ENERSCAPES - Territory Landscape And Renewable Energies

CONTEXT ANALYSIS & DEFINITION OF METHOD

BACKGROUND REPORT & SWOT

MALTA

Name of the partner **MIEMA**

Country **MALTA**

Region

Person in charge

Signature **Date**

0 CONTENTS

1 INTRODUCTION

1.1 Most of the world still relies heavily on fossil fuels and nuclear power to generate its electricity. This situation is associated with a number of negative effects affecting the health of citizens, resulting in instability of the Earth's climate, and affecting the proper provision of clean air, water and energy independence for future generations.

1.2 Renewable Energy Sources (RES) are today offering cleaner energy technologies, resulting in lower environmental impact.. They offer more energy security and stability. The European Directive 28/2009/CE has been adopted with the aim of promoting energy using RES. One of the targets is to have 20% of the total energy to be generated from RES by the year 2020. Member States are to implement 'appropriate measures' to maintain this commitment. Malta's target is set at 10%.

1.3 This scenario gives rise to the Enerscapes project, which strives to analyse the effects of unregulated use of RES on the environment. RES can present a radical change on the environment, and the potential effects can be on aesthetics, ecology and natural habitats, geology, archaeology and heritage, and also on social and financial environments.

1.4 Enerscapes combines 'Energy' and 'Landscapes', creating a new awareness about the compatibility of the RES with landscape and heritage preservation policies. Landscape gives a sense of identity and forms part of the heritage of any locality, and hence the project combines the needs for energy and landscape preservation in a sustainable manner.

1.5 The project adopts the guidance of the European Landscape Convention (CoE), which 'promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues'. The CoE defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' and such landscape needs to be protected through 'actions to conserve and maintain the significant or characteristic features of a landscape, justified by its heritage value derived from its natural configuration and/or from human activity'.

1.6 The objectives of Enerscapes are to:

- define and test an energy planning method able to assess and minimise territorial impacts deriving from the use of RES;
- take into account landscape and environment in the development of the RES market that is one of the main actions introduced to reach the 20-20-20 objective in the EU;

- assess the local governance processes in place and their impact on the involvement of local stakeholders as part of the decision and planning processes.

1.7 By connecting energy and territorial planning, partners can identify suitable strategies for considering ecological, landscape and heritage aspects while setting up RES promotion policies. A shared assessment of landscape 'historic', 'social' and 'environmental' value within the process of introduction of RES systems into Med territories and landscapes is being carried out, and the project will be investigating and evaluating a set of impacts on distinct but recurring patterns of landscape all over the Mediterranean regions.

It will then assess the impact of non-regulated diffusion of RES, identify the most suitable strategies using the European Landscape Framework, set up RES promotion policies, identify an environmental assessment methodology to evaluate the impact on landscapes, define the development procedures for 'RES-Landscape Plans', and test on pilot experiences by each partner.

1.8 The Enerscapes project has a diverse set of specialist partners covering a vast range of territory in the Mediterranean region. This ensures a wide-encompassing study covering various scenarios, territories, case studies and different legal frameworks. The eight partners come from seven countries, as follows:

- MIEMA, Malta
- Andalucia, Spain
- Magnesia, Greece
- Cyprus Energy Agency, Cyprus
- Vercelli Provice & Lazio Region, Italy
- University of Maribor, Slovenia
- RhonalpEnergie, France

1.9 Investment in sustainable renewable energy sources is a rapidly expanding market and needs to be done in the most responsible and regulated manner possible. Enerscapes helps re-affirm the validity of RES and will identify the best solutions on how these can be compatible with landscape.

2 BACKGROUND

2.1 **Archipelago** - Malta is a small country with two main islands, the larger being Malta itself and the smaller being Gozo, located on the northwestern extremity. Between these main islands lies the much smaller island of Comino. Other smaller islands form part of the archipelago, but these are not inhabited and only have environmental and geographic significance.

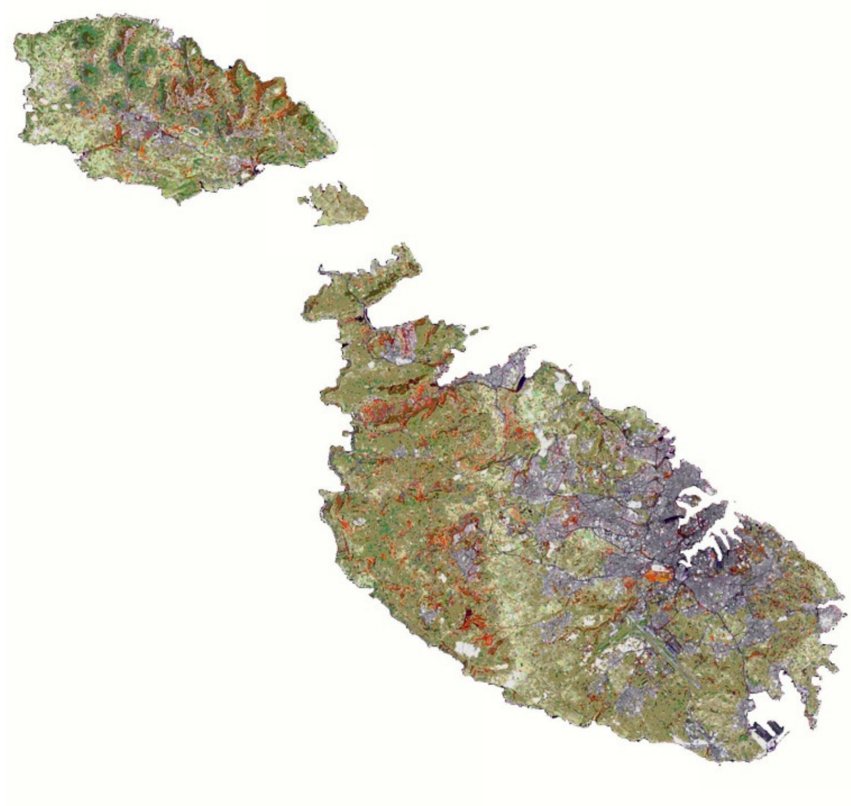


Figure 1: Map of the Maltese Archipelago

2.2 **History** - It is estimated that Man first arrived in Malta around 5200 BC. These were Neolithic people and probably arrived from Sicily. They were mainly farming and fishing communities. This society eventually disappeared.

Around 1000 BC saw the arrival of the Phoenicians from the eastern Mediterranean. They used Malta as an outpost to further expand their sea explorations and trade. The name of Malat, meaning "refuge" was given to Malta.

Although fortifications existed in the period that ensued, significant military land use was developed much later, at the time of the Knights. In the early 16th century, the Ottoman Empire reached South-East Europe. Suleiman II drove the Knight Hospitallers of St. John out of Rhodes, and wanting to protect Rome from invasion from the South, in 1530, Charles V handed Malta to these Knights. They stayed for almost three centuries and built towns, palaces, churches, gardens, and fortifications. The Knights of Malta started defence and embellishment projects and implemented numerous works of art and developed the cultural heritage.

Due to the confrontations taking place at the time, one of their main tasks was to provide medical assistance, although by time, the priorities changed to favour military over being hospitalliers. They thus became great seamen with a good fleet. They resumed their attacks of Ottoman shipping and this prompted the Ottomans to initiate a final attack on the Order in Malta.

In 1565, the Ottomans laid siege on Malta. They attacked the newly built fort of St. Elmo at the mouth of the Grand Harbour, and this took them a whole month to be overcome. They did not manage to make significant gains. In history this is referred to as “the Great Siege”, the Ottoman Empire conceded defeat and afterwards they made no further significant military advances in Europe.

The Order immediately started work on the new city of Valletta on the peninsula between the two natural harbours. It was designed to have state-of-the-art fortifications. These defences were eventually never tested, since the Ottoman Empire never attacked again. They hence remain to be one of the best-preserved fortifications of this period.

Malta voluntarily became part of the British Empire in 1800, after a brief occupation by the French. Initially it was not given much importance, but with the opening of the Suez Canal, its harbours became a huge asset. It was further developed into a military and naval fortress, and served as the headquarters of the British Mediterranean fleet.

In 1964 Malta gained its independence and in 1979 the last British forces left the Island after the end of the economic pact to stabilise the Maltese economy. This is celebrated on 31 March as Freedom Day.

Since becoming independent in 1964, Malta has made huge strides in its development.

2.3 **Population** - The population in Malta has increased over the years, reflecting the history together with social and economic influences. At the last published population census of 2005, the Maltese population stood at 404,962 persons.

	Total	Males	Females
Pop over 65	52,302	22,033	30,269
Pop less 15	69,486	35,639	33,847
Total	404,962	200,819	204,143
pop ageing rate			
pop >65 / pop <15	0.8	0.6	0.9

Table 1: National Population-aging Rate 2005

When population statistics are compared to the land area available, Malta has one of the highest population densities in the world. The population distribution within Malta includes a concentration that forms the urban conurbation on the eastern part of the Island around the twin ports. Within this concentration itself, there exist variable population densities.

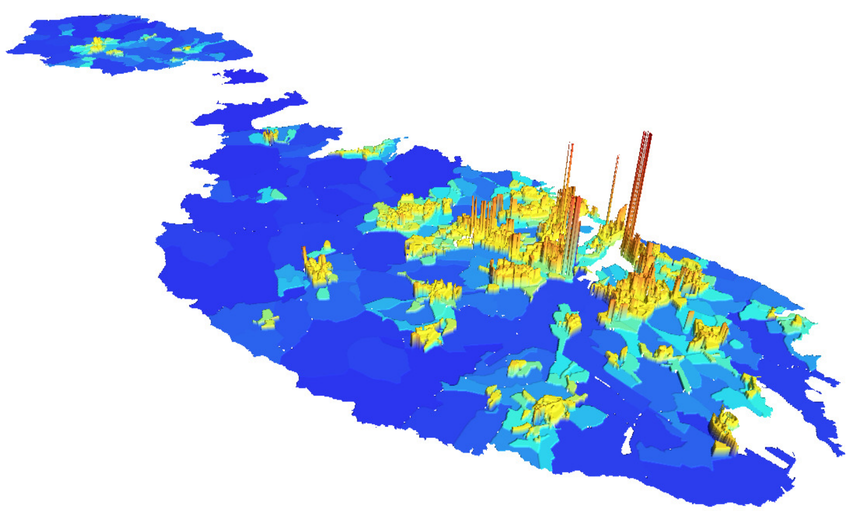


Figure 2: Graphical representation of population density in Malta 2005
Source: Formosa (2007)

Data available in the 2005 census indicates that on a national level, there were 1.4% unemployment cases in the population. This should not be confused with the official rate of unemployment. It however shows how many persons considered themselves as unemployed in the census period, and this as a percentage of the total population.

