High Resolution Layer HRL
Wetness and Water
Report 2015

Copernicus Land Monitoring 2014 -2020
in the framework of Regulation (EU) No 377/2014 of the European
Parliament and of the Council of 3 April 2014

Specific Contract No 3436/R0-COPERNICUS/EEA.57273 Implementing Framework service contract No
EEA/IDM/RO/16/009/Malta
Malta

Tasks:

1. Production of CLC for the 2018 reference year	Y
2. Post-production **verification** of the High Resolution Layers (HRL's) for the 2015 reference year	Y
3. Dissemination	

1. Abstract

A national coverage exercise was carried out to analyse the water and wetness using in-situ imagery data and the HRL WAW_2015 provided for verification. The WAW 2015 HRL data layer was superimposed onto the in-situ data namely; Orthoimagery1 (2012), OrthoImagery 2016, the CLC layers (2012, 2018) and the national inland water bodies database layer (updated as of 2014).

In Malta's case it was deemed best to apply a complete coverage methodology rather than verifying specific area samples. As highlighted in the HRLs 2015

verification guidelines the nature of the 2015 WAW product is fundamentally based on time-series and frequency of occurrence data sources. As such a quantitative verification was not feasible except for the permanent water class.

In this respect the focus of the verification was on the areas marked as permanent water bodies utilising in-situ Orthoimagery (2012 and 2016), the CLC database (for the reference years 2012 and 2018), and the local inland water bodies layer. All the major errors identified were categorized as “Commission” or “Omission” error types as per guidelines provided for the verification process. When considering the physical area of the Maltese Islands, applying this method of photo interpretation, resulted in a more adequate verification of the HRL layer giving us a more detailed result.

Overall HRL layer provides a generalized overview when compared to the level of detail that is normally utilized locally (1:1000). However the detail provided in the WAW 2015 layer can still be deemed acceptable for the parameters/requirements of this verification exercise. All in all eight (8) errors were identified, five (5) Commission cases and the remaining three (3) being Omission cases.

2. Background

The Planning Authority (PA) is the “National Reference Centre on Landcover” for the European Environment Agency (EEA). In this function the Agency supports European institutions dealing with land cover, land monitoring and land use.

PA has been working on issues like European wide homogeneous data sets emphasising on land cover topics for several years. Land cover plays an important role for environmental spatial and territorial analysis. As PA is composed of both the land-use and spatial planning agencies, it has a wider responsibility in having up-to-date data about landuse and landcover at very high detail, nominally at 1:1000. In view of such detailed-scale usage, maps at scales required by CLC are rarely used due to the generalized product that is not used for local consumption.

PA has also been responsible for the production of the CLC1990, CLC2000, CLC2006, CLC2012 as well as the CLC2018 update. Since it also hosts the NFP, PA's role is twofold, ensuring delivery of all datasets as well as the production of all environmental spatial data and information systems. In effect CLC products will be incorporated within its generalized dissemination process as an example of international datasets Malta is party to.

In addition this specific contract covered the processes of post-production verification of the 2015 High Resolution Layers (HRLs) as per the terms of reference for the Implementing Framework service contract No EEA/IDM/R0/16/009/Malta. The aim of this task was to identify systematic classification errors that are eligible for improvement/enhancement.

The themes covered by the HRL Verification process included:-

- Imperviousness - Imperviousness density
- Forest - Tree Cover Density
- Forest - Dominant Leaf Type
- Grassland
- Wetness and Water
- Small woody features

For each theme the necessary verification guidelines were provided in order to produce the required outputs. At each stage of the process the drafted outputs were reviewed internally and a final 'verification' report for each HRL submitted to and approved by EEA as per outputs delivery guidelines provided.

All CLC and HRL deliverables were affected through the EEA CDR Dataflow system. All datasets are being used for EU reporting as per Directive requirements. Note also that as per Framework Agreement and as per relevant specific contract agreement requirements the revised CLC2012 layer, the 2012-2018 CLC change, CLC2018 layers were concluded in Aug2018 and are currently disseminated locally through the Planning Authority's Geoportal http://geoserver.pa.org.mt/publiceeoserver as well as through the COPERNICUS Land monitoring online services.

3. References

- *CLC2018 Technical Guidelines: I. General* project *description*
- *CLC2018 Technical Guidelines: II. Interpreting land cover changes and producing CLC2012-2018*
- *CLC2018 support package - Including Interchange and Intercheck software packages and their respective user manuals.*
- *Local ancillary data as highlighted in* Section 3.

