/EC). The Directive aims to protect the environment (together with other components) against harmful effects caused by the collection, transport, treatment, storage and disposal of waste by laying down basic waste management principles.

Another recommendation being put forward by Nature Trust is the need to improve the current environmental permitting system to enable the capture of all activities that results in discharges into the marine environment that could otherwise result in significant detrimental effects to marine biodiversity as well as accumulation of toxic substance within the food chain.

Furthermore it is important that continuous environmental monitoring is put in place in order to inform managers and decision makers on the current levels of contaminants reaching the marine environment from land-based sources of pollution.

7. References

Axiak V, (2004). National Diagnostic Analysis for Malta. National Action Plan for Malta for the Reduction and Elimination of Land Based Pollution. Report submitted to the UNEP Coordinating Unit for the Mediterranean Action Plan through the Environmental Protection Directorate of the Malta Environment and Planning Authority.

Axiak V, (2005). National Diagnostic Analysis for Malta. National Action Plan for the Marine Environment from Land Based Activities. Report submitted to the UNEP Coordinating Unit for the Mediterranean Action Plan through the Environmental Protection Directorate of the Malta Environment and Planning Authority.

MEPA, (2011). MSFD Initial Assessment: Nutrient Enrichment.

H. Infrastructure

1. Background and current situation

i) Ports and harbours

The ports and harbours of the Maltese Islands include:

- The Grand Harbour – range of services 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;
- Iċ-Ċirkewwa Landing Place - primarily a ferry terminal comprising of a passenger and vehicle handling facilities;
- Marsamxett Harbour - primarily a leisure port that also 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;
- Mġarr Harbour - 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;
- Ramla tal-Bir Landing Place;
- St Paul's Bay, and
- Marsaxlokk Bay - incorporates the container trans-shipment terminal and industrial storage facilities which are operated by the Malta Freeport Terminals[35] as well as a number of fuel terminals.

In addition to the above, there are five offshore bunkering areas and a waiting area for vessels headed for Malta which area is used on a regular basis by vessels waiting to enter the Malta Freeport or Marsaxlokk Harbour for bunkering. Use of bunkering areas depends on weather conditions.

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 has reduced significantly during the last decade. However, the Shipyards have recently been privatised (Palumbo Malta Shipyards Ltd.) and currently carry out various activities related to yacht and ship repair, conversion and building of marine vessels, surface treatment of vessels and general engineering works.

[35] *Malta Freeport Terminals Ltd is presently one of the leading transhipment hubs in the Mediterranean, handling approximately 2 million TEU (Twenty-foot Equivalent Unit (TEU) is the industry standard of measurement for containerised trade. One TEU represents a capacity of approximately 34 m^3) containers and 1,500 vessels per annum ranging from 9,068 gross tonnes (9,800 deadweight) to 95,000 gross tonnes (110,000 deadweight) per year. The Freeport specialises in container handling and warehousing.*

ii) Submarine cables and pipelines

Submarine pipelines are associated with potable water distribution, disposal of treated urban wastewater and transfer of fuels from ship to land based installations. There are five pipelines for fuel (comprising of gas, oil, kerosene and petrol), one for freshwater and one for ballast water; the latter is no longer in use. The pipelines are almost all localized and concentrated in inshore waters. The only offshore pipeline passing on Malta's continental shelf is the gas pipeline connecting Libya to Sicily.

Pipelines supporting the gas and fuel industry are currently only present in Marsaxlokk harbour. They are used for transfer of fuel by EneMed Ltd. and San Luċjan Oil Company Ltd. from designated points within the bay to land based installations. Liquefied Petroluem Gas (LPG) is also transferred via pipeline from supply vessels moored at the designated buoys within Marsaxlokk Bay to the nearby plant located on the coast in Qajjenza (fig. 32 - H1). The underwater pipelines in operation conduct vapour and liquid fuel to vessels using flexible hosing connected to a buoy. The LPG plant in Qajjenza has been decommissioned and currently being removed but the underwater pipelines were not removed so as to minimise any contamination.

San Luċjan Oil Company Ltd operates 3 subaquatic pipelines for transfer of fuel oil, light cycle oil and gas oil between vessels and its facility in the San Luċjan area in Marsaxlokk.

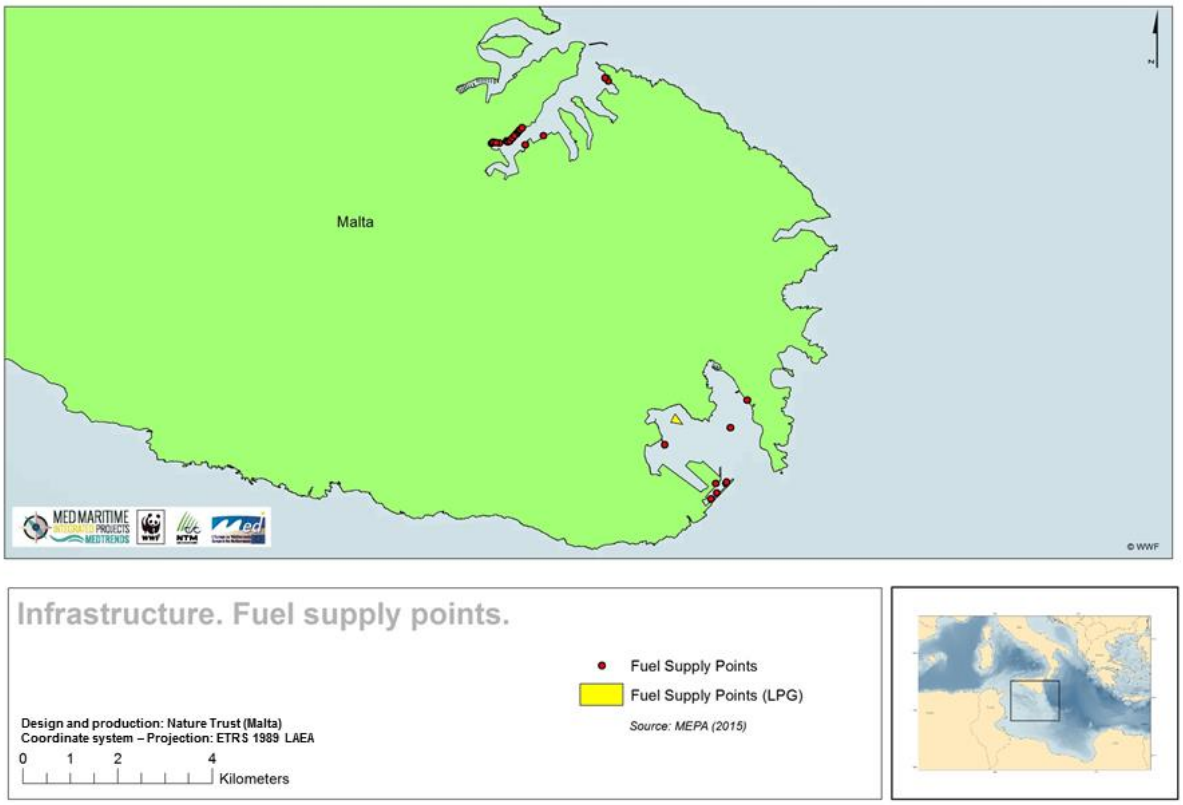

Figure 32 - H1. Location of fuel supply points in Grand Harbour and Marsaxlokk Harbour.

Underwater cables are also found in connection with the transmission of electric power and for telecommunication. 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 was granted permission in 2012. This 95 km underwater cable

supplements Malta with a capacity of 225 MW, 220 kV electricity generated by the Italian network at a Ragusa substation.

The three major telecommunications companies in Malta have in recent years laid underwater telecommunications cables linked to Sicily. 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. The gaming industry sector (NACE code 92) is also heavily dependent on underwater cables for its operation.

2. Pressures and impacts

i) Ports and harbours

Harbours/port areas are main points of entry for non-indigenous species (NIS) in view of shipping activities (i.e. at Grand Harbour and Marsamxett Harbour) and associated activities such as hull cleaning. Introduction of such species may cause a change in the structure and habitat of the area or species of interest, thus affecting their conservation status.

MEPA (2011) reports that the highest number of NIS records were collected from Marsaxlokk Bay and Birżebbuġia Bay which are both in the vicinity of the Freeport container terminal, bunkering stations, fishing and aquaculture installations. It is expected that their combined presence would lead to cumulative impacts on the natural communities living in this interconnected and multi-purpose harbour.

Discharges in port areas result in high turbidity also resulting from activities such as dredging. This effect can impact the level of biodiversity that can be supported in the harbour area.

The ports and harbours are vulnerable to harmful algal blooms (HABs). Sampling carried out between 2000 and 2001 revealed that a high proportion of toxic and harmful phytoplankton species were found in all locations samples (Marsamxett and Grand Harbour: Sliema Point (reference site), Sliema Creek, Msida Creek, Pietà Creek, Marsa (Menqa) and Dockyard Creek in Vittoriosa, with higher percentage relative abundances in Marsamxett than in the Grand Harbour.

Baseline monitoring carried out in line with the Water Framework Directive (WFD) has reported eutrophic conditions in the Grand Harbour area, which area is also subject to limited seawater circulation (plus other optimal factors such as prevailing onshore wind). HABs have also been reported from such areas.

The preliminary studies undertaken so far also point to such a scenario. For instance, the interim conclusions from the preliminary coastal surveys as part of the WFD monitoring regime mentioned that although a definite ecological status for the biological quality element (BQE) phytoplankton could not be calculated for reasons of lack of robust time series data; however, the first snapshot provided in this sampling survey indicates that the situation of coastal waters is worst in the Grand Harbour area and in front of Marsaxlokk Harbour and seems relatively better in the northern islands of the Maltese Archipelago.

Within the ports and bunkering areas, marine pollution may occur in connection to errors and accidents during the various operations that take place involving transfer of fuel as cargo or for bunkering. Certain bunkering areas are more heavily used than others. The areas are used depending on the weather to provide safer conditions for operations. Areas that are at particular risk for pollution events include the two ports of the Grand Harbour and Marsaxlokk,

as well as the five offshore bunkering areas. In the Grand Harbour, the shipyards discharge their effluents directly into the Grand Harbour – Malta Shipyards activity has significantly reduced over the last 10 years. A substantial share of all recorded oil spills within Malta in the last 12 years occurred within the Grand Harbour and Marsaxlokk, 55% and 12% respectively.

Other cargo handling to and from vessels is also carried out within these ports. Cargo transfer has the potential to result in the release of either hydrocarbons through a vessel collision or Hazardous and Noxious Substances (HNS) from the actual cargo. These risks are reduced respectively through compulsory pilotage for all vessels wishing to enter the port and managing of cargo movements, as is the case in Marsaxlokk and Grand Harbour.

Physical loss and damage to marine habitats occurring as a result of construction of the necessary infrastructure and ancillary facilities and anchoring are pressures resulting from the maintenance and use of port infrastructure.

Port activities also generate underwater noise that could have negative effects on certain marine species, for instance, cetaceans.

The construction of coastal defence infrastructure can have important implications including those related to physical damage and loss, potential increased risk of eutrophication, potential release of contaminants in the water column during construction, water quality during both construction and operation, and noise impacts during construction. The Ministry for Gozo has submitted an application for the construction of coastal sea defences at Marsalforn Bay, however this application remains pending. Given the scope for further expansion of marinas at Sliema, the eventual construction of a breakwater, or series of breakwaters at Marsamxett harbour is also likely and necessary (MMA, 2009).

ii) Submarine cables and pipelines

Fitting and maintaining underwater pipelines and cables generally lead to localised, short-term impacts on the seabed, mainly coming from the physical disturbance of the seabed substrata through re-suspension of sediments and increased turbidity. The duration of the adverse effects is however dependent on the benthic habitat type. One must also take into account the physical loss of habitat within the footprint of these artificial structures.

