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ECoLaSS

Evolution of Copernicus Land Services based on Sentinel data



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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.

This Deliverable D16.4: “D51.1d - Stakeholder Consultation Report” is the fourth and final Deliverable of Work Package (WP) 16: “WP 51 – Stakeholder Consultation”, and as such an update of the third issue D16.3: “D51.1c - Stakeholder Consultation Report”. WP 51 aims to ensure the proper involvement of main stakeholders and decision makers in this assessment process through regular consultations with the main stakeholders such as EEA, JRC and EC, in which the proofs-of-concepts/prototypes of Task 4 were discussed in order to determine priorities for continuation of work in the ongoing project phase and seek the stakeholders’ view/approval of suggested operational candidates.

This Deliverable has also a close link to WP 21 “Assessment of Service Evolution Requirements”. In the frame of this WP user and stakeholder interviews have been carried out, and the functional and technical evolution requirements of existing and upcoming services for the CLMS beyond 2020, both of the Continental and Global CLMS Component, were collected and documented. In practice, gathering stakeholder requirements in the frame of WP 21 and consulting with stakeholders on the planned service developments in WP 51, often go hand in hand. Whereas the present Deliverable documents the stakeholder consultation process and what has been done in that respect, the related thematic recognitions are documented in AD05 and are therefore not repeated in the present report.

For a Horizon2020 project like ECoLaSS, with clearly defined tasks and resources, it would be generally not possible to individually interact with the entirety of potential stakeholders on a single basis. Therefore, the ECoLaSS team has taken on the approach of consulting in as many cases as possible with federating entities of relevant stakeholder segments, or proxies of relevant bigger groups of stakeholders. These allow to comprehensively address or interact with, a large group of stakeholders in an efficient manner.

Summarising the project’s achievements in stakeholder consultation towards the end of the second Reporting Phase, substantial and fruitful interactions have been taking place with all major relevant European and many national stakeholders, as well as with a multitude of further stakeholder groups. This was facilitated by the consortium partner’s collective unique positioning in the Copernicus and land monitoring community, as well as by the sophisticated stakeholder consultation concept, building on a dual strategy of targeted stakeholder meetings and using basically every opportunity for back-to-back meetings. Therefore, the consortium considers the WP 51 to be carried out with great success. The close and fruitful contacts with EEA will be continued.

In view of the collected information, the project team gained many valuable insights with respect to future CLMS product developments and the perception, use and further needs of the various stakeholders with respect to the CLMS products.

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Abbreviations

AD	Applicable Document
AFIGEO	Association Française pour l'Information Géographique (French Association for Geographical Information)
AG	Aktiengesellschaft (stock company)
AGM	Annual General Meeting
AI	Artificial Intelligence
APRRRR	Croatian Paying Agency for Agriculture Fisheries and Rural Development
ARC	Agriculture Research Council
AT	Austria
BE	Belgium
BELSPO	Belgian Science Policy Office
BKG	Bundesamt für Kartographie und Geodäsie (German Federal Agency for Cartography and Geodesy)
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur (German Federal Ministry of Transport and Digital Infrastructure)
C3S	Copernicus Climate Change Service
CAP	Common Agricultural Policy
CCI	Climate Change Initiative
CCI+	Climate Change Initiative + (follow-up)
CEMS	Copernicus Emergency Management Service
Cerema	French Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement
CGDD	Commissariat Général au Développement Durable (French General Office for Sustainable Development)
CLC	CORINE Land Cover
CLC+	CORINE Land Cover plus (with improved specifications)
CLMS	Copernicus Land Monitoring Service
CMEMS	Copernicus Marine Environment Monitoring Service
CNIG	Conseil National de l'Information Géographique (French National Council for Geographic Information)
CO	Confidential
CODE-DE	Copernicus Data and Exploitation Platform – Deutschland
CRAW	Centre wallon de Recherches Agronomiques
CreoDIAS	one of the Copernicus Data and Information Access Services (DIAS)
CSS	Copernicus Security Service
CwRS	Controls with Remote Sensing
DAFM	Irish Department of Agriculture, Food and the Marine
DE	Deutschland (Germany)
DEM	Digital Elevation Model
DG/s	Directorate-General/s
DG AGRI	Directorate-General for Agriculture and Rural Development
DG CLIMA	Directorate-General for Climate Action
DG DEVCO	Directorate-General for International Cooperation and Development
DG ENV	Directorate-General for Environment
DG GROW	Directorate General for Internal Market, Industry, Entrepreneurship and SMEs
DG MOVE	Directorate General for Mobility and Transport