CLC and HRL Team:

Mr Stephen Conchin — Senior Information Officer - CLC/HRL MT Project Co-ordinator

Ms Maria Refalo — GIS Development Officer - Photo/Image Interpreter

Prof Saviour Formosa — PA Consultant - Final Reviewer

Drafted at the Planning Authority

Date: 13th November 2018

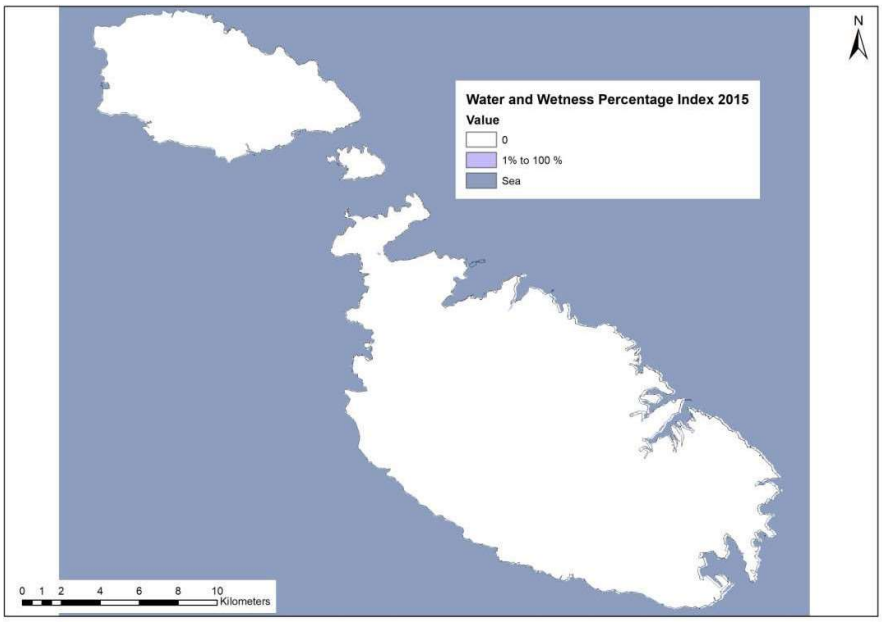
HRL verification report template for WATER AND WETNESS 2015

I. Administrative part

HRL	*Water and Wetness 2015, Full delivery 20x20m, national projection*
Country (and region, if regions are verified separately)	Malta
Institution carrying out the work	Planning Authority (PA)
General overview of data quality done by (name,position and e-mail)	Maria Refalo, Photo-Interpreter, maria.refalo@mepa.org.mt Stephen Conchin, Senior Information Officer, stephen.conchin@mepa.org.mt
Look-and-feel analysis done by (name, position and e-mail)	Maria Refalo, Photo-Interpreter, maria.refalo@mepa.org.mt Stephen Conchin, Senior Information Officer, stephen.conchin@mepa.org.mt
Statistical verification done by (name, position and e-mail)	Maria Refalo, Photo-Interpreter, maria.refalo@mepa.org.mt Stephen Conchin, Senior Information Officer, stephen.conchin@mepa.org.mt
In situ data used. *Replace Data-x with the full name of the dataset. Mention quality issues if relevant.*	*National Orthophoto database of the Maltese islands Reference Years:- 2012 and 2016 (Total Coverage) Resolution 0.10m (2016)*
	CLC2012/CLC2018 databases for Malta and Inland Water Bodies_2014
	SENTINEL 2 - Visual Products: 27/06/17, 25/10/17
Internal quality control done by (name, position and e-mail)	Prof Saviour Formosa, PA Consultant, saviour.formosa@pa.org.mt
Date and place of writing the report	13/11/18

II. General overview of data quality

Results of the general overview of data quality (obligatory)



A national coverage exercise was carried out to analyse the water and wetness using in-situ imagery data and the HRL WAW_2015 provided for verification. The WAW 2015 HRL data layer was superimposed onto the in-situ data namely; Orthoimagery[1] (2012), OrthoImagery 2016, the CLC layers (2012, 2018) and the national inland water bodies database layer (updated as of 2014).

In Malta's case it was deemed best to apply a complete coverage methodology rather than verifying specific area samples. As highlighted in the HRLs 2015 verification guidelines the nature of the 2015 WAW product is fundamentally based on time-series and frequency of occurrence data sources. As such a quantitative verification was not feasible except for the permanent water class.