3. Future trends

i) Ports and harbours

The use of specific bunkering areas has increased between 2005 and 2011. Transport Malta's 2013 Annual Report also reported that the number of ship calls also registered a further increase of 5% (Transport Malta, 2013). During that year, Malta Freeport Terminals handled over 2,744,848 TEUs (Twenty-Foot Equivalent Units), which is an 8% increase in throughput over the previous year. Figure 33 - H2 illustrates container throughput at the Freeport between 2003 and 2013. Trailers at the Grand Harbour registered a 9% decrease in 2013 from 2012. Figure 34 - H3 illustrates the number of trailers handled in the Grand Harbour between 2003 and 2013. Analysing the trend data suggests a continuing growth in

port activity. In further support of this assumption, COM(2009)[36] identifies an expected increase in maritime transport including passenger transport up to 2018 growing from 3.8 billion tonnes in 2006 to approximately 5.3 billion tonnes in 2018. Continued growth is likely then to require additional facilities and investment in expansion of port and harbour facilities can be expected.

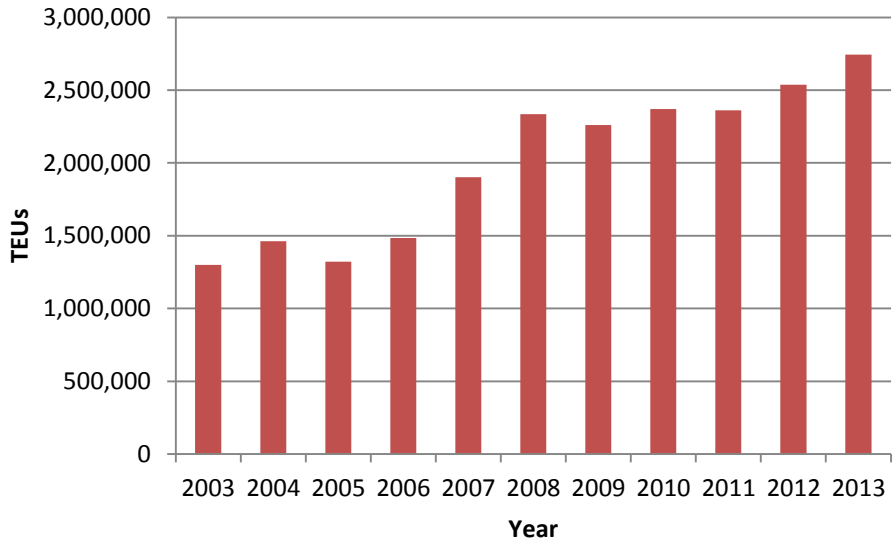

Figure 33 - H2. Container throughput at the Freeport (Transport Malta, 2013).

As previously indicated, there was a decrease of 38 cruise liner vessels in 2013 when compared to 2012. Figure 35 **-** H4 illustrates the number of cruise liner vessels visiting Malta.

The draft Tourism Policy 2015-2020 predicted an increase in the cruise liner visits to Malta. Thus the extension of existing facilities as well as the creation of new quays (as proposed for Gozo) is being anticipated in order to improve efficiency of operation. Malta's Partnership Agreement 2014-2020 includes a strategic direction for investment in port infrastructural expansion on Gozo to attract boutique cruise liners to the island. Investment into the expansion of Mġarr Harbour is also mentioned including investment in quays, berthing and other facilities. Moreover, with the strategic direction to promote maritime transport, investment in port infrastructure such as landing platforms is also part of the expected growth.

[36] *COM(2009) 8 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Strategic goals and recommendations for the EU's maritime transport policy until 2018.*

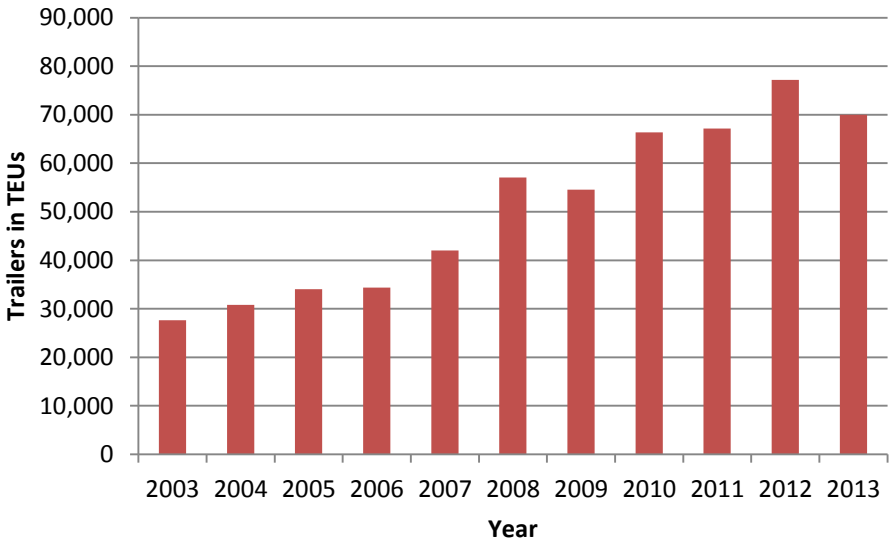

Figure 34 - H3. Trailers handled at the Grand Harbour (Transport Malta, 2013).

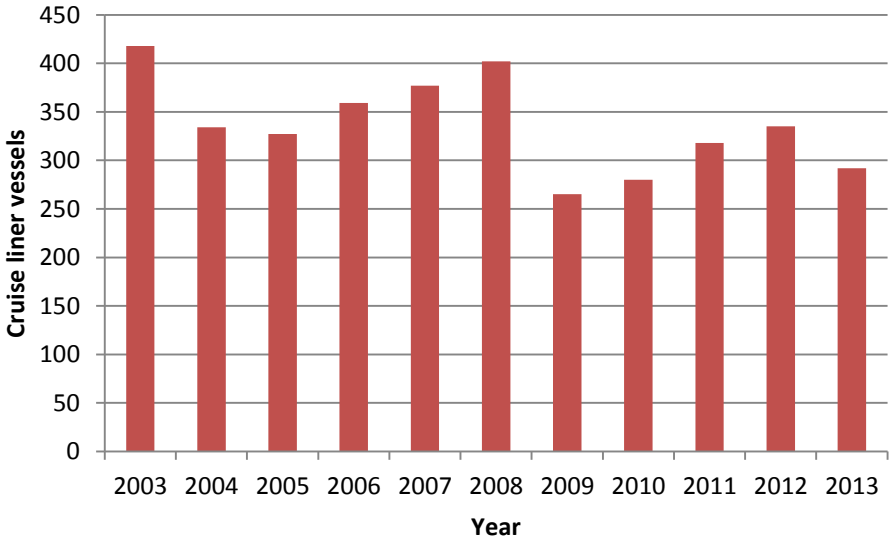

Figure 35 - H4. Cruise liner vessels visiting Malta between 2003 and 2013 (Transport Malta, 2013).

The number of vessels visiting Maltese waters in 2013 increased by 5% from the previous year. Figure 36 – H5 illustrates the number of vessels visiting Malta over a period of 11 years while fig. 37 – H6 illustrates gross tonnage of vessels visiting during the same period.

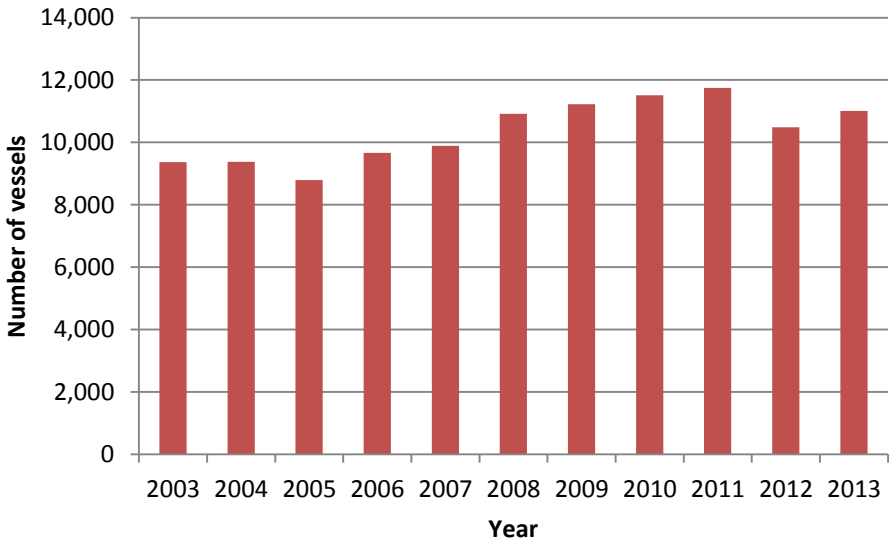

Figure 36 - H5. Number of vessels visiting Maltese waters (Transport Malta, 2013).

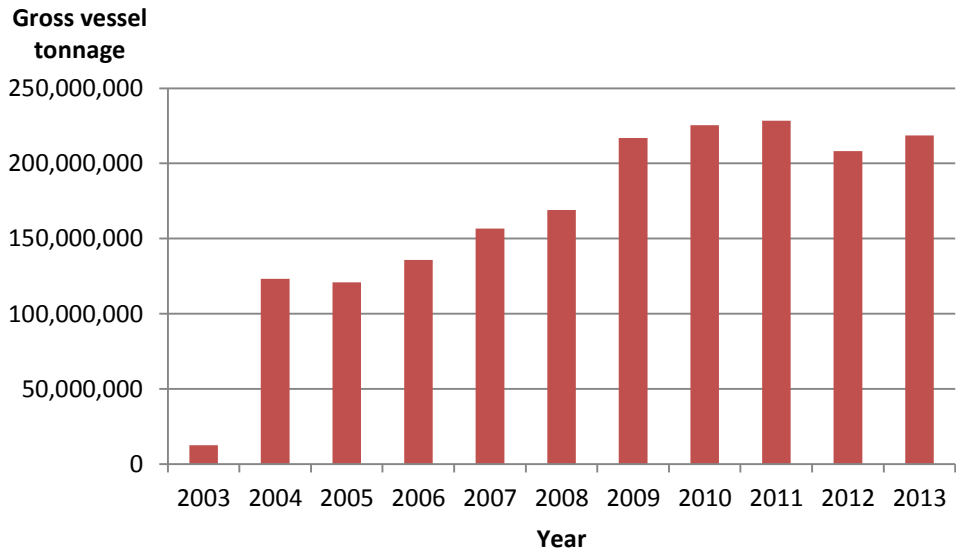

Figure 37 - H6. Gross tonnage of vessels visiting Maltese waters (Transport Malta, 2013).

MSFD's report on Economic and Social Analysis indicates that approximately 56% of the activities of firms within NACE (which is a statistical classification of economic activities in the European Community) codes 30 and 33 use the maritime waters in their provision of products and services. However, according to MEPA (2011), these sectors exhibited a decline in employment but still registering an overall net increase in GVA due to the privatisation of a major shipyard

An increased GVA and overall employment has also been recorded by firms within NACE code 50 and 52 (such as Malta Freeport Corporation, ship chandlers, warehousing and support activities for transportation, etc.). The growth in this sector's activities also partly reflects the success in cruise-liner tourism, which requires its own specific services.

With the growth of the yachting sector (refer to section VI(E) of this report) additional coastal defence is likely to be developed.

ii) Submarine cables and pipelines

The main potential change in the future for this sector is related to the possibility of the laying down of a gas pipeline between Sicily and Malta or alternatively, a connection to the Libya – Italy gas supply pipeline. On the basis of this possibility, the MSFD Economic and Social Assessment report (MEPA, 2011) predicts an increase in the use of the marine environment by this sector.