The 2005 census also shows that immigration in Malta has been limited, except for specific localities. It is important to note, however, that evidence suggests that this situation has changed during the last decade, when many asylum seekers have been granted such status. In 2005, foreigners in Malta represented 3% of the population, amounting to 12,112 persons out of a total of 404,962. Female numbers were slightly higher than those for males.

During the last decade Malta has experienced a huge arrival of irregular migrants when compared to previous years and to the number of Maltese residents. Between 2002 and 2009, 13,130 irregular migrants were registered to have arrived in Malta, approximately equivalent to 1 irregular migrant to every 30 Maltese nationals.

This situation has resulted in unease among the local population and has created tensions between the irregular migrants and the Maltese. In line with its international obligations, and bearing in mind the size of Malta, open centres have been set up for these irregular migrants, some of whom are asylum seekers. The majority of irregular migrants originate from the African continent, whilst a few come from Asia and Turkey. In 2010, there were 1992 persons residing in open centres and other institutional households (Source: The Agency for the Welfare of Asylum Seekers).

2.4 **Administration** - Eurostat is the statistical office of the European Union. All European member countries have been defined by administrative divisions. This classification is called the “Nomenclature of Territorial Units for Statistics” – NUTS in short. This uniform division makes it is possible to compare data among the member countries and has existed since 1988 (Source http://www.geodan.com).

Malta has a national government at NUTS 1 and 2. At NUTS 3 the island of Malta has no administrator but the island of Gozo has a Minister.

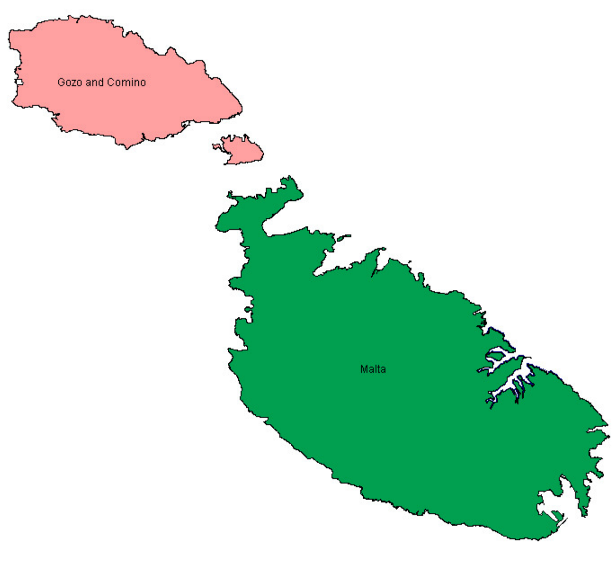


Figure 3: Malta NUTS 3 Level

A level designating five regions (not corresponding to NUTS 4 Districts level) has been recently created. This was done through Act No. XVI of 2009, which amended the Local Councils Act Chapter 363 (11th Schedule). The governance level at this stage is still in an embryonic phase and comprises a number of local councils within each region. The regions were not created in line with NUTS 4 and are envisaged to create issues of data harmonisation and cross-thematic analysis.

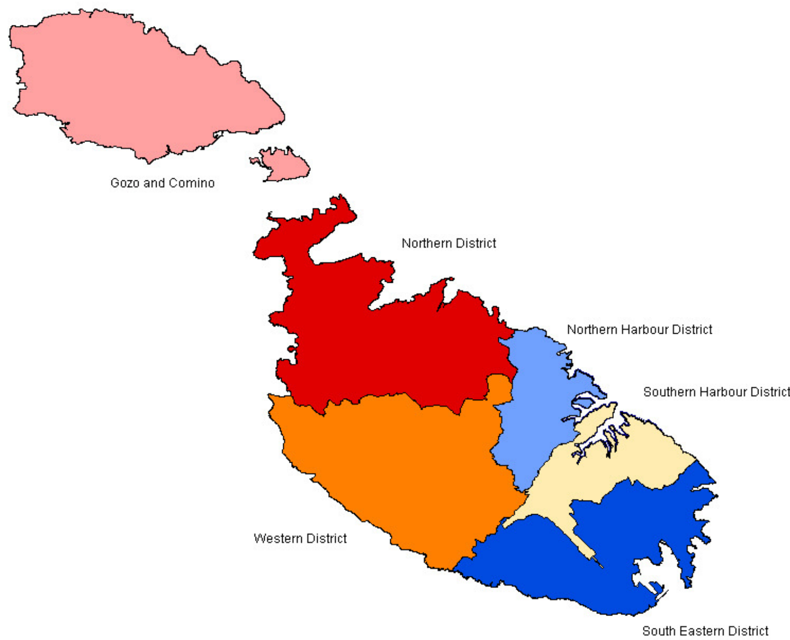


Figure 4: Malta NUTS 4 Level (No Governance equivalent)

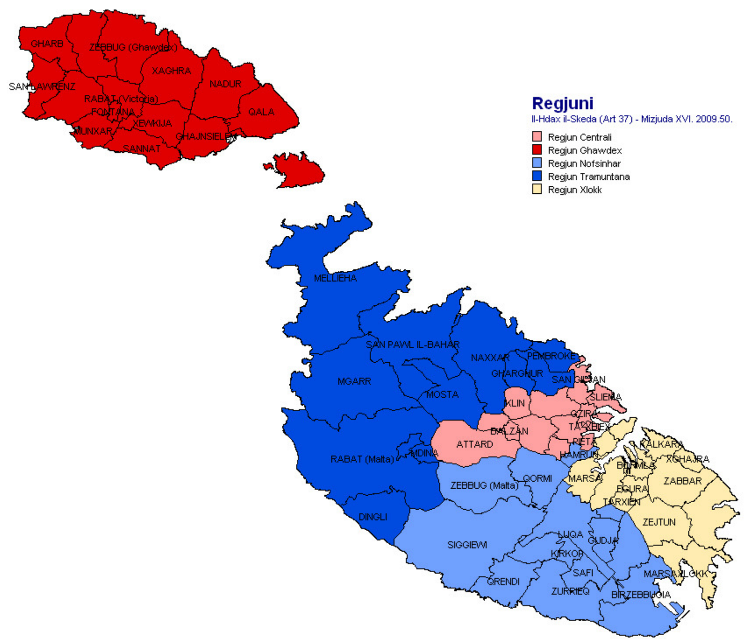


Figure 5: Regions as per Act No. XVI of 2009

At NUTS 5 level, Malta has 68 Local Councils, all with governance roles.

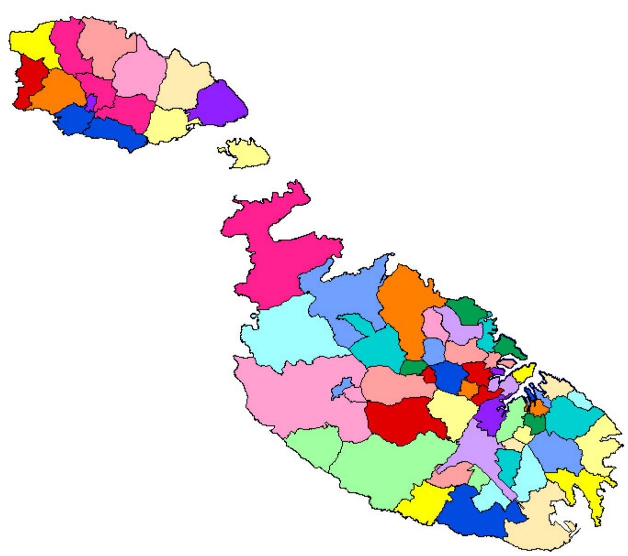


Figure 6: Malta NUTS 5 Level

2.5 **Governance** – Malta is a Republic, with the Head of State being the President. It has a democratically elected parliament with a five-year term, and this parliament appoints the President. The political party with a majority of the parliamentary seats is entrusted to form the government, led by the Prime Minister. This government is responsible for all affairs of State, and therefore leads the country.

The Prime Minister appoints a Cabinet of Ministers, each leading a Ministry with its own portfolio, depending on the priorities for the legislature. These usually take the form of sector specific responsibilities, such as tourism, infrastructure, social affairs, and the economy.

At locality level, 68 local councils are elected with four-year terms. The powers of local councils are relatively limited, but increasing as time goes by. General functions include cleanliness and waste collection, upkeep and maintenance of roads and public recreational areas, traffic management and assistance to citizens within the respective localities.[1] They also advise central government and its authorities, agencies and public institutions on all issues related to their localities.

The responsibility for spatial planning in Malta falls on the Office of the Prime Minister (OPM) and the Malta Environment and Planning Authority (MEPA). The OPM acts as the strategic focus and sets the priorities. MEPA, on the other hand, acts as the technical advisor to the OPM on spatial planning and environmental issues. It then translates these priorities into spatial policy documents, is responsible for development control, for environment protection, and for enforcement. There are no further sub-divisions in terms of planning agencies at local or regional level.

Two levels of policy documents cover the geographic area of Malta. The Structure Plan for the Maltese Islands gives strategic direction. This policy document was approved in 1990 and is in the process of being replaced. At the regional and locality levels, seven Local Plans cover the geographic area of Malta.