DG REGIO	Directorate General for Regional Policy
DFD	Deutsches Fernerkundungsdatenzentrum
DIAS	Data and Information Access Service
DLR	Deutsches Zentrum für Luft- und Raumfahrt (German Aerospace Center)
DRI	Direction de la Recherche et de l'Innovation (French Innovation and Research Directorate)
EAA	Environmental Agency Austria (Umweltbundesamt Österreich)
EARSC	European Association of Remote Sensing Companies
EARSeL	European Association of Remote Sensing Laboratories
EC	European Commission
ECoLaSS	Evolution of Copernicus Land Services based on Sentinel data (H2020 project)
ETCs	European Topic Centres
ECV	Essential Climate Variable
EEA	European Environment Agency
EEA39	The 33 member countries of the EEA (i.e., the EU-28 member states together with Iceland, Liechtenstein, Norway, Switzerland and Turkey), plus 6 cooperating West Balkan countries (i.e., Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia as well as Kosovo)
EEEs	European Entrusted Entities
EIONET	European Environment Information and Observation Network
ELI	Earth and Life Institute
ECMWF	European Centre for Medium-Range Weather Forecasts
EO	Earth Observation
ESA	European Space Agency
ESRIN	European Space Research Institute
EU	European Union
EU ETS	EU Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
FISE	Forest Information System for Europe
FOR	Forest (HRL)
ForestSAT	Association for Forest Spatial Analysis Technologies
FR	France
GAF	GAF AG (a service provider)
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GIS	Geographic Information System
GmbH	Gesellschaft mit beschränkter Haftung (limited liability company)
GMES	Global Monitoring for Environment and Security
GRA	Grassland
GRSS	Geoscience and Remote Sensing Society
H2020	Horizon 2020 (the 8 th Framework Programme for Research and Technological Development of the EC)
HR	High Resolution
HRL/s	High Resolution Layer/s
IACS	Integrated Agricultural Control System
IEEE	Institute of Electrical and Electronics Engineers

IGN	Institut National de l'Information Géographique et Forestière (National Institute of Geographic and Forest Information)
IMP	Imperviousness (HRL)
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
INTERGEO	Tradefair for geo-information professionals
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
ISPRS	International Society for Photogrammetry and Remote Sensing
ISRSE	International Symposium on Remote Sensing of Environment
IUFRO	Interconnecting Forests, Science and People
JR	Joanneum Research GmbH (a service provider)
JRC	Joint Research Centre of the EC
KO	Kick-Off
LaVerDi	LandschaftsVeränderungsDienst
LC	Land Cover
LC/LU	Land Cover/Land Use
LPS	Living Planet Symposium
LU	Land Use
LULUCF	Land Use, Land Use Change and Forestry
MARS	Monitoring Agricultural ResourceS
MR	Medium Resolution
MS/s	Member State/s
MRSS19	Munich Remote Sensing Symposium 2019
MULTIPLY	MULTIscale SENTINEL land surface information retrieval Platform
mundi	one of the Copernicus Data and Information Access Services (DIAS)
N2000	Natura 2000
NASA	National Aeronautics and Space Administration
NFP	National Focal Point
NRC	National Reference Centre
ONDA	one of the Copernicus Data and Information Access Services (DIAS)
OSM	Open Street Map
PICES	Producer Independent Crop Estimate System
PU	Public (Dissemination Level)
REA	Research Executive Agency (of the EC)
SAR	Synthetic Aperture Radar
SAS	Société par actions simplifiée
SEIS	European Shared Environmental Information System
Sen2Agri	Sentinel-2 for Agriculture
Sen4CAP	Sentinels for Common Agriculture Policy
Sensagri	Sentinels Synergy for Agriculture
SIG	Special Interest Group
SIRS	Systèmes d'Information à Référence Spatiale SAS (a service provider)
SME	Small and Medium Enterprise
sobloo	one of the Copernicus Data and Information Access Services (DIAS)
SOeS	Service de l'Observation et des Statistiques (French Observation and Statistical Service)
SWF	Small Woody Features

UA	Urban Atlas
UBA	Umweltbundesamt Deutschland (German Environment Agency)
UCL	Université Catholique de Louvain (Catholic university of Leuven), Belgium
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
VITO	Flemish Research Institute
WEKEO	one of the Copernicus Data and Information Access Services (DIAS)
WFP	World Food Programme
WP	Work Package
WRI	World Resources Institute

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 for future next-generation operational Copernicus Land Monitoring Service (CLMS) products of the pan-European and Global Components. This will contribute to demonstrating operational readiness of the finally selected products, and shall allow the key CLMS stakeholders (i.e. mainly the Entrusted European Entities (EEE) EEA and JRC) to take informed decisions on potential procurement of the next generation of Copernicus Land services from 2020 onwards.

To achieve this goal, ECoLaSS makes full use of dense time series of Sentinel-2 and Sentinel-3 optical data as well as Sentinel-1 Synthetic Aperture Radar (SAR) data. Rapidly evolving scientific as well as user requirements are analysed in support of a future pan-European roll-out of new/improved CLMS products, and the transfer to global applications.