The three major telecommunications companies in Malta have in recent years laid underwater telecommunications cables due to the increased demand for telecommunications services (such as broadband internet, and telephony).

The local MSFD Economic and Social Assessment report noted that it is still difficult to predict future growth in view of the volatility in the performance of the telecommunication sector. The Malta Communications Authority is currently examining the possibility of additional underwater cable to enhance internet connectivity (MEPA, 2011).

With respect to the gaming industry (NACE code 92) that utilises the maritime environment, the national MSFD Economic and Social Assessment report indicated a recent growth of 6% p.a.; however, this growth is expected to diminish in the coming years.

4. Impacts on GES

Table 17 - H1 below provides an assessment on the evolution of the pressures exerted by infrastructure, based on a set of established indicators.

MSFD Descriptor	Impacts of infrastructure on GES	Future trends
D1 – Maintenance of biological diversity	Expected increased maritime shipping activity shall result in increased impact due to increased dredging, construction noise, hydrographical changes, turbidity, eutrophication, etc. Benthos in the vicinity of cables and pipelines is likely to be negatively affected.	
D2 - Non-indigenous species	Expected introduction is expected to be high and likely to be on the increase.	
D3 – Commercially exploited species	No data.	unknown
D4 – Marine food webs	Further data collection required to define impact significance.	unknown
D5 – Nutrient enrichment	Significant pressure in harbour areas as indicated by occasional presence of HABs.	
D6 - Sea-floor integrity	Localised but constant or increasing, depending on type of port development.	
D7 – Alteration of hydrographical conditions	Localised but constant or increasing, depending on type of port development.	

MSFD Descriptor	Impacts of infrastructure on GES	Future trends
D8 – Concentrations of contaminants	Expected to increase within harbour areas. Possibility of release of pollutants from harbour-related activities including the re-suspension and bioavailability of contaminants adhered to sediment.	↗
D9 - Contaminants in seafood	Potential release of contaminants into the water column that could result in contamination of commercial species through the food chain.	unknown
D10 - Marine litter	Port activity should be well managed and avoid any release of waste into the marine environment. However, even with controls in place, works carried out in the marine environment could result in increased release of marine litter.	↗
D11 – Introduction of energy, including underwater noise	Construction works generate noise that can impact species such as cetaceans.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 17 - H1. Expected future impacts by infrastructure on GES.

5. Interaction with other sectors

Harbour operations generally represent a significant risk from the introduction of non-indigenous marine species, some of which can potentially threaten the conservation status of local marine habitats. Other conflicts with the conservation of marine biodiversity include impacts from pollution, including underwater noise pollution, changes in hydrographical processes and increased turbidity.

Port activities are highly dependent in terms of maritime traffic, including that generated by leisure boats/ships. The expected increase in these activities (refer to section VI(E) of this report) is likely to put additional pressure on existing infrastructure within ports, and potentially drive further development within ports.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) considers that activities related to land reclamation works will likely result in a significant deterioration of the marine environment and should not form part of the Government's plan as an economic opportunity.

Moreover, coastal development and further artificialisation of the coast should be reduced to a minimum except in port areas.

Nature Trust (Malta) urges local authorities to control and monitor bunkering areas with a view of minimising the currently documented serious negative impacts to the seabed and biogenic reefs resulting from mooring and anchorage[37].

Concerning the proposed infrastructural works to enhance connectivity between the islands of Malta and Gozo, in the form of either a bridge or underground tunnel, Nature Trust (Malta) strongly emphasises that such works should be objectively evaluated on the basis of demand, feasibility and potential environmental impact.

In cases where the development of a breakwater is under consideration, Nature Trust (Malta) recommends that the associated mandatory studies should ensure that changes to hydrographical properties (currents and waves) are effectively studied and minimised as much as possible.

7. References

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Ministry for Tourism (2015). Draft Tourism Policy – 2015-2020. https://0d2d5d19eb0c0d8cc8c6-a655c0f6dcd98e765a68760c407565ae.ssl.cf3.rackcdn.com/131698820e48399beabf94621425b1bf44909615.pdf

MMA, (2009). Development of Yachting Facilities in Malta. 76pp.

Transport Malta, (2013). Annual Report – 2013. 99pp

[37] *http://www.timesofmalta.com/articles/view/20150322/environment/Exposing-underwater-devastation.560953*

I. Extraction of Non-living Resources

1. Background and current situation

i) Dredging

Dredging in Malta is primarily done to maintain fairways in ports and harbours; however, it is also carried out in relation to coastal engineering projects, such as the building of coastal platforms, news quays and related extensions, as well as for the development of new marinas.

In Malta, there are no official designated areas dedicated to dredging, although some parts of Marsaxlokk harbour area are dredged on a regular basis. According to official maritime Notices, dredging works also take place within the Grand Harbour and Marsamxett harbour.

Locally, uncontaminated dredged material can be disposed of at sea, at the designated offshore spoil ground, located off the North Eastern coast of Malta. According to Malta's Waste Management Plan for the Maltese Islands (2013-2020), approximately 1 million tonnes of waste was disposed of at sea during the period 2007-2011. It is interesting to note that between the period 2007-2009 the majority of the waste thrown at the offshore spoil dump originated from land-based construction and demolition projects, while that registered during the period 2010-2011, was made up of dredged material.

Malta's MSFD Economic and Social Analysis report categorised dredging as falling within NACE codes 42 & 43 (Civil Engineering and Specialised Construction Activity), where around 9% of the economic activity of these sectors is linked to marine-related infrastructural projects. Such projects are subject to the attainment of a development permit which must abide with development and planning policies.

ii) Desalinisation plants

Similar to other Mediterranean insular regions, local freshwater supply is scarce and subject to intense pressures from various users. Potable water is sourced by extracting groundwater (from a system of galleries and boreholes) and from desalination of seawater. Pumping stations and water mains connect to storage reservoirs and to consumers.

Currently, there are three operational water desalination plants. These are at Għar Lapsi, Ċirkewwa and Pembroke with a combined production capacity of 100,000 m^3 per day. Two other plants that were constructed over a similar time period between 1982 and 1992 in Tigne' and Marsa have since been decommissioned. The plant at Pembroke is the largest operational facility with a capacity of 54,000 m^3 per day.

In 2011, the Water Services Corporation (WSC) produced a total of 29,782,523 m^3 of potable water. Figure 38 - I1 illustrates a breakdown of sources and their percentage contribution.

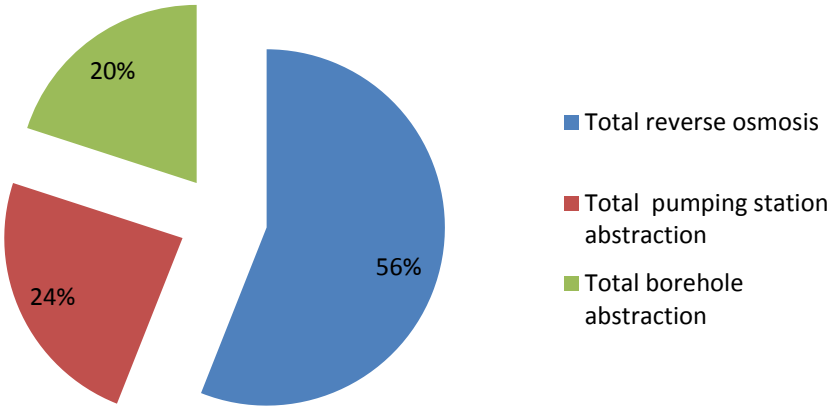

Figure 38 - I1. Breakdown of sources and their percentage contribution (WSC, 2011).

Water produced from the desalination process is blended with groundwater in order to satisfy the demand and quality for drinking water. Approximately 40 million m^3 of seawater is treated every year. Seawater is not abstracted directly and intake takes place through deep beach wells. Brine discharge to the marine environment amounts to 23 million m^3 per year.

In 2011 a total of 16,721,969 m^3 of water was produced by desalination plants. Figure 39 - I2 illustrates the output of each desalination plant in 2011 – 54% from Pembroke, 30% from Lapsi, and 16% from the Ċirkewwa plant.

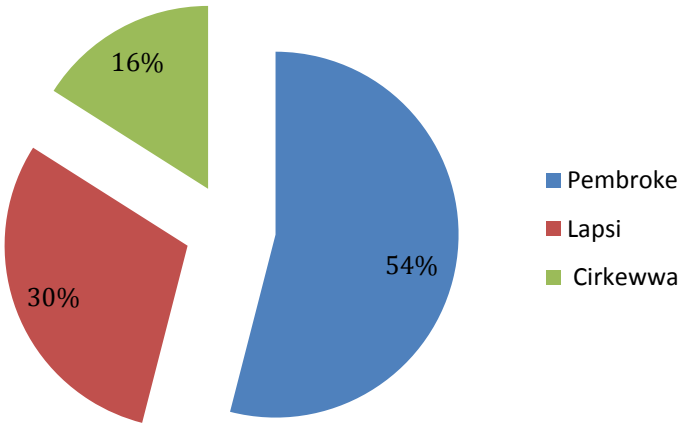

Figure 39 - I2. Output of each desalination plant in 2011 (WSC, 2011).

A polishing plant to improve groundwater was constructed on Gozo in 2004. To relieve pressure on the groundwater supply, a submarine pipeline transferring water from the Ċirkewwa reverse osmosis plant to Gozo was also constructed.

The Water Services Corporation 2011 Annual Report provides production trend data and indicates that by 2011, overall water production (including groundwater abstraction and distillation) had remained below 30 million m^3 per annum from the all-time high of over 50 million m^3 measured during 1992-93.

The production of groundwater decreased in 2012 when compared to the level of production in 2007. This is contrasted by the observed increase of 3.7% in the production of desalinated water during the same period (Malta's Operational Programme I, 2014-2020 citing the Water Services Corporation).

Certain large scale hotels include their own reverse osmosis plant. Information on the amount extracted and outflow of brine water from these plants is not available.

2. Pressures and impacts

Studies and reports show that dredging works can result in a number of impacts, including:

- Surface abrasion resulting in physical loss of or damage to benthic habitats;
- Re-suspension of sediments and release of contaminants, resulting in reduced water quality;
- Smothering of benthic biota including those listed in Annex I priority habitat *P. oceanica* meadows;
- Changes in the hydrographical conditions of the dredged sites through changes in seabed and sediment characteristics;
- Significant alterations to the seabed, both directly and indirectly. Indirect impacts occur where spoil has been dumped and benthic habitats around the area are deemed to be impoverished; and
- Increased turbidity, which could also lead to physical damage to the benthic habitats.

The impacts from local dredging works can be considered to be localised since it is generally restricted to harbour areas.

As part of the process, desalination plants discharge brine to the sea, leading to localised effects due to changes in salinity levels. Moreover, a number of chemicals of concern have been detected in desalination discharges such as boron, and to a lesser extent, arsenic and nitrates. It is likely that such chemicals are originally found in the feed waters and are being concentrated in the discharged brine stream. Nevertheless, water quality and biomonitoring tests need to be carried out in order to determine whether any potential impacts on the marine environment can be considered as significant.

3. Future trends

Malta's MSFD Economic and Social Analysis report showed an average annual growth in GVA for NACE codes 42 and 43 by 6.9% p.a. whilst the GVA in employment grew by 5.1% between 2006 and 2012. It concludes by saying that the growth of significant construction activities is somewhat uncertain.

However, the recent impetus in proposed projects to construct new marinas and cruise-liner facilities (such as the submitted applications for the construction of marinas in Sa Maison and Marsamxett Harbour), could reverse the above-mentioned uncertainty.

Other potential construction works include the construction of coastal defences in Marsalforn, Gozo, and also at Marsamxett Harbour (refer to section VII(H) of this report). Such projects are likely to require a degree of extensive dredging works as well.

According to the 2011 WSC annual report, water production in the 1990s was much higher than that shown in more recent years. Water production from desalination plants has been more or less stable in recent years.

