Projet cofinancé par le Fonds Européen de Développement Régional (FEDER)
Project cofinanced by the European Regional Development Fund (ERDF)

Enerscapes

Geographical Information System Report

Name and country of partner:	MIEMA, Malta
Name of pilot area:	Maltese Islands
Entity which realized the GIS :	MIEMA
Tool used for GIS:	Mapinfo, ArcGIS, ArcPad
Date :	20th September 2012

1) *Context - the pilot area*

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.

At the last published population census of 2005, the Maltese population stood at 404,962 persons. When population statistics are compared to the land area available of 315 km^2, 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. The rest is generally described as a rural area.

2) *Geographical Information System*

The GeoServer has been shortlisted as the GIS web Server for Enerscapes. It has been developed via a full transactional Java implementation of the OpenGIS Consortium's Web Feature Server and Web Coverage Server specification such that is can offer an integrated Web Map Server.

Documentation about GeoServer has been made available online as a Wiki. The documentation covers the latest updates and experiences, hints and tips. GeoServer has the option of 'task tracker' which is meant to report any feature requests or bugs.

The study entailed the creation of a series of maps identifying the areas that could be analysed for each of the different energy sites. Each spatial data layer was converted to the UTM WGS84 projection and subsequently converted for geoserver integration and upload. The geoserver necessitated conformity to INSPIRE regulations and sld protocols. The process was thus employed as follows : initial run entailed the creation of vector maps using MapInfo and on site ArcPad whilst detailed analysis entailed the use of ArcGIS and Vertical Mapper.

GeoServer is OGC compliant meaning that it abides to the standards set by the Open Geospatial Consortium. OGC is the leading standards organization in the Geospatial data thus being focused on geospatial applications.

Web Map Server (WMS) describes a standard protocol for creating cartographic maps over the Internet.

Web Feature Server (WFS) specifies a protocol for querying and accessing vector features over the web. WMS and WFS are the most prominent OGC specifications to date. GeoServer is the reference implementation of the WFS spec, and also fully implements the WMS spec.

GeoServer is an open source software development software which was developed in Java in the aim of allowing users to share and edit geospatial data. It was mainly designed for interoperability, so that it publishes data from any major spatial data source using open standards.

Being an open-source project, it is a community-driven project. GeoServer is developed and supported by a diverse group of developers and organizations from around the world.

GeoServer is the reference implementation of the Open Geospatial Consortium (OGC) Web Feature Service (WFS) and Web Coverage Service (WCS) standards, as well as a high performance certified compliant Web Map Service (WMS). GeoServer forms a core component of the Geospatial Web.