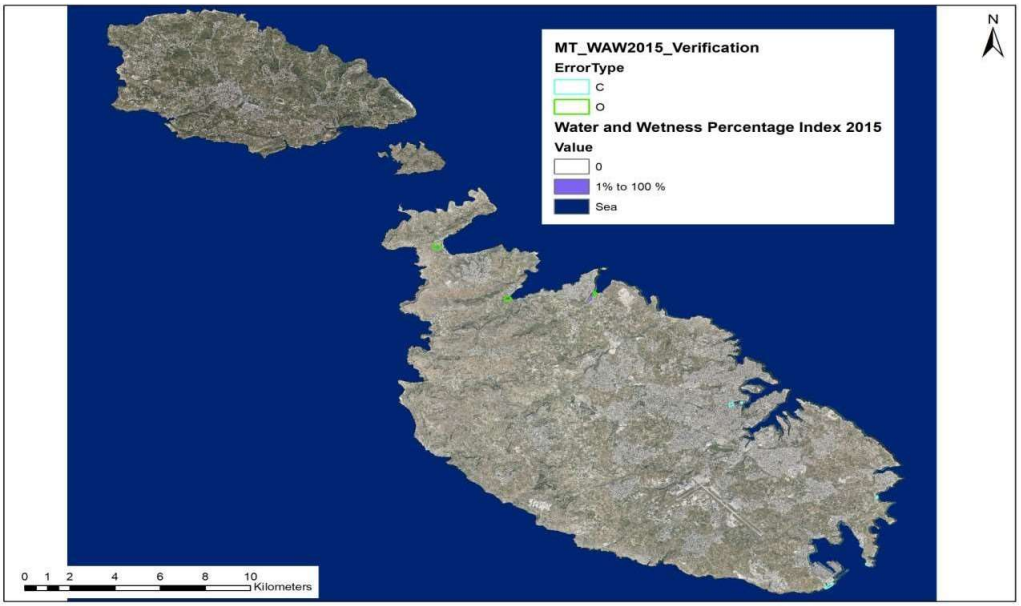
In this respect the focus of the verification was on the areas marked as permanent water bodies utilising in-situ Orthoimagery (2012 and 2016), the CLC database (for the reference years 2012 and 2018), and the local inland water bodies layer. All the major errors identified were categorized as "Commis-sion" or "Omission" error types as per guidelines provided for the verification process. When considering the physical area of the Maltese Islands, applying this method of photo interpretation, resulted in a more adequate verification of the HRL layer giving us a more detailed result.

Overall HRL layer provides a generalized overview when compared to the level of detail that is normally utilized locally (1:1000). However the detail provided in the WAW 2015 layer can still be deemed acceptable for the parameters/requirements of this verification exercise. All in all eight (8) errors were identified, five (5) Commission cases and the remaining three (3) being Omission cases.

[1] *ERDF 156 data, (2013), Developing National Environmental Monitoring Infrastructure and Capacity, Malta Environment & Planning Authority.*

III. Look-and-feel (obligatory)

Stratum	Name of the stratum	Number of errors identified	*Comments*
Commission			
1	Sea – Yacht Marina	2	Sea areas located in yacht marinas/port areas having floating pontoons have been erroneously classified as wetland areas.(refer to Annex 5 figure 1)
2	Sea – Coastal Area	3	Sea areas in close proximity to the coastline classified as wetlands. (refer to Annex 5 figure 2)
Omission			
3	Inland Wetlands	2	Two areas classified locally as natural marshland areas (and also as bird sanctuaries/nature reserves) were not identified as wetlands in the HRL. This might be attributed to the high vegetation present in the areas as well as to the possibility of the images processed were taken during a temporary dry period. (refer to Annex 5 figures 3 and 4)
4	Saline marshland	1	Some areas of a know saline marshland in the Northeast of Malta were omitted possibly due to their proximity to the coast as well as due to the possibility that they might have been temporarily dry during the image acquisition/interpretation of the HRL. (refer to Annex 5 figure 5)
Overall evaluation			***Insufficient***
Comments			In this case the only two areas known to be nature reserves and permanent water bodies in local datasets were not identified as wetlands in the HRL.