Other national authorities and agencies are responsible for planning and implementation of policies by sector. These authorities are accountable to the specific Ministry that is assigned the responsibility. Examples include

---

1 In terms of spatial planning, local councils can be responsible "within the parameters of any national plan, to issue guidelines to be followed in the upkeep, restoration, design or alteration of the facade of any building or of any building or any part of a building normally visible from a street, including the type of lighting and materials used, advertisements and shop fronts, and in the case of premises which are open to the public, to ensure that such premises are, as far as possible, accessible to all persons, including persons who use a wheel-chair;" However, to date, no local council seems to have made direct use of this piece of legislation, leaving such matters to MEPA.

agencies such as Transport Malta, Malta Enterprise, Heritage Malta, Malta Information and Technology Agency, and Malta Financial Services Authority.

2.6 **Economy** - Throughout Malta's history, its geographic location has defined the country's economic development. In 1869, with the opening of the Suez Canal, Malta became one of the principal ports of the Mediterranean.

Today, Malta's real economy is dependent on the services sector (2010 estimate of 80.9% of GDP), mainly tourism and more recently niche sectors including financial services. It also relies on foreign trade, including manufacturing (17.2% of GDP), such as of electronics and pharmaceuticals. Agriculture only represents 1.9% of GDP, and Malta only produces about 20% of its food needs. The Island has no other notable resources. The supply of fresh water is very limited and Malta has currently very few domestic energy sources.

Malta adopted the euro on 1 January 2008. The financial services sector has grown during the last decade and managed to escape significant damage during the 2008-09 financial crisis. This is because the indigenous real estate market sector plays a significant role and is not highly leveraged. Secondly, the Maltese banking system is very stable due to its prudent risk-management practices.

Between 2005 and 2007, Malta recorded an average GDP growth rate of 3.7%. During 2009 GDP contracted by 1.9%, but then recovered and grew by 2% during 2010. In 2010 Malta also took measures to correct an excessive budget deficit of 4.3% and appears likely to reach its deficit target of 2.8% of GDP in 2011. Debt was projected to reach a peak of 71.5% of GDP in 2010 (http://www.indexmundi.com; http://www.euro-challenge.org).

GDP in real terms		**Rate of growth**	**Real GDP per capita**
Year			
€ 000		**per cent**	**€**
2000	3,973,322		10,189.0
2001	3,909,090	-1.6	9,944.4
2002	4,011,516	2.6	10,131.8
2003	3,999,212	-0.3	10,036.5
2004	4,035,341	0.9	10,059.2
2005	4,197,338	4.0	10,405.0
2006	4,349,920	3.6	10,710.1
2007	4,510,693	3.7	11,028.8
2008	4,626,815	2.6	11,222.5

Table 2: Malta GDP 2000 - 2008 (Provisional)
Source: National Statistics Office

The labour force statistics reflect Malta's GDP sectors. In 2010, 73.9% of the labour force was estimated to be in the services sector, 24.8% in industry and 1.3% in agriculture. Unemployment for 2010 is estimated to have been around 6.7%, down from 7% in 2009.

For example, the cruise terminal on the Valletta/Floriana side of the Grand Harbour continues to increase in significance on both the region and the Maltese economy. The ferry terminal on the same waterfront location complements the cruise terminal. In 2009, the cruise terminal handled 439,630 passengers, including transits, embarkations and landings. On the other hand, the ferry terminal handled 181,581 passengers in embarkations and landings between Malta and Italy.

Figure 7: Cruise ships in the Grand Harbour (http://www.vallettawaterfront.com)

Figure 8: Superyachts at Grand Harbour, Vittoriosa htttp://www.maltashipphotos.com

2.7 **Infrastructure** - The development, progress and potential of any region depend on the infrastructure that the region has. This infrastructure is necessary for economic and social functions to occur, without which the system will not be able to work.

If Government expenditure is taken as an indicator of its priorities in terms of functional sectors, over the period 2005 – 2009 one could notice a substantial 41% increase in percentage in the expenditure in environmental protection, from €73.4M to €103.4M equivalent to €30M. On the other hand, the highest decrease was of 53% in housing and community amenities, equivalent to €18.9M.

COFOG	**2005**	**2006**	**2007**	**2008**	**2009**	**Change 05-09**
General public services	326431	347856	347339	395800	420942	29%
Defence	43708	37143	35601	38103	51935	19%
Public order and safety	76219	75894	80263	86256	90242	18%
Economic affairs	304778	310342	324965	432062	293572	-4%
Environment protection	73446	81550	86962	94863	103459	41%
Housing and community amenities	35749	37066	33595	40134	16923	-53%
Health	309021	325613	315643	316008	324140	5%
Recreation, culture and religion	31566	29120	31602	36178	35807	13%
Education	272466	286898	295812	311328	321731	18%
Social protection	676937	714396	772703	822037	866762	28%
Total	**2150321**	**2245877**	**2324485**	**2572769**	**2525513**	**17%**

Table 3: General Government expenditure (x €1,000) by function

When these figures are seen as a percentage of GDP, Government expenditure reveals importance to social protection, general public services and education.

COFOG	**2005**	**2006**	**2007**	**2008**	**2009**
General public services	6.8	6.8	6.3	6.8	7.2
Defence	0.9	0.7	0.6	0.7	0.9
Public order and safety	1.6	1.5	1.5	1.5	1.5
Economic affairs	6.3	6	5.9	7.5	5
Environment protection	1.5	1.6	1.6	1.6	1.8
Housing and community amenities	0.7	0.7	0.6	0.7	0.3
Health	6.4	6.3	5.7	5.5	5.6
Recreation, culture and religion	0.7	0.6	0.6	0.6	0.6
Education	5.6	5.6	5.4	5.4	5.5
Social protection	14	13.9	14	14.2	14.9
Total	**44.6**	**43.6**	**42.2**	**44.4**	**43.3**

Table 4: General Government expenditure by function as a % of GDP
Source: Gross Domestic Product for September Quartet 2010, 9th December 2010, News Release No. 234/2010

One important infrastructure that any developed country needs to invest in is transport, both as regards the physical road infrastructure and as regards public transport. Malta has over 250km of arterial and distributor roads, over 530km of main roads, and over 2340km of minor roads. With 297,776 registered vehicles in 2009, this translates to over 127 vehicles per km of minor roads, 559 vehicles per km of main roads, and 1179 vehicles per km of arterial and distributor roads.

DESCRIPTION	Road_Lenght_Km		No of Registered Vehicles 2009		Vehicles per Road Type
Arterial and Distributor Roads	252.4		297776		1179.8
Main Roads	532.1		297776		559.6
Minor Roads	2343.1		297776		127.1
Total - Main and Arterial-Dist Roads	784.5		297776		379.6
Total - All Roads	3127.6		297776		95.2

Table 5: Vehicle registrations and road type

Public transport, on the other hand, is currently undergoing an operational change. This is only based on the public bus system, with no other modal alternatives such as trams or other rapid transit systems.

The availability of water and its production is another important aspect of the Maltese infrastructure. Malta has no natural fresh water sources and relies on pumping of ground water and on Reverse Osmosis plants. In 2005-06, almost 31M cu/m of potable water was produced in Malta and Gozo. 43% was derived from various groundwater sources, with the main one being the Ta' Kandja Pumping Station, a series of galleries 8km in length and 100m below ground (http://www.wsc.com.mt). Potable water is distributed through a vast and complex network of over 2136km of pipes, pumps, reservoirs and other mechanical equipment. The network includes 142,000 connections to users' premises.

Information and Communication Technologies (ICT) infrastructure is essential in today's world. Malta has been very proactive in this respect during recent years. In 2010, a survey by the National Statistics Office revealed a true picture of ICT use in Malta. ICT usage in enterprises is an example of the progress achieved in this sector. It shows that ICT usage at enterprise level is quite widespread, notwithstanding the fact that most of Maltese enterprises fall into the Micro-enterprise category.

	Size class 10-49 % of total	Size class 50-249 % of total	Size class 250+ % of total
Computer use by enterprises	94.6	100	100
Availability of Local Area Network (LAN)	81.6	94.8	92
Availability of wireless LAN	42.3	60.2	64.2
Availability of an Intranet	24.6	42.3	73.9
Availability of an Extranet	26	37.8	56.8
Use of third party free or open source operating systems	9	20.6	28.4
Internet use by enterprises	92.7	97.8	100
Use of the Internet by enterprises for banking and financial services purposes	84.8	89.8	90.9
Use of the Internet by enterprises for training and education purposes	33.9	50.9	64.2
Percentage use of e-Government services by enterprises	79.8	93	92
Enterprises with a website or home page	65.9	83.3	94.9
Enterprises using digital signatures in outgoing messages	15.9	27.4	19.3
Electronic transmission of data between enterprises	46.4	60.8	69.3
Electronic share of information with enterprise suppliers and customers: January 2010	20.8	31.3	28.4
Availability of Enterprise Resource Planning (ERP) software	14	30.3	53.4
Availability of Customer Relationship Management (CRM) software	21.5	34	40.3
Enterprises conducting sales via e-Commerce	16.3	26.6	27.8
Enterprises conducting purchases via e-Commerce	21.3	38.1	30.7

Table 6: ICT usage in enterprises

During January 2010, 50% of enterprises used electronic transmission of information between enterprises, a 12% increase over January 2009. 67% of enterprises also shared information over a "supply chain management" system via a website. 51% shared internal information concerning sales orders automatically, while 44% have shared purchase orders at an internal level. Enterprise Resource Planning (ERP) and Customers Relationship Management (CRM) software was also used by 18% and 24% respectively by enterprises.

Another form of essential infrastructure is the human infrastructure base and the robustness of the workforce. The NSO survey results show that 73% of households had access to a computer from home. This was 6 percentage points higher than the 2009 estimate, indicating the ever-increasing popularity of computer systems for personal use. In 2010, 70% of households had Internet access, compared to 64% in 2009. Furthermore 96% of households comprising two adults and children benefited from Internet facilities within the home. Computer usage is most common among the younger generation. In fact 97 per cent of individuals in the 16-24 age bracket had computer access from home. The percentage of students using a computer went up from 96.6 per cent in 2009 to 100 per cent in 2010, making this group the most avid computer users. In general, internet popularity decreases with age and increases with the level of education.

