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Evolution of Copernicus Land Services based on Sentinel data



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AD05	European IPR Helpdesk: Fact Sheet - The Plan for the Exploitation and Dissemination of Results in Horizon 2020, Issued: July 2015
AD06	D21.1a – Service Evolution Requirements Report Issue 1.0, Issued: 09.08.2017
AD07	D61.1 - Project Website Issue 1.0, Issued: 03.07.2017
AD08	D61.3a – Collection of Communication and Dissemination Material. Issue 1.0. Issued: 28.06.2018
AD09	D62.1a – Market Opportunities and IPR Strategy Issue 1.0, Issued: 28.12.2018
AD10	D51.1c – Stakeholder Consultation Report Issue 3.0, Issued: 01.04.2019
AD11	D53-1a – Integration Plan into Copernicus Service Architecture. Issue 1.0, Issued 23.12.2018
AD12	P41.2a – Data Sets of Time Series-derived Indicators and Variables. Issue 1.0, Issued: 23.10.2018
AD13	P42.2a – Data Sets of HR Layer Incremental Updates. Issue 1.0, Issued: 23.10.2018
AD14	P43.2a – Data Sets of HRL Permanent Grassland Products. Issue 1.0, Issued: 23.10.2018
AD15	P44.2a – Data Sets of Crop Area and Crop Status/Parameters Products. Issue 1.0, Issued: 23.10.2018
AD16	P45.2a – Data Sets of New LC/LU Products. Issue 1.0, Issued: 23.10.2018
AD17	D32.1a – Methods Compendium: Time Series Preparation. Issue 1.0, Issued: 28.02.2018
AD18	D33.1a – Methods Compendium: Time Series Analyses for Thematic Classification. Issue 1.0, Issued: 29.03.2018
AD19	D34.1a – Methods Compendium: Time Series Analyses for Change Detection. Issue 1.0, Issued: 29.03.2018

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AD22	D43.1a – Prototype Report: Improved Permanent Grassland. Issue 1.0, Issued: 17.07.2018
AD23	D44.1a – Prototype Report: Crop Area and Crop Status/Parameters Monitoring. Issue 1.0, Issued: 10.08.2018
AD24	D45.1a – Prototype Report: New LC/LU Products. Issue 1.0, Issued: 03.08.2018
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EXECUTIVE SUMMARY

The Horizon 2020 (H2020) project, “Evolution of Copernicus Land Services based on Sentinel data” (ECoLaSS) addresses the H2020 Work Programme 5 iii. Leadership in Enabling and Industrial technologies - Space, specifically the Topic EO-3-2016: Evolution of Copernicus services. ECoLaSS is being conducted from 2017–2019 and aims at developing and prototypically demonstrating selected innovative products and methods as candidates for future next-generation operational Copernicus Land Monitoring Service (CLMS) products of the pan-European and Global Components. ECoLaSS assesses the operational readiness of such candidate products and eventually suggests some of these for implementation. This shall enable the key CLMS stakeholders (i.e. mainly the Entrusted European Entities (EEE) EEA and JRC) to take informed decisions on potential procurement as (part of) the next generation of Copernicus Land services from 2020 onwards.

To achieve this goal, ECoLaSS makes full use of dense time series of High-Resolution (HR) Sentinel-2 optical and Sentinel-1 Synthetic Aperture Radar (SAR) data, complemented by Medium-Resolution (MR) Sentinel-3 optical data if needed and feasible. Rapidly evolving scientific developments as well as user requirements are continuously analysed in a close stakeholder interaction process, targeting a future pan-European roll-out of new/improved CLMS products, and assessing the potential transferability to global applications.

The deliverable D19.3: “D61.2b - Communication, Dissemination and Exploitation Plan” (PEDR) is the fourth deliverable of Work Package (WP) 19: “WP61 - Communication, Dissemination & Exploitation” as part of the ECoLaSS Task 6: “Measures to maximise impact”. The main objective of this task is i) to prepare, perform and report on all activities and issues related to dissemination, communication and exploitation of the projects results in order to maximise the impact on the “Copernicus Economy” by promoting the project’s technical and operational advancements and ii) to prepare the grounds for the transfer of the accepted pre-operational products to EC, EEA and JRC for future operational procurement, under consideration of a balanced IPR strategy. This task is fundamental to both, the dissemination to different target user groups, and the transfer of innovations to future operational products, using appropriate strategies for exploitation and communication.

The PEDR of the ECoLaSS project describes the strategies for the dissemination of the knowledge gained during the project and the exploitation plan of the information arising from the project in terms of scientific advances and knowledge, as well as data products. The goal of the PEDR is to develop and report on the roadmap for implementing various dissemination and promotional activities in the project and to increase the awareness of the ECoLaSS project. It defines dissemination and exploitation activities as well as summarizes outreach materials for both project phases. The PEDR is a strategic document supporting to establish the bases for the intellectual property strategy, dissemination and exploitation activities [AD05].

The dissemination strategy gives an orientation as to the organisation of the planned project activities and therefore addresses i) the needs the project responds to, ii) the problem that the proposed solution addresses, iii) the new knowledge (results) the project generated (assessment of the state of the art), iv) the user of these results, v) the benefits being delivered and vi) methods applied to inform the end users about the generated results. The main objectives of the dissemination and exploitation activities are to increase the awareness of the ECoLaSS project, to provide up-to-date information about ongoing activities, such as events or meetings, and print media (publications, presentations, official documents, etc.), to regularly inform relevant Copernicus Land stakeholders and decision makers on the status of ongoing research and development activities in the project in the best suitable way, to improve the interaction with existing and potential stakeholders and users, to get access to new potential users and to generate a market demand for the prototypes developed.

The present report details the planned and conducted actions fulfilling the PEDR. The purpose and scope of ECoLaSS are framed in the Introduction chapter and the Project implementation background, identified research needs together with the proposed solutions are described in the Project Overview chapter 2. The core of the PEDR is contained in chapter 3 Dissemination and Communication strategy and chapter 4 Exploitation. Conclusions are summarized in chapter 5.

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Abbreviations

AFIGEO	Association Française pour l'Information Géographique (French Association for Geographical Information)
AGIT	Applied Geo-Information Technologies Geophysical Union
BiDS	Big Data from Space
CCI+	Climatic Change Initiative
CLC	CORINE Land Cover
CLC+	CORINE Land Cover plus (with improved specifications)
CLMS	Copernicus Land Monitoring Service
CNES	Centre National d'Études Spatiales (French Space Agency)
CNIG	Conseil National de l'Information Géographique (French National Council for Geographic Information)
DG(s)	Directorate-General(s)
DG AGRI	Directorate-General for Agriculture and Rural Development
DG CONNECT	Directorate-General for Communications Networks, Content and Technology
DG DEVCO	Directorate-General for International Cooperation and Development
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DG ENV	Directorate-General for Environment
DG MOVE	Directorate-General for Mobility and Transport
DG REGIO	Directorate-General for Regional Policy
DIASes	(Copernicus) Data and Information Access Services
EAGLE	EIONET Action Group on Land Monitoring in Europe
EARSC	European Association of Remote Sensing Companies
EARSeL	European Association of Remote Sensing Laboratories
ECoLaSS	Evolution of Copernicus Land Services based on Sentinel data project
EC	European Commission
EEA	European Environment Agency
EEEs	European Entrusted Entities
EGU	European Geosciences Union
EIONET	European Environment Information and Observation Network
EO	Earth Observation
ESA	European Space Agency
EU	European Union
EUROGI	European Umbrella Organisation for Geographic Information
FAO	Food and Agriculture Organization (of the UN)
GEMET	General Multilingual Environmental Thesaurus

GIS	Geographic Information Systems
H2020	Horizon 2020 Programme
HR	High Resolution
HRL(s)	High Resolution Layer(s)
IACS	Integrated Agricultural Control System
IGARSS	International Geoscience and Remote Sensing Symposium
IGN	Institut National de l'Information Géographique et Forestière (National Institute of Geographic and Forest Information)
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
IPR	Intellectual Property Rights
ISPRS	International Society for Photogrammetry and Remote Sensing
ISRSE	International Symposium on Remote Sensing of Environment
IUFRO	International Union of Forest Research Organizations
JRC	Joint Research Centre
LC/LU	Land Cover / Land Use
MARS	Monitoring Agricultural ResourceS
MODIS	Moderate Resolution Imaging Spectroradiometer
MR	Medium Resolution
NASA	National Aeronautics and Space Administration
NEREUS	Network of European Regions Using Space Technology
NRC	National Reference Centre
PEDR	Plan for the Exploitation and Dissemination of Results
REA	Research Executive Agency
R&D	Research & Development
SAR	Synthetic Aperture Radar
SEIS	Shared Environmental Information System
SIGs	Special Interest Groups
SMEs	Small and Medium Enterprises
SPOT	Satellite Pour l'Observation de la Terre
UNEP-GRID	United Nations Environment Programme – Global Resource Information Database
VHR	Very High Resolution
WBS	Work Breakdown Structure
WMS	Web Map Service
WP	Work Package

1 Introduction

The Horizon 2020 (H2020) project, “Evolution of Copernicus Land Services based on Sentinel data” (ECoLaSS) addresses the H2020 Work Programme 5 iii. Leadership in Enabling and Industrial technologies - Space, specifically the Topic EO-3-2016: Evolution of Copernicus services. ECoLaSS is being conducted from 2017–2019 and aims at developing and prototypically demonstrating selected innovative products and methods as candidates for future next-generation operational Copernicus Land Monitoring Service (CLMS) products of the pan-European and Global Components. ECoLaSS assesses the operational readiness of such candidate products and eventually suggests some of these for implementation. This shall enable the key CLMS stakeholders (i.e. mainly the Entrusted European Entities (EEE) EEA and JRC) to make informed decisions on potential procurement as (part of) the next generation of Copernicus Land services from 2020 onwards.

To achieve this goal, ECoLaSS makes full use of dense time series of High-Resolution (HR) Sentinel-2 optical and Sentinel-1 Synthetic Aperture Radar (SAR) data, complemented by Medium-Resolution (MR) Sentinel-3 optical data if needed and feasible. Rapidly evolving scientific developments, as well as user requirements, are continuously analysed in a close stakeholder interaction process, targeting a future pan-European roll-out of new/improved CLMS products, and assessing the potential transferability to global applications.

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This report highlights the ECoLaSS outreach and dissemination activities which took place until M27 and defines the roadmap of activities for the remaining project duration. The entire collection of materials until M18 is provided in AD08, which will be updated to include all remaining materials in issue 2.0 at M36.

1.1 Purpose and Scope

The PEDR of the ECoLaSS project describes the strategies for the dissemination of the knowledge gained during the project and the exploitation of the information arising from the project in terms of scientific advances and knowledge, as well as data products. The goal of the PEDR is to document the implementation and planning of various dissemination and promotional activities in the project and to increase the awareness of the ECoLaSS project. It defines dissemination and exploitation activities as well as material for both project phases. It is used by the consortium as a benchmark against which dissemination progress is measured over time. The PEDR is a strategic document supporting to establish the bases for the intellectual property strategy, dissemination and exploitation activities [AD05].

The dissemination strategy gives an orientation as to the organisation of the project activities and therefore addresses:

- i) the **needs** the project responds to,
- ii) the **problem** that it solves,
- iii) the **new knowledge (results)** the project generated (assessment of the state of the art),
- iv) the **users** of these results,

- v) the **benefits** being delivered and
- vi) **methods** applied to inform the end users about the generated results.