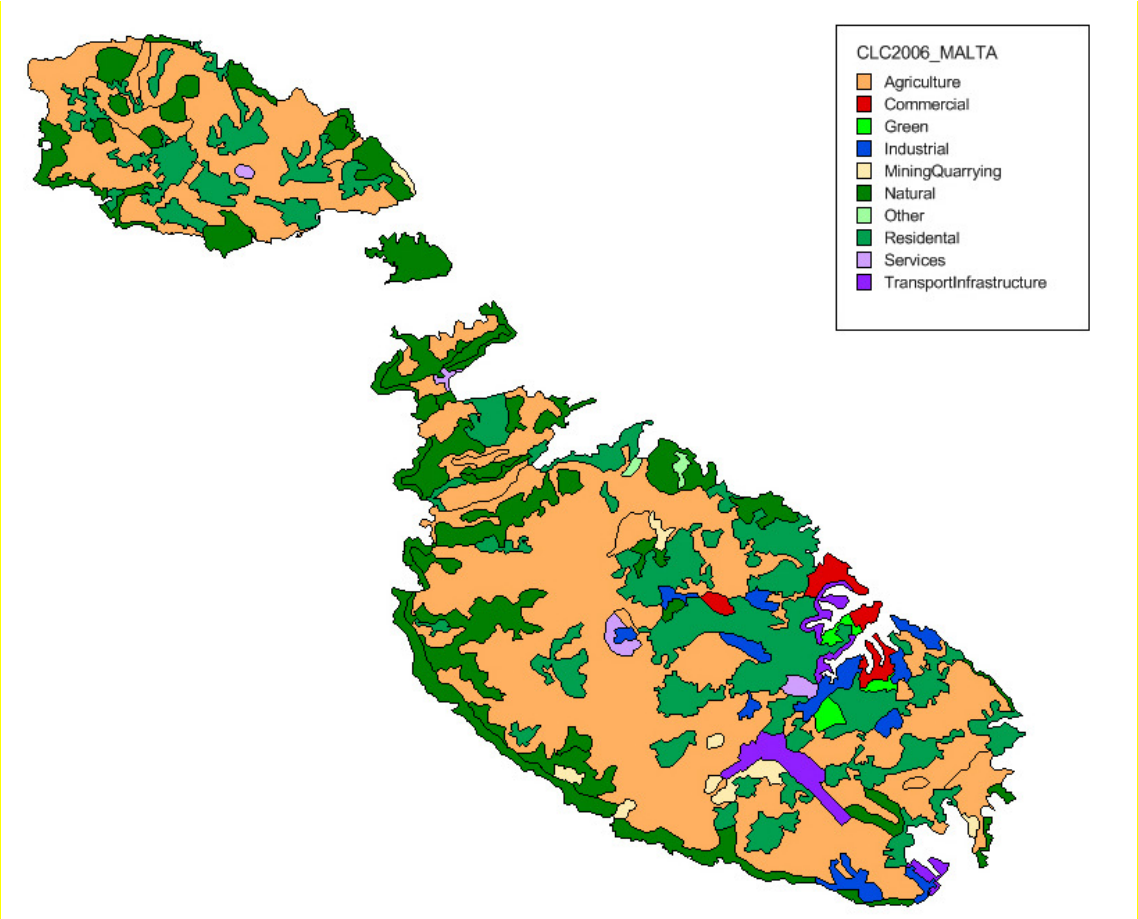
Geographic Reference system used:

Compatible file format has been used for the database, like for example shapefile, postgress, postgis.

Not compatible with Microsoft access.

3) Natural and landscape resources : Maps

3.1. LAND USE MAP



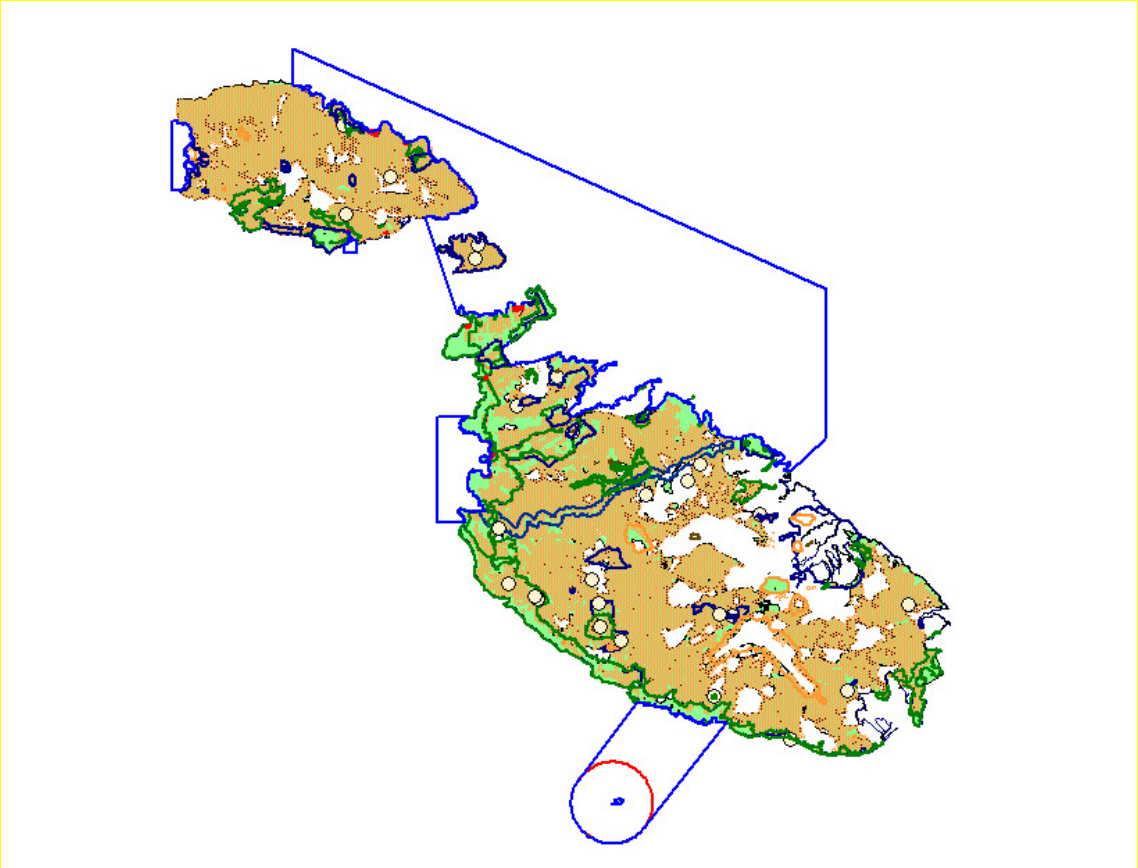
Malta has relatively high urban land cover, attributable to its population density. There is over-supply of residential, commercial and industrial premises. Agriculture remains the predominant land cover at 51 % of land area, followed by natural vegetation at 18 %, of which 84 % is drought-resistant.