One of the constant challenges of the education system is to reduce the number of illiterate persons to a minimum, since this impacts all the other aspects of socio and economic performance. In 2005, almost 8% of the population was illiterate. Efforts have therefore been made to improve this percentage. Among these is access to free libraries, both at national, regional and local levels. There are now 57 local libraries in most of the Local Council areas, 7 regional libraries, and 1 central public library (http://www.libraries.gov.mt).

2.8 **Energy** - In terms of energy generation, Malta's power plants are oil fired. There are currently two plants, an older one at Marsa, and another one at Delimara to the south. The Marsa power plant is being phased out, and this should be complete once connection to the European power grid is achieved. In total, the current output of the Marsa plant reaches a capacity of 247MW.

As part of the EU 2020 strategy, Malta has also embarked on the path of increasing the share of energy derived from Renewable Energy Sources. This process is however still in its initial phases. Among the options considered is the use of wind turbines on a national level, and of photovoltaic cells on a diffused level.

Government has introduced a scheme to encourage the use of such photovoltaic panels, mainly aimed at private households and manufacturing entities, apart from the identification of a number of public buildings where such panels can be installed. Capital costs for installation however remain as the main stumbling block for widespread adoption.

3 RES – ENERSCAPES SCOPING INVESTIGATION

3.1 **The National Renewable Energy Action Plan (NREAP)** - Dated June 2010, this plan establishes the objective that in 2020, 10% of gross final energy consumption in Malta should come from renewable sources. This gross energy consumption includes electricity, heating and transport.

It is planned to achieve this figure through a combination of the following:

Biofuel	2.40%
PV	0.69%
Offshore wind farms	3.48%
Onshore wind farms	0.61%
Waste – electricity	2.18%
Waste – heat	0.32%
Solar water heaters	0.52%
Total	**10.2%**

The NREAP reveals that, with reference to electrical energy, the Maltese target for 2020 is that **13.8%** of electricity will be generated from renewable energy sources using a combination of PV, wind and waste treatment. The plan is based on the following specific targets:

PV (domestic and government roofs)	19.1 GWh
Wind (onshore and offshore)	253.0 GWh
Waste treatment	55.5 GWh
Total	327.6 GWh

3.2 **The Wind Energy, Landfill Gas options, and Wave Energy** - Malta had started its contribution in this project by carrying out a scoping exercise in order to investigate which types of RES are the most promising and hence which ones can have a substantial impact on the landscape and environment in the future.

Given that the NREAP estimates that the main source of RES will be from Wind Energy, this RES type would have been the most likely candidate to investigate. However, investigations on this RES type are already very advanced, including the identification of sites and the foreseen environmental impact of the wind farms, both onshore and offshore. The most likely site would be is-Sikka L-Bajda, a reef covering about 11 square kilometres offshore, 2 kilometres east of L-Ahrax tal-Mellieha. Studies conducted include: effect on birds and bats; effect on marine ecology; visual and noise impact; impact of the rotating shadow; impact on the quality of the marine environment; study on possible archaeological remains; impact on air traffic; effect on communications; and impact on fishing and aquaculture.

More detailed studies on the technical feasibility of this energy source at this site are being carried out today, and will continue for the next two years. It will accommodate between 19 and 24 turbines, each with a diameter of between 100m and 126m. It was therefore decided that this RES would be incorporated as part of the Enerscapes project only as part of the Option 0 which maintains the status quo.

Figure 9: Artist's impression of the proposed wind farm (Source – The Times)

Based on discussions with relevant agencies, an investigation on the possible impact potential for Landfill Gas Projects and Wave Energy projects was carried out. Two sites were identified. One area is located on the North East side of the island of Malta whilst the second is on the extreme opposite side, that is, on the South West side. Both areas are coastal zones but have a totally different character.

The NE area lies just inland of a bay and is known as the Maghtab area, a locality of Naxxar, whilst the second SW area lies offshore from the cliffs that characterise this part of Malta, and is known as the Filfla sea area just off Qrendi and Zurrieq.

In terms of administration, both areas fall within the responsibilities of national public administration or national agencies – Maghtab to Wasteserv, the national agency dealing with the management of waste, whilst the sea area near Filfla to Transport Malta (dealing with sea transportation) and the Malta Environment and Planning Authority. Geographically, Maghtab relates to the Local Council area of Naxxar whilst the Filfla sea area relates to those of Qrendi and Zurrieq.

3.3 **The Maghtab coastal area for Landfill Gas** – Maghtab has been the site for dumping of waste for the last few decades. It now houses three major sites – the original Maghtab waste tip, the newer Zwejta controlled landfill, and the latest Ghallis controlled landfill. In 2006, the area was approved as the site for the development of a long-term engineered landfill. The permit covered the development of the following facilities:

• A controlled landfill for non-hazardous, non-inert waste with a capacity of 1.7 million cubic metres;
• A controlled landfill for certain types of hazardous waste with a capacity of 100,000 cubic metres;
• A facility for the temporary storage, pre-treatment and transfer of hazardous waste;
• Leachate and gas management plants;
• Administration and Site Management Buildings.

All the three sites above result in landfill gas as a by-product of the operation, although to varying degrees. Future plans, not directly related to the above, also include the installation of a Sewage Treatment Plant, which will also produce biogas (still not quantified) on this site.

As part of the operation, leachate is treated in a Reverse Osmosis plant, and second-class water is produced. This is used for cleaning, irrigation and dust control purposes.

Green waste is reused, recycled or exported.

The coordinates for Maghtab are: 35*56’46”N, 14*26’28”E.

The general area that was under consideration is a low coastal area along the NE part of Malta. Near Maghtab the sea has corroded long tracts of the low, rocky coastline. Pools and Lapis characterise this landscape of low lying rocky shoreline. The coast here is stable as the geological structure is mainly composed of Globigerina Limestone and Lower Coralline Limestone. The platforms are jagged especially when cut in Coralline Limestone.


Figure 10: The new Ghallis Landfill under construction

The site forms part of a rural area and is surrounded by a number of urban towns and villages. The immediate vicinity though, is composed of a mix of areas with different vegetation types. The closest urban settlement is at Bahar Ic-Caghaq, just southeast of Maghtab.

Access to the area is very easy since the site is located just off the main arterial road that links the North of Malta to the East and South. Beyond the main road, the coastal area is protected. However, there are no protected sites within the borders of the chosen area itself. The general area has been used as a rubbish dump for a number of decades.

Apart from the general site itself, the surrounding area is a very scenic part of Malta, and is located along one of the most important tourist corridors of the Island.

The site itself is a degraded site and does not possess any positive environmental characteristics. The impact of having such a plant at L-Ghallis is not expected to have any significant effect on the landscape due to the nature of the site.

The largest impact on the environment is thought to result from the neighbouring Maghtab uncontrolled waste, not from the engineered landfill itself and much less from the extraction of landfill gas.

3.4 **Biogas Energy Potential** – In terms of Biogas potential, the National Strategic Reference Framework 2007-2013 states that Malta cannot benefit from the cultivation of energy crops because of the scarcity of land and water.

This project, therefore, presents an alternative that needs to be developed further.

The idea of the pilot project is to have a biogas plant located on this site so as to extract and make use of trapped gases inside the engineered landfill. The general area has acted as the main waste disposal site for decades. In recent years parts of the area have now been managed as an engineered landfill.

The landfill is exposed to Oxygen in the air. The adjacent dump (not engineered) gives 1%-2% methane, a hydrocarbon, through normal aerobic digestion. This project at the engineered landfill, by comparison, results in methane produced in a range of between 40%-60% of the Volatile Organic Compounds extracted. This fuel is directly burnt, and can be used to drive gas engines and generators in the production of electricity.

Currently, extraction trials are being carried out. Since this is a biological process, gas production is variable, depending on weather conditions. A baseline is thus being established. It is estimated that the Combined Heat and Power generator can produce between 150kWH to 250kWH of electrical power, apart from the possibility of tapping the heat generated. This does not include estimates for the future Sewage Treatment Plant.

Bearing in mind that the extraction amount is relatively minimal and not commercially viable, together with the fact that the plant is located in a degraded area, it was concluded that this RES would be incorporated as part of the Enerscapes project only as part of the Option 0 which maintains the status quo.

3.5 **The Filfla sea area for Wave Energy** – This general offshore area had been identified as one of the areas with potential for the production of electricity through the conversion of wave energy.

The coordinates for the Filfla sea area are: 35*46'30"N, 14*27'28"E

The area is offshore SE of the island of Filfla and south of the mainland cliffs found on the west coast of Malta. It is a very exposed area and characterised by heavy seas. Sea depth varies to 153m.

Apart from the island itself, two small rocks (Xiutu z-Zghir and Xiutu l-Kbir or il-Blata ta Santa Marija) lie to the southwest of Filfla, and Stork Rock lies 700m to the south of Filfla. In addition, the occurrence of large boulder fields exists, leading to large stretches of sandy bottom.

Figure 11: View of the island of Filfla

Malta is late in drawing up a marine strategy but will soon be in a position to deliver on its obligations according to EU rules. Draft regulations should shortly be issued for public consultation before their final adoption into national law.

The Marine Strategy Framework Directive, which came into force in June 2008 and covers the territorial waters of all EU countries aims to ensure that Europe's seas achieve good environmental status by 2020. Member states need to draw up coordinated strategies to protect and restore marine ecosystems and to ensure the ecological sustainability of activities linked to the marine environment.

In the closed Mediterranean Sea, storm and wind-driven waves are the main source of Wave energy. This technology is not yet well advanced and is hence considered to be still progressing at its initial stages.

3.6 **Wave Energy Potential** – Wave energy is a relatively new RES. Several technologies are being developed that convert kinetic wave energy into electricity. Although gaining momentum around the globe, it has not yet reached a commercial stage.

The Earth's gravity, the moon, the wind and ocean water temperatures interact to create waves. Only those created with 3 to 8 knots of wind or with at least 16 feet difference between high and low tides are suitable for energy production.

In Malta, this RES is still very much at an experimental stage. The main commercial research being carried out aims to achieve long lasting, low impact, contaminants free wave energy converters each producing around 250KW/hour. Research, though is still at an early stage, with different wave site locations being tested.

Given this situation, and considering that such converters will be located off-shore, it was concluded that this RES option would not be investigated further as part of the Enerscapes project.