1.2 Dissemination and Exploitation Objectives

Dissemination and communication activities have been and are being conducted throughout the lifetime of the project, preparing the exploitation of ECoLaSS products and developed methodologies. Activities such as the establishment of a network community, the use of social networks (Twitter and ResearchGate), the provision of publishable deliverables and the setting up of workshops support the interaction with existing and potential stakeholders and users.

The dissemination plan considers the different knowledge levels of the targeted stakeholders and users relevant for the subsequent dissemination: e.g., disseminating product related information is expected to be of special interest for the EEEs for the Copernicus Land Monitoring Service and the EC's thematic directorates general (DGs), while the scientific community is targeted with the scientific and methodological innovations generated.

The main objectives of the dissemination and exploitation activities are:

- to increase the awareness of the ECoLaSS project,
- to provide up-to-date information about ongoing activities, such as events or meetings, and print media (publications, presentations, official documents, etc.),
- to regularly inform relevant Copernicus Land stakeholders and decision makers on the status of ongoing research and development activities in the project in the best suitable way,
- to improve the interaction with existing and potential stakeholders and users,
- to get access to new potential users, and
- to generate a market demand for the prototypes developed.

The ECoLaSS project follows a two-phased approach of two 18 months periods. This deliverable comprises the second issue compiled at month 27 of the project duration, thus midway through the second project phase. It lines out the achievements regarding communication and dissemination so far and lays out the roadmap for the remaining project duration.

1.3 Document structure

This section describes the structure of the document.

- Section 1 is this introduction.
- Section 2 gives an overview of the project and highlights the needs that the project responds to, the problem that the proposed solution addresses and the new knowledge that the project generates.
- Section 3 describes the Dissemination and Exploitation Strategy including the definition of the target groups, a description of the dissemination and communication media and the actual plan how project results are disseminated depending on the target group.
- Section 4 provides the exploitation plan.
- Section 5 provides the conclusion as well as an outlook towards post-project considerations

2 Project overview

The following chapter compiles the background of the ECoLaSS project (section 2.1) as well as the current research needs of the Copernicus Operational Services (section 2.2). In section 2.3 the solutions for these needs and the new knowledge expected from and/or provided within the ECoLaSS project are explained.

2.1 Project background

The European Earth Observation (EO) programme Copernicus, headed by the European Commission (EC) in partnership with the European Space Agency (ESA), provides a wealth of environmental information for better understanding the state and changes of our planet. Since entering its operational stage in 2014 (EU-EEA Agreement – Annex 1), Copernicus provides six operational services on the earth's main sub-systems (i.e. Land, Atmosphere, Oceans) and on cross-cutting processes (i.e., Climate Change, Emergency and Security). These services are largely based on EO satellite data, increasingly being provided by the fleet of European Sentinel satellites launched since 2014. All Copernicus products and Sentinel data are made available free-of-charge via a free and open data policy.

The Copernicus Land Monitoring Service makes use of these and other EO data to operationally derive spatially explicit information on various spatial scales related to bio-geophysical variables and land cover/land use (LC/LU) characteristics as well as their changes over time. It distinguishes services related to

- (i) the Global Land component – addressing global bio-geophysical variables with a typical spatial resolution of several 100m, and a global Hot Spot Mapping of protected areas;
- (ii) the Continental (pan-European) Land component – providing maps of LC/LU, related characteristics and their changes on European level with 10-20m spatial resolution; and
- (iii) the Local Land component – addressing selected European hot spots of biodiversity and human activity at very high spatial resolution (1-2.5m). A dedicated In-situ component is implemented alongside the thematic services, providing access to a range of regional-scale physical measurements, station data and other very-high resolution (VHR) reference data sets.

Implementation of the Land service component has been delegated by the EC to EEEs, of which the European Environment Agency (EEA) has taken responsibility for the Local and the Continental (pan-European) component, and the EC's Joint Research Centre (JRC) for the Global component. Whereas the Global component has been able to make use of a reasonable precursor EO data situation (e.g. SPOT-VGT, MODIS) since several years, the current status of implementation of the pan-European component still suffers from the delayed start of Sentinel-2A in June 2015, and an implementation level of products/services which are currently (still) predominantly geared towards being static snapshots in time, mostly derived from a mono-temporal image coverage rather than as dynamically evolving products derived from time series of satellite data. This comprises mainly the set of five High Resolution Layers (HRLs) on specific land cover characteristics (Imperviousness, Forest, Grassland, Water and Wetland/Wetness, Small Woody Features) and the well-established CORINE Land Cover (CLC).

The ECoLaSS project focuses on the pan-European and Global component aspects, as these are partially closely related, and takes into account the respective needs of the key user and stakeholder community.

2.2 Research needs of Copernicus Operational Services

The key challenges of the present Copernicus Land Services component are:

- (i) the variable probability for obtaining sufficiently cloud-free optical satellite image coverages across Europe from current precursor (third-party) satellite missions – deemed to improve significantly since Sentinel-2A and its twin satellite Sentinel-2B are now in full-operations mode;

- (ii) the resulting long time lag between original acquisition of satellite imagery and the delivery of final information products for pan-European scale;
- (iii) long product update cycles of currently 3-6 years for the pan-European component;
- (iv) the (still) significant regional heterogeneity residing in the products (mainly: the HRL).

With the era of full Sentinel constellation deployment ahead, the challenges are extended by

- (v) the vast volumes of EO data being acquired by the Sentinel satellites (currently Sentinel-1A and -1B, Sentinel-2A and -2B, Sentinel-3A and -3B), and the related massive data handling, data integration, processing and storage issues;
- (vi) the resulting necessity for the services to evolve towards processing of dense time series of both optical and SAR-based Sentinel data.

At the same time, also the users' requirements for future Land Services are rapidly evolving [AD06]. As one result, the AD06 report states that, in terms of future service specifications, a general need for shorter update frequencies and change products (e.g. through incremental updates) was mentioned throughout. Concerning new services, a particular need for a pan-European Agricultural Service as well as for a Phenology Layer were the most frequently recorded responses. In the second project phase Task 2 update we find out that the new Land Cover products now being demanded are stressing production and timely update of Phenology products, moving even towards near real time monitoring on the basis of season intravariability, as well as the improvement and renewal of the CLC (CLC+ will be produced at 10-20 m resolution and include new categories).

Furthermore, a general trend which could be established is an increased demand for geographically unrestricted coverage, with a better match between the continental and global cross-scales. The pan-European component's thematic services based on HR data, for example, are presently focusing only on Europe, while – considering the enhanced data availability through the Sentinels – they have huge potential for emerging also towards Global applications, e.g. for mapping of global-scale high-resolution LC/LU systems through integrated use of Sentinel-1, Sentinel-2 and Sentinel-3 observations.

In view of these new EO data possibilities, in combination with increased technical challenges and evolving user requirements, there is a strong need for targeted Research & Development (R&D) to support the evolution of the Copernicus Land Monitoring Service, with a view to a sustainable long-term perspective. Only through such dedicated action in the frame of the Horizon 2020 programme – going significantly beyond the 'regular' service improvement and maintenance efforts of the operational services – it is possible for the services to fully evolve towards exploiting the entire potential of high volume data processing for benefitting multiple thematic Land applications. Specifically the possibilities of exploring, developing and systematically benchmarking also commercially not yet fully mature (i.e. more 'risky') but technically promising concepts in the well-defined research framework of Horizon 2020 are expected to support closing the gap between the excellent EO data situation offered by the Sentinels and the CLMS component's capabilities.

From the identified needs for an operational Copernicus service evolution in the EO-03-2016 Guidance Document [AD02], ECoLaSS addresses seven of the ten requirements from the pan-European and Local component Land Monitoring Services as well as the Global component Land Monitoring Services:

- 5.2.2 LC/LU mapping and change mapping based on integrated radar and multi-spectral data,
- 5.2.3 Automated change monitoring based on Sentinel data time series,
- 5.2.4 Improved permanent grassland identification methods,
- 5.2.5 Crop area and crop status monitoring, and
- 5.2.6 Methodology to provide yearly incremental updates in HRL layers, and for the Global component:
- 5.3.1 High volume data processing lines, and

- 5.3.2 Automated change detection.

2.3 Solutions and new knowledge

The project's key objectives are the development of several prototypes of new or enhanced Copernicus Land services of the Continental and the Global component, which make full use of high data volume processing of dense time series of SAR and optical Sentinel (and other) EO data, and shall be suggested to EC and the relevant decision-makers for qualifying as candidates for operational integration into the future Copernicus Land Monitoring Service from 2020 onwards. The project bases all its developments on regularly updated high-priority user requirements (WP21), and assesses/benchmarks all operational product candidates in view of their innovation potential and technical excellence, automation level, potential for roll-out to pan-European level and/or global scale, timeliness for operational implementation, costs versus benefits, etc (WP52).

Faced to the state of the art presented in the previous section, ECoLaSS addresses specific challenges for operationalisation of land monitoring services by developing innovative solutions on the following aspects:

- Integration of multi-source data by exploiting optical and SAR satellite time series from Sentinel-1 and -2 mainly, with unprecedented spatio-temporal resolution for large area LC/LU mapping and change monitoring systems. Sentinel 3 was not fully operational for robust testing of sensor integrations. Nonetheless, ECoLaSS is still testing multiscale multisensor approaches using MR sensors like PROBA-V.
- Improving pre-processing methods, especially in the field of gap-filling and noise reduction of dense time series, where methods were implemented for fully automatic generation of continuous time series. Special emphasis was put on retaining the high spatial resolution of 10m which is required for monitoring LC/LU changes. As opposed to current approaches which are often based on mosaicking of imagery within defined time-intervals, the gap-filling and noise reduction procedures results in complete, continuous temporal trajectories of the derived features [AD17].
- Fully utilizing the information content of dense time series with innovative classification and monitoring methods which are based on the temporal trajectory of the signal and not limited to selected metrics derived from the time series data [AD18, AD19]. Advanced methods are being developed to handle the important Sentinel-1 and -2 data streams based on the consortium partners' expertise gained in the frame of the previous and ongoing Copernicus HRL production and the current Copernicus Land Validation projects. Such robust classification methods allow for incremental updates of HR layers [AD21], improved permanent grassland identification [AD22], continuous crop status monitoring [AD23] and new LC/LU products [AD24] and hence for addressing 2020+ Copernicus user needs.
- Providing advanced tools for harmonizing the Copernicus Land services with coherent temporal change updates [AD19]. The developed approaches are suitable to ensure logical consistency of time series HRL products and provide meaningful incremental updates with ideal update frequency.
- Defining and deriving new time series-derived indicators and variables to procure metrics based on spectro-temporal information that provides complementary information of land surfaces relying on Sentinel-1 and -2 time series [AD20].
- Continuous monitoring in near real time can be achieved by processing of satellite images over the full time series until the most recent satellite acquisition by fusing anomaly detection results from optical and SAR time series. Instead of generating yearly mosaics and/or derivation of metrics such as maximum reflectance over one year, the developed approaches allow to compare the temporal trajectory of derived features at a continuous basis (e.g. in case of monitoring disturbances, confidence intervals of the temporal trajectories are used to determine outliers).