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

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

The data analysed in this spatial layer was created as part of the CLC1990, CLC2000 and CLC2006 exercises carried out in the Maltese Islands which employed satellite imagery, areial orthophotos and various landuse and land cover datasets which enabled the verification of the various processes as per EEA guidelines.

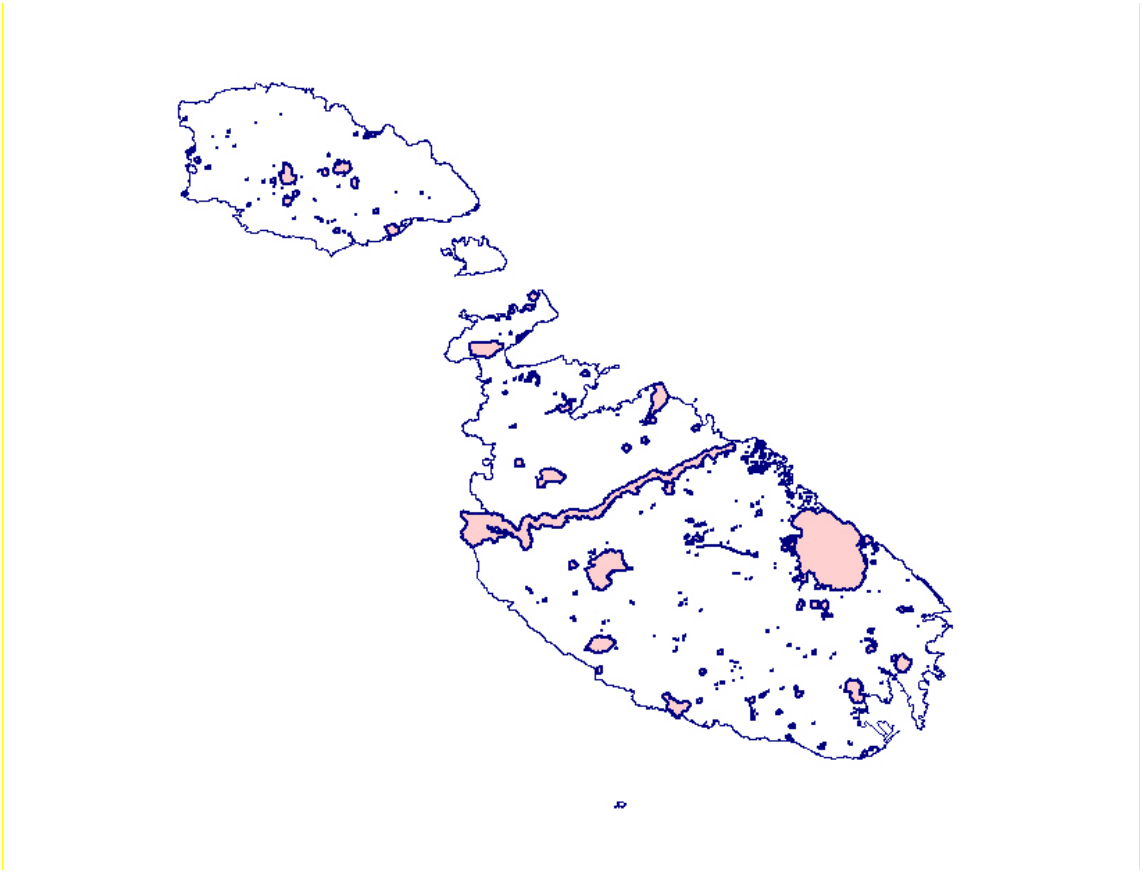
3.2. NATURAL LANDSCAPE MAP



The natural landscape map is the result of an integration of protected zone datasets based on Natura2000, Areas of High Landscape Value, as well as other terrestrial and marine protected zones.

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. 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.

3.3. HISTORICAL AND CULTURAL LANDSCAPE MAP



Maltese history has produced a splendid collection of built heritage, including the old village cores, together with 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. One main planning aspect introduced in urban protection covers the concept of landscape visualization protection, where sites are protected for their visual impact.