3.7 **Solar Energy** – Given the current status of development of RES in Malta, the only other feasible RES that is thought to be suitable for investigation in the Enerscapes project is through Solar Energy and photovoltaic cells[2].

Malta's targets in respect of energy generated from PV are relatively low and it is planned that these will be achieved through PV installations on rooftops (domestic, industry, government buildings) rather than through the use of PV farms. Studies[3] indicate that Malta has potential for a much higher PV output than the official target, even when considering only rooftop installations, but the main barrier is the capital cost involved.

The NREAP identifies a number of uncertainties and challenges associated with the development of the onshore and offshore wind farms, which might make it necessary to resort to alternative mechanisms to achieve the established targets.

It was therefore decided that the Enerscapes project can provide a very good platform to investigate what the effect of PV and PV farms would be on the environment and landscape should it prove impossible to achieve the other targets, such as the wind-powered energy targets.

2 See para 3.2 - Wind Energy was also considered as an option, however, detailed studies on wind energy have already been carried out and potential sites have already been identified and are in the process of further detailed studies.

3 Feasibility Study for Increasing Renewable Energy Credentials, Mott McDonald, Jan 2009

4 SOLAR TECHNOLOGY

4.1 **Available Technologies** - The energy conversion for solar technology takes place in a device (PV cell) that comprises a properly treated semiconductor material, which creates an electric field; it orients the electric charges generated by the interaction of solar radiation (photons) with the electronic structure of the semiconductor material, giving rise to an electricity flow.

An investigation was carried out on the state-of-the-art of this technology. The currently available technologies identified are the following:

- *Monocrystalline Silicon*

Monocrystalline panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Monocrystalline panels are more efficient than polycrystalline ones but are more expensive. They require the highest purity silicon and have the most involved manufacturing process.

- *Polycrystalline Silicon*

This technology uses solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than monocrystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than monocrystalline silicon. They are also slightly less efficient, though the performance gap has closed in recent years. Polycrystalline PV panels currently have the largest market share.

- *Thin film*

In this new technology solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. Thin film solar panels offer the lowest manufacturing costs, and are becoming more readily available commercially. This technology offers a high degree of flexibility in manufacturing and can also be made as a lightweight flexible film which is ideal for applications such as camping and adventure trips. It is still relatively young and not clear whether it matches the lifetime of crystalline silicon. Indications however show that this will be the technology of the near future.

Figure 12: Thin Film clip on systems

- *Other technologies*

A number of other technologies are under development but have not yet entered the mainstream market.

Technology	Advantages	Disadvantages
Monocrystalline	High efficiency	More costly than polycrystalline
Polycrystalline	Less expensive than monocrystalline	Less efficient than monocrystalline
Thin Film	Less expensive than crystalline Lightweight panels	Less efficient than crystalline, still new, unproven lifetime, but probable technology of the future.

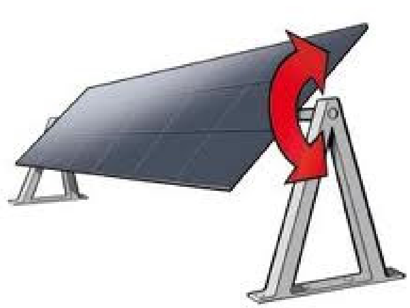
Table 7: Available Technologies

Given this situation, for the purposes of this project it will be assumed that thin film technology will be adopted, increasing take-up in urban areas but having the same characteristics of crystalline silicon technology for rural areas. The market, together with incentives given by authorities will eventually choose the type that is implemented, and such decisions would have to be based on quoted cost, efficiency and power output, which are expected to be favouring thin film technology during this decade.

4.2 **Positioning** - Solar panels are normally mounted on fixed supports but it is also possible to make use of solar tracking systems, which may be either single-axis or dual-axis. Efficiency of photovoltaic systems improves by adjusting the mounting angle of the PV panel as the sun moves across the sky, maximising the sunlight reaching it. Since efficiency of a panel decreases at excessive temperature, one can program the tracker to avoid overheating.

Figure 13: Examples of fixed systems

Single-axis tracking systems can increase output by about 30%, while dual axis systems can improve output by up to 36%. However, the additional cost, complexity and maintenance requirements of the tracking system need to be carefully considered. A detailed analysis of the costs involved is needed to make firm recommendations between static or tracking mountings.



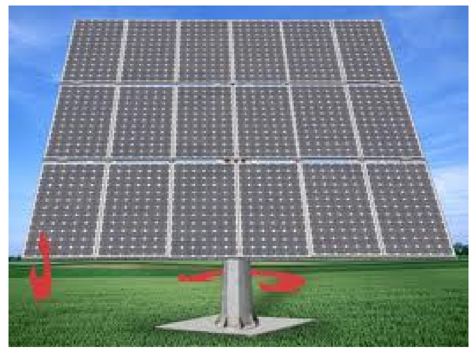


Figure 14: Tracking systems

Tracking systems also require more land area than static mounts, which is an important consideration in a country such as Malta where land is in short supply.

On the basis of the above considerations, it will therefore be assumed that for the purposes of this project, fixed mountings will be used.

Existing PV farms in other countries utilise a variety of different configurations. Since land is at a premium in Malta, it is recommended to opt for a compact layout based on rows of PV panels side by side with service areas between successive rows.

Figure 15: Various types of configuration

4.3 **Land Area and Location** - PV technology and efficiency are continuously improving, but typical parameters for current technology are listed below:

Panel size: 1.63 sq m
Power rating: 1.1 kWp
Annual output: 400 kWh p.a.

The land area required for a PV farm depends on a variety of factors such as the configuration of the panels and the type of mounting used. In previous sections recommendations were made to opt for choices which made most efficient use of land area whenever possible.

The 1.63 sq.m. panel referred to above would have a footprint of about 1 sq.m. since it will be mounted at an angle. Based on the recommendations above, it is believed that a nominal land area of 2.5 sq.m. for each panel is a realistic figure upon which to base calculations.

Using the above parameters, the land area required for PV farms with the desired output is as follows:

Electrical output GWh	**Panels required**	**Area required sq.km**
100	250,000	0.625
200	500,000	1.350

Table 8: Output vs Land Area required

When evaluating the suitability of a location for the installation of a PV farm, the following typology characteristics need to be considered, as applicable to crystalline silicone technology[4]:

- The location should ideally be a large flat area. Inclined or stepped areas should not be ruled out, but these introduce additional complexity and would probably require a larger total area due to inefficiencies in land utilisation;
- If the location is on an incline it should be facing South in order to maximise direct sunlight;
- The location should not be in the shadow of a higher elevation which will reduce sunlight;
- A location which is exposed to sea spray should be avoided since this will result in corrosion to the panels and mounting equipment.

[4] Indications in thin film development show that these characteristics may not apply to such a technology. Indeed, it is expected that such a technology will offer less constraints, therefore increasing the possibilities for adoption of solar energy. Hence, this study can be taken to present a worst-case scenario for the implementation of solar technology.

5 Environmental and Landscape Characteristics

5.1 **Environmental Monitoring** - EU environmental policy has helped Malta's policy and practice in terms of environmental processes. Malta has historically been weak in environmental monitoring, is still investing heavily and monitoring programmes are being revised within the context of a sector-wide structural funds project aimed at setting in place a comprehensive environmental monitoring programme for air, soil and water.

5.2 **Geomorphology** - The Maltese coastline has a diverse range of characteristic features as a result of the geological rock strata making up its limestone.

As a result of rifting, alternate uplifting has resulted in many places around the Maltese Islands, resulting in a tilt towards the NE. The NE has a low indented shoreline while the south-west has sheer, rectilinear coasts with the highest point being 253m above sea level. The eastern coastlines, on the other hand, are drowned. The result is a predominant NE trend of drainage channels on Malta.

Two main fault systems go across Malta, and these represent the effects of two separate rifting episodes. The Great Fault is older and trends SW to NE. A system of horst and graben structures of E-NE trend gives rise to a series of rifts and valleys north of the Great Fault. The coasts on the NE side of Malta are quite stable, mainly composed of Globigerina Limestone and Lower Coralline Limestone.

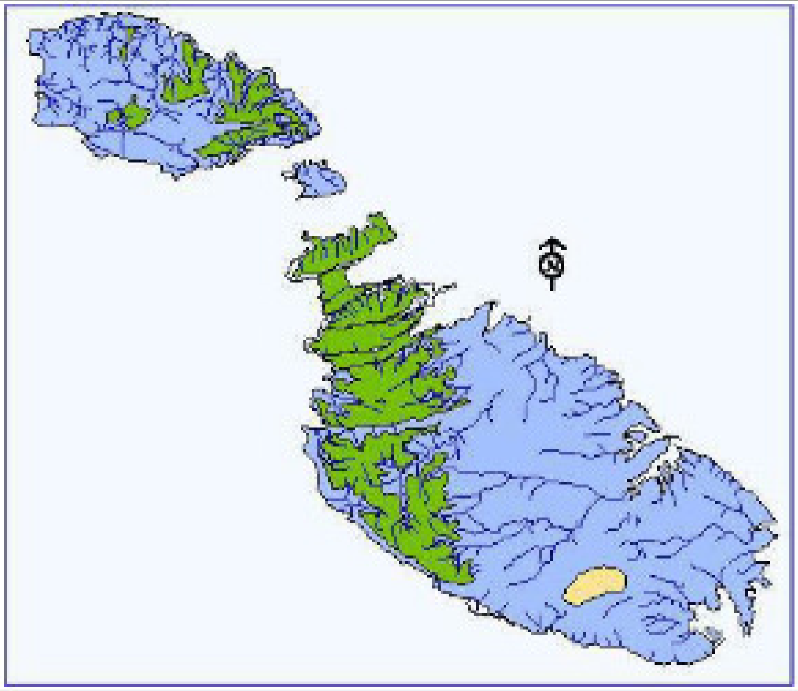


Figure 16: Geological Map of the Maltese Islands
Green represents Coralline Limestone
Blue represents Globigerina Limestone

On the other hand, the Maghlaq Fault system trends approximately NW to SE along the southern coast. This resulted in the down throw of Filfla to sea level.