- Developing multi-sensor services for reliable and timely delivery of agriculture-related products (including crop discrimination and status) at pan-European scale and adapting key components at global scale exploiting the synergy of Sentinel 1 and 2 data streams [AD23].

3 Dissemination and Communication

Dissemination activities have the aim to provide the important project results to current and potential users as soon as they are mature enough to be published, during the project's lifetime as well as in the follow-up of the project. Thereby, a strong focus is set on the participation of project members in relevant workshops and conferences, which target different user groups and enable dissemination as well as communication activities.

3.1 Dissemination and Communication of the project results

To successfully disseminate the results of ECoLaSS, the diverse stakeholders and potential users have to be addressed with the right distribution channels. Here, the PEDR accounts for such a diversity of potential users in structure, interests and in knowledge by classifying them in distinct user groups. The PEDR focuses on the following points:

Who – are the target groups that should be informed about the ECoLaSS activities and products?

- Responsible **EEEs** for the Copernicus Land Monitoring Service,
- The **EC's thematic DGs**,
- Local, Regional, and/or National Authorities and decision makers (current users and potentially new ones),
- Other public entities,
- Scientific community,
- Private sector, and
- The general public.

What - are the outcomes to be disseminated?

- Evolution of the project: Status on how the development of the prototypes is advancing as well as related meetings and workshops where the project is involved
- Prototypes of new or enhanced Copernicus Land Services, based on high data volume processing of dense time series of SAR and optical Sentinel (and other) EO data, i.e., processed products (maps) suitable to be used by the non-scientific community and qualified as candidates for operational integration into the future Copernicus Land Monitoring Service from 2020 onwards.
- Proof-of-concept for the following innovative **prototypes**:
 - Indicators and variables from high spatial and temporal resolution data [AD12];
 - Incremental update strategies for the main pan-European products (i.e. the HRLs) [AD13];
 - Improved permanent grassland identification [AD14];
 - Crop area and crop status/parameters monitoring [AD15];
 - Further novel LC/LU products [AD16].

How - are the outcomes disseminated?

The media or the communication systems used for the dissemination of ECoLaSS (what) to the specific target groups (who). This communication, dissemination and exploitation plan specifies which media (scientific papers, presentations in conferences, user reports, online/social media, etc.) were used for each group in order to facilitate dissemination.

When - are the outcomes disseminated?

According to the dissemination plan of each media taking into account the target groups every time.

3.2 Definition of target groups of users

To accomplish the project objectives and effectively disseminate the project results, users need to be identified and categorised according to their specific needs taking into account different aspects as e.g., which degree of connection they have to the project; which degree of knowledge they have about the topic; or how they use the results. Target groups were divided according to their knowledge related to ECoLaSS as well as their particular interest in the project and its outcomes.

There are four main target audiences that have been identified likely to be interested in the project outcomes and thus, are addressed for the dissemination of the results.

- **Group 1, Public Sector Entities:** this group comprises several entities:
 - The responsible **EEEs** for the Copernicus Land Monitoring Service: The most important stakeholders are representatives of **EEA** (being the EEE for the Continental and Local Copernicus Land components and the in-situ component (several thematic units)) and **JRC** (as research organisation of the EC and being the EEE for the global Copernicus Land component) who are responsible for implementing the Copernicus Land Monitoring Service as well as defining the main needs for its evolution.
 - **EC – DG GROW**, being responsible both for the overall programmatic coordination of Copernicus and for the management of this H2020 project (via REA);
 - The **EC's thematic DGs** such as **ENV, AGRI, REGIO, MOVE, DEVCO, CONNECT**: These DGs have the responsibility for coordinating specific environmental, agricultural, regional, infrastructural and policy issues in Europe (and partially beyond) which are not necessarily connected to Copernicus yet, but could support in formulating future requirements and could become users themselves later on.
 - **Copernicus Committee and User Forum**, being composed of EU member states' representatives, assisting the EC on user requirements, policy definitions, implementation measures and coordination of the Copernicus programme with its public-sector users.
 - **National Copernicus User Forums**, being held by each EU member state on a regular basis, collecting country specific requirements, policy definitions, implementation measures, etc. from regional and local administrations to be submitted to the European Copernicus Committee and User Forum.
 - Further **Public Sector Entities** in Europe: In supplement to strong communication with the EEEs, exchange with the **EIONET-EAGLE Group**, which is working on a relevant new data model on Land Cover and Land Use is foreseen [AD10]. Other important partners in terms of Land services development, mainly in an agricultural context, are **FAO** and the **UNEP-GRID**.
 - **Regional Networks** in Europe: In order to promote new prototypes and new products from ECoLaSS also on regional levels, regional networks such as the **Network of European Regions Using Space Technology (NEREUS)** and **European Umbrella Organisation for Geographic Information (EUROGI)** are targeted, by which typically several Copernicus

events are organised before. Two consortium partners, GAF and DLR, are located in the German region of Bavaria which is member of NEREUS (organised by bavAIRia e.V. (bavAIRia 2016)). Also the French region of Midi-Pyrenees (with one ECoLaSS demonstration site there) is represented as full member.

- **Group 2, Scientific Community:** Since the ECoLaSS project contains a significant R&D component, the exchange of scientific ideas or product innovations with the scientific community, e. g. from university institutes or research institutes, is accomplished via participation in scientific conferences and workshops as well as the publication of scientific results in international journals (Table 2.2.a). A wider dissemination of project results could be facilitated via the *European Association of Remote Sensing Laboratories (EARSeL)* that contains *Special Interest Groups (SIGs)* regarding, e.g., Forestry, Land Use/Land Cover, Urban Remote Sensing, or Temporal Analysis of Satellite Images, and frequently offers workshops in this field.
- **Group 3, the Private Sector** in Europe: The private Earth Observation sector in Europe can be addressed via federating organisations like the *European Association of Remote Sensing Companies (EARSC)*, which is recognised as the representative of the European remote sensing value-adding industry. Many of its members represent Small and Medium Enterprises (SMEs) which are not yet actively involved in Copernicus.
- **Group 4, General Public** in Europe: addressing the general public in Europe that will access the basic level of information. We expect that information about the ongoing project activities and demonstrating the unique potential of international collaboration and innovative high-capacity Land services for supporting responsible environmental policies and sustainable land management in the Sentinel era is the most interesting for the public.

A number of known key representatives, which have been identified and interviewed for AD06 and which were addressed during the progress of the project, are listed in the Table 3-1. A detailed account of the conducted meetings and conference participations is given in the AD10.

Table 3-1: Addressed European stakeholders and key national users

ORGANISATION	CONTACT POINT	ROLE OF ORGANISATION IN COPERNICUS	COUNTRY
European Environment Agency (EEA)	Tobias Langanke	European Entrusted Entity (EEE) for Copernicus implementation	European
Joint Research Centre (JRC)	Michael Cherlet	European Entrusted Entity (EEE) for Copernicus implementation	European
Joint Research Centre (JRC)	Guido Lemoine, Olivier Léo	European Entrusted Entity (EEE) for Copernicus implementation	European
DG Environment (DG ENV)	Frank Vassen	Key European stakeholder and user	European
DG Environment (DG ENV)	Peter Löffler	Key European stakeholder and user	European
DG Regional and Urban Policy (DG REGIO)	Hugo Poelman	Key European stakeholder and user	European
DG Climate Action (DG CLIMA)	Rene Colditz	Key European stakeholder and user	European
UBA Germany	Christian Schweitzer, Andreas Littkopf	Key national coordinating Copernicus entity and user	Germany

BKG Germany	Ralf Gehrke	Key national coordinating Copernicus entity and user	Germany
DLR Raumfahrtmanagement	Michael Bock	Key national coordinating Copernicus entity and user	Germany
EAA Austria	Andreas Littkopf	Key national coordinating Copernicus entity and user	Austria
CGDD (DRI+SOES)	Vincent Pircher, Benoit David, Frédérique Janvier	Representatives of national user	France
CNIG, AFIGEO (workshop)	Pascal Lory	Group of national users	France
Space Research and Technologies Institute at the Bulgarian Academy of Sciences, Bulgaria	Ventzeslav Dimitrov	NRC	Bulgaria
Czech Environmental Information Agency, Czech Republic	Lenka Rejentová	NRC	Czech Republic
Federal Agency for Cartography and Geodesy (BKG), Germany	Friederike Emig	NRC	Germany
Croatian Agency for Environment and Nature (CAEN), Croatia	Branimir Pavlinec, Bojan Karaica, Tamara Kirin	NRC	Croatia
Environmental Protection Agency (EPA), Ireland	Gavin Smith	NRC	Ireland
Malta Environment and Planning Authority (MEPA), Malta	Stephen Conchin	NRC	Malta
Wageningen Environmental Research (WENR), Netherlands	Gerard Hazeu	NRC	Netherlands

3.3 Dissemination and Communication Activities

Several communication activities have been conducted and are planned for the duration (and at the end of) the project to discuss and promote the results and products developed in the project, and communicate them to diverse audiences. ECoLaSS communication activities are oriented towards the guidelines stated in the H2020 Annotated Model Grant Agreement Article 38, as well as the H2020 Online Manual. The ECoLaSS Communication Plan contains one way-exchange as well as two-way exchange communication means. Communication and promotion activities can be categorised into passive promotional efforts to achieve general awareness. The more proactive promotion/dissemination efforts aim at direct contact with the users including feedback, to engage with relevant programmes/activities, as well as the financing and scientific community. Communication activities which were carried out within this WP 61, are inter-linked with dissemination activities. Moreover, there is a strong link to WP 51 “Stakeholder Consultation” [AD10].

A public policy perspective of EU research and innovation funding is specifically addressed by ECoLaSS. Through transnational cooperation in a European consortium consisting of five partners from four EU member states, the quality and quantity of achievements can be significantly raised and the network of dissemination and communication addressees can thereby be enlarged. Through collaboration of partners with strong backgrounds and legacy in the Copernicus Land domain (see chapter 3.3), the consortium

covers a wide range of scientific excellence and knows from its long-time involvement in the Copernicus Land process history the societal challenges and policy makers' requirements to be covered by future Land services.

After having available first product prototypes as outcomes of project phase 1, detailed strategies for service evolution were discussed, e.g. in a dedicated IACS workshop with stakeholders from agriculture (EC DG AGRI, national stakeholders). Besides the discussions with stakeholders, a detailed assessment of the prototypes towards their overall maturity and readiness for operational roll-out has been made in the frame of WP52 [AD25]. Moreover, an Integration Plan into the Copernicus Service Architecture is given in WP 53 [AD11]. Throughout the second project phase the outcomes of both WP 52 and 53 will be discussed together with the latest and upcoming results of the prototype generation.

Recurrent meetings have taken place in the frame of the stakeholder consultation process with representatives of the Copernicus Land and SEIS (Shared Environmental Information System) group of EEA, supplemented by meetings with JRC and involved EC DGs. Participation in Copernicus Land workshops, as well as in annual meetings of the national EIONET representatives and the EAGLE group support promoting the potential use of new service products on a European and national level. Moreover, presentations at application-oriented workshops provide further valuable means of dissemination and allow retrieving feedback on the ECoLaSS products which can be taken into account in steering their development to make sure the most suitable methods are being used.

An overview of the communication media and measures of their success, as well as additional information on timing is given in Table 3-2.