IV. Statistical verification[2]

Stratification	*A complete coverage photo interpretation method was applied to identify wrongly classified areas (Commission) or for completely omitted areas (Omission). This way all major errors were identified and thus providing a comprehensive overview of the changes required for the enhancement stage of the HRL.*
Comment on stratification	*N/A*
Number of random samples for finding omission errors	*N/A*
Number of valid (applicable) samples for finding omission errors	*N/A*
Omission error (%)[3] with uncertainty	*N/A*
Comment on omissions	*N/A*
Number of random samples for finding commission error	*N/A*
Number of valid (applicable) samples for finding commission error	*N/A*
Commission error (%)[4] with uncertainty	*N/A*
Comment on commissions	*N/A*
Overall evaluation	***Insufficient,*** *as the number of errors has increased when compared to the WET 2012. All commission errors were attributed to areas close to the coastline in close proximity to port areas and yacht marinas. In the case of the Omission errors case the only two areas known to be nature reserves and permanent water bodies in local datasets were not identified as wetlands in the HRL.*

[2] not relevant for Grassland product, and also not relevant for permanent/temporary wet, and temporary water classes of WAW product

[3] Producer's accuracy (%) = 1 – omission error (%)

[4] User's accuracy (%) = 1 – commission error (%)

V. Documentation of errors and critical findings.

Commission errors:

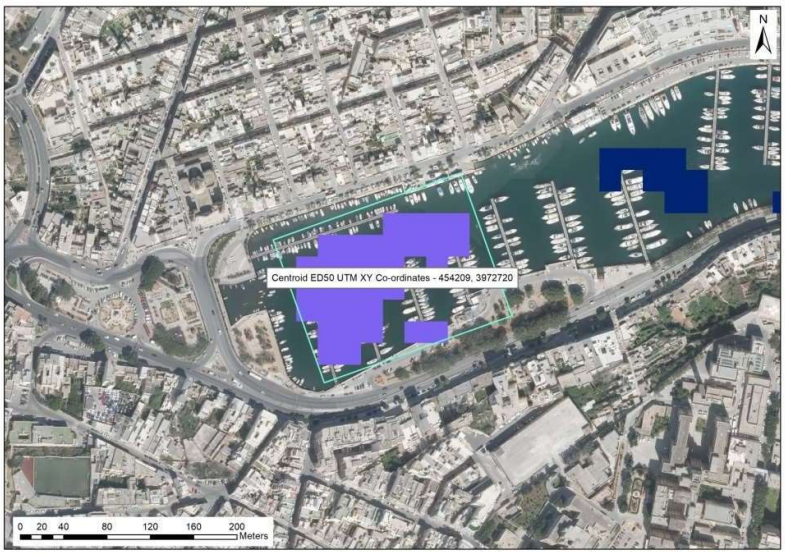


Figure 1: Sea – Yacht Marina

Example where a yacht marina area located in a port area erroneously identified as wetlands.

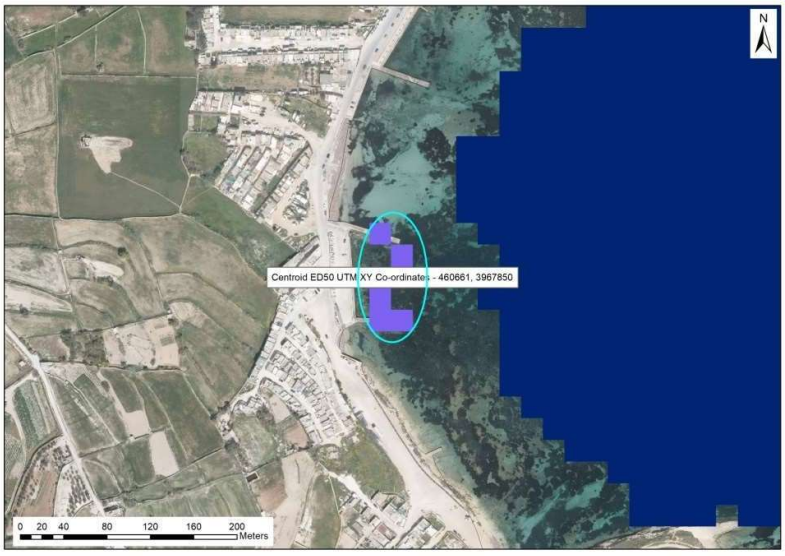


Figure 2: Sea – Coastal Area

Example where an area in close proximity to the coast erroneously identified as wetlands.