Legally protected landscapes in the Maltese Islands now amount to 33% of the total land area.

Energy sources

3.4. Existing RES plants

Existing RES plants are mainly residential in nature and are not mapped.

3.5. Energy potential

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.

Dated June 2010, the National Renewable Energy Action Plan (NREAP) 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:

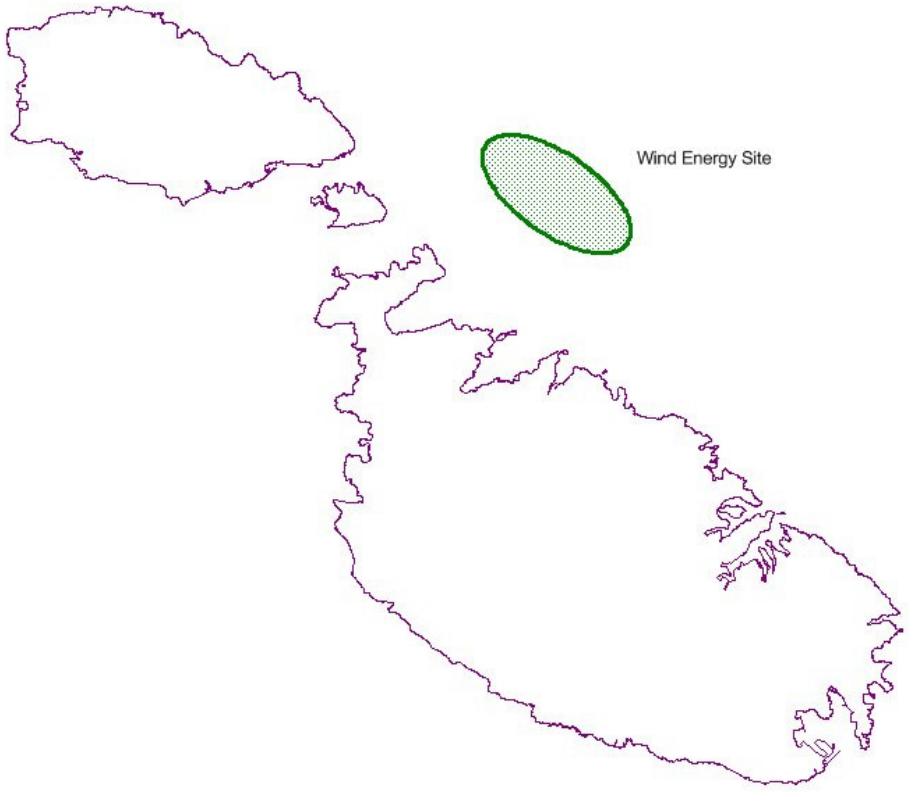
Biofuel	2.40%
PV	0.69%
Offshore wind farms	3.48%
Onshore wind farms	0.61%
Waste – electricity	2.18%
Waste – heat	0.32%
Solar water heaters	0.52%
Total	**10.2%**

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

Wind Energy potential : 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 km^2 offshore, 2km east of L-Ahrax tal-Mellieha. It will accommodate between 19 and 24 turbines, each with a diameter of between 100m and 126m. This wind farm will fulfil the needs of the NREAP in terms of wind energy and can hence produce around 250GWh pa.