Table 3-2: Targeted communication and measures of their success

Targeted communication	Purpose with respect to the project objectives	Measurement of success of communication activity	Date, timing	Pro-active/passive	One-way/two-way c.
Meetings with stakeholders	<ul style="list-style-type: none"> Coordination and future planning Review of work and deliverables 	<ul style="list-style-type: none"> Progress meeting minutes 	Annual or bi-annual	A	2W
Face-to-face meetings, Telephone calls and webinars with stakeholders	<ul style="list-style-type: none"> Requirements definitions and understanding Collecting specific needs 	<ul style="list-style-type: none"> Deliverable 21 	One for each phase of the project	A	2W
Scientific Conferences	<ul style="list-style-type: none"> Presentation and discussion of project methods, results and achievements Exchange of knowledge and expertise Feedback from scientific communities Feedback from Financing communities 	<ul style="list-style-type: none"> Discussion about presented results New or intensified contacts to possible users and communities 	According to Table 3-4	P/A	1W /2W
Workshops and side events of specific conferences	<ul style="list-style-type: none"> Discussion of project achievements Discussion on new strategies & methods Diffusion of lesson learned in ECoLaSS Feedback from topical communities 	<ul style="list-style-type: none"> New or intensified contacts to possible users and communities 		A	2W

3.4 Dissemination and Communication Media

In the following, the media that are being used to carry out a wide-ranging dissemination and communication are presented including the corresponding activities which have taken place in the report time-frame.

3.4.1 Webpage

The webpage has been set up at www.ecolass.eu and is maintained and regularly updated throughout the project's lifetime (see AD07). This dissemination instrument provides information about the ECoLaSS project including background, the members of the consortium, the test and prototype sites of the project, as well as up-to-date information about ongoing activities, e.g., the participation in relevant events. Furthermore, it provides contact details and links to other outreach instruments, such as social media channels or the blog.

Since the webpage serves content to a diverse audience, it was structured to provide multiple levels of technical depth. A high-level overview for users not yet familiar with the project or users without in-depth understanding of remote sensing or Copernicus Services is served under "Home" and "About". The general information about the consortium members is given under "Consortium". Next, a more detailed breakdown of the ECoLaSS findings, methods and products for audiences familiar with the technical specifics is provided under "Developments&Findings". Lastly, the in-depth technical documents on prototype developments and definitions, methods compendia and other project deliverables are provided as embedded documents for expert users (see Figure 1).

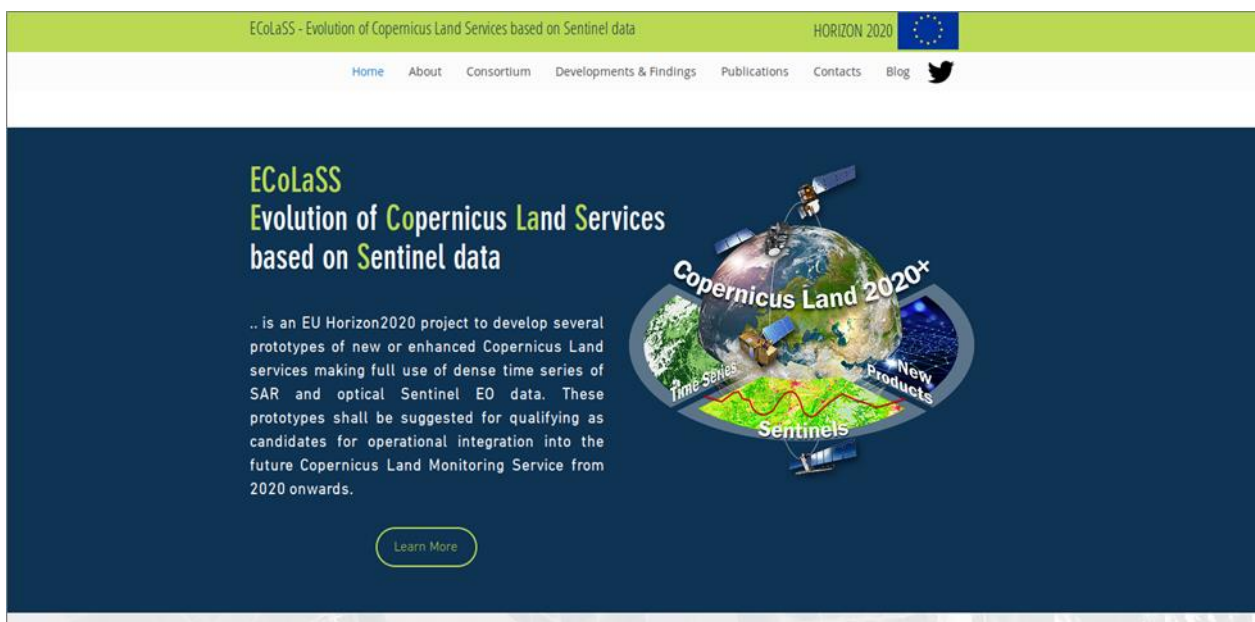


Figure 1: ECoLaSS website - main page available under <https://www.ecolass.eu/>.

Going into phase 2 of the project, significant efforts have been undertaken to improve the presentation of the project results so far. This includes:

- Summaries of service, data and infrastructure requirements identified in Task 2
<https://www.ecolass.eu/requirements>
- Summaries of processing approaches
<https://www.ecolass.eu/processing-lines>
- Updated information on test and demonstration sites
<https://www.ecolass.eu/test-prototype-sites>

- Interactive presentations of the ECoLaSS high resolution layer prototypes (Figure 2 and Figure 3)
<https://www.ecolass.eu/hrlprototypes>
- Prototype descriptions including embedded in-depth metadata
<https://www.ecolass.eu/hrl-landcover>
<https://www.ecolass.eu/hrl-agriculture>
<https://www.ecolass.eu/hrl-imperviousness>
<https://www.ecolass.eu/hrl-time-series-indicators>
<https://www.ecolass.eu/hrl-grassland>
<https://www.ecolass.eu/hrl-forest>
- Summaries of operationalization prospects as identified in Task 5
<https://www.ecolass.eu/operationalization>
- For maximal transparency and outreach, all project deliverables with dissemination status PU are being made available on the website once they have been accepted.
<https://www.ecolass.eu/project-deliverables>
- Scientific publications including materials such as slides and presentations are made available
<https://www.ecolass.eu/scientific-publications>



Figure 2: Overview over ECoLaSS HRL prototypes on project website available under <https://www.ecolass.eu/hrlprototypes>.

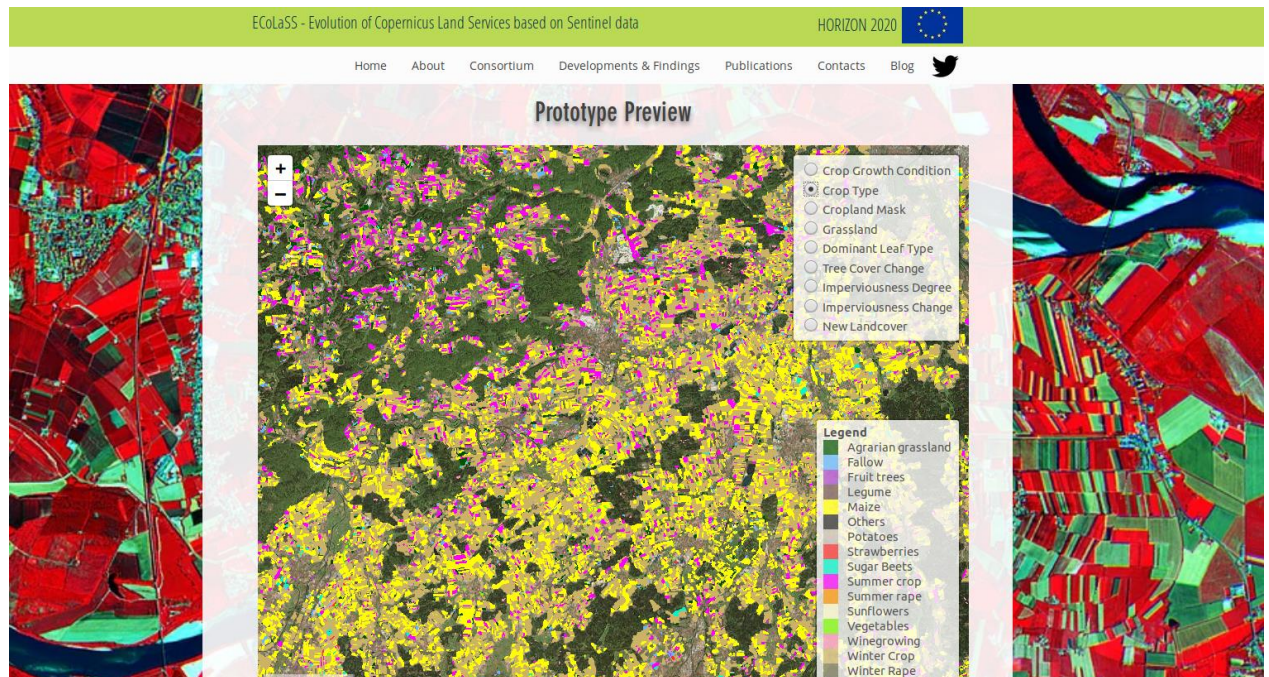


Figure 3: Interactive maps of ECoLaSS high-resolution prototypes on project website available under <https://www.ecolass.eu/hrlprototypes>.

The success of the website in terms of the number of visitors and time spent per site is not directly measurable due to technical limitations of the server hosting company. At the moment, user tracking would technically only be possible by embedding third party tracking code, for example Google Analytics, however due to user privacy concerns we decided not to do this, which is in line with recent EU efforts to improve personal data protection. A direct, subjective evaluation of the ECoLaSS website has been conducted by requesting feedback by non-project related colleagues, in how well the website transported the project's aim, approaches and results. This feedback was directly incorporated by restructuring and added information, so that at the current state, we are confident that the website has become a high-quality tool for the dissemination of ECoLaSS project achievements.

3.4.2 Prototype Dissemination

In order to facilitate interactive exploration of ECoLaSS prototypes, they have been ingested into the DLR Geoservice tile-server (<https://geoservice.dlr.de/web/>). Not only does this server power the interactive maps on the main ECoLaSS homepage, but it has also been set-up to include the ECoLaSS prototypes also in its own interactive viewing platform (see Figure 4). This has the side-benefit of increasing the dissemination of ECoLaSS products to new expert users, which frequently explore the continuously growing suite of high-quality products on this platform (e.g. the Global Urban Footprint or the TanDEM-X DEM).

