



High Resolution Layer HRL Grassland 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	
3. Dissemination	Y

1. Abstract

A national coverage exercise was carried out to analyse the effective grassy and non-woody vegetation areas highlighted in the 'Grassland' HRL layer using in-situ imagery data and the HRL GRA_2015 provided for verification. The GRA 2015 HRL data layer was superimposed onto the in-situ data namely; Orthoimagery1 (2012), Orthoimagery 2016, the CLC layers (2012, 2018), the national biotope map database layer (updated as of 2011) as well as other in-situ data and input from local expertise

The main product of the “HRL Grassland” is the ‘Grassland’ layer, a grassland/non-grassland mask for the EEA39 area. The grassy and non-woody vegetation baseline product includes all kinds of grassland: managed grassland, semi-natural grassland and natural grassy vegetation. This layer is not directly comparable to the precursor HRL Grassland layer for the reference year 2012.

In Malta’s case, permanent grasslands are practically non-existent and a specific in-situ layer is not available. Hence it was deemed best to apply a complete coverage methodology rather than verifying specific area samples and visually verify the layer using in-situ Orthoimagery and local knowledge. All the major errors identified are categorised as “Commission” or “Omission” error types as per guidelines provided for the verification process. In this case all of the identified errors are of the “Commission” type with a total of 90 cases identified.

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/publicceoserver> 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: 29th November 2018

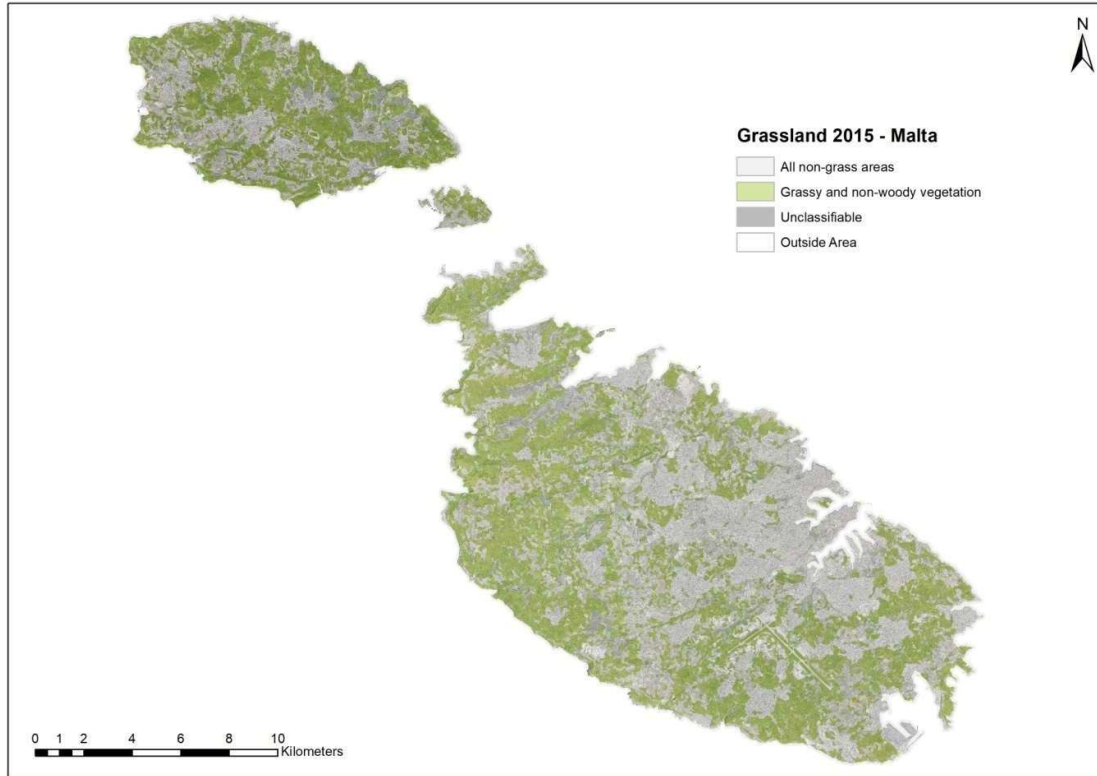
HRL verification report template for Grassland 2015