Wind Energy site – proposed Sikka l-Bajda location



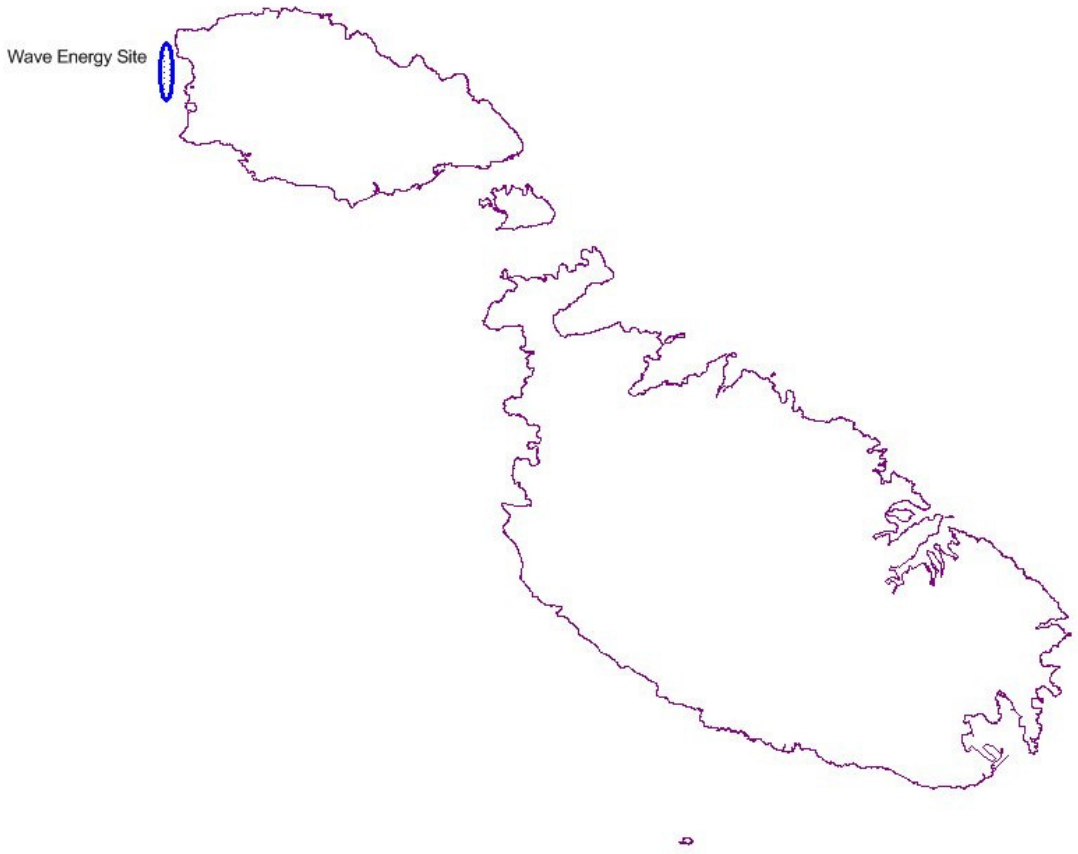
Landfill Gas potential : The landfill gas area lies just inland of a bay and is known as the Maghtab area, a locality of Naxxar. In 2006, the area was approved as the site for the development of a long-term engineered landfill. Future plans, not directly related to the above, also include the installation of a Sewage Treatment Plant, which will also produce biogas (still not quantified) on this site.

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 pa to 250kWh pa of electrical power, apart from the possibility of tapping the heat generated. This does not include estimates for the future Sewage Treatment Plant.