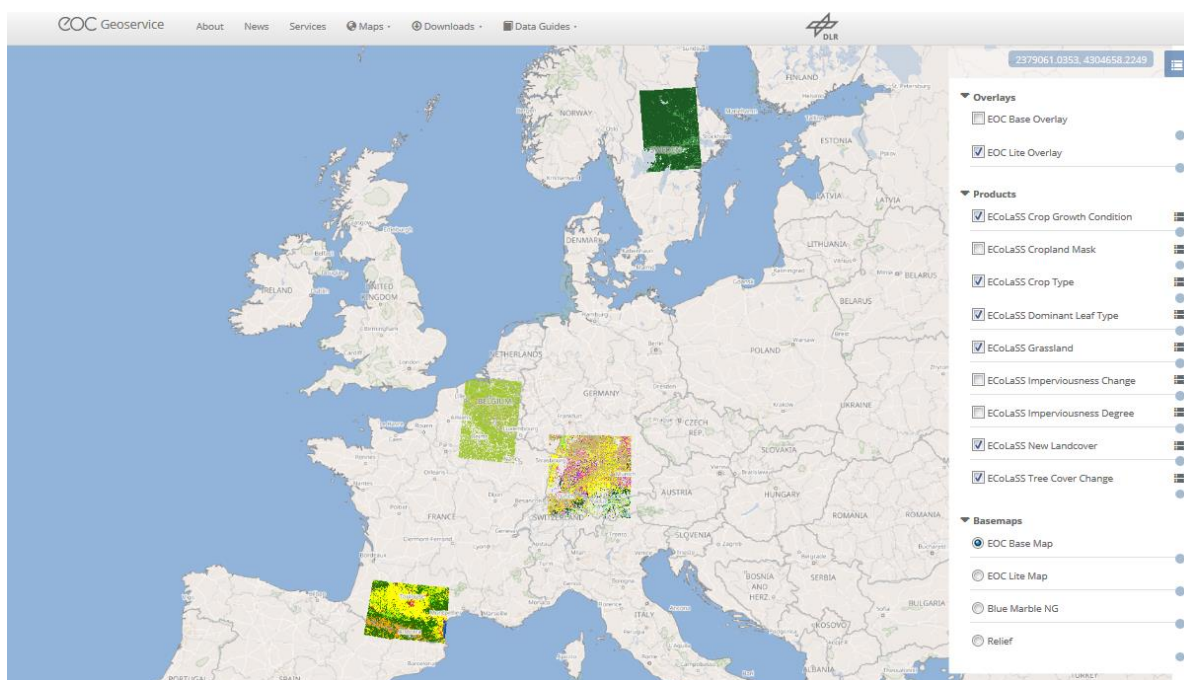


Figure 4: ECoLaSS prototypes featured in the DLR Geoservice portal available at <https://geoservice.dlr.de/web/maps/demo:ecolass>. Background and vector overlay data: OpenStreetMap.

Moreover, now the ECoLaSS prototypes are available to be imported as a remote data source in most GIS applications. This allows to display, evaluate and work with the data locally in a GIS with any combination of remote and local GIS layers (Figure 5).

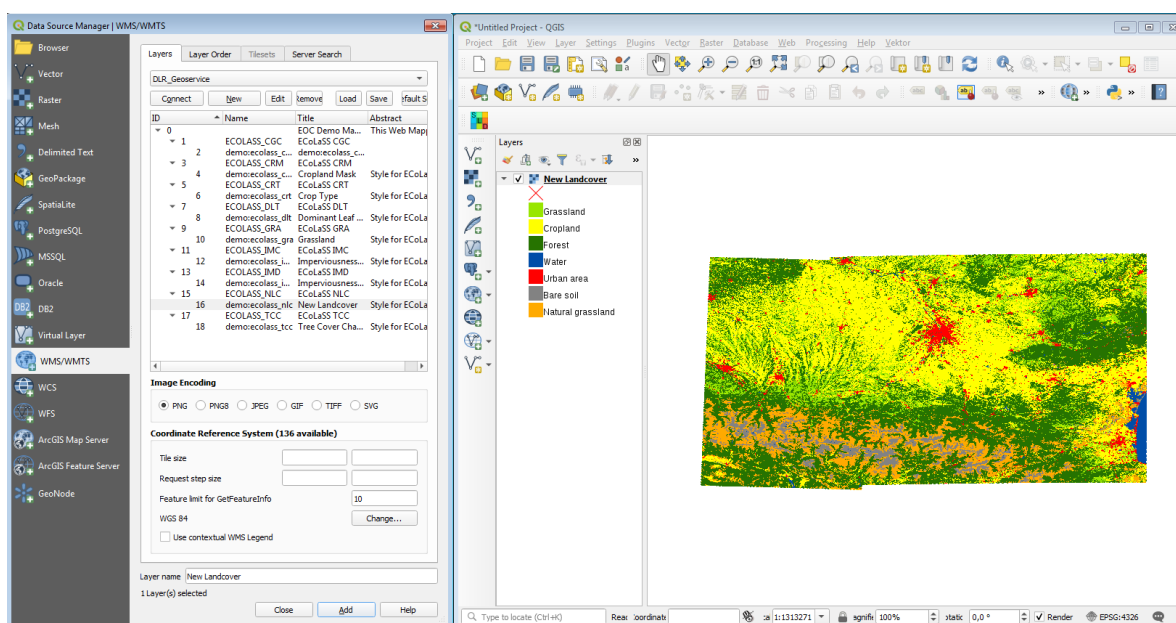


Figure 5: ECoLaSS prototype data as WMS layer service for local GIS software.

3.4.3 Social Media

The main objective of social media is to increase publicity, to generate requests, to exchange information, to offer support, to strengthen the user loyalty, and to expand the user community. Social media has the great advantages of reaching users and potential new users faster than through traditional communication

channels. Social media helps advertising new developments and/or products of the project and attracting new users, as these channels can reach outside the related community.

To measure the success of social media, the number of followers, likes, retweets, etc. are recorded. The Twitter account @ECoLaSS2020 (<https://twitter.com/ECoLaSS2020>) has been created 6 months after project start and is maintained and regularly updated throughout the projects lifetime. The account follows 12 other accounts, has 119 followers and 38 tweets (see Figure 6).

Furthermore, discussions on ECoLaSS related issues and papers with the scientific community are made possible via ResearchGate (<https://www.researchgate.net/project/ECoLaSS>). Scientific outcomes and publications will be shared in this academic specialized website.



Figure 6: ECoLaSS twitter account available under <https://twitter.com/ECoLaSS2020>.

3.4.4 Blog

The weblog is an important outreach instrument to inform users more into detail about new developments or important events of the ECoLaSS project. In general, it includes articles with additional detail compared to social media which are supplemented with graphics or videos.

The blog is embedded in the projects webpage (see Figure 7) and is maintained and regularly updated throughout the projects lifetime (<https://www.ecolass.eu/blog>). So far, 15 blog posts have been published highlighting project collaboration and presence at conferences.

With regards to measuring the success of the blog, the same conditions lined-out in 3.4.1 apply, in that user tracking is not technically feasible at the moment and not desired for reasons of user privacy

protection.

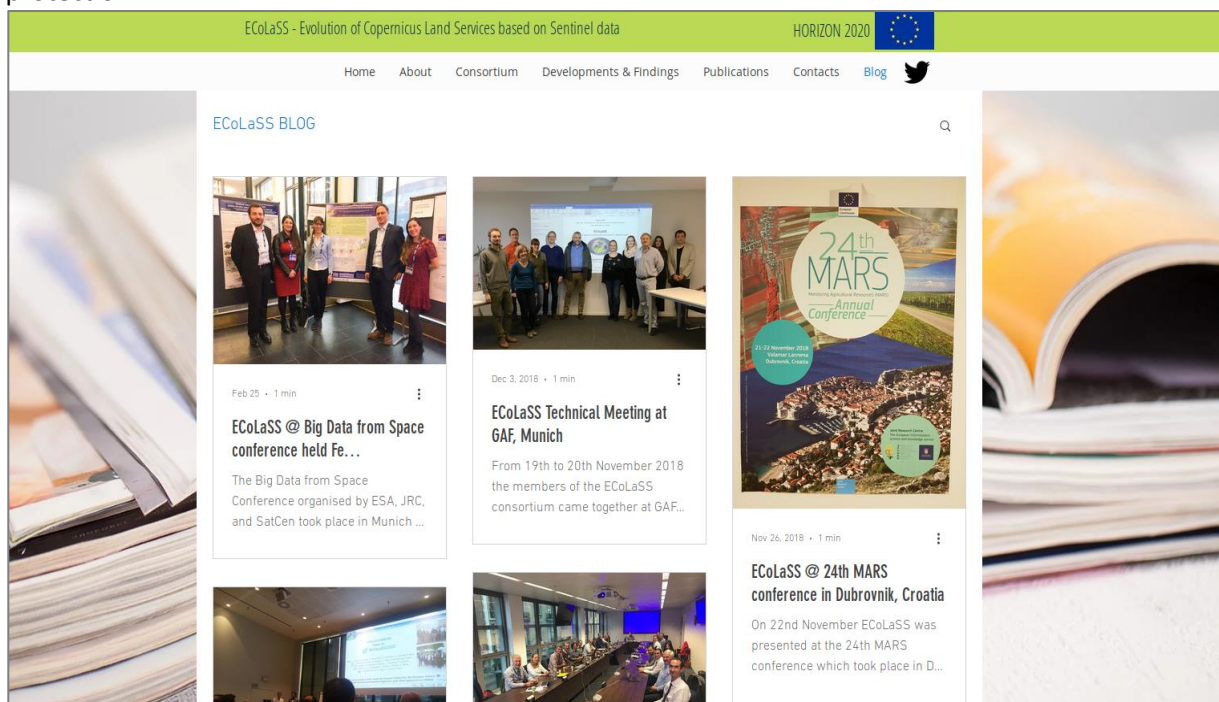


Figure 7: Blog on project website available under <https://www.ecolass.eu/blog>.

3.4.5 Project Flyer

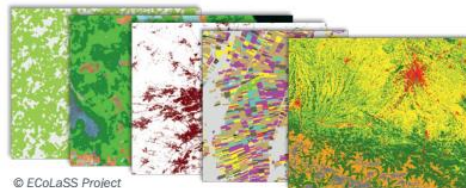
This dissemination instrument aims at providing the essential information about the ECoLaSS project including contact information (project coordination, website, blog, etc.) to potential new users and thus making them aware of the ECoLaSS project, which can be sent via Email or disseminated during conferences, workshops, etc. The flyer includes a short description of the project's background, objectives, envisaged achievements/innovations, and partner as well as contact details (project coordination, website, blog, etc.) and graphics of as well as meaningful and impressive examples of outputs of the ECoLaSS project. The ECoLaSS project has been advertised in a flyer on Mundi Web Services by GAF AG (Figure 8), since the Mundi platform is planned to be used in the upcoming months for the prototype production. This flyer has been distributed on various events (e.g. Defence Geospatial Intelligence Conference 2019 in London, Big Data from Space Conference in Munich). A total number of 116 copies were handed out so far.

ECoLaSS - Evolution of Copernicus Land Services Based on Sentinel Data

The Horizon 2020 project **ECoLaSS** aims at developing innovative methods, algorithms and prototypes for improving and creating future pre-operational Copernicus Land services from 2020 onwards, making full use of dense Sentinel time series of optical (S-2, S-3) and Synthetic Aperture Radar (SAR) data (S-1).

ECoLaSS will involve methodological developments such as:

- (i) Sentinel-1/-2/-3 time series integration,
- (ii) time series pre-processing methods,
- (iii) thematic classification and
- (iv) change detection from time series analysis, and
- (v) the development of an incremental update methodology for the Copernicus Land High Resolution Layers (HRLs).



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These methods will be applied on test and larger **demonstration sites** representing various bio-geographic regions in both Europe and Africa, and the following **innovative prototypes** will be implemented:

- indicators and variables from high spatial and temporal resolution data;
- incremental update strategies for the main pan-European products (i.e. the HRLs);
- improved permanent grassland identification;
- crop area and crop status/parameter monitoring;
- further innovative LC/LU products.

ECoLaSS will make use of not only the data provided by the Mundi Web Services but also cloud services data for testing demonstration cases with regard to their future implementation.