The Deliverable **D16.4: D51.1d – Stakeholder Consultation Report** is the fourth and final Deliverable of Work Package (WP) 16: “WP 51 – Stakeholder Consultation”, as part of Task 5: “Operationalisation Framework”, in which the future conditions are being investigated, under which the new/improved Copernicus Land products will (or will not) qualify as operational Copernicus Land service candidates (i.e. the so-called operationalisation framework). WP 51 Stakeholder Consultation specifically aims to ensure the proper involvement of main stakeholders and decision makers in this assessment process through regular consultations with the main stakeholders such as EEA, JRC, European Environment Information and Observation Network (EIONET), and the EC, in which the proofs-of-concepts/prototypes of Task 4 will be discussed in order to determine priorities for continuation of work in the ongoing project phase and seek the stakeholders’ view/approval of suggested operational candidates.

This Deliverable D51.1d has a close link to WP 21 “Assessment of Service Evolution Requirements” in the frame of which user and stakeholder interviews as well as webinars have been carried out and the functional and technical evolution requirements of existing and upcoming services for the CLMS beyond 2020, both of the Continental and Global CLMS Component, are collected and consolidated. In practice, gathering stakeholder requirements in the frame of WP 21 and consulting with stakeholders on the planned service developments in WP 51, often go hand in hand.

The subsequent benchmarking and selection process of the most mature operational CLMS new service candidates will be undertaken by WP 52 Candidates for Operational Roll-out, considering various aspects such as operational feasibility, technical maturity, cost/benefit ratio, timeliness, etc., before WP 53 Integration Plan into Copernicus Service Architecture will suggest strategies how to best integrate the selected new/improved products into the existing Copernicus Land service environment, ensuring consistency and complementarity with the other Copernicus Land suite of products.

The ECoLaSS project follows a two-phased approach of two times 18 months duration. The stakeholder consultation process, i.e. the interactions and collection of feedback and recommendations, is documented in the present Deliverable *D16.4: D51.1d – Stakeholder Consultation Report*, which has been regularly updated until now and delivered in four issues. The present version is the fourth and final issue of the Stakeholder Consultation Report, compiled at M34. It will, amongst others, constitute a major input to WP 52 “Candidates for Operational Roll-out” and WP 53 “Integration Plan into Copernicus Service Infrastructure”, where – next to the technical and operational maturity – the voiced priorities of the stakeholders will be key decision criteria.

The relevant final 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 by WP 61) have been and will be 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.

For a Horizon2020 project like ECoLaSS, with clearly defined tasks and resources, it would be generally not possible to interact individually with the entirety of potential stakeholders on a single basis. Therefore, the ECoLaSS team has taken on the approach of consulting in as many cases as possible with federating entities of relevant stakeholder segments (see e.g. section 3.2.4), or proxies of relevant bigger groups of stakeholders (see e.g. section 3.2.3). These allow to comprehensively address - or interact with - a large group of stakeholders in an efficient manner.

The Deliverable provides both a description and a rationale of which stakeholder (groups) are addressed by ECoLaSS (chapter 2), and provides detailed documentation of the work undertaken and first recognitions gained from these consultations (chapter 3). It provides a conceptual description of the project's consultation concept (section 3.1) as well as comprehensive summaries of the outcomes from dedicated consultation activities with the CLMS main stakeholders EEA and JRC (section 3.2.1), with the EC DGs (section 3.2.2), with key national stakeholders (section 3.2.3), with federating stakeholder groups (section 3.2.4), and with other parallel projects of relevance for ECoLaSS (section 3.2.5). The results of further stakeholder consultations in the frame of other workshops and events (section 3.3) are additionally described. A final summary of findings and conclusions is given in chapter 4.

2 Stakeholders

Various European, national and other stakeholders, the latter ranging from federal stakeholder entities to other projects with relevance for Copernicus Land, have been addressed in the ECoLaSS stakeholder consultation process. The following stakeholder entities and groups have been identified as generally (or potentially) relevant and are therefore addressed by ECoLaSS:

- **EEA**, being the EEE for the continental and local Copernicus Land components and the in-situ component (several thematic units);
- **EC DG JRC**, being the EEE for the global Copernicus Land component, and being a key driver of conceptual studies towards a future pan-European agricultural service as well as agricultural services for the Common Agricultural Policy (CAP);
- **EC – DG GROW**, being responsible both for the overall programmatic coordination of Copernicus and for the management of this H2020 project (via REA);
- **EC – thematic DGs such as ENV, AGRI, CLIMA, REGIO, MOVE, DEVCO**, being responsible for the coordination of specific environmental, infrastructure and policy issues in Europe (and partially beyond);
- **EIONET**, being an EEA39 wide network of NFPs and NRCs responsible for specific thematic topics (such as land cover/use) which is coordinated by EEA, supporting collection and organisation of data as well as development and dissemination of information concerning Europe’s environment.
- **National Stakeholders** with a relevant Copernicus mandate or acting as coordinating user for Copernicus implementation in key Member States such as Germany or France.