The Maltese archipelago has two types of cliffs. The first are vertical plunging cliffs formed from Lower Coralline limestone and Upper Coralline Limestone, without shore platforms at their feet due to the absence of mass movement processes and are probably tectonic in origin, as in the SW coast of Malta.

The second are the scree cliffs, which occur when marls of Blue Clay formations are overlaid by upper coralline limestone. Blue Clay is easily eroded by wave action, and during torrential rains, water percolates through the overlying limestone fissures resulting in the saturation of the clay that then becomes plastic. The Upper Coralline Limestone on top is undercut and rock falls occur. A gradual cliff retreat occurs as a result of this. The rdum cliffs are common in the NW side of Malta due to the extensive Upper Coralline Limestone plateau found there.

5.3 **Ecology** – The Maltese Islands' size and location in the middle of the Mediterranean result in a rich ecological landscape highly influenced by the proximity to the sea.

Although regarded as having an impoverished flora and fauna, in reality, when considering their land mass and the rate of urbanization, they are home to a very diverse array of plants and animals. In addition, they support a number of species of plants and animals which unique and not found anywhere else in the world.

In terms of terrestrial ecosystems, one finds two categories: major communities and minor communities (specialized to occupy particular habitats, or occupy rare habitats, or are relics from a previous ecological regime). Classification and description is based mainly on vegetation, with the most important being:

- *Woodland* - In the Maltese Islands, the native forest is almost extinct. Remnants remain at four localities, all on the island of Malta, and take the form of small copses of Holm Oak, some of which are estimated to be between 500 and 900 years old; in addition, Buskett (Malta) originally planted by man, is now self-regenerating. It may be described as a semi-natural woodland, dominated by Aleppo Pine (*Pinus halepensis*) but also including various others like Olive, Carob, and Holm Oak apart from an extensive undergrowth of shrubs. It represents the only woodland ecosystem in the islands and so has a large number of woodland plants and animals which are locally very rare.
- *Maquis* – The semi-natural maquis develops in relatively inaccessible locations such as steep valley sides and at the foot of inland cliffs. It includes a number of small shrubs.
- *Garrigue* – This is the most common type of vegetation, can be natural, but can also result from degradation of forest and maquis. This vegetation is found on rocky ground.
- *Coastal Communities* – These take a number of forms: Saline marshlands (an interface between the marine, freshwater and terrestrial environments, a muddy substratum on which a pool of brackish water collects in the wet season, drying up in summer); Sand dunes (associated with sandy beaches making up only 2.4% of the entire coastline, a dynamic ecosystem created by the transportation of sand through wave action and wind which deposit beach sand and eroded material of terrestrial origin to the back of the beach); Rupestral communities (or cliffs, mainly along the southern and western shores, harbouring some endemic species, and are in a relatively good conservation status mostly due to their relative inaccessibility); Low lying rock communities (gently sloping coralline and globigerina shores found along North East Malta and North East Gozo, that are rich in species including halophytic vegetation, and closest to the sea largely characterised by exposed rock and seawater rockpools); and Coastal wetlands (mainly seasonal and arise when rainwater collects in depressions close to the sea, colonized by species typical of freshwater and which have some degree of tolerance to maritime influence).

- *Caves* - The best known cave dwellers are bats but there are many other species, particularly invertebrates, with a number of these species endemic to the Maltese Islands.

http://www.maltabioplatform.org
http://ressources.ciheam.org

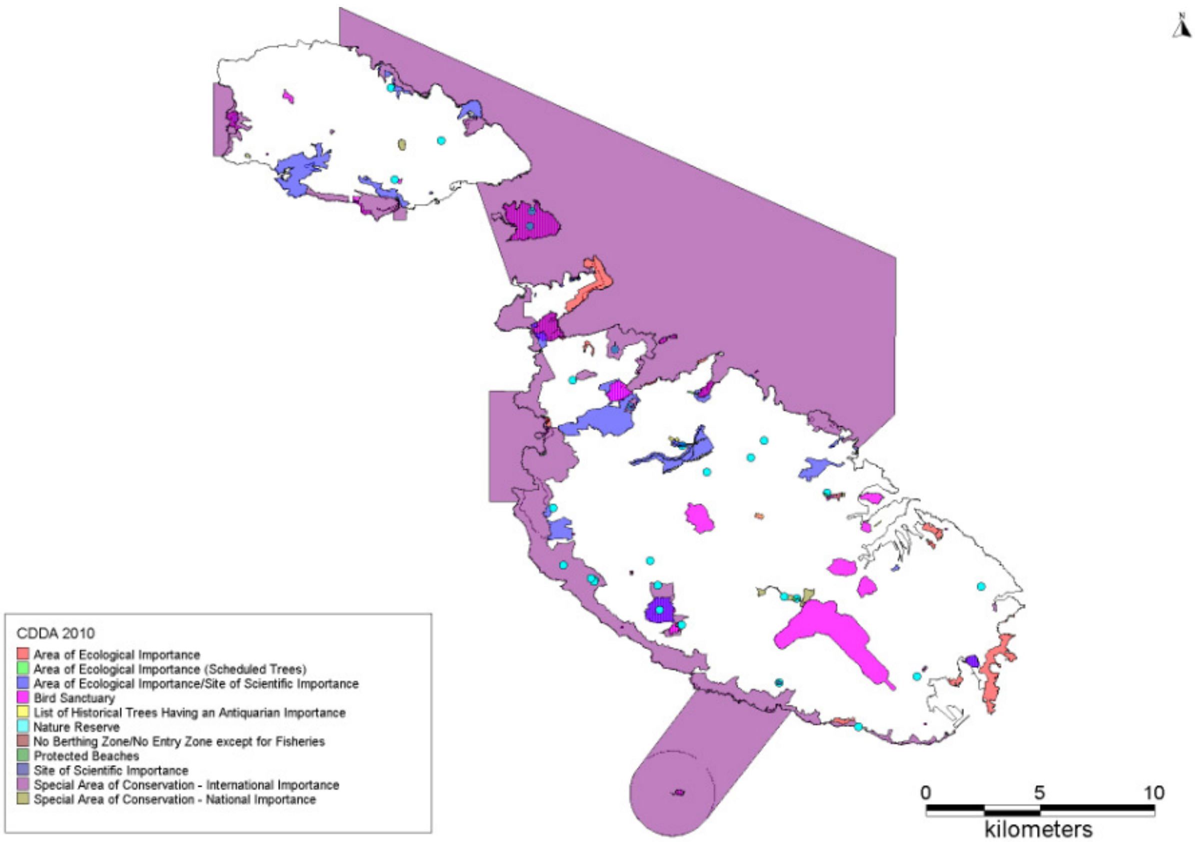


Figure 17: Ecology 2010 (Source: MEPA)

5.4 **Landscape** – The Maltese landscape has an attractive and distinctive character, and includes a rich diversity of landscape features. The coast and the sea play determining roles. In addition, Maltese history has produced a splendid collection of strategically located fortifications both on the shores and on high ground. Add to all this the terraced fields and churches that still dominate the skyline, and a unique landscape takes shape.

This also means that the Maltese landscape is very sensitive, where relatively small features can have a disproportionate influence on long distance views.

Legally protected landscapes in the Maltese Islands now amount to 33% of the total land area. The newly protected areas reflect the findings of the

Landscape Assessment Study carried out by the Malta Environment and Planning Authority, which had identified that over 51% of the Maltese Islands had high or very high landscape sensitivity.

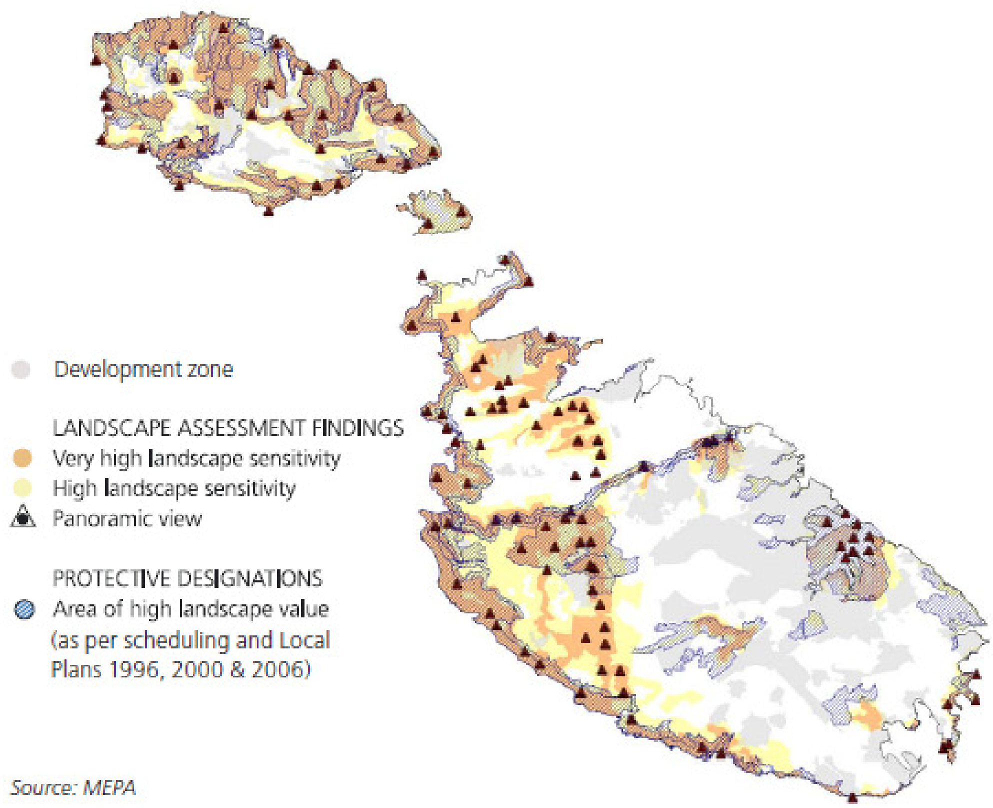


Figure 18: Landscape assessment study (Source: MEPA 2004)

Areas of High Landscape Value (AHLV) have been designated under the provisions of the Development Planning Act in 1996, 2000 and 2006, and through the local planning process. Among these sites one finds the chain of coastal cliffs that runs along the western flank of Malta, the fortifications along the great fault at the Victoria Lines and the Grand Harbour.