I. Administrative part

HRL	<i>Forest – Dominant Leaf Type 2015, Full delivery 20x20m, national projection</i>
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. <i>Replace Data-x with the full name of the dataset. Mention quality issues if relevant.</i>	<i>National Orthophoto database of the Maltese islands Reference Years:- 2012 and 2016 (Total Coverage) Resolution 0.10m (2016)</i>
	<i>CLC2012/CLC2018 databases for Malta and National Biotope areas (2011)</i>
	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	29/11/18

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 effective grassy and non-woody vegetation areas highlighted in the 'Grassland' HRL layer using in-situ imagery data and the HRL GRA_2015 provided for verification. The GRA 2015 HRL data layer was superimposed onto the in-situ data namely; Orthoimagery¹ (2012), Orthoimagery 2016, the CLC layers (2012, 2018), the national biotope map database layer (updated as of 2011) as well as other in-situ data and input from local expertise

The main product of the "HRL Grassland" is the 'Grassland' layer, a grassland/non-grassland mask for the EEA39 area. The grassy and non-woody vegetation baseline product includes all kinds of grassland: managed grassland, semi-natural grassland and natural grassy vegetation. This layer is not directly comparable to the precursor HRL Grassland layer for the reference year 2012.

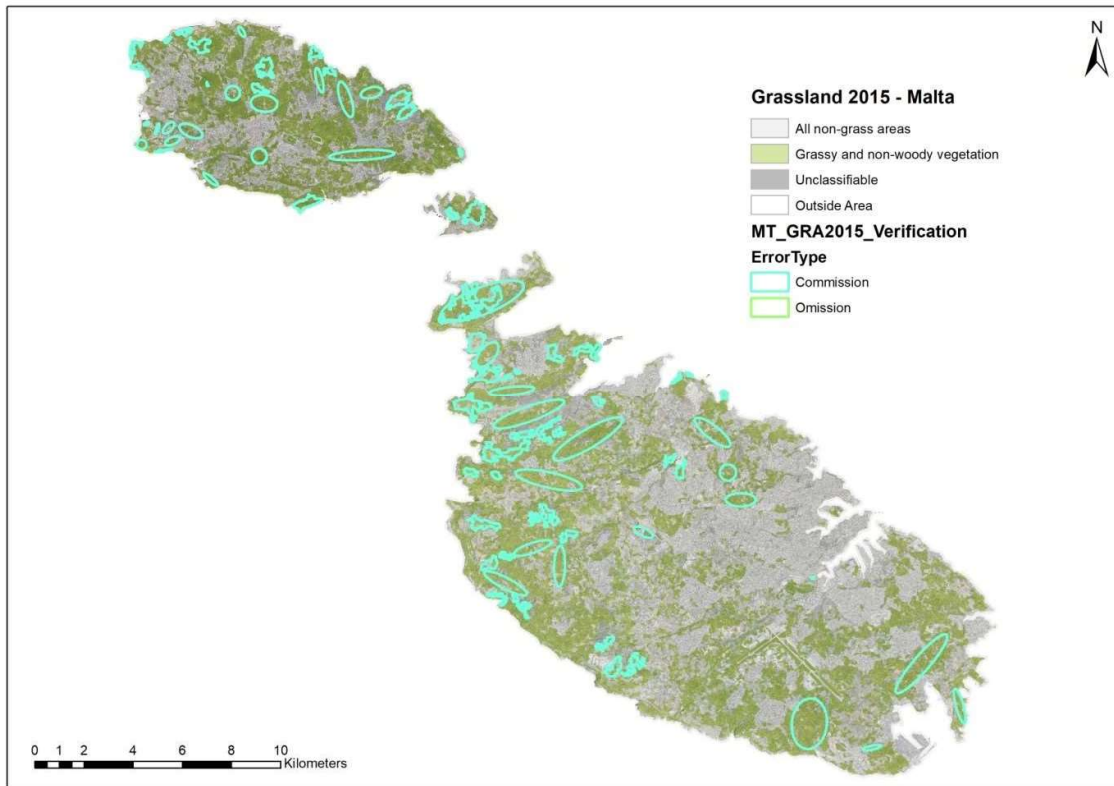
In Malta's case, permanent grasslands are practically non-existent and a specific in-situ layer is not available. Hence it was deemed best to apply a complete coverage methodology rather than verifying specific area samples and visually verify the layer using in-situ Orthoimagery and local knowledge. All the major errors identified are categorised as "Commission" or "Omission" error types as per guidelines provided for the verification process. In this case all of the identified errors are of the "Commissions" type with a total of 90 cases identified.