In section 2.1 the various European stakeholders will be described more in detail, section 2.2 outlines national stakeholders from key Member States and section 2.3 focusses on all other stakeholders and groups of stakeholders.

2.1 European-level Stakeholders

For ECoLaSS, the most crucial stakeholders are the two EEAs responsible for CLMS implementation, i.e. the European Environment Agency (EEA) and the Joint Research Centre (JRC), the latter being a European Commission (EC) Directorate-General (DG). Further EC DGs are however also relevant and are therefore described as well in this section.

EUROPEAN ENVIRONMENT AGENCY (EEA)

The European Commission entrusted EEA with coordinating the implementation of the Copernicus Land Monitoring Service’s continental (pan-European) and local components, as well as with the service cross-cutting in situ component coordination. The main contact persons in charge of the CLMS at EEA are Mr Tobias Langanke and Mr Hans Dufourmont; a long-term relation exists between both and several ECoLaSS project partners, through various previous/parallel Copernicus Land project implementations.

EEA is a European Union (EU) public body seated in Copenhagen, Denmark. It supports the EU in the development and implementation of environmental policies by providing relevant, reliable, targeted and timely information on the state of the environment and future prospects, as well as independent scientific knowledge and technical support. Currently, EEA has 33 member countries (i.e. the 28 Member States of the European Union, Iceland, Liechtenstein, Norway, Switzerland and Turkey) and 6 cooperating countries (<https://www.eea.europa.eu/>). EEA is the hub of the EIONET (see section 2.3). Together, they contribute to the European Shared Environmental Information System (SEIS), a distributed, integrated, web-enabled information system based on a network of public information providers sharing environmental data and information. It builds on existing e-infrastructure, systems and services in the Member States and EU institutions.

EC DG JOINT RESEARCH CENTRE (JRC)

The EC's JRC, specifically the "Knowledge for sustainable development & Food security" Unit as part of the "Knowledge Management Directorate" is, amongst other activities, in charge of coordinating the implementation of the Copernicus Land Global Component. The main contact person for the CLMS Global Component is Mr Michael Cherlet (plus his colleagues Peter Strobl and Andreas Brink) and for a future pan-European Agricultural service Mr Guido Lemoine and Mr Olivier Léo (retired) as well as Mr Felix Rembold for the topic of global crop forecasting.

The JRC acts as the European Commission's science and knowledge service. The mission of the JRC is "to support EU policies with independent evidence throughout the whole policy cycle. Its work has a direct impact on the lives of citizens by contributing with its research outcomes to a healthy and safe environment, secure energy supplies, sustainable mobility and consumer health and safety" (<https://ec.europa.eu/jrc/en/about/jrc-in-brief>). In addition, the JRC is "Comprised of strategy and coordination, knowledge production, knowledge management and support directorates, and is spread across six sites in five different countries within the EU" (<https://ec.europa.eu/jrc/en/about/organisation>).

As for Monitoring Agricultural Resources (MARS), "the JRC develops methods, tools and systems for use within agricultural monitoring activities applied to Europe, sub-Saharan Africa and other areas of the world. Crop yield forecasting is undertaken to provide monthly bulletins forecasting crop yields to support the EU's CAP. Providing early warning of crop shortages or failure provides rapid information for EU development aid activities to support food insecure countries, as part of the JRC work on global food security. Within the CAP, techniques and guidance are continually being refined for the standardized measurement of field areas, identification of crop types, geo-location of landscape features and assessment of environmental impacts. Such techniques for agricultural monitoring are a key part of the Integrated Agricultural Control System (IACS) which is at the core of CAP implementation in Europe: JRC provides methods and technical guidance in support of this implementation." (<https://ec.europa.eu/jrc/en/mars>). As from 1st June 2018, Dr. Alan Belward, a well know remote sensing scientist, has become the new head of the MARS unit to succeed to Neal Hubbard.

With the availability of the full fleet of the Sentinel-1 and -2 satellites, the JRC is currently propagating a paradigm change in European CAP monitoring, moving from sample-based controls of about 10% of the European arable land area per annum with VHR satellite/aerial imagery to Sentinel-based monitoring of the full area extent each year.

EC DG ENVIRONMENT (DG ENV)

The Directorate-General for Environment (DG ENV) acts as European key stakeholder and user of Copernicus Land Products. DG ENV is the European Commission department responsible for EU policy on the environment. It aims to protect, preserve and