Figure 8: Excerpt from GAF flyer advertising the ECoLaSS project.

3.4.6 Publications in Scientific Journals

This dissemination instrument includes publications in (peer-reviewed) journals to present the project's objectives, developed methods and results to the scientific community. This further strengthens the scientific reliability of ECoLaSS and places it among the innovative and state-of-the-art approaches. Moreover, this allows attracting new potential users, namely the readers of such journals. Publications are being submitted to open-access journals in order to maximise their reach and further the uptake of the novel ECoLaSS developments and products.

The publication in scientific journals is taking place in the second phase, towards the end of the project, once prototypes and methods are finalised. The success of a publication in a scientific journal is measured by means of the number of citations, downloads and view statistics from the scientific journals' websites, and discussions about the publication.

Already planned peer-reviewed publications until the end of the project:

- **Topic 1:** Outcome of WP31: Summary of the joint consortium's experiences on the synergies, redundancy or exclusivity of the information content in Sentinel-1 and Sentinel-2 time-series in the application domains of the different ECoLaSS prototypes.
Lead: DLR, Contributions: All partners

- **Topic 2:** Outcome of WP 43: Grassland mapping efforts with particular focus on mapping land-use intensity.
Lead: JR, Contributions: All partners
- **Topic 3:** Agriculture processors and prototype results.
Lead: UCL

Further publications are expected to become viable, once the prototype demonstration phase has succeeded. This will likely include publications in the follow-up phase after project termination.

3.4.7 Other publications

Further press releases in other thematic newspapers and magazines (i.e., EOMAG, Horizon Magazine (<https://horizon-magazine.eu/>), research*eu results magazine (http://www.cordis.europa.eu/research-eu/home_en.html)) are foreseen for the end of the project. Moreover, presentations from conferences may also be available to public. First publications have already been released.

- 01/2017: Eomag! Article
<http://eomag.eu/articles/3902/gaf-ag-and-partners-will-investigate-the-future-evolution-of-copernicus-land-services-based-on-sentinel-data-the-ecolass-project>
- 01/2017: Press release
<https://www.gaf.de/content/gaf-ag-and-partners-will-investigate-future-evolution-copernicus-land-services-based>
- 02/2017 EARSC Press release
<http://earsc.org/news/gaf-ag-and-partners-will-investigate-the-future-evolution-of-copernicus-land-services-based-on-sentinel-data-the-ecolass-project>
- 04/2018 Press release
<https://www.gaf.de/content/gaf-ag-participated-23rd-mars-conference-dublin-ireland-27-29-november-2017>
- 09/2018 Press release
<https://www.gaf.de/content/ecolass-team-presents-recent-achievements-copernicus-land-monitoring>

3.4.8 Conferences and other relevant events

This outreach instrument mostly includes oral or poster presentations of the project's status and results at international conferences and workshops related to LU/LC from the remote sensing/IT perspective carried out by members of the consortium.

This allows a direct contact with the user community and, hence, to get additional comments and feedback which can be taken into consideration for further improvements of the technical or methodological developments of ECoLaSS. The participation at conferences and publication of results in the conference proceedings or as a poster is foreseen according to the plan (see Table 3-4 for conference scheduling). The ECoLaSS consortium undertook many efforts to disseminate the project in conferences and events. In the last 27 months 13 conferences were attended where the project was presented either in an oral presentation or a poster. The number of participants in these conferences/events reach from several hundred to thousand.

In the following the comprehensive list of conference and workshop contributions until M27 is displayed. For the remaining 9 months of the project the list is going to be extended, since there will be many conferences and events with participation of ECoLaSS throughout the year (see Table 3-4). The

corresponding materials (slides and posters) are available on the website under <https://www.ecolass.eu/scientific-publications>:

Posters:

- Sannier, C., Villerot, S., Pennec, A., Lhernould A., Kenner, C., Mass A. (2019): “Ensuring spatial and temporal consistencies for the time series of the Copernicus Land Monitoring Pan-European HRLs”, ESA Big Data From Space Conference, 19-21 February 2019, Munich, Germany.
- Moser, L., Probeck, M., Ramminger, G., Herrmann, D., Kovatsch, M., and Schwab, K. (2018): “Sentinel-based Evolution of Copernicus Land Services – The ECoLaSS Project” Multiply Workshop “Integrating Sentinels data within the Multiply platform: Facilitating land surface parameter retrieval and earth observation applications”, 6-8 February 2018 in Frascati (Rome), Italy.
- Moser, L., Probeck, M., Ramminger, G., Sannier, C., Desclée B., Schardt, M., Gallaun, H., Deutscher, J., Defourny, P., Blaes X., Klein, I., Keil, M., Hirner, A., and Esch, T. (2017): “Sentinel-based Evolution of Copernicus Land Services on Continental and Global Scale” WorldCover 2017, 14-16 March 2017 in Frascati (Rome), Italy.
- Moser, L., Probeck, M., Ramminger, G., Rieke, C., Mack, B., Ickerott, M., Storch, C., Sommer, C., Richter, R., Herrmann, D., Ruiz, I., Kovatsch, M., and Schwab K. (2018): “Evolution of Next-generation Copernicus High Resolution Layers on Forest and Agriculture: The ECoLaSS Project” 3rd joint EARSeL LCLU & NASA LCLUC Workshop, 11-12 July 2018 in Chania, Greece.

Presentations:

- Sevillano Marco, E., Schwab, K., Probeck, M. (2019): “ECoLaSS: Evolution of Copernicus Land Services based on Sentinel data” 2019 IACS Workshop, CLMS-related H2020 projects session, 10- 11 April in Valladolid, Spain.
- Ramminger, G., Sindram, M., Ickerott, M., Sommer, C., Homolka, A., Fourie, C., Rieke, C., Storch, C., and Mack, B. (2019): “Production of Copernicus High Resolution Layers 2018 – A Cloud Native Land Cover Mapping Environment on MUNDI for Large Scale Processing”, ESA Big Data from Space Conference, 19-21 February 2019 in Munich, Germany.
- Moser, L., Probeck, M., Ramminger, G., Richter, R., Herrmann, D. (2018): “Sentinel Time Series for Next-generation Copernicus High Resolution Layers on Agriculture and Grassland”, INSPIRE Conference, 18-21 September 2018 in Antwerp, Belgium.
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- Sannier, C. (2018): “Production de couches HR à partir d'analyse automatique multi-temporelle d'images.” Seminaire data, data science et big data, 14 March 2018 in Paris La Défense, France.

- Puzzolo, V. (2018): “H2020 research projects - evolution and applications of Copernicus for agriculture – ECoLaSS” Copernicus for Agriculture - Industry Workshop, 5 February 2018 in Brussels, Belgium.
- Probeck, M. (2018): 10th Conference on European Space Policy, 23-24 January 2018 in Brussels, Belgium.
- Moser, L., Probeck, M., Ramminger, G., Defourny, P. (2017): “Working towards Next-Generation Copernicus Agricultural Services: The ECoLaSS Project.” 23rd MARS Conference, 27-29 November 2017 in Gormanston, Ireland.
- Moser, L., Probeck, M., Ramminger, G., Sannier, C., Desclée B., Schardt, M., Gallaun, H., Deutscher, J., Defourny, P., Blaes X., Klein, I., Keil, M., Hirner, A., and Esch, T. (2017): “Sentinel-based Evolution of Copernicus Land Services on Continental and Global Scale.” Intergeo: Tradefair for geoinformation professionals 26 - 28 September 2017 in Berlin, Germany.
- Moser, L. (2017): Advances in Copernicus High-Resolution Land Monitoring - HRL 2015. University of Applied Sciences Munich, 30 June 2017 in Munich, Germany.
- Sannier, C. (2017) Atelier sur l'évolution des services Copernicus, 14 June 2017 in Paris, France.
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Others:

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- Moser, L., Probeck, M., Ramminger, G., Rieke, C., Ickerott, M., Storch, C., Sommer, C., Richter, R., Herrmann, D., Ruiz Gomez, I., Kovatsch, M., Schwab, K. (2018): Evolution of Next-Generation Copernicus High Resolution Layers on Forest and Agriculture: The ECoLaSS Project. Abstract book of the 3rd joint Workshop of the EARSeL Special Interest Group on Land Use and Land Cover and the NASA Land Cover and Land Cover Change Science Team on “Land Use/Cover Change Drivers, Impacts and Sustainability within the Water-Energy-Food Nexus”, pp. 30-31. Chania (Greece), 11-12 July 2018.

3.4.9 Meetings with stakeholders

Meetings with stakeholders support promoting the potential use of new service products on a European and national level. These meetings aim at coordinating and plan future developments by:

- regularly informing relevant Copernicus Land stakeholders and decision makers on the status of ongoing research and development activities in the project
- gathering their feedback on the project’s technical developments, thematic evaluations, service/product maturity assessments and the suggested candidate products for later operational implementation;

- receiving advise on current/evolving priorities and/or emerging adaptation needs for the continuation of work in the next project phase(s); and
- supporting the EC and other stakeholders in a sufficiently timely manner such as to allow leading informed discussions on the future implementation of Copernicus Land products.

Annual or bi-annual meetings have taken place in the frame of the stakeholder consultation process, which were organized within WP51 led by GAF and which are reported in AD10.

Prior to the consultations (see Table 3-4), the relevant most recent results and outputs of both Task 3 (i.e. developed methods and related documentation, methods compendia, etc.) and of Task 4 (i.e. proof-of-concept/prototype data sets of new and improved products, including derived/estimated accuracy figures) and/or related dissemination material (organised and provided this WP 61) were compiled and provided by the consortium to the addressed stakeholders, in order to realistically reflect the actual status of development, with all relevant advantages and limitations discovered by then. Further information about the number and success of these stakeholder interactions can be found in AD10.

3.4.10 Workshops and demonstration events

Workshops and demonstration events are dissemination instruments that are used especially to engage new users and communities and to strengthen the contact to known ones. Dedicated and focused half-to-full day workshops as well as presentations and discussion sessions (upon invitation) are organised by WP51 (led by GAF). Purpose of these workshops and demonstration events is to discuss about project achievements, new strategies and methods, to disseminate lessons learnt in ECoLaSS and the gather feedback from thematic communities.

These workshops and demonstration events are being organised in coordination with conferences or other events, where the project consortium is participating. They provide additional valuable means of dissemination and allow retrieving feedback on the products, which can be taken into account for the further developments. From the project start in early 2017 until now there have been 6 workshops attended, where the ECoLaSS was presented in either an oral presentation or participation of ECoLaSS team members. The number of participants in these workshops go up to several hundred.

3.5 Dissemination plan

In the following, the dissemination plan is presented. Table 3-3 gives a detailed overview on how the individual dissemination activities and media is used to approach the different target groups, while Table 3-4 shows the intended dissemination schedule.

Table 3-3: Dissemination media with respect to the target groups of users and frequency of dissemination.