Malta's draft Operational Programme I (OPI) highlights that Malta will seek funding for a new desalination plant on Gozo. The main justification for this project is that this new plant would lead to (1) reduced energy consumption needed to pump potable water from Malta to Gozo, (2) reduced losses, and (3) ensure that Gozo would have an adequate and secure supply of potable water. Construction of this new plant is expected to generate a new point source of brine effluent to the marine environment. The proposed site for this new plant has not yet been announced. The draft OPI also seeks additional investment to improve and update the primary class water network distribution to reduce losses as well as to promote the use of secondary class water, and promote rainwater harvesting.

In the absence of an approved National Water Policy, it remains difficult to predict future trends in water production through desalination.

4. Impacts on GES

Table 18 - I1 provides an assessment on the evolution of the pressures exerted by the extraction of non-living resources, based on a set of established indicators.

MSFD Descriptor	Impact of extraction of non-living resources on GES	Future trends
D1 – Maintenance of biological diversity	Impact from maintenance dredging expected to remain constant. However, this trend is uncertain in light of potential new coastal developments. Localised impacts expected to be associated with the construction and operation of a new desalination plant on Gozo and by individual hotels along the coast. Depending on the extent of these developments, cumulative negative impacts may occur.	↘
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	No data.	unknown
D4 – Marine food webs	Impacts are expected to be localised and not significant on food webs for the larger ecosystem.	↗
D5 – Nutrient enrichment	No data.	unknown
D6 - Sea-floor integrity	Constant or slight increase of localised impact on sea-floor integrity is expected.	↗
D7 – Alteration to hydrographical conditions	Constant or slight increase of localised impact is expected.	↗

MSFD Descriptor	Impact of extraction of non-living resources on GES	Future trends
D8 – Concentrations of contaminants	Constant or slight increase of localised impact from desalination plants is expected. Any significant effect of certain parameters in the discharge water and their concentrations is not known. Dredging can release contaminants from polluted sediments into the water column making them bioavailable.	↗
D9 - Contaminants in seafood	Release of some non-synthetic and synthetic contaminants is expected as result of this activity.	unknown
D10 - Marine litter	No data.	unknown
D11 – Introduction of energy, including underwater noise	Construction works generate noise that can impact species such as cetaceans.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 18 - I1. Expected future impacts by the extraction of non-living resources on GES.

5. Interaction with other sectors

An increase in capital dredging may arise as a result of investment in the tourism sector, e.g. with an increase in development of marinas. Similarly, the creation of a new desalination plant/s technically increases land-based activities that discharge to the marine environment, though the level of significance should be determined by the necessary assessments prior to, during and after development.

It should also be noted that water desalination is moderately vulnerable to the occurrence of oil spills along the coast or that may reach the coast, since oil contamination has been found to affect the operational performance of reverse osmosis membranes. However, it is important to note that since seawater is extracted from beach wells, surface contamination is not expected to cause immediate malfunction of desalination plants. Under such circumstances, continuous monitoring would need to take place with the possibility of switching off the entire plant as a precautionary measure, depending on the extent of incident.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) strongly urges the Government to publish the National Water Policy. This should be done as early as possible on the basis of its concern that groundwater is current being mismanaged as well as on the widespread lack of knowledge among both the general public and decision makers about the true nature of Malta's water status.

Moreover, it recommends that in its project selection criteria, Malta's Operational Programme should give priority to those projects that seek a reduction in water demand and instead promote alternative water sources (such as harvesting of rainwater). This can be translated in a reduced demand for desalinated water.

On a similar note, Nature Trust (Malta) strongly recommends that the Rural Development Programme for 2014-2020 should include measures that seek to reduce water demand, improve efficiency and reduce wastage by this sector. This will in turn reduce the need to desalinate more water with a consequent reduction in discharges from desalination plants.

7. References

MEPA, (2005). National Action Plan for the Protection of the Marine Environment from Land-Based Activities. 84pp.

MEPA, (2011). MSFD Initial Assessment: Contamination by hazardous substances.

Water Services Corporation, (2011). Annual Report - 2011. Water and Wastewater Facilities.

J. Safety and Security

1. Background and current situation

i) Military defence

The Armed Forces of Malta (AFM) is Malta's military organisation tasked with primary defence functions and safeguarding national sovereignty and interest, both in peacetime and in crises. Malta's military instrument, in the form of the operational capabilities delivered by the AFM, is a major component of the Maltese Island's national defence and security architecture.

The AFM conducts and coordinates maritime safety and security operations for defence purposes, maritime law enforcement and search and rescue. These activities are supported by training activities such as live gunnery exercises at sea in three established areas. The AFM also plays a supporting role in addressing marine pollution incidents.

The Maritime Squadron is the maritime component of the AFM. Its fleet includes search and rescue launches, small to medium-sized patrol boats and offshore patrol vessels, most of which are located at the AFM's main Maritime base at Hay Wharf in Marsamxett Harbour.

Liquid waste generated by the AFM patrol craft is either stored in a suitable shore installation or treated aboard up to a standard that allows its discharge into the sea. Maintenance of the Maritime Squadron's fleet is carried out during scheduled dry docking activities at local commercial ship-repair facilities which are required to have the appropriate waste management practices on site. All spent lubricants are stored and disposed of appropriately (AFM, personal communication, 2015).

A historic munitions dumping ground is located north of Gozo.

ii) Coastal defence

Coastal defence structures in the Maltese Islands mainly consist of breakwaters aimed at providing shelter to harbour areas or marinas. These structures are concentrated within the main harbour areas including the Grand Harbour, Marsaxlokk Harbour, Ċirkewwa and Mġarr Harbour, Gozo. Readers should refer to section VII(H) of this document for further information related to their impact on GES.

2. Pressures and impacts

i) Military defence

Routine maritime activities carried out by the Maritime Squadron are not seen to be associated with significant pressures or impacts on the marine environment. AFM's patrol boat and shore support facilities fully comply with environmental standards and regulation related to the discharge of pollutants in the marine environment and there is no direct discharge of oil, contaminated water or sewage into the sea.

The dumping of munitions on the other hand can result in the release of contaminants associated with explosives, which may include trinitrotoluene (TNT), pentaerythriol tetranitrate

(PETN), cyclotrimethylenetrinitramine (RDX), and cyclotetramethylenetetranitramine (HMX)[38]. Impacts on the marine environment need to be verified; however, it is assumed that the impact should be much localised and minimal due to the low rate of munitions dumping. There are currently two munition dumping sites, one located off the coast of Gozo (currently disused) and another one located at the Ordnance and Fuel Jettison Area (Transport Malta, 2011; Notice to Mariners 45/2011).

ii) Coastal defence

Coastal defence structures could potentially interfere with hydrographical processes which may result in changes to water currents and sediment characteristics. Changes in water currents may also lead to coastal erosion or interferences with processes related to sand accretion and coastal stability. Construction of coastal defences is also associated with physical loss and physical damage to the seabed. Environment Impact Assessments are conducted prior to the construction of coastal defence structures in line with local regulations.

3. Future trends

Coastal defence activities are deemed to have increased between 2006 and 2012 in terms of GVA and declined in terms of employment. This economic sector is stable as reported by the MSFD Initial Assessment Report (MEPA, 2011).

4. Impacts on GES

Table 19 - J1 illustrates the evolution of the pressures exerted by safety and security activities, based on a set of established indicators.

MSFD Descriptor	Name of the sector	Future trends
D1 – Maintenance of biological diversity	No major impact expected from military activities under normal operating conditions. Construction of new coastal defence structures could affect water quality and result in physical loss with negative consequences on marine biodiversity.	↘
D2 - Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	No data, but not likely to exert any pressures.	unknown
D4 – Marine food webs	Changes to community structure and function are expected, especially due to hydrographical changes, which could impact food webs where changes occur.	↗

[38] *https://www.serdp-estcp.org/Featured-Initiatives/Munitions-Response-Initiatives/Munitions-in-the-Underwater-Environment*

MSFD Descriptor	Name of the sector	Future trends
D5 – Nutrient enrichment	Increasing berthing space for new and existing marinas will result in additional boat activity in the harbour areas. This is likely to continue to increase the potential for eutrophication in these areas. If new marinas require the construction of ancillary structures such as a breakwater, this may further impact negatively on the internal water circulation within harbour areas. Such effects would need to be studied.	↗
D6 - Sea-floor integrity	Potentially impacted in the case of construction of new coastal defence structures.	↗
D7 – Alteration to hydrographical conditions	Negatively impacted in the case of construction of new coastal defence structures.	↗
D8 – Concentrations of contaminants	No data.	unknown
D9 - Contaminants in seafood	No data.	unknown
D10 - Marine litter	No data.	unknown
D11 – Introduction of energy, including underwater noise	Construction works related to coastal defence structures generate noise that can impact species.	↗

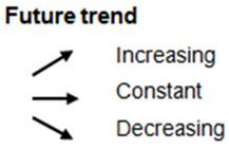

Table 19 - J1. Expected future impacts by the Safety and Security activities on GES.

5. Interaction with other sectors

The military is trained to provide assistance in case of oil spills, for which positive impacts may be accrued in terms of nature conservation, tourism, fisheries and aquaculture.

An increase in the tourism sector, in particular in terms of recreational boating and the construction of additional berthing spaces (i.e. marinas) will potentially result in an increase in coastal defence infrastructure with potentially subsequent additional pressures that may affect GES.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) recommends local authorities to fill in the existing data gaps of related to this sector, with particular reference to the effects on marine habitats due to past and current activities falling under this sector. Of particular concern is the potential release of toxic chemicals in the marine environment from the munitions dump, on which data is lacking.

As indicated in table 19 - J1 of this report, the current lack of information on impacts resulting from this sector does not allow a proper assessment of current and future state on GES. Nevertheless, Nature Trust (Malta) sincerely hopes that such an assessment shall be locally addressed by the EU Water Framework Directive and supported by the MSFD.

7. References

MEPA, (2011). MSFD Initial Assessment: Physical loss and damage.

MEPA, (2011). MSFD Initial Assessment: Interference with hydrological processes.

MEPA, (2011). MSFD Initial Assessment: Contamination by hazardous substances.

Transport Malta (2011). Notice to Mariners No 45 of 2011. Charts effected: BA2124.

K. Waste Disposal

1. Background and current situation

i) Construction and demolition waste

A national spoil ground for the Maltese Islands is located off the North Eastern coast of Malta. Waste streams that can be dumped there are in accordance with the Barcelona and London Dumping Conventions[39]. The Water Management Catchment Plan (2001) identifies that although the spoil ground is the only official site where inert and non-hazardous wastes as described above can be disposed of, dumping in other areas and spillage from barges on their way to the spoil ground have also been reported.

As indicated in the Waste Management Plan for the Maltese Islands 2014-2020, construction and demolition (C&D) waste is the largest waste stream generated in the Maltese Islands. Figure 40 - K1 illustrates the volumes of C&D waste generated and its fate. It can be seen that the main disposal method for C&D waste was that connected with landfilling. As part of the rehabilitation of spent limestone quarries, inert C&D material was used to backfill these sites for their eventual restoration.