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

Overall the Permanent Grassland HRL layer provides a generalised view compared to the level of detail that is normally utilized locally (1:1000). In this case the GRA2015 layer was insufficient due to the considerable number of erroneously classified areas found during the verification stage. The majority of the “Commission” errors were in areas where sclerophyllous vegetation (CLC 323) and agricultural areas were dominant but still classified as grassland areas. This issue was particularly evident in the island of Gozo and mostly in the north west side of the island of Malta where both agricultural areas and Sclerophyllous vegetation are abundant.

III. Look-and-feel (obligatory)

Stratum	Name of the stratum	Number of errors identified	Comments
Commission			
1	Agricultural land	29	Known areas of agricultural land erroneously classified as being grassland (refer to Annex 5 figures 1 and 2)
3	Sclerophyllous vegetation	61	Significant extents of sclerophyllous vegetated areas classified as grassland. (refer to Annex 5 figures 3 and 4)
Overall evaluation			Insufficient
Comments			In this HRL many agricultural areas and sclerophyllous vegetation rich areas were erroneously classified as grassland.



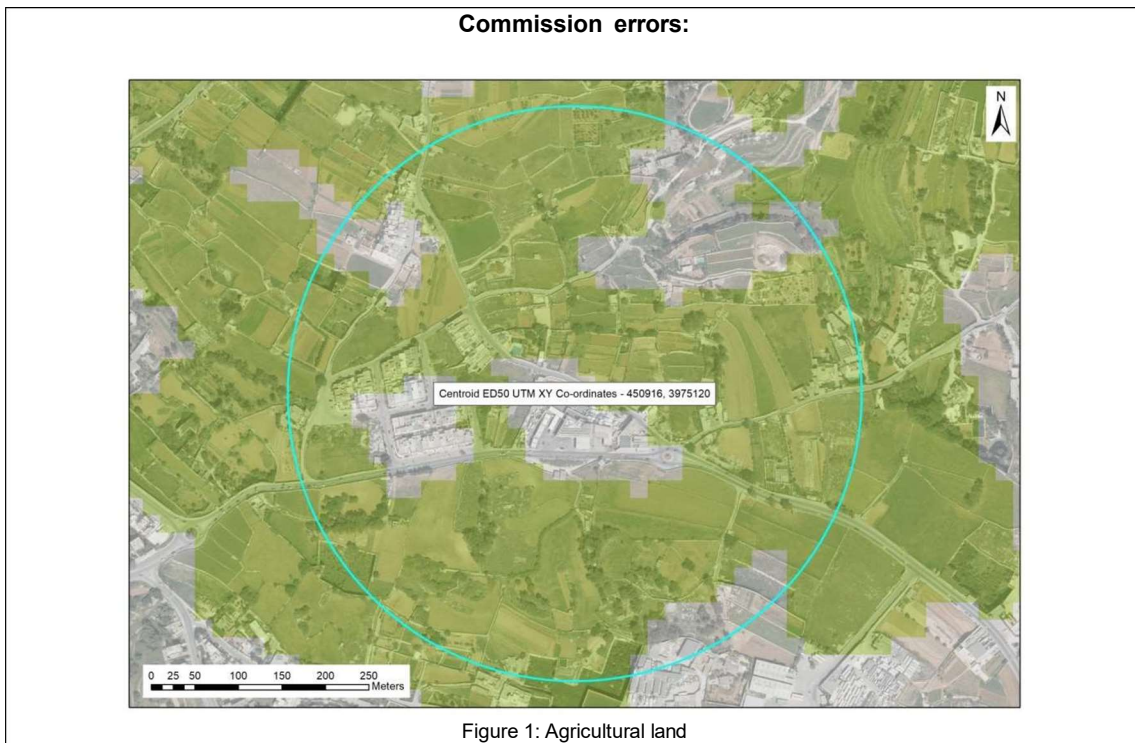
IV. Statistical verification

Stratification	<i>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.</i>
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 (%) ² 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 (%) ³ with uncertainty	N/A

² Producer's accuracy (%) = 1 – omission error (%)

Comment on commissions	N/A
Overall evaluation	Insufficient: The major errors were clearly identified and classified as being all of the “Commission” type. No “Omission” errors identified during the HRL verification process. The majority of the errors consisted of sclerohoyllous vegetated areas and agricultural areas being wrongly classified as grassland. The low lying vegetation must have contributed to the misinterpretation. Also most of the “Commission” errors identified spanned over the North West of the island of Malta as well as spread over Gozo.