The following figure shows the extracted Areas of High Landscape Value from the preceding figure.

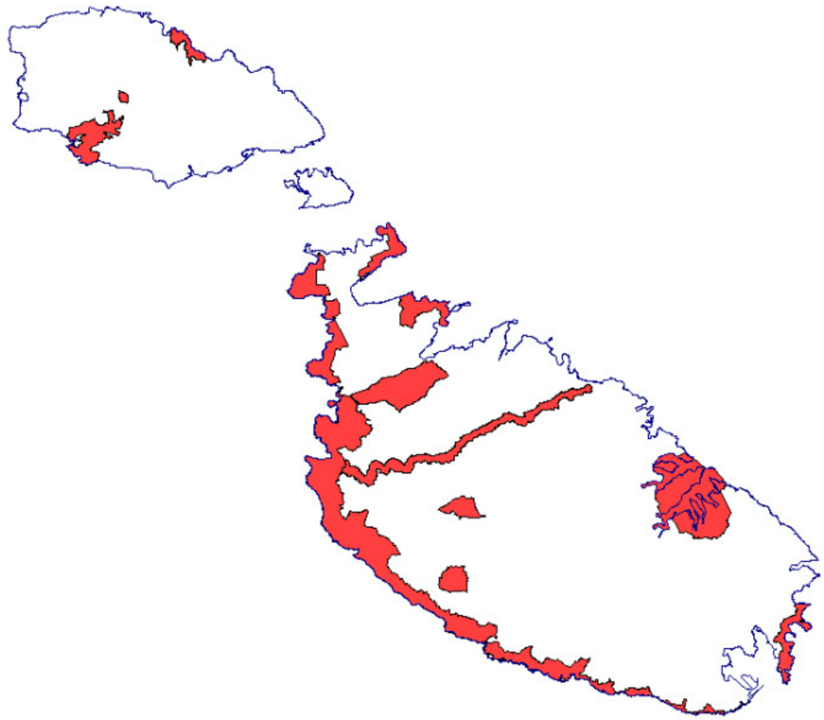


Figure 19: Designated Areas of High Landscape Value (AHLV)

5.5 **Scheduling** – The process for legally protecting heritage in Malta is referred to as scheduling. This relates to both urban and rural settings and sites.

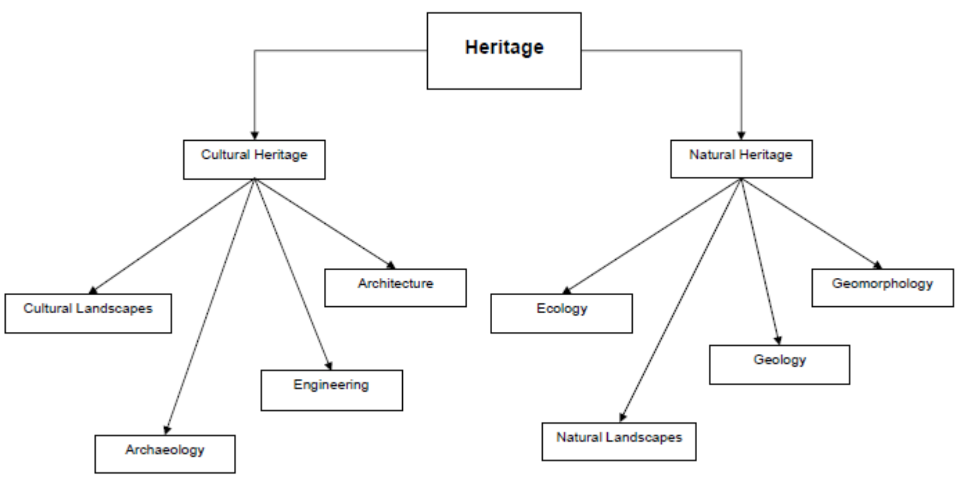


Figure 20: Heritage Flowchart (Source-MEPA)

Hence, scheduled areas include both natural heritage and urban heritage, with the latter including monuments and Urban Conservation Areas. Scheduled sites are included within the National Protective Inventory. Development on or near these areas is more strictly controlled and assessment of development applications includes more rigorous procedures and consultation with the relevant heritage organisations.

A register of sites and properties of cultural or natural importance is kept and is continuously updated

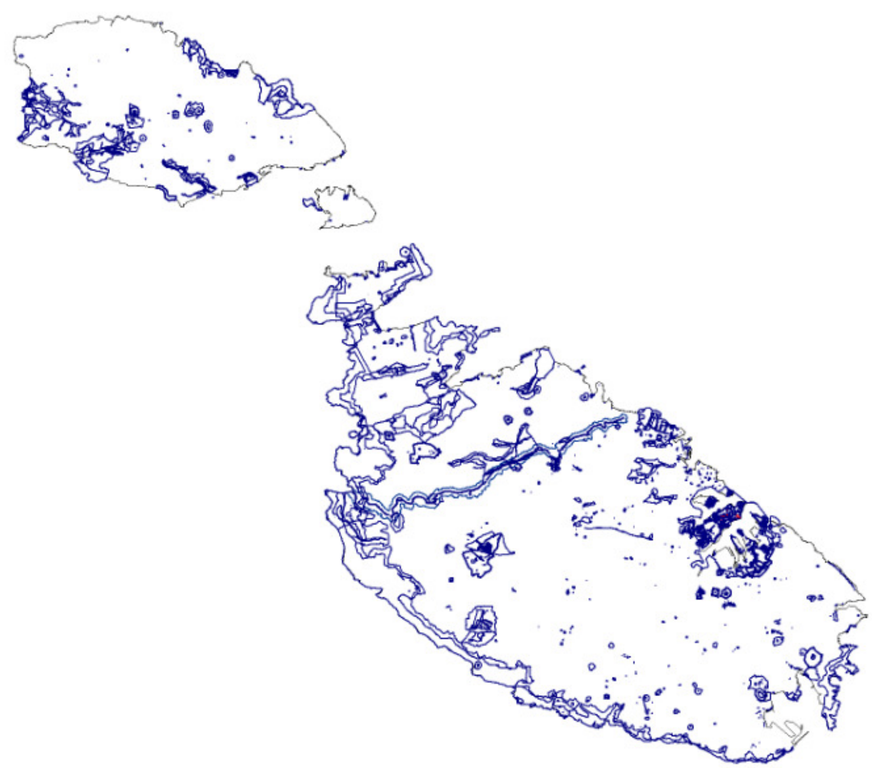


Figure 21: Scheduled Areas 2011 (Source – MEPA)

5.5 **Urban Development** – Urbanisation in Malta has spread around the two harbours next to the Valletta peninsula on the North Eastern coast. The region forms one large conurbation. In Gozo, a number of satellite settlements have evolved, with the main city, Victoria, assuming a central role.

Approximately 22% of the islands' 315 km^2 is characterised by urban development. An additional 7% is covered by industrial and commercial units, mineral extraction sites, airports, port areas, dump sites, green urban areas and sports and recreational facilities.

Between 2000 and 2006, approximately 2.7 km^2, or 0.85 % of the total land area was converted from sclerophyllous vegetation, agricultural land and non-irrigated arable land to discontinuous urban fabric, industrial or commercial units, mineral extraction sites and dumping sites.

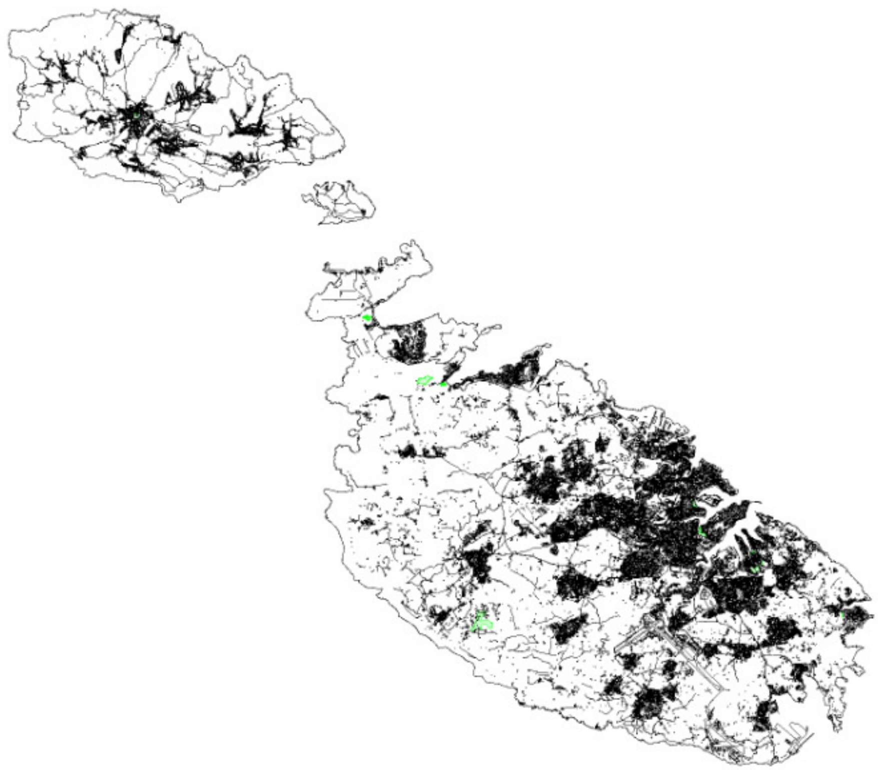


Figure 22: Built up 1988 (Source – MEPA)

The overall trend since 2000 has been for the development ratio to increasingly favour brownfield (previously developed) land: in 2000, 70 % of all development was greenfield (as yet undeveloped) land, but in 2005 it amounted to only 40 %. However, since 2005, the percentage of development on greenfield land has slowly begun to rise again, to 51 % in 2008.