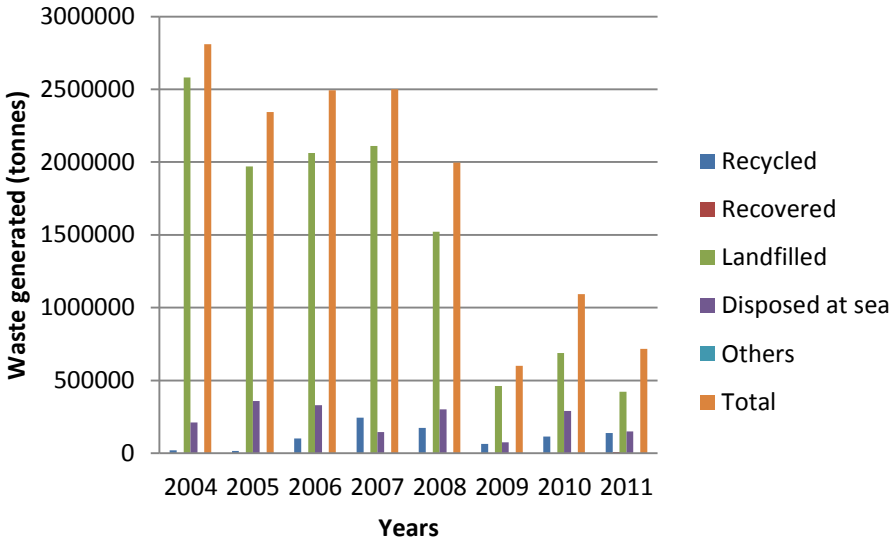

Figure 40 - K1. Volumes of construction and demolition waste generated between 2004 and 2011. (Solid Waste Management Plan for the Maltese Islands, 2014-2020).

The preferred method of disposal for dredged, uncontaminated material is disposal at sea. This option has been preferred over landfill methods in order to economise on land traffic movement. In 2010, 353 tonnes of spoilt cargo (grain) were also disposed of at sea.

Before the landfill engineering works at Ta' Żwejra and Għallis landfills, the Magħtab site was used as a C&D dump such since 1977. All waste types were disposed of at the Magħtab landfill site without any segregation. Despite this, monitoring of the marine environment, including sediments and water quality, has not indicated any significant contamination when compared to the recommended Environmental Quality Standards.

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[39] *Such as uncontaminated dredged material generated in the maintenance of fairways, inert geological material, decommissioned explosives, and spoilt cargo that is considered suitable for dumping.*

The Wied Fulija landfill was operational between 1979 and 1996. This landfill was located on the coast and potential contaminants could have reached the marine environment through surface water runoff and contaminated groundwater.

Il-Qortin landfill on Gozo, which has been in operation since 1968, is now closed and is under rehabilitation by WasteServ. This landfill traditionally accepted largely municipal solid waste as well as construction and demolition waste in more recent years. Scott-Wilson (2001) reported evidence of waste overspill from the landfill. Waste could reach the marine environment with surface water run-off following heavy rains as well as through the springs that run under the plateau upon which the landfill is situated.

ii) Storage of gases

Currently, Malta has no local sources of mineral primary energy sources and therefore relies on imported fuels, mainly heavy fuel oil and light distillate, for energy generation purposes.

2. Pressures and impacts

In terms of impacts associated with disposal of waste at sea, a preliminary survey of the seabed at the designated spoil ground and surrounding area was carried out by Borg & Schembri (2008). They described the seabed at the spoil ground as being predominantly characterised by soft sediments and supported two main types of assemblages: the biocoenosis of circalittoral muds and sands and coralligenous biocoenosis, both of which were deemed to be impoverished. They also indicated that the seabed manifested significant changes where spoil has been dumped, which was characterised by large boulders and unconsolidated material. Accumulations of dumped material were located both within the designated spoil ground and beyond.

These authors also noted the turbid conditions which they attributed them to the presence of fine sediments and particulate matter originating from the regular spoil dumping activities. An increase in turbidity is likely to result in physical damage to the benthic habitats.

3. Future trends

The Waste Management Plan for the Maltese Islands (2014-2020) identified a positive shift towards the appreciation of local limestone as a non-renewable resource and efforts are currently being made to ensure that wastage during its extraction is significantly reduced.

However, it is very likely that the offshore spoil ground will continue to be regularly used both due to the on-going need for maintenance dredging as well as continued emphasis on new constructional and coastal engineering developments. Thus long-term future effects on the marine environment within the spoil ground area are uncertain but are likely to continue impacting the marine environment.

Based on the new upgrades to the Delimara power station in accordance with policy decisions, the country is planning to develop a floating Liquid Natural Gas (LNG) terminal at Marsaxlokk Harbour to service the new power station. This raises issues with respect to disposal of waste discharges to the marine environment as well as the risk associated with having such a facility in the Harbour.

4. Impacts on GES

Table 20 - K1 illustrates the evolution of the pressures exerted by waste disposal on GES, based on a set of established indicators.

MSFD Descriptor	Name of the sector	Future trends
D1 – Maintenance of biological diversity	Continued pressure on the area of the spoil ground and its surroundings is expected. Observed increased turbidity negatively affects the structure and function of benthic habitats. Moreover, spillage of material to be dumped can affect other areas besides that of the spoil ground.	↘
D2 -Non-indigenous species	No data.	unknown
D3 – Commercially exploited species	No data.	unknown
D4 – Marine food webs	Potentially significant if habitats supporting important feeding grounds are negatively affected.	↗
D5 – Nutrient enrichment	No data, but impact should be minimal.	unknown
D6 - Sea-floor integrity	Continued physical loss at spoil ground is expected.	↗
D7 – Alteration to hydrographical conditions	No data.	unknown
D8 – Concentrations of Contaminants	Only uncontaminated material is allowed to be disposed of at sea. Operational landfills are now engineered, reducing risk of contamination of the marine environment. Potential impacts from discharges from the planned LNG should be noted although the degree of significance is uncertain at this point.	→
D9 - Contaminants in seafood	No data.	unknown
D10 - Marine litter	No data.	unknown
D11 – Introduction of energy, including underwater noise	Uncertain, but likely to increase with increasing generation and disposal of inert waste at the offshore spoil dump.	↗

Future trend

↗ Increasing
→ Constant
↘ Decreasing

Table 20 - K1. Expected future impacts by waste disposal activities on GES.

5. Interaction with other sectors

It is important to note that port activity generates dredged material that is generally disposed of at sea.

Construction of an LNG floating terminal at Marsaxlokk Harbour, which is related to energy sector (see section VII(D) of this report), could result in negative impacts to the tourism sector as well as the defence sector since it poses a potential risk. This raises issues with respect to potential discharges to the marine environment as well as the risk to other users within the same harbour.

It is interesting to note that the underwater wave climatology using numerical modelling conducted by IAMC-CNR Oristano (http://www.seaforecast.cnr.it/en/climatology.php), indicate that in 2010, the 30m underwater currents in the vicinity of the offshore spoil dump predominately moves towards the SE direction. This is based on monthly simulations of the underwater currents. Here reference is made to the location of aquaculture sites along this prevalent direction (fig. 41 - K2) and to the prevalent fishing by trawlers (fig. 42 - K3).

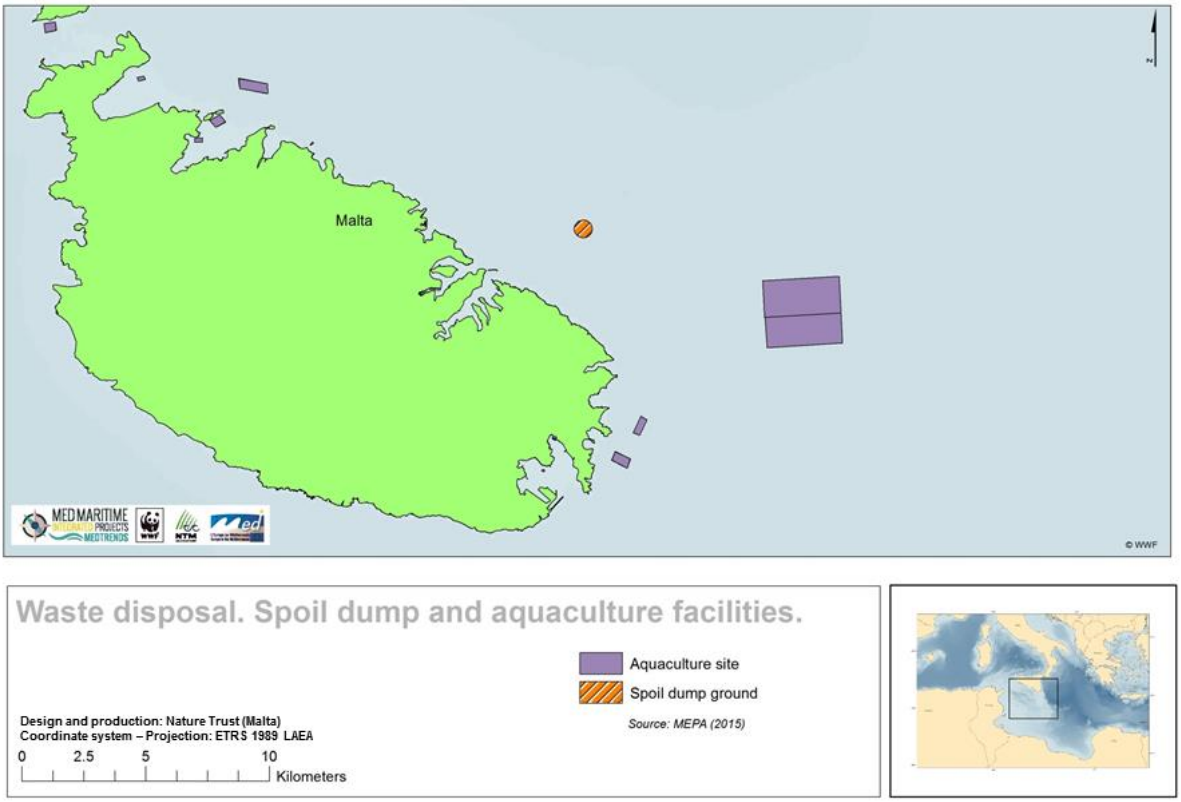

Figure 41 - K2. Location of offshore spoil dump in the vicinity of aquaculture areas.

6. Nature Trust (Malta) recommendations

Nature Trust (Malta) strongly recommends that monitoring at the offshore spoil ground should be significantly improved with the scope of obtaining further information on possible detrimental impacts on marine biodiversity, water quality and on other indicators of GES. Suspended sediments resulting from such dumping reduces light levels, is capable of causing physiological stress on marine life, impairs growth and reproduction, clogs the gills of fish, etc. Such monitoring should also include the impact that can be potentially generated by the

amount of sediments spilled during such practices. In the absence of adequate monitoring, it is easy to deny the environmental impacts of such inert waste disposal on the marine environment, and to claim that the impacts are manageable.

Moreover, there is currently no information concerning the potential dispersal of suspended particles by underwater currents in the vicinity of the offshore spoil dump. One should not exclude the strong possibility that sediment spoil does not disperse over long distances.

7. References

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.