Landfill Gas site – proposed Maghtab location

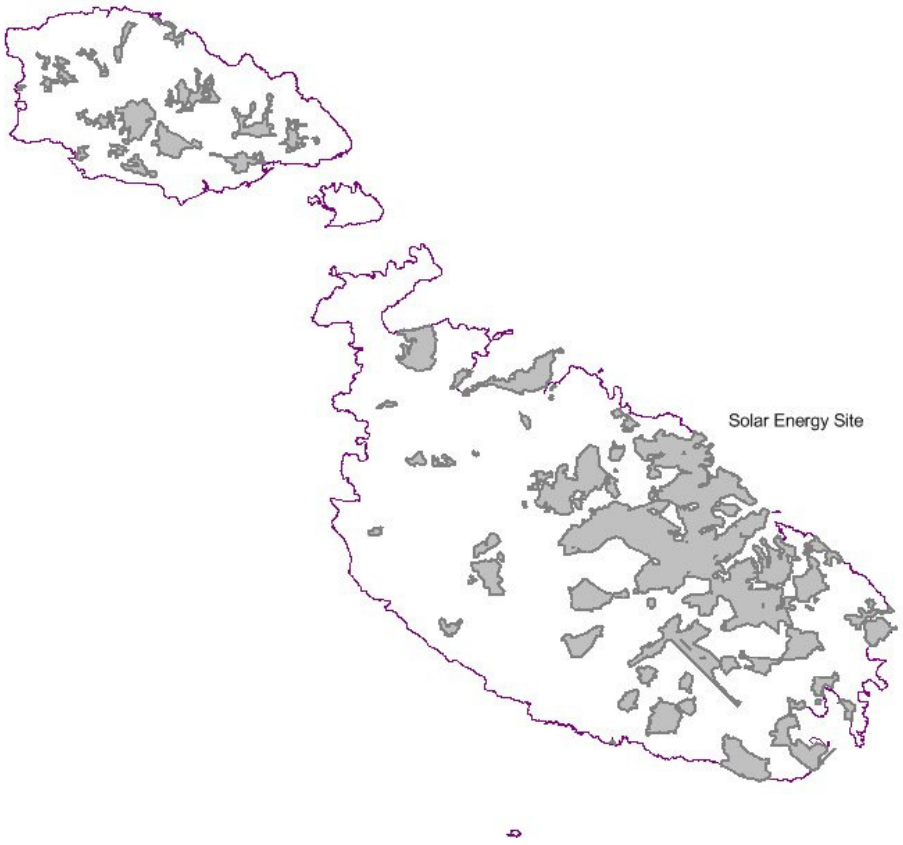
Wave Energy potential : In Malta, this RES is still very much at an experimental stage. The main commercial research being carried out aims to achieve long lasting, low impact, contaminants free wave energy converters each producing around 250KW/hour. Research, though is still at an early stage, with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

Wave Energy site – testing area off Gozo



Solar Energy potential : 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 indicate that Malta has potential for a much higher PV output than the official target, even when considering only rooftop installations. It is estimated that this can reach over 200GWh per annum.

Solar Energy sites – Urban Areas



4) Use of the GIS

The GIS tool was instrumental in the development of the Enerscapes project on a local scale.

These maps, together with images of others that were publicly available, were used in the study to analyse whether sites were realistically available for the location of RES plants on the Maltese Islands. The information in these maps helped to sieve the Maltese Islands and helped to test the scenarios being proposed.

The Land Use map and the Energy Sources map were used to generally direct the search for such sites. The Environmental and Cultural maps were used as part of the exercise to exclude such areas from being considered for RES plants.

Only in this was it could realistically be assured that what was being proposed could actually be implemented on the ground in the future.

These maps also served as a basis for the public participation process, highlighting such areas to stakeholders and the general public, and hence giving the utmost credibility to the work that was being carried out and to the project in general.

5) Transnational replication and capitalisation potential of the GIS

This GIS is based on data collected from other sources since the project did not foresee that such data needed to be collected directly by the partners. Hence, the reproduction of such data is not possible. However, the project builds up on the experience gained in spatial mapping and geoserver technology usage as based on INSPIRE guidelines on such data layers as CLC, urban zoning and protected sites, amongst others. Protocols created for geoserver data creation help in the preparation for more interactive technology as against the current geoserver status. However, the GIS itself, the process of its creation, and most importantly, the way it was used to help in the attainment of other useful information and the project results can be widely used by others.

Given that all partners have participated in this process, the sharing of experiences was in itself a learning and amelioration process. Other transnational projects can therefore benefit from the experiences of the partners collaborating on the Enerscapes project.

The project should be taken further to integrate scenario modeling using real-time GIS, which though not the scope of this study, ensure that the technology is taken to a state where the user can test scenarios based on different data parameters within the limits of the natural environment.