

# AN INTEGRATED COASTAL MAP FOR THE MALTESE ISLANDS

Anthony Galea <sup>1\*</sup>, Audrey Zammit <sup>1</sup>, Adam Gauci <sup>1</sup>, Alan Deidun <sup>1</sup> and Aldo Drago <sup>1</sup>  
<sup>1</sup> Physical Oceanography Research Group, University of Malta - anthony.j.galea@um.edu.mt

## Abstract

The Maltese coastal area, comprising its associated resources and services, is of substantial importance to the Maltese economy. An innovative web interface has been developed to combine information from different sources, including coastal properties, physical features, resources and amenities, into an innovative comprehensive interactive map of the Maltese coastline. It serves as a general informative tool for users in the public domain, bringing different layers of data together, and targeting a delivery over smart media like mobile phones and tablets.

*Keywords: Coastal management, Malta Channel, Mapping, Interfaces*

Being the interface between the land and the ocean, the coastal zone offers an array of socio-economical services [1]. The services offered by the coastal zone can be categorised into three main groups, namely infrastructure, which includes features such as harbours and slipways; food production, which relates to fishing and other associated activities; and recreation, which includes all the features which are aesthetically appealing and attract visitors [2,3]. The coastline of the Maltese Islands, including all of the Islands' beaches, have been the foundation of numerous initiatives aimed at boosting the local economy by attracting tourists and investment. The Maltese Archipelago is composed of three main islands and a number of smaller islets, with a collective coastline of 196 km [4]. A study conducted by MEPA in 2018 determined that 21% (around 41 km) of the Maltese coastline has undergone some sort of development [5].

Maps are important tools whereby a wide variety of information can be displayed and extracted depending on their usage. In the particular case of coastal maps they provide the essential features pertaining to the land and sea boundaries forming part of the coastal zone areas. Malta did not have a single map that displayed all relevant information in relation to the coastal region. This web based map interface strives to fill in this gap by gathering and extracting information from various other existing maps and online sources, on top of additional gathered and updated in-situ information, displayed on layers in a single mapping resource. The Integrated Maltese Coastal Map is freely available online and the data that has been collected so far can be accessed through [www.capemalta.net/coastalmap](http://www.capemalta.net/coastalmap)

mapped data suiting their needs, and as an aid to multiple users. Google's Maps Javascript API provides the functionality necessary to achieve this. Various zoom levels are available, with fewer features and items being displayed at lower zoom levels to avoid cluttering. A number of online data sources and maps were consulted and used throughout the data collection and extraction processes, such as with regards to diving sites, marker buoys, Marine Protected Areas (MPAs), and swimmers' zones. Such sources included nautical charts and coastal maps, most of which were published on Local Notices to Mariners. In situ data was collected from along the coast following a systematic procedure, utilizing a GPS to record the location of all features and photo documentation. The collected data was digitised, creating a database composed of eight tables: areacoordinates, areafeatures, areafeature\_bay, bays, infrastructure, pointfeatures, linefeatures and linecoordinates. A bathymetric map is added to the map, displaying isobath polylines at fixed depths of 5m depth intervals, up to 100m depth. Swimming Zones and MPAs regions are displayed as polygons. The coastal features are represented using different icons.

The features included in the Integrated Maltese Coastal Map shall aid an array of users, including tourists/visitors, stakeholders and decision-makers, to identify the different amenities available in a particular stretch of coastline. For example, the bathymetric map encompasses a wide range of potential users, including fishermen, coastal navigators and relevant authorities (e.g. Transport Malta, Department of Fisheries and Aquaculture). Similarly, the MPAs displayed in the coastal map allow NGOs (e.g. Birdlife Malta) and decision-making entities (e.g. The Ministry for Sustainable Development, Environment and Climate Change) to easily identify the locate the activities and resources within the different MPAs, and their relationship with other features along the coastline. The map includes a 'beach card' – a beach info section for each bay, indicating whether a particular beach is a Blue Flag beach, its composition (sandy, pebbly or rocky), VHF channel and the availability of numerous amenities, which include: swimmers' zones, public restrooms, Wi-Fi, slipways, parking areas, accessibility, water sports, showers, food and beverage facilities and sunbed rentals. Other ancillary information such as that regarding camping or barbeque allowance areas forms also part of the beach card.

The Integrated Maltese Coastal Map system is set up in a way that allows updating and additions of more data layers, serving as a baseline for its future evolution to serve a wider number of users over newer public media.

## References

- 1 - Ramesh, R., Chen, Z., Cummins, V., Day, J., D'Elia, C., Dennison, B., Forbes D.L., Glaeser B., Glaser M., Glavovic B., Kremer, H., Lange M., Larsen J.N., Le Tissier M., Newton A., Pelling M., Purvaja R., Wolanski E. (2015). Land-ocean interactions in the coastal zone: Past, present & future. *Anthropocene*, 12, 85-98.
- 2 - Luisetti, T., Turner, R. K., Jickells, T., Andrews, J., Elliott, M., Schaafsma, M., Beaumont N., Malcolm S., Burdon D., Adams C., Watts, W. (2014). Coastal Zone Ecosystem Services: from science to values and decision making: a case study. *Science of the Total Environment*, 493, 682-693.
- 3 - Clark, J. R. (2018). *Coastal zone management handbook*. CRC press.
- 4 - Cassar, J. (2010). The use of limestone in a historic context—the experience of Malta. *Geological Society, London, Special Publications*, 331(1), 13-25.
- 5 - MEPA. (2018). State of the environment report 2018. Retrieved from <https://bit.ly/2TKEDHW>



Fig. 1. A snapshot of the online user interface showing the isobaths around the Maltese Islands and information buttons along the coast at the beaches/ports.

The map makes use of the Google maps platform. It is presented on a user-friendly display with simple functionality, allowing users to customise the