Ministry for Sustainable Development, the Environment and Climate Change, (2014). Waste Management Plan for the Maltese Islands 2014-2020. 209pp

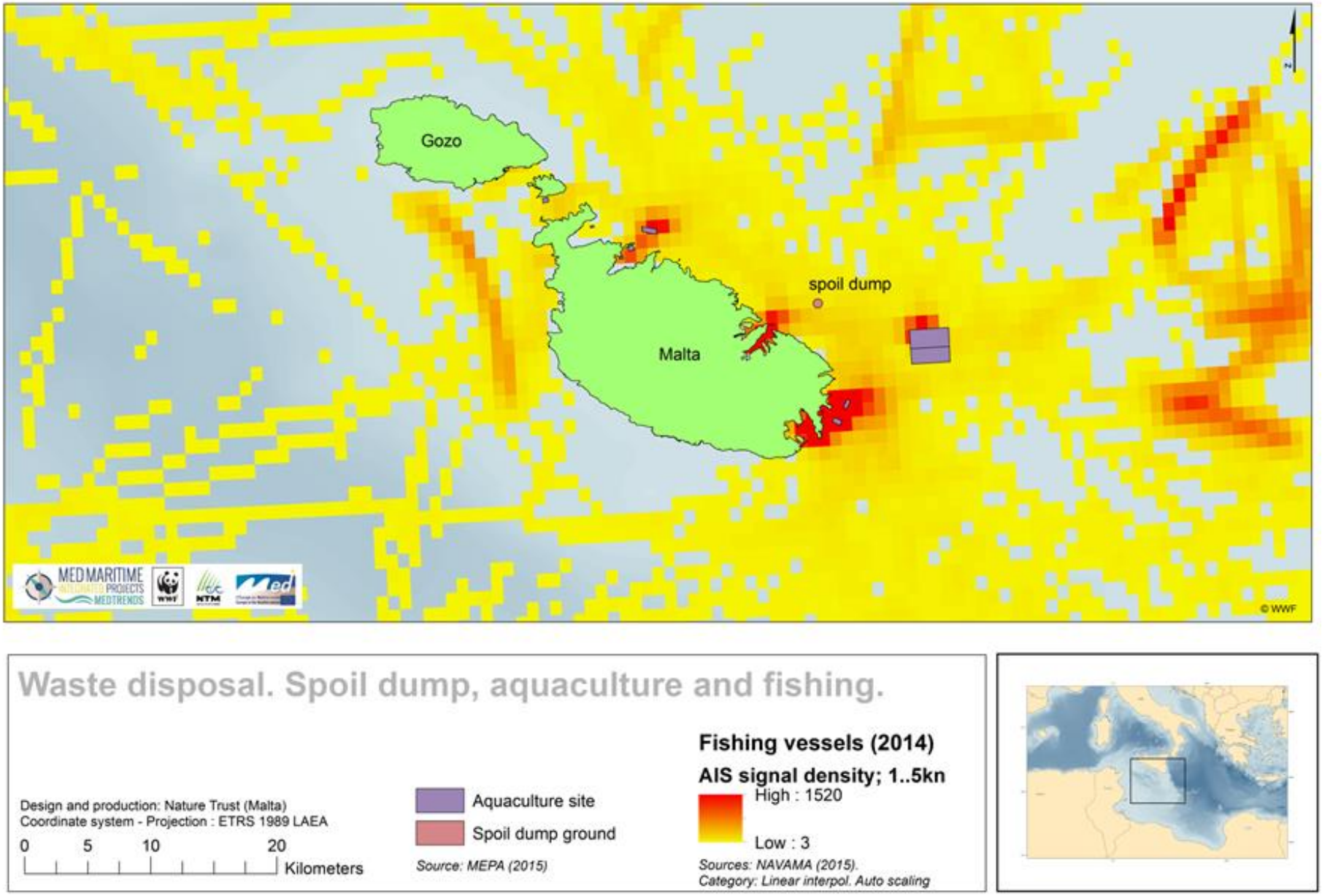

Figure 42 - K3. Location of offshore spoil dump in the vicinity of aquaculture areas and prevalent fishing activities in the vicinity.

VIII. CROSS-CUTTING ANALYSIS

1. Background

The cross-cutting analysis is based on the investigation of future trends for the different economic sectors as featured in the previous chapter. Specifically, it evaluates whether these sectors are likely to overlap in terms of the exploitation of marine resources.

This analysis is biased in favour of shallow marine habitats due to the fact that most of the available data on the distribution and state of the marine environment is restricted to such habitats and not to offshore areas. This means that unless such data is available, conclusions concerning maritime offshore activities can only be partially considered. One must keep in mind that these economic activities could also be partly subjected to unofficial activities such as as in the case of illegal fishing which would not show in the official national landing figures.

Moreover, this chapter makes the best use of available estimates and published national data; in other words it is limited to a trade-off between thoroughness and experiential observation. The scope is to highlight the potentially conflicting uses that may hinder compliance with attaining a GES and jeopardise the achievement of the 10% target of MPAs by 2020. This is presented not by showing a “before and after” scenario but rather how sustainable policies could move trends away from not achieving this target.

2. Sectoral interactions in the marine environment

Cross-sectoral interactions on the marine environment originate from the following sectors:

1. Maritime transport
2. Energy production
3. Land-based activities
4. Coastal development
5. Maritime transport and ports
6. Tourism and recreation
7. Aquaculture and fisheries

Until management plans are developed and implemented, transposing the Habitats Directive will also be fundamental in ensuring protection of these sites.

i) The local scale

Figure 43 shows a number of spatially conflicting sectors as far as the conservation of the marine environment is concerned.

With the proposed increased activities in sectors such as aquaculture and increased berthing for yachting and cruise liners, obvious cross-cutting issues will emerge concerning the maintenance of biological diversity in the marine environment, especially within the already designated marine protected areas. The presence of marine Natura 2000 sites does not necessarily exclude other economic activities within these areas. Fundamentally, the aim of such designation is to ensure that the habitats and species of conservation interest as indicated in relation to the Habitats and Birds Directives maintain or improve their

conservation status. To this end, therefore, it is necessary to ensure that other activities will not negatively affect the integrity of these sites.

The conservation and management of protected sites must necessarily consider an integrated planning approach that has to be defined by appropriate measures that ensure the integrity of the site, and where possible that the conservation status (of both habitats and species of interest) is improved. Development of management plans must thus include a strong element of stakeholder involvement and consultation, both at the strategic level (to ensure that sectoral plans take into consideration the relevant conservation objectives and management measures), as well as to ensure that human activities would not negatively affect the integrity of the protected areas.

This is particularly relevant to the proposed marinas in designated Natura 2000 site in Qala (Gozo) and in St Paul's Bay. The increased pressures on the marine environment resulting from the increasing yachting facilities along the south-east coastline (such as Birżebbuġia and Marsaskala areas) would challenge any future protection of these sites. One should not forget that such designation carries with it considerable obligations to biologically conserve such sites, including routine monitoring, controlled development and the implementation of other management practices. This would also require additional sources of funding and further capacity building by national authorities to manage additional sites.

The location of fish cages in coastal waters such as the ones situated along St Paul's Bay, in Marsaxlokk harbour and off Xrobb l-Għaġin are creating localised negative impacts that can be traced along parts of touristic coastline.

Additional geospatial information listed below, which for reasons of clarity have been omitted from fig. 43, illustrate the current problematic state of the local marine environment:

- Relatively high levels of mercury (>0.01 mg kg^{-1} wet weight) found in marine biota at coastal sites in St Paul's Bay, St Julian's, Xgħajra, Marsaskala, Xrobb l-Għaġin area, and Delimara (see fig. 6);
- Nitrate levels in coastal waters that exceeded 2 mg/l during monitoring exercise which include San Lawrenz (Dwejra), Xagħra, Sannat (off Mġarr ix-Xini) in Gozo, and Naxxar (Baħar iċ-Ċagħaq), St Julian's, and Marsaskala in Malta. Such nutrient enrichment is also causing the increase of phytoplankton and phosphate levels at these sites;
- The presence of tributyl tin and Di(2-ethylexyl)phthalate at sites located in marine protected areas such as Mġarr (Għajn Tuffieħa), Mellieħa (off Armier Bay), Mġarr Harbour (Gozo) and Żebbuġ (off Marsalforn, Gozo);
- Extensive maritime traffic caused by recreational boats within the designated marine protected areas without any control on anchorage practices, generation of litter and release of antifoulant chemicals in the marine environment;
- Increased tourism-related activities especially related to diving, tourism infrastructure and services, and
- Proposed addition of desalination plant in Gozo, thus affecting local marine environment with its brine water discharge.

Future conflicts arising from several economic sectors that have so far impacted the marine environment need to be addressed and balanced in view of the required management of marine biodiversity in the near future. The future cross-cutting trend is therefore very challenging. Fish cages in coastal waters, for example, would eventually need to be relocated further offshore. Similarly, recreational fisheries in current (and future) protected areas would ultimately need to be controlled due to the evident growth of this sector in the future.

In conclusion, the attainment of GES of Maltese waters by 2020 is considered to be highly challenging, requiring substantial collection of baseline information, updating of current information on the marine environment, revision of current policies, implementation of

management practices, and conflict resolution between the different economic sectors with a scope of sustaining marine biodiversity and related ecosystem services.

ii) The sub-regional scale

The conservation of the marine environment at the sub-regional scale is equally challenging. Figure 44 evidently shows a number of what can be considered as hotspots based on multiple uses of marine living and non-living resources. For reasons of clarity, fig. 44 again omits geospatial reference to intensive fishing activities as detected by the 2014 AIS signals coming from commercial fishing boats and trawlers, especially in regions considered to be ecologically sensitive.

For example, the intensive traffic arising from cargo ships between Malta and Sicily, together with the designation of most of the sea floor for oil and gas exploration raises serious concerns on whether the areas earmarked for marine conservation (such as the ACCOBAMS and the more extensive EBSA regions) can be truly attained. In this case, the potential risks of collisions between ships as well as between ships and cetaceans make the sub-regional environmental area vulnerable to further degradation.

Moreover, the sub-regional area is expected to become more vulnerable to oil pollution should further drilling of oil and gas continue to increase within Italy's EEZ. Any accidents resulting from deep water drilling could result in catastrophic impacts on the local and regional marine biodiversity, including that found in Maltese waters. Under such a scenario multiple economic sectors would also be negatively affected including commercial and recreational fisheries, aquaculture, tourism, transportation, security and extraction of non-living resources.

The attainment of GES at the sub-regional level necessitates transnational agreements that must address the interests and conflicts specifically arising from a number of economic sectors. The right political and technical forum would probably need to be sustained in order to propose and negotiate practical synergies that favour the maintenance of marine biological diversity. This approach is deemed to be conceivable between EU member countries but less so with EU non-member States, especially those that are currently undergoing political and economic instability.

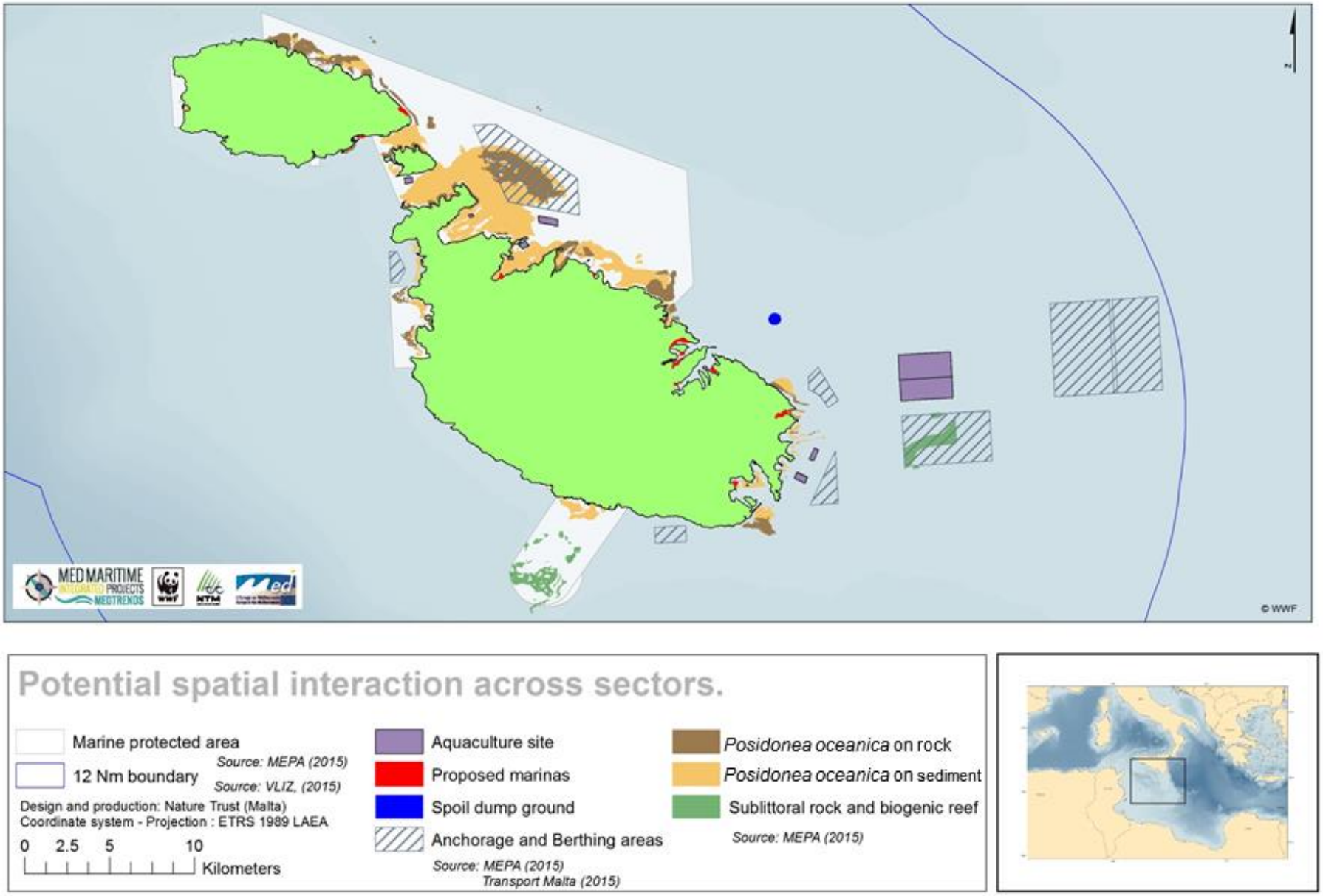

Figure 43. Potential spatial interaction across some economic sectors at the local level.