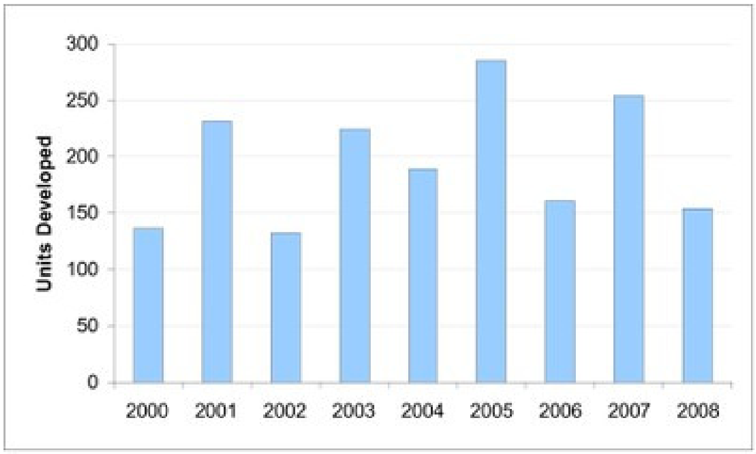


Figure 23: Number of dwelling units outside development zones
(Source – MEPA)

5.6 **Land Cover** – Malta has relatively high urban land cover, attributable to its population density. However, overall efficiency of land use needs to improve. In 2005, 22.4 % of residential dwellings were permanently vacant, and only 5 % were second homes, with similar over-provision evident in commercial and industrial sectors. There is over-supply of residential, commercial and industrial premises.

Agriculture remains the predominant land cover at 51 % of land area, followed by natural vegetation at 18 %, of which 84 % is drought-resistant.

Land cover type	**Area (km^2)**	**%**
Agricultural areas	161.5	51.2
Urban areas	70.4	22.3
Forested areas	2.1	0.7
Coastal wetlands	0.3	0.1
Natural vegetation	57.8	18.3
Industrial and commercial units, mineral extraction, airports, port areas, dump sites, green urban areas and sports and recreational facilities	23.31	7.4

Table 9: Area and pecentage of land cover by type, CLC 2006 (Source – MEPA)

Other major types of development in rural areas include quarries, access routes including roads and paths, boundary walls, and additions to already existing developments. In terms of land take, major social and community developments have also had an impact.

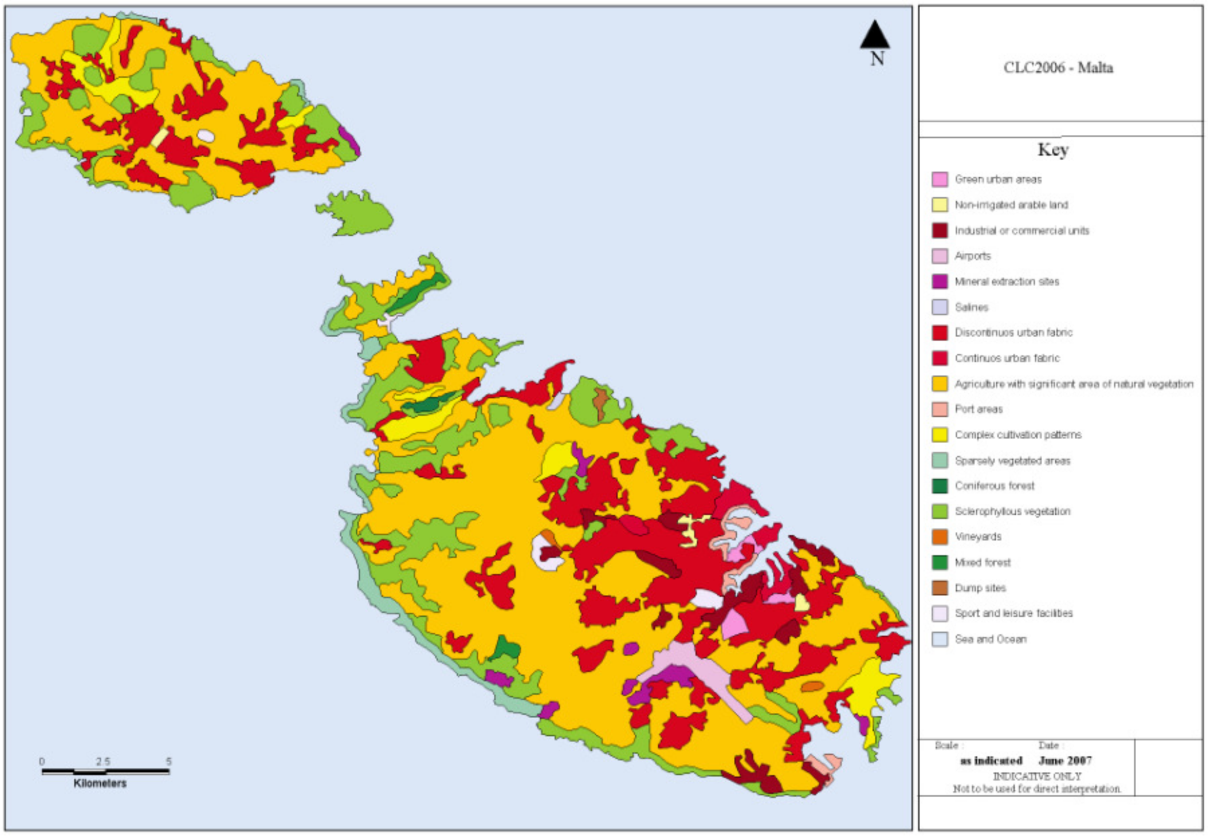


Figure 24: Land Cover CLC 2006 (Source – MEPA)

6 SWOT Results

6.1 **Procedure** – Based on the research carried out as part of this project, it has been possible to identify some Strengths, Weaknesses, Opportunities and Threats related to the RES – Landscape situation in Malta. This SWOT is carried out from a number of perspectives, namely the Technical perspective, the Environmental perspective, the Economic perspective, the Social perspective, the Visual perspective and the Land Use perspective.

STRENGHTS	WEAKNESSES
Economy: - very good performances in tourism sector, thanks also to underwater landscapes - high relevance of fishing sector, offshore/inshore - Increase in PV efficiency and decrease in costs to install new PV technologies and to maintain - increasing prices for electricity generated by hydrocarbon fuel encourage the development of sustainable energy production - potential energy production from waste biomass - better environmental image for tourism - PVs easily integrated in existing building mass/structures ***Society:*** - presence of R&D departments in academic institutions - presence of a National Plan regarding RES development (NREAP) - political commitment for EU 2020 strategy - elaboration of a strategy of sustainable development for Gozo (Eco Gozo Strategy, 2008) - national investments in recent years in Environment Protection and Infrastructure Development with a planned update to the strategic plans - financial support from government for new RES installations - low energy bills mean more disposable income - savings in health care - PVs are completely silent and potentially non-intrusive (visually as they follow terrain or non visible from streetscape if on roofs ***Territory:*** - flexibility, reversibility, and possibility to easily integrate PV plants, especially in urban and industrial environment ***Environment:*** - good potential for solar energy development, due to the latitude of Malta - good potential for wave energy production due to the high presence of offshore areas	***Economy:*** - low rate of return of investment in RES (long payback period) - high dependence from oil fired generated electricity production - peaks of waste production during summer season, that make difficult to manage waste biomass as a long lasting source of energy ***Society:*** - low development in research on RES, especially regarding wave energy - high installation capital costs ***Territory:*** - small land area with many competing land uses and small average land property sizes, making difficult to realize big size plants - fragmentation of land ownership points towards difficulty in employing large tracts of land for PVs - demanding logistics needed to import PV systems and maintain supply - PVs's south reflection negatively affects drivers and landing aircrafts - difficulties to integrate PV plants in landscape, due to the high level of inter-visibility in Malta - low development of RES technologies, especially in wave energy - large land areas are needed for commercialisation - ancillary infrastructure needed for large plants ***Environment:*** - closeness to the sea is a factor of corrosion, especially for current PV technology - visual clutter in existing urban and industrial areas, degrading the landscape quality

OPPORTUNITIES	THREATS
Economy: - possibility to improve RES efficiency and energy production due to the expectable increase of energy consumption in next years - further increases of households' disposable incomes if a plan of development of integrated PV plants is adopted - significant reduction of dependence on non-renewable energy sources - waste biomass could be used as energy source, reducing also the waste transportation and disposal costs - RES can satisfy the ever increasing energy needs - high solar exposure of Malta means more efficient PV installations - potential use for walls as against roofs would generate spinoffs inclusive of building protection (extra protective anti-fungal layer as well as sealant) ***Society:*** - Malta could act as a test bed for innovative technologies - Malta could improve job numbers in the sector of RES development, installation and maintenance - a local action plan may improve citizens' awareness regarding CO_2 emissions' reduction and sustainable development - the reduction on CO_2 emissions will improve the health state of Malta's population - R&D departments in academic institutions ***Territory:*** - Local Municipalities in Malta could sign the Covenant of Mayors - Malta could achieve 2020 goals in reduction of CO_2 emissions - significant roof areas are available in urban public areas and private individuals/entities could be brought on board ***Environment:*** - a balanced Local Energy Plan will have positive effects on landscape and environment integration - the development of RES will reduce CO_2 emissions - the high presence of offshore areas can support a development of wave energy production without negative impacts on tourism - mitigation measures, including screening, can be applied	***Economy:*** - a development of PV plants and other RES without appropriate landscape concerns will negatively affect tourism, which is the main source of income in the country - without an adequate technological development *in loco*, logistics can become very demanding for Malta's economy - without adequate financial measures, PV generated electricity storage/pricing will be unfavourable - the activities of deep-sea fishing, coastal fishing, sport fishing and underwater tourism can be threatened by a unbalanced development of wave energy production - shade from high buildings and canyonisation (high buildings close enough to result in narrow street canyons) - increase in National recurrent expenditure ***Territory:*** - the coastal environment, due to salinity, may threaten the development of specific RES, especially PV plants with current technology - without a reinforcement of land use regulations, the landscape can be damaged by RES development ***Environment:*** - need to develop ancillary infrastructures may negatively affect ecological conditions - biomass waste plants may have negative effects on ecological conditions