Omission errors:

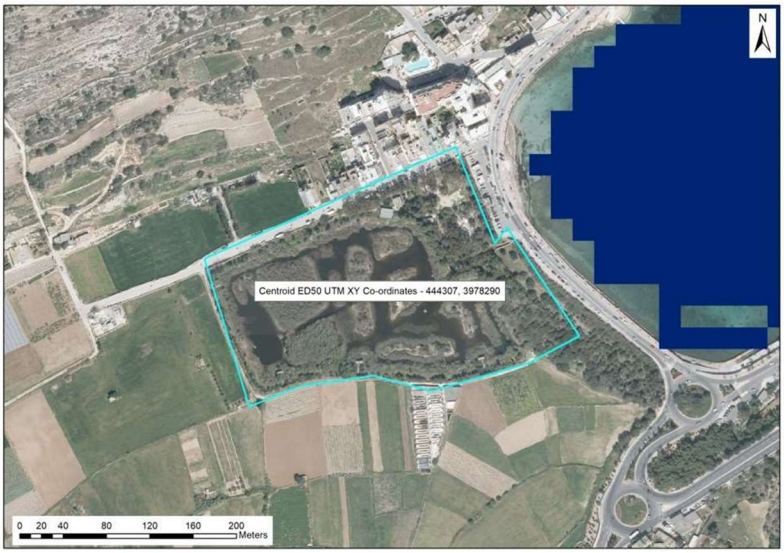


Figure 3: Inland Wetland – 'Is-Simar' Nature Reserve

First instance of the officially designated nature reserve/inland wetland area not recorded in the WAW 2015 HRL.

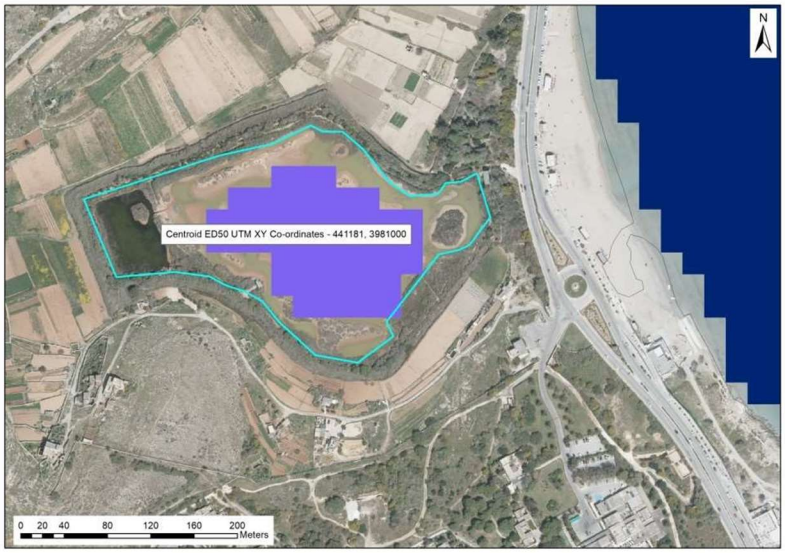


Figure 4: Inland Wetland – 'L-Ghadira' Nature Reserve

Second instance where the officially designated nature reserve/inland wetland area not recorded in the WAW 2015 HRL.

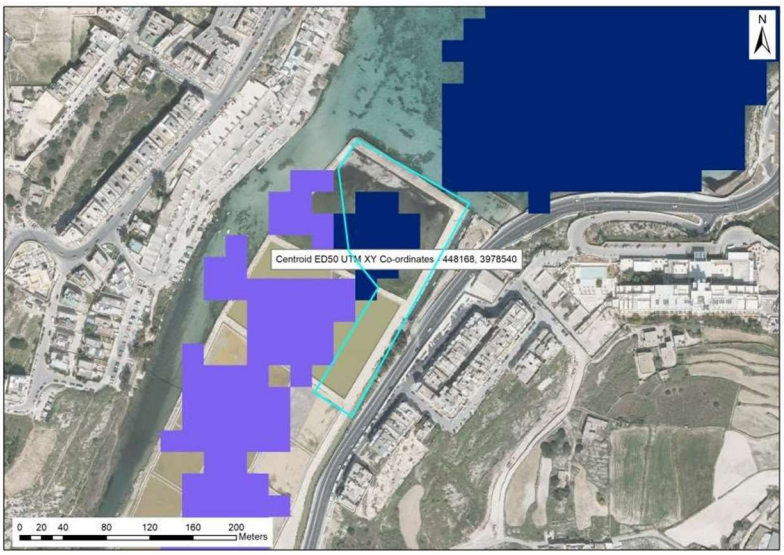


Figure 5: Saline Marshland – North East part of the island of Malta

The only instance where the officially designated saline marshland area is not recorded in the WAW 2015 HRL.

VI Documentation of software used for verification

Please provide detailed information on the software type and exact version of software used for the validation.
Software used for the verification process – **Arcmap 10.3.1** as part of the ESRI Enterprise License Agreement deployed at the Planning Authority, Malta.