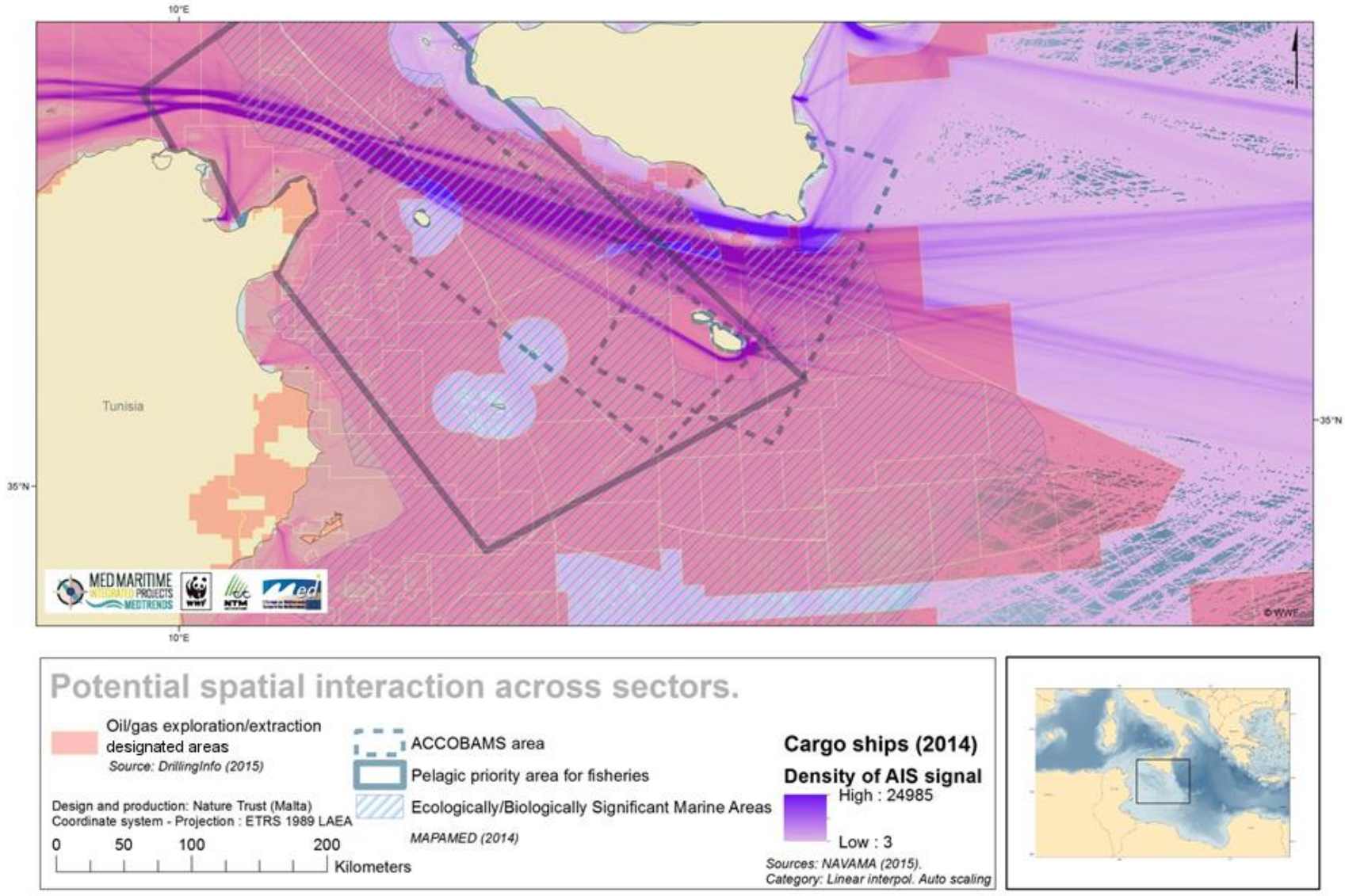

Figure 44. Potential spatial interaction across economic sectors at the regional level.

iii) Expected growth and sector interaction

The relative expected growth for tourism, maritime transport and military defence by 2020 are illustrated in figure 45 below. Both the local tourism and shipping sectors are expected to grow in the near future, though a greater growth rate is expected for tourism. An increase in shipping activity is likely to result in negative effects for the tourist sector though the significance of this is uncertain. Impacts will relate to cumulative effects on water quality and in particular the increased risk of an oil spill which would likely result in significant, potentially medium-term negative effects on the tourism industry. Military defence is generally expected to remain stable and potential negative impacts identified as a result of this sector are not expected to be significant. On the other hand, potentially positive impacts can be accrued by this sector's ability to help mitigate negative impacts from oil spills.

Figure 45. The relative expected growth diagrams for tourism, maritime transport and military defence.

It is difficult to predict the growth rate of the coastal infrastructure as related to services, telecommunications, gaming sector, etc., in view of the laying of additional underwater cables. In the context of land-based activities, the expected increased demands on resources due to an increase in visitors will place additional pressure on marine resources, such as increased demand to generate electricity, potable water and to treat larger volumes of wastewater. A move towards increased exploitation of renewable energy sources as well as measures to increase efficiency could serve to alleviate the dependence on energy from non-renewable sources. However, the continued dependence on desalination plants (such as the expected construction of an additional plant on Gozo continues to place a burden on the country in terms of energy consumption. The direct discharge of untreated wastewaters into the marine environment will continue unless immediate attention is given to the urgent introduction of appropriate disposal methods for agricultural waste. The implementation of an agricultural waste policy should therefore seek to identify waste management opportunities for the sector.

Currently there are indications of increased commitment towards nature conservation beyond business-as-usual. However, with the current limited financial and human resources to manage both current and additional conservation areas, developments in this field will continue to reflect minimum effort whilst ensuring legislative compliance. Given the expected growth in the economic sectors described, ensuring the effectiveness of nature conservation efforts, in particular where investment is required, is likely to prove challenging and may threaten or slow down the ability to achieve GES.

Cross-cutting issues between professional fisheries and other economic sectors that make use of the marine environment are somewhat restricted to the (1) integrity of seabed habitats, (2) impact on commercial and non-commercial marine species, (3) generation of continuous underwater noise, and (4) generation of marine litter.

Impact on fisheries on the integrity of seabed habitats are generally associated with the harm made by towed fishing gears, which often leads to the scarring of the seabed and a consequent degradation of benthic habitats. This obviously includes disruption of marine ecosystems and changes to the structure and composition of benthic communities. In spatial terms this damage would be related to the coverage made by trawling activities. Regulations

however exclude this fishing practice in areas containing *P. oceanica* meadows and other sensitive flora.

Impacts of fisheries on non-commercial species are mainly associated with by-catches of non-target species. The main impact caused by professional fisheries is that related to the increased mortality rate of commercially exploited fish stocks. Yet fish stocks exploited by Maltese fisheries are shared with other countries and thus assessments of such exploits should be carried out at a regional scale in order to get a more realistic picture of this type of negative pressure. The Maltese MSFD Initial Assessment however reports that most species' populations within the short-term observation period (2005-2012) for the assessment area were healthy, although this assessment does not consider the full life cycle and spatio-temporal distribution of the target species. On the other hand, recent data shows that for some type of stocks, such as Mediterranean swordfish, the current fishing mortality slightly exceeds the assigned maximum sustainable yield.

Sources of marine litter resulting from fisheries include limestone slabs used in setting up Fish Aggregating Devices. Increased maritime traffic is also likely to increase marine litter. However, additional information on marine litter is limited to isolated research studies and not based on long-term and standard monitoring.

3. Cumulative impacts on the marine environment

The traditional marine-related economic sectors, namely transport, tourism, oil and gas transportation, desalination, and waste disposal are particularly relevant when discussing their impacts on the marine environment. Local studies also identify shipping, infrastructure, fishing and aquaculture as additional sources that lead to environmental impacts[40].

Cumulative impacts from these activities are resulting in physical damage, pollution, as well as biological disturbance of the marine environment. Quantification of the cumulative impact is however impossible due to lack of local data. Physical damage occurs as a result of a number of activities including boating, construction of infrastructure, dredging, and dumping of dredge spoil. Physical disturbance includes noise pollution from maritime activities including port activities and boating, as well as marine litter. Interference with hydrological processes is also of concern.

Polluting activities that result in the release of hazardous substances include maritime transport, waste disposal and agriculture (diffuse land-based pollution source). Microbial pathogens can be introduced with raw sewage. Nutrient and organic matter enrichment occurs largely from untreated sewage reaching the marine environment, but also from boats and pleasure crafts discharging raw sewage to the marine environment. Aquaculture also contributes to nutrient enrichment, though impacts are largely localised.

Biological disturbance through the introduction of non-indigenous marine species is largely caused by maritime transport. Ship/boat strikes are another cause for concern for certain species of conservation importance including cetaceans and marine turtles.

[40] *Adi Associates, E-Cubed Consultants, EcoServ. Initial Assessment. Result 3b: A report on the economic and social analysis of the use of the marine waters and of the costs of degradation of the marine environment as defined by the MSFD, stating assumptions and sensitivity of analysis and integration of this report in the MSFD Initial Assessment. AEE Consortium.*

IX. CONCLUSIONS AND RECOMMENDATIONS

This report, which has been prepared by Nature Trust (Malta) is part of its commitment towards the MedTrends project[41] in cooperation with the World Wide Fund for Nature (WWF).

Based on the latest published information, the report evaluates those economic sectors that are impacting the local marine environment as well as their possible future trends.

The analysis adopted for this document is primarily based on the MSFD's 11 descriptors as presented by Malta's Initial Assessments of the state of ecosystems on a number of indicators (MEPA, 2012). Thus an understanding of the current and future attainment of GES is hereby provided for each sector through a cross-cutting analysis by reviewing:

- those economic activities that could potentially deter from achieving GES due to their negative impacts on the marine environment;
- the main current and future impacts on GES using a number of MSFD descriptors (D1-D11) and summarised in the form of a graphic, and
- the degree and type of sectoral interaction using geospatial presentation of geo-located data, thus providing a comprehensive picture of the competitive use of marine resources

It is important to emphasise that by means of this report, Nature Trust (Malta) is contributing to local authorities an analysis of existing marine-related data as part of the requirement for Malta to achieve GES. Moreover, this work also endeavours to provide authorities with the 'bigger picture' in terms of regional cross-cutting impacts and interactions with other territorial and regional seas as far as common spatial area designations of conservation importance is concerned.