V. Documentation of errors and critical findings.



³ User's accuracy (%) = 1 – commission error (%)

A typical example where areas dominated by tilled fields/agricultural land being classified as grassland.



Figure 2: Agricultural land

Another typical example where areas dominated by tilled fields/agricultural land being classified as grassland.

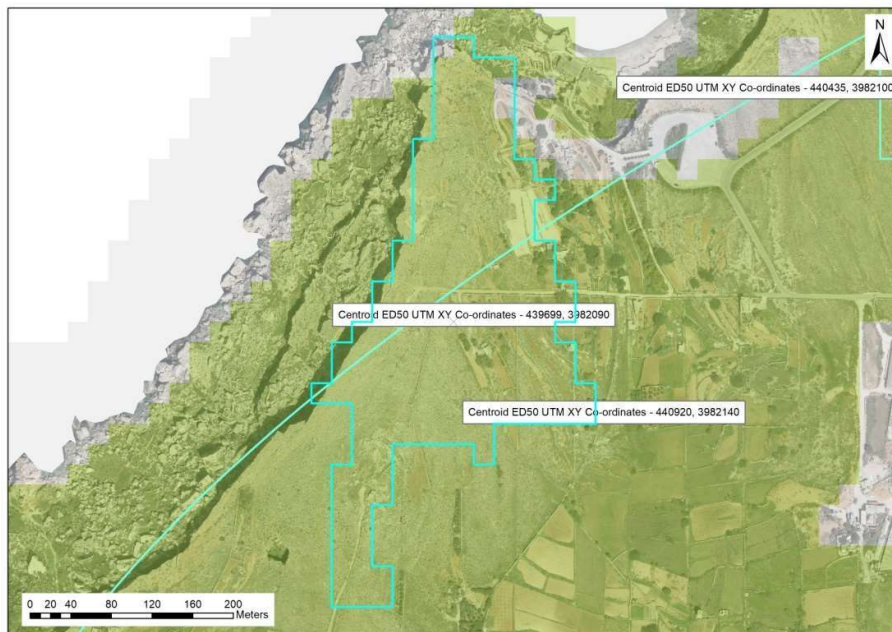


Figure 3: Sclerophyllous vegetation

An example where areas having Sclerophyllous type vegetation being highlighted as grassland in the HRL.

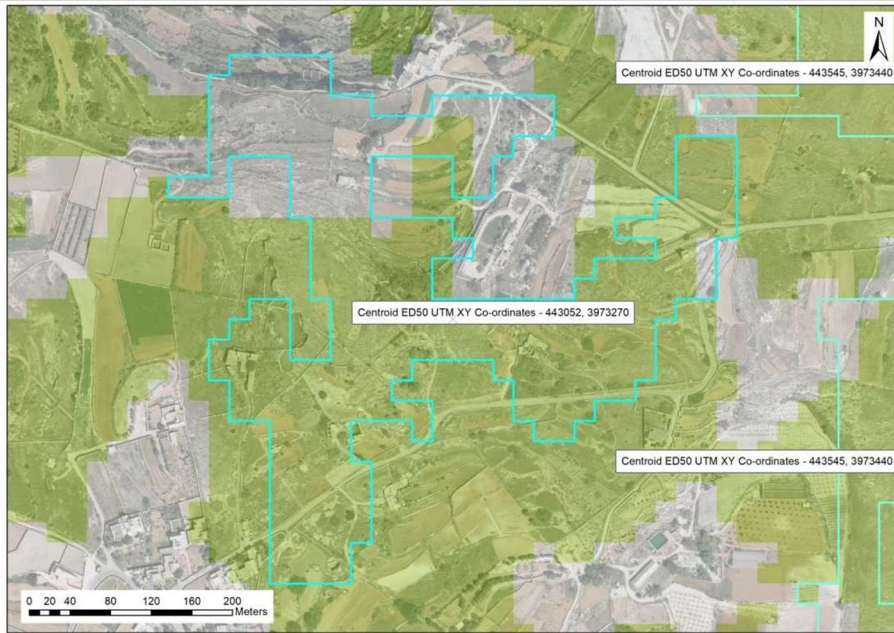


Figure 4: Sclerophyllous vegetation

Another typical example where areas having Sclerophyllous type vegetation being highlighted as grassland in the 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.