Dissemination and Communication Media	Who	How	When	Dissemination frequency	Measure of success	Responsible	Envisaged contributions	Current status
Webpage	All target groups	Internet	M6	Updated continuously	- Counting visitors	DLR	All	Webpage is online and current
Social Media	All target groups	Internet	M6	Updated continuously	- Direct feedback - Counting likes in posts - Counting of sharing - Number of followers	DLR	All	Two social media accounts are active at Twitter and ResearchGate
Blog	All target groups	Internet	M6	Updated continuously	- Direct feedback. - Counting likes in posts - Counting of sharing	DLR	All	Blog is online, with 15 published articles
Project Flyer	All target groups	Distributed during conferences, events, meetings, workshops	M12	Once	- Direct communication and feedback - Number of flyers handed out	DLR, GAF	All	One flyer available, 116 copies handed out

Publication in Scientific Journals	Group 2	Publications	After M12	Whenever important results are mature enough to be published	<ul style="list-style-type: none"> - Number of citations - Downloads and view statistics from scientific journals' websites; - Discussion about the articles 	All	All	Planned for M27-36
Other publications	All target groups	Publications	Ongoing	Whenever important results are mature enough to be published	<ul style="list-style-type: none"> - Direct feedback - Discussion about the articles 	All	All	5 press releases and articles in journals
Participation in conferences and other events	Group 2	Presentations, Publications, Demonstrations	According to Table 3-4	Whenever important results are mature enough to be published	<ul style="list-style-type: none"> - Direct feedback - Number of participants - New or intensified contacts to possible users and communities 	All	All	13 conferences with several hundred to thousand attendees
Meetings with stakeholders	Group 1	Presentations, Demonstrations	M1	Annual or bi-annual	<ul style="list-style-type: none"> - Direct feedback - Number of participants 	GAF	All	See AD10
Face-to-face meetings, Telephone calls and webinars with stakeholders	Group 1	Presentations, Demonstrations	M1	One for each phase of the project	<ul style="list-style-type: none"> - Deliverable 21 	GAF, SIRS	All	Several interviews and phone calls in phase 1 2 webinars in phase 2 See AD06
Workshops and demonstration events	Group 1, Group 2	Presentations, Demonstrations	After M12	Annual or bi-annual	<ul style="list-style-type: none"> - Direct feedback - Number of participants - New or intensified contacts to possible users and communities 	GAF	All	6 workshops with up to several hundred participants

Table 3-4: List of Conferences and Workshops attended and planned.

Type: S = Stakeholder interaction; D = Dissemination, C = Conference, W = Workshop, F = Fair.

Event	Date	Location	Status	Type	Relevant Topics	Consortium Participant
2017						
WorldCover 2017	14-16 March 2017	ESA, Frascati, Italy	Poster	D, C	LC/LU, Global CLMS Products	GAF (L. Moser)
German National Copernicus User Forum	14-16 March 2017	Berlin, Germany	Oral presentation	S	Copernicus (national)	GAF (M. Probeck)
CNES COSPACE Workshop on Vegetation	28 March 2017	Paris, France	Participation	D, W	Copernicus (national)	SIRS (C. Sannier)
French national event with different stakeholders (CNIG, IGN, AFIGEO)	30 March 2017	Marne la Vallée, France	Participation	S	Copernicus (national)	SIRS (C. Sannier)
French Ministry of Solidary Ecological Transition	13 April 2017	France	Participation	S	Copernicus (national)	SIRS (C. Sannier)
37th International Symposium on Remote Sensing of Environment (ISRSE)	8-12 May 2017	Tshwane, South Africa	Participation	D, C	LC/LU, including Global Land Service special session	SIRS (C. Sannier)
French National Copernicus User Forum: workshop on the evolution of Copernicus Services	14 June 2017	Paris, France	Participation	S	Copernicus (national)	SIRS (C. Sannier)
MultiTemp 2017	27-29 June 2017	Bruges, Belgium	Participation	D, C	LC/LU, time series methods and monitoring applications	GAF (C. Sommer), SIRS (S. Villerot, B. Desclée), UCL (X. Blaes, P. Defourny)
Presentation at the University of Applied Sciences Munich	30 June 2017	Munich, Germany	Oral presentation	D, W	ECoLaSS presentation	GAF (L. Moser)
Annual General Meeting of the European Association	04-05 July 2017	Brussels, Belgium	Participation	S	GEO and global Land products and evolution potential, ESA plans for Land services evolution	GAF (M. Probeck)

Event	Date	Location	Status	Type	Relevant Topics	Consortium Participant
of Remote Sensing Companies (EARSC)						
CCI+ Information Day	6 July 2017	ESA, Frascati, Italy	Participation	S	R&D plans for further evolution of land services, amongst others on bridging the gap between global and continental CLMS component	UCL (P. Defourny), GAF (M. Probeck)
IUFRO 125th Anniversary Congress	19-22 September	Freiburg, Germany	Oral presentation	D, C	Monitoring based on time series	JR (H. Gallaun)
Intergeo: Tradefair for geoinformation professionals	26-28 September 2017	Berlin, Germany	Oral presentation + Booth	D, F	Status and Evolution of Copernicus Land Services, addressing the geo-spatial industry	GAF (M. Probeck)
EuroGeographic Land Meeting	15 November 2017	Brussels, Belgium	Participation	S	Land Use/Land Cover Products: Challenges and Opportunities	GAF (M. Probeck)
EEA Land Monitoring & CLC+ Workshop (tbd.)	16 November 2017	Brussels, Belgium	Participation	S	Future Copernicus Land Services, CLC 2018 and CLC+	GAF (M. Probeck)
Multiply – Sensagri – ECoLaSS Meeting	17 November 2017	Brussels, Belgium	Meeting	S	Meeting between three H2020 Land Projects: MULTIscale SENTINEL land surface information retrieval Platform (MULTIPLY), Sentinels Synergy for Agriculture (SENSAGRI), Evolution of Copernicus Land Services based on Sentinel data (ECoLaSS)	GAF (M. Probeck), SIRS (B. Desclée)
MARS Conference	28-29 November 2017	Dublin, Ireland	Oral presentation	D, C	Integrated Administration and Control System (IACS), Future Agricultural Services	GAF (L. Moser), SIRS (C. Sannier)
Big Data from Space Conference	28-29 November 2017	Toulouse, France	Participation	D, C	Conference on Big Data from Space	GAF (H. Ott), SIRS (C. Sannier)
Meeting with DG CLIMA	7 December 2017	Brussels, Belgium	Meeting	S	Meeting with Rene Colditz from the EC Directorate-General for Climate Action	GAF (M. Probeck)
Meeting with EEA	14 December 2017	Copenhagen, Denmark	Meeting	S	Meeting with Hand Dufourmont, Tobias Langanke and Matteo Matteuzzi from the European Environment Agency	GAF (M. Probeck, L. Moser), SIRS (C. Sannier)

2018						
Meeting with DG AGRI	01 February 2018	Brussels, Belgium	Meeting	S	Meeting with EC Directorate-General for Agriculture and Rural Development	GAF (L. Moser, M. Probeck), SIRS (B. Desclée)
Meeting with DG ENV	02 February 2018	Brussels, Belgium	Meeting	S	Meeting with EC Directorate-General for Environment	GAF (Linda Moser, Markus Probeck)
Copernicus for Agriculture - Industry Workshop	05 February 2018	Brussels, Belgium	Participation	D, W	Meeting at EC Directorate-General for internal market, industry, entrepreneurship and SMEs	GAF (L. Moser), SIRS (B. Desclée), UCL (P. Defourny)
Multiply Workshop	06-08 February 2018	Frascati, Italy	Participation	D, W	Workshop on application of the Multiply tools and platform	GAF (L. Moser), SIRS (S. Villerot)
Meeting with DG REGIO	14 March 2018	Brussels, Belgium	Meeting	S	Meeting with EC Directorate-General Regio	SIRS (B. Desclée), DLR (A. Metz-Marconcini)
PROBA-V Symposium 2018	29-31 May 2018	Brussels, Belgium	Participation	D, C	MR remote sensing focused on PROBA-V	UCL
Copernicus Event "20 years Baveno Manifesto"	20-21 June 2018	Baveno, Italy	Participation	S	Future of the Copernicus Programme	GAF (M. Probeck)
EARSC Workshop on Data and Information Access Services (DIAS)	26 June 18	Brussels, Belgium	Participation	S	Workshop on DIAS (and eoMall)	GAF (M. Probeck)
EARSC Workshop on the future of the European EO/Copernicus	27 June 18	Brussels, Belgium	Participation	S	Strategic workshop on the future direction for the EO service industry and relationship with Copernicus Programme	GAF (M. Probeck)
EARSeL/NASA LULC Workshop	11-12 July 2018	Chania, Crete	Oral presentation	D, C	Special Interest Group workshop on LCLU; recommended by EEA	GAF (L. Moser)
IGARSS 2018	23-27 July 2018	Valencia, Spain	Oral presentation	D, C	Broad remote sensing topics and methods	GAF (L. Moser)
INSPIRE Conference	18 - 21 September	Antwerp, Belgium	Oral presentation	D, C	INSPIRE-relevant topics, oral presentation upon invitation of DG ENV	GAF (L. Moser)
Intergeo 2018: Tradefair for	16-18 Oktober 2018	Frankfurt, Germany	presentation at booth	D, F	Status and Evolution of Copernicus Land Services, addressing the geo-spatial industry	GAF (M. Probeck)

geoinformation professionals						
ESA Φ-week	12-16 November 2018	Frascati, Italy	Participation	D, C	EO Open Science and FutureEO	SIRS (A. Masse)
Exchange meeting of CLMS related H2020 projects and Copernicus Entrusted Entities	15 November 18	Brussels, Belgium	Oral presentation	S	Progress of the H2020 sister projects Sensagri, MULTIPLY, EO4Agri and ECoLaSS	GAF (K. Schwab, M. Probeck), SIRS (C. Sannier, S. Villerot), UCL (P. Defourny, J. Wolter)
MARS Conference	21-22 November 2018	Dubrovnik, Croatia	Oral presentation	D, C	Monitoring agricultural resources	SIRS (J.-P. Gachelin)
German National Copernicus User Forum	27-29 November 2018	Berlin, Germany	Oral presentation	S	Copernicus (national)	GAF (M. Probeck)
2019						
ESA BigDataFromSpace BIDS 2019	19-21 February 2019	Munich, Germany	Oral Presentation, Poster	D, C	Big data and time-series processing	GAF (E. Sevillano, SIRS, DLR
Copernicus Workshop on Data Access and Contributing Missions	2 April 2019	Brussels, Belgium	Participation	D, W	Data access and DIASes, contributing missions	GAF (M. Probeck)
CLMS H2020 Projects Meeting	9 April 2019	Valladolid, Spain	Oral presentation	S	ECoLaSS progress and CLMS H2020 projects collaboration	GAF (E. Sevillano Marco), UCL (P. Defourny)
IACS workshop	10-11 April 2019	Valladolid, Spain	Oral Presentation	D,W	IACS data and CAP	GAF (E. Sevillano Marco), UCL (P. Defourny),
ESA Living Planet Symposium 2019	13-17 May 2019	Milan, Italy	Oral Presentation, Poster	D, C	Broad variety of topics, including EO missions (e.g. Sentinels); renowned sessions on land monitoring (e.g., LC/LU, agricultural & other applications)	GAF (M. Probeck), SIRS, DLR
MultiTemp 2019	5-7 August 2019	Shanghai, China	Participation planned	D, C	LC/LU, time series methods and monitoring applications	SIRS
Intergeo	17-19 September 2019	Stuttgart, Germany	Participation planned	D, F	Commercial GIS Applications	GAF

Munich RS Symposium	19-20 September 2019	Munich, Germany	Participation planned	D, C	Broad remote sensing topics and methods	GAF
ITISE 2019	25-27 September 2019	Granada, Spain	Participation planned	D, C	International conference on Time Series and Forecasting	GAF
ISRSE/PECORA 2019	6-11 October 2019	Baltimore, USA	Participation planned	D, C	Broad remote sensing topics and methods	SIRS
MARS Conference	27-29 November 2019	Prague, Czech Republic	Participation planned	D, C	Monitoring agricultural resources	GAF
Meeting with national stakeholders	2019	TBD	Participation planned	S	Service Evolution, EO data needs	SIRS, GAF

2020						
ISPRS 2020	14 - 20 Juni 2020	Nice, France	Participation planned	D, C	Conference of the International Society of Photogrammetry and Remote Sensing, topics: various disciplines of remote sensing	SIRS

3.6 Potential impact

The expected impact of these comprehensive dissemination and communication activities are:

- a) To promote the engagement between the ECoLaSS consortium and EEEs, EC's DGs, as well as local, regional, or national authorities and decision makers, thus facilitating the rapid dissemination of the results into action;
- b) To facilitate knowledge, data and technology transfer between participating institutions, thus enhancing both the research capacities of the individual partners and the ECoLaSS consortium as a whole;
- c) To increase awareness about contribution to Europe's largest environmental monitoring programme from space, providing a more timely and more reliable assessment of the State of the Environment;
- d) To improve competitiveness of the European EO service provision industry through the successful development and realisation of the new/enhanced Copernicus Land services utilising large data volume processing and analysis techniques for various applications;
- e) To strengthen the competitiveness of the service provider community as well as the various user communities outside the consortium through open access publications.