At the end of this chapter, a number of general recommendations and actions are provided. Nevertheless, it is necessary to go beyond this step, in support of the implementation of the recommendations made by this document towards achieving GES.

Any long-term forecasts described in this report are based on, and limited to the available data and thus contain an element of uncertainty. However, this project treats uncertain forecasts to have a much higher value than simply accepting that there will be no future change to the marine environment. At the same time the main message of this report is an optimistic one aimed at conveying a transition from critical challenges to overall improvement.

Nature Trust (Malta) wishes to convey some very important messages as the principal output of this report. Nature Trust (Malta) is thus presenting its perception on the following issues:

- Thanks to EU Directives and other regional obligations, Malta's territorial sea is becoming rich in environmental data and in targeted scientific information knowledge. **However, more work is required to fill in existing information gaps that could provide better indications of future trends.** Malta has been asked to develop national maritime spatial plans by 2021 to better coordinate its maritime activities and to make them more efficient and sustainable. These plans will in fact help (1) avoid future potential conflicts between the diverse uses of marine resources, (2) create a stable environment that is attractive to investors and at the same time ensuring that a GES is achieved, and (3) introduce an overarching tool to manage the diverse interests and conflicts resulting from the use of marine resources. One of the

[41] http://mediterranean.panda.org/about/marine/marine_protected_area/medtrends_project/

deliverables set by this action plan is in fact the establishment and implementation of an on-going monitoring programme aimed at routinely assessing the environmental status and to investigate causes for failing to achieve the desired status. This requirement will ensure that our marine environment is closely monitored according to approved expectations.

- The above-mentioned situation contrasts sharply with the assessment of the **sub-regional environmental status which is extremely poor in consistent and integrated assessments, particularly in those areas that are prone to political instability.** The difficulty to produce regular integrated assessments is a major handicap for the region as a whole.

- The Maltese territorial waters and EEZ offer fantastic economic assets; however, it is a sea which is exposed to excessive human pressures. **This document identifies a number of hotspot areas that require a regional solution rather than merely a national one.** A case in point is the conflict between the need to sustain regional conservation zones and the future expansion of economic sectors such as the fisheries, transportation and energy sectors (see fig. 44).

- This document highlights regional and national maritime hotspots that are problematic towards the achievement of GES. **It is Nature Trust's wish to align the efforts that are needed to overcome these problems with the EU's Integrated Maritime Policy.** This Policy has the aim of increasing the coordination between different policy areas and cross-cutting policies, including Maritime Spatial Planning.

- The analysis presented in this report points to the fact that our society is currently still **transforming both the potentialities and opportunities which our seas offer us into threats for the future**. Such threats at failing to achieve GES are coming from a number of economic sectors, including shipping, recreational fisheries, tourism, energy and the waste disposal sectors.

- Nature Trust (Malta) strongly believes that our marine environment will only be what we make of our coastal and offshore areas. **It is determined to continue cooperating with all those entities who value highly this environment and who are willing to work towards achieving GES.** It sees this as a matter of understanding the collective interest as well as the rights of future generations.

- This document assumes that the area earmarked by our territorial sea and EEZ is a "key pillar" for the development of the country's economy, and so it is not in the national interest to put the local marine environment and related ecosystem services at risk. **By supporting the "Blue Economy" initiative, national authorities can concentrate on a marine version of the green economy. This approach is also supported by some important EU Directives, Policies and Plans.** Nature Trust (Malta) believes that if national authorities are committed to focus their energies to safeguard the well-being of our seas through wise management decisions and with the right investments, then Malta could continue profiting from this rich natural resource. The other side of the coin is the degradation of our marine environment from the unsustainable use of marine resources, which would ultimately put marine ecosystems, food security and human well-being at risk.

- **The initiative to support the Blue Economy is likely to be strengthened in the near future by the overarching EU Blue Growth Strategy which aims at supporting a sustainable growth in all maritime sectors.** The EU is seeing five sectors as potential drivers of such growth: aquaculture, marine and coastal tourism (including cruise and recreational boating), marine biotechnology and marine mineral mining. This trend corroborates the recent initiatives made by the Maltese Government

to formulate future strategies in the field of aquaculture, coastal tourism, and maritime services (in the form of a Maritime Hub).

- **Malta's traditional maritime economic sectors are expected to keep growing in the coming years.** This includes tourism, shipping, aquaculture, oil and gas exploration and related utilities. This will not be the same for a number of emerging sectors seen elsewhere in the Mediterranean, such as renewable energy, seabed mining and biotechnology.

- In spite of both technological and legislative progress to combat marine pollution, the forecasted growth of a number of maritime sectors shall continue to increase pressures and negative impacts on the local marine environment**. There is therefore a risk that Malta will fail to achieve GES by 2020 for a number of the MSFD descriptors of the Marine Strategy Framework Directive.**

- The continued growth of a number of economic maritime sectors in Malta will most probably challenge the need for the EU to meet the demand made by the Convention on Biological Diversity Aichi Target 11, which requires at least 10% of EU waters to be within MPAs by 2020. In less than 6 years European coastal states need to designate more or less the same number of protected areas that have been established since the past 20 years at EU level. Nature Trust (Malta) is aware that Maltese authorities still need to implement effective and coherent management of existing MPA sites, as required by the Marine Strategy Framework Directive. **This implies that the designation of new local MPAs will be very challenging, both from a management perspective, and more importantly from the competing use of the same resources between emerging and expanding economic sectors and commercial activities.**

- Nature Trust (Malta) notes that the current regional demand for energy is being reflected by a fast development of offshore oil and gas exploration contracts. It is important to note that In the Mediterranean, oil exploration activities already covers more than 20% of the area, with potential new contracts targeting an additional 20%. **The development of Malta's offshore oil and gas sector will impose additional risks to Maltese waters and to those sectors that are dependent on a healthy marine ecosystem,** such as tourism, fisheries, aquaculture and production of potable water by desalination plants. The professional fisheries sector will certainly be affected due to loss of fishing grounds, fish stocks, and concentrations of contaminants in the marine food web.

- This report shows that **due to current gaps in knowledge and information, it is difficult to determine the full extent of sectoral interaction and their resulting cumulative impacts on the state of the marine environment**. It should be noted that the combined effects of these impacts can potentially decrease the overall resilience of marine ecosystems. At the same time, current (but limited) evidence shows that the observed impacts have not yet induced large-scale changes to our marine environment; however, this is not so when the impacts are considered at a local scale, such as the case of harbours and marinas, in areas next to coastal and offshore aquaculture facilities as well as in areas next to spoil dumps. Further growth of these sectors could well lead to an amplification of such localised deterioration of the marine environment, unless adequate sustainable practices that are backed by continuous monitoring are implemented.

- **Nature Trust (Malta) feels that governments from neighbouring Mediterranean States should be aware of the increasing trans-boundary pressures on the**

marine environment (see fig. 44 above). Living marine resources have no boundaries and so there should be appropriate political fora at which decisions to reach GES can be taken jointly and in unison.

- Despite the efforts implemented at the local level thanks to very strong EU Directives related to environmental management, protection and access to information (i.e. the INSPIRE Directive 2007/2/EC), the local availability of marine data among public and private users is still in its infancy when it comes to access to national data.

- In conclusion, the fostering of Sustainable Blue Growth initiative remains a significant challenge. **Nature Trust (Malta) urges the European Commission to provide further guidance on this plan, especially on what is required by Malta to ensure that the Blue Economy leads to environmental sustainability.** Although Malta seems to be on the right track with regards to the future implementation of the Maritime Spatial Planning Directive (2014/89/UE), which needs to be transposed by September 2016, the process seems to be complex and tentative.

General recommendations

- In Malta, most of the documented sectoral pressures are currently being addressed separately by means of European legislation and policies. Such policy tools include the Common Fisheries Policy (CFP), the Integrated Maritime Policy (IMP) which covers maritime spatial planning (MSP) and the EU's Blue Growth strategy, the Marine Strategy Framework Directive (MSFD) and its ecosystem approach, the EU Biodiversity Strategy, the EU Strategy on adaptation to climate change which is key to coastal areas and the Water Framework Directive (WFD). In addition, Malta is signatory to the Barcelona Convention protocols aimed at acquiring basin-wide sustainability. **Nature Trust (Malta) strongly recommends that the Maltese Government integrates as soon as possible these policies so that effective management of the marine environment is achieved. Such an initiative must be taken in tandem with the rapid growth of a number of marine economic sectors** (see figs. 43 and 45).

- **Nature Trust (Malta) recommends that national authorities take into account both the geographical and temporal (i.e. future) dimension of conflicting uses of the marine environment** in order to anticipate future challenges in the sustainability of common marine resources:

    - *At the temporal level*: development of future trends need to be assessed over a time span of 15 to 20 years;
    - *At the regional (transnational) level*: development of future trends need to be assessed from a transboundary perspective, especially with regards to the (over)exploitation of commercial species, oil pollution, shipping accidents, and protection of conservation areas.

- Integrated management of local marine resources requires that all stakeholders agree on basic underlying principles of the Sustainable Blue Economy initiative so as to ensure that the economic development of the maritime sector truly contributes towards the well-being of local citizens and to the conservation of the marine environment. **Nature Trust (Malta) recommends that national authorities should:**

    - **give priority to EU policy visions that aim at establishing a circular green economy**. For instance, the recycling of construction and demolition waste should be maximized before considering disposal at sea. Similarly,

the extensive use of secondary class water should be maximised before considering its disposal at sea;
- in the likely of an increased interest for oil and gas exploration in Maltese waters, **a 'no-go' position is taken for any such developments**;
- hasten the implementation of the **MSFD ecosystem-based approach as the main pillar to achieve GES**;
- apply the precautionary principle when pivotal data necessary to inform smart decision-making processes are missing;
- **promote a participatory approach when it comes to the local, national, and transnational resolution of pressures on the marine environment**, in line with the spirit of the MSFD;
- **promote the collection, accessibility and dissemination of national data** for public use;
- **identify priority areas of environmental nature that require intervention at national and transnational level**. As demonstrated by this report, the geographical mapping of cumulative impacts can be crucial to visualize the anthropogenic impact on our territorial sea and EEZ;
- **overlap cumulative impacts maps with designated and/or priority areas for conservation at several spatial scales** so at to identify clearly priority areas and hot spots that require urgent action (see figs. 43 and 44);
- **protect deep-sea ecosystems from adverse anthropogenic impacts originating from offshore operations.** It is important that in their actions to promote the national economy, national authorities need to respect and align with the measures taken by international bodies to protect the high seas[42]. This should range from the evaluation of work plans for exploration to the assessments of environmental impacts, including cumulative impacts.
- **Support the setting up of high seas and deep seas marine protected areas in the Mediterranean areas in both Malta's EEZ and international waters.** Nature Trust (Malta) supports the existence of *Specially Protected Areas of Mediterranean Importance* (SPAMI) sites that have been identified by RAC/SPA as areas requiring protection.

- **Nature Trust (Malta) encourages national authorities to align with EU's 2020 Biodiversity Strategy[43] by mapping and assessing the state of marine ecosystems and their services, the value of such services and integrate them into the national accounting and reporting system by 2020.** This effort can be based on the national information generated as part of the Habitats Directive, Water Framework Directive and Marine Spatial Framework Directive, among others. In doing so, regulatory agencies responsible for the relevant economic sectors can take an adaptive approach to build a resilient marine ecosystem-based service approach.

[42] *such as the considerations and guidance given by the Convention on Biological Diversity (EBSAs), FAO (VMEs), IUCN (preservation of the High Sea Marine Protected areas), etc.*
[43] *http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm*

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