



Fig 1: Aerial image depicting Marsascala Bay in Southeastern Malta

# MAPPING THE MICRO STATE

SAVIOUR FORMOSA AND ELAINE SCIBERRAS CONNECT LIDAR, SEIS, AARHUS AND INSPIRE

The state of affairs in Malta's information management and dissemination is peppered with both success stories and uphill struggles. Users plodding through the data-information-knowledge-action process experience various barriers to access to data, high costs, archaic mapping, bureaucratic procedures and aged data the currency of which is unusable in a rapidly changing world. Various initiatives taken up by the Maltese Islands include the review of potential for the integration of the requirements pertaining to the Aarhus Convention, the INSPIRE Directive and the Shared Environmental Information System initiative.

Though the legislative aspects have been instrumental in enabling the academic and scientific field to be aware of the availability of data for further analysis, the general public lagged in the understanding of the use to which such data could be employed at governance and locality levels.

The Malta case study sought to analyse the situation on the ground as at 2006 most datasets were disparate, basemaps were dated as at 1988, environmental data capture was ad hoc and the dissemination, a mapserver was available with a date tag of 2000 and data were available to the public on a request basis.

The idea to bring all the aspects of baseline information, a comprehensive nation-wide digital terrain and bathymetric model, environmental and spatial data into an interactive medium was brought to the fore with the eventual application for ERDF funding. This was aimed at the eventual dissemination of all information for free through an INSPIRE compliant online tool. This sequence of events brought to the fore the need for a speedy approach to implement

the changes to ensure compliance with the legislative requirements, eventually culminating in a Shared Environmental Information System.

Such was made possible through the award of a project that formed part of a €4.6 million project, entitled *Developing National Environmental Monitoring Infrastructure and Capacity*, a project co-financed by the European Regional Development Fund, which provides 85% of the project's funding and the Government of Malta, which finances the rest under Operational Programme 1 – Cohesion Policy 2007-2013 – *Investing in Competitiveness for a Better Quality of Life*.

Through the project, the connections between the different themes were made through the procurement of GI tech and ware, development of information management systems, outsourcing environmental baseline surveys, training of staff, and the enhancement of the national monitoring programmes. In addition, Malta is upgrading its current monitoring capacity, as well as acquiring new environmental monitoring data, including data acquired through novel technologies, such as in the case of 3D land and marine topographic data.

The process entailed the setting up of a national mapping agency (NMA) in 1988, a transition to a fully digital scenario between 1994 and 1998 which also saw the introduction of GIS, the launch of a Census ImageMap/GIS Client system, the launch of the mapserver in 2000, the introduction of GI in most state agencies, the internationalization of its datasets to align its procedures to EU membership dataflows and finally the creation of thematic information systems culminating in a Shared Environmental Information System, the latter through the ERDF initiative.

This connecting-the-dots process entailed the commissioning



of a high resolution 3D terrestrial data coverage for the Maltese Islands using a combination of oblique aerial imagery (Fig1) and Light Detection and Ranging (LIDAR) data (Fig 2), as well as through a bathymetric survey of coastal waters within 1 nautical mile (nm) radius off the baseline coastline, using a combination of bathymetric LIDAR surveys, acoustic scans and a physical grab sampling survey of the entire land area (316.16 km.sq) and the immediate marine area (361 km.sq) (Fig 3). The terrestrial and bathymetric scans to a total of 677 km.sq were entrusted to Terraimaging, and their subcontractors Peldryn (UK) and AquaBioTech Group.

The main outputs to be disseminated to the public comprise:

- LIDAR Scan: Terrestrial (Topographic Light Detection and Ranging (LiDAR)

Digital Surface Model (DSM) and Digital Terrain Model (DTM) (316 km.sq)

- Bathymetric LIDAR aerial survey - depths of 0 m to 15m within 1 nautical mile from the Maltese coastline (38 km.sq)
- Bathymetric Scan: Acoustic (side scan sonar)

Digital Surface Model and an acoustic information map of sea bed (361 km.sq)

- High resolution oblique aerial imagery and derived orthophoto mosaic and tiled imagery of the Maltese Islands (316 km.sq) (Fig 4)
- Satellite imagery (GeoEye, RapidEye, Quickbird) (316 km.sq)

In addition to the service deliveries, a number of supply technologies have been acquired and implemented. Such include:

- Remote GPS Cameras (Remote capture GPS receiver)
- Integrated GI infrastructure (workstations, servers, san and GI raster/vector –based software)
- 3D scanner and 3D printer
- GIS Handhelds for field surveys
- Global Navigation Satellite System Station



Malta, NASA



Fig 2: Lidar image depicting the Valletta Floriana peninsula



Fig 3: Total area scanned the blue area depicts bathymetric sidescan, brown bathymetric LIDAR, and green terrestrial LIDAR zones



Fig 4: Oblique imagery depicting the Inner Harbour Town of Gwardamangia

Undoubtedly, the outputs will result in ancillary spin-offs such as nautical charts, viewshed analysis maps and cross-thematic studies in the physical, social and environmental domains. Of special interest is the impact that the planning development has on the health and socio-psychological fields through shadow-analysis and other cross-thematic studies. Users will be able to generate digital terrain 3D models which can be used for various applications planned for urban and transport planning, environmental impact assessments, infringement analysis, security review, green criminology, modeling of runoff water, monitoring of and enforcement of land use activities, amongst others.

Paramount to all the major works being carried out, the main fulcrum of the project remains the assurance of free delivery of all data to the general public. This is the result of an integrated exercise to adhere to the requirements as outlined by the Commission's Communication COM (2008) 46 Final "Towards a Shared Environmental Information System", the INSPIRE Directive (Directive 2007/2/EC) and the Aarhus Convention. The tool is being developed by Epsilon International through the creation of a viewing, analytical dissemination tool employing a web portal, which is compliant to the EU's Shared Environmental Information System (SEIS), leading the way for voluntary geographic input, which system is to be launched in 2013.

Connecting the dots has not been an easy exercise, but the harvest should suffice the public's thirst for spatial information.

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