Since the beginning of the project, point a) has been addressed and ongoing.. Since the development of new methods and their implementation within the prototypes, and the operationalization build upon WP21 "Assessment of Service Evolution Requirements", close contacts to several national and pan-European stakeholders have been used/established in order to take into account the specific needs and expectations of the users/stakeholders when defining e.g. the methodological approach and technical specifications. All the interim results of the project are being regularly presented and discussed in several events (see Table 3-4). Throughout the project, the contacts are being and will be constantly maintained and improved where necessary. Further details on the specific user/stakeholder groups addressed within ECoLaSS are given in AD06 and AD10.

The ECoLaSS consortium encompasses representatives from both research institutions (JR, UCL, DLR) and private companies (GAF, SIRS). For the successful and efficient processing of the different tasks it was and still is mandatory to join efforts between the consortium partners (see point b)). Therefore, overarching teleconferences were/are held every 4-6 weeks not only to exchange on the recent progress but also to share knowledge gathered within the project or expertise from other projects. Furthermore, the consortium decided to distribute the task of pre-processing data for the different test and demonstration sites so that every partner is in charge of data pre-processing and the data provision for at least one site. This decision required a precise fine-tuning so that the ready to use data have the same specifications which was solved by sharing the workflow for the pre-processing of both optical and radar data. Besides the EO data also the ancillary data (e.g. for validation purposes) were commonly shared within the consortium.

The contributing role is pointed out in nearly every dissemination activity by emphasizing the relation between ECoLaSS and the Copernicus programme and, in particular, the function the project has in context to Europe's largest environmental monitoring programme from space, as related in point c). A good example for the enhancement of the CLMS through ECoLaSS is the fact that various technical specifications and approaches successfully investigated in the first phase of ECoLaSS could be incorporated in the HRLs 2018 requirements and will thereby be applied in the recently started update of the HRLs 2015. The thematic focus is not only laid on already existing products within the CLMS but also on potential new ones. The project has taken into account the mentioned user/stakeholder requirements with the aim of building a reliable scientific basis for the potential enlargement of the CLMS product portfolio.

Point d) is addressed by the use of large time-series for the development of the ECoLaSS prototypes. For their calculation data from both Sentinel-1 and Sentinel-2 (and where necessary PROBA-V) of up to 11 months are used for both phase 1 and phase 2 prototypes. Although these dense time-series mostly lead to better classification results than less data, the large amounts of data lead to infrastructural challenges at the same time (e.g. in context to data storage and their pre-processing). To address these issues different DIASes were/are planned to be used for the more efficient proceeding within the next months. All these efforts are going to enhance the competitiveness of the European EO service provision industry by providing use cases for the future development and realisation of the new/enhanced Copernicus Land services utilising large data volume processing and analysis techniques for various applications.

Strengthening the competitiveness of the service provider community and user communities through open access publication is also one of the potential impacts (point e)). Not only is the consortium currently providing all public project reports, presentations held in the frame of conferences and workshops, and posters presented at the same occasions on the project's website, but also several publications in scientific journals are being prepared. All of them are going to be handed in to open access journals so that every user interested can get access. The consortium will inform the community about the latest publications by using social media (ResearchGate, twitter) and the projects homepage.

4 Exploitation

Exploitation is the use of the results during and after the project's implementation. It does not only/mainly cover commercial purposes but also improving policies, and tackling economic and societal problems. For ECoLaSS, the exploitation of the project results has commercial and industrial impacts, as it is expected from the Call definitions. Furthermore, it goes towards the enhancement and the growth of the CLMS portfolio. The main expected impacts from the Work Programme 5. Leadership in Enabling and Industrial technologies iii. Space, and the specific Topic EO-3-2016: Evolution of Copernicus Services include the need to:

- “enhance the European industry’s potential to take advantage of emerging market opportunities and capacity to establish leadership in the field”;
- “boost competitiveness of the industrial actors in EU and national procurements”; and
- “establish a proof-of-concept or a prototype, which can act as reference for the independent assessment of Copernicus service evolution, in light of product extensions and service improvements”.

In that sense, the proposed activities in the project are expected to create positive impacts as follows:

- **Emerging market opportunities and enhanced capacities of European industries**

The ECoLaSS project is primarily aiming to provide innovative services and products that increase or improve the future Copernicus Land Monitoring Services. It is a project not oriented to obtain specific knowhow that could be sold independently from the Copernicus Services, but to improve its portfolio and its results. Thus, instead of a business plan to address market opportunities, the project has, after thorough assessment of all project findings, provided an “Integration Plan into the Copernicus Service Architecture” [AD11], which addressed new potential uses and services focused on the CLMS users.

- **Improving competitiveness of industries in EU and national procurements**

Through a successful development and realisation of the new/enhanced Copernicus Land services, which utilise big data processing and analysis techniques for various land applications, the competitiveness of European EO service provision industries will improve. Moreover, the emerging next-generation services will allow the European industry to take advantage from strengthening its know-how and leading market position in the international competition, and will thus also support creating company growth and new export opportunities. The research partners also pursue own exploitation opportunities, targeting a return of their co-investments via an enhancement of their capabilities to act as technology transfer hubs.

- **Thematic Proof-of-concepts/Prototypes as a reference for Copernicus Land Service Evolution**

Through the development of dedicated Sentinel-based processing methods (Task 3) and thematic prototypes (Task 4) for a future Copernicus Land Service Evolution, ECoLaSS tries to close gaps in the current Copernicus Land service in terms of technical, methodological as well as operational capabilities [AD02]. Outcomes from phase 1 [AD12-16] have been presented in many communication and dissemination fora where identification of research needs and production gaps were discussed. Interactions resulting from Task 2, Task 5 and Task 6 activities are driving proof-of-concepts implementation in phase 2. With a view to a potential operational implementation period beyond ECoLaSS, in which the proposed methods and prototypes may be established, a clear strategy how to deal with Intellectual Property Rights (IPR) is required. For

that, a dedicated WP on “Market Opportunities & IPR Strategy” is part of the project. AD09 gives further and more detailed information on the topic.

- **Important Environmental, Societal and further Impact**

Through the development of innovative, thematically and spatially more detailed and more consistent information products and services, a more timely and reliable assessment of the state of the environment is being provided. This adds value to the existing Copernicus Land services and helps extend as far as possible the pan-European experiences to other regions/ continents.

- **Advancement of the Scientific State of the Art**

Through open access publications the competitiveness of the service provider community as well as the various user communities outside the consortium are strengthened.

The consortium profits from the developed methods, processing chains and scientific enhancements for further research activities in- and outside Copernicus. Product and service development is a key aspect addressing the main project objectives to develop candidates for future implementation of operational Copernicus services. In order to maximise usability and uptake by users, standardisation according to the INSPIRE implementation rules and technical guidelines is being applied in ECoLaSS for all Prototypes and new products. All relevant data-related outcomes of the project are considering the General Multilingual Environmental Thesaurus (GEMET) and are provided with INSPIRE-compliant metadata.

In terms of further exploitation of the project results, ECoLaSS goes beyond to focus on the impact on further research activities, developments, services and standardisation activities, including also a section on IPR and knowledge management. Here, a dedicated deliverable within the WP62 “Market Opportunities & IPR Strategy” [AD09] focussed on the assessment of long-term market opportunities for European EO service provision industry in terms of Copernicus service provision, downstream applications, export opportunities, etc., and elaborated on the management of IPR issues, including access rights, confidentiality levels and knowledge management.

Furthermore, it should be noted that the project does primarily aim to elaborate an “Integration Plan into the Copernicus Service Architecture” [AD11] for operational Land service candidates instead of providing a business plan to address market opportunities, after thorough assessment of all project findings. This plan addressed new potential uses and services focused on the CLMS users.

5 Conclusion and Outlook

A wide variety of different avenues has been and is being pursued in WP 61 in order to maximize the impact of the ECoLaSS project. These dissemination activities have been planned with this PEDR and their success so far has been evaluated. Most notably, the strategies to maximise impact encompassed:

- The incorporation of existing knowledge of domain experts at conferences, workshops and interviews, which ensured up-to-date technical developments;
- A tight coupling of prototype developments with stakeholder and technical operationalization requirements;
- Successful advertisement and dissemination of the ECoLaSS achievements to the general public at different levels of complexity, by means of the project website, Social Media and the distribution of information materials;
- Uptake of ECoLaSS achievements into the scientific discourse by means of presentations at conferences and workshops as well as peer-reviewed publications;
- Dissemination of the actual prototype products as a web-mapping service;
- Transparency through the publication of all non-confidential project deliverables, and the selection of scientific journals by open-access policy.

For all dissemination activities for which measures of success could be quantified directly, dissemination progress was found to have achieved its goals up to now. Others, for which no such directly quantifiable metrics are available, such as the project website, were evaluated positively on non-quantitative grounds, such as user's feedback.

Most of the dissemination activities related directly and exclusively to the project that are currently ongoing will cease with the end of the ECoLaSS project duration. However, it is expected to keep the website online for a year as well as the social media accounts on ResearchGate and Twitter. Collateral mentions to the project in other dissemination activities will probably continue happening, due to the impact of ECoLaSS in other projects, i.e. HRL 2018 dissemination activities.

Furthermore, we expect that the achievements of the ECoLaSS project consortium will lead to a number of joint peer-reviewed articles even after the project termination. Either directly or indirectly by having constituted Sentinel exploitation testbeds for next generation HRL, citations related to ECoLaSS are not to be discarded. Indeed, considering the aim of the ECoLaSS project being to prepare the grounds for the transfer of the accepted pre-operational products to EC, EEA and JRC for future operational, it is expected that the project's impact will persist through the uptake into future operational CLMS products.

Therefore, this document and the project-long accompanying actions prove that the PEDR strategy is fundamental towards the dissemination to different target user groups, and the transfer of innovations to next-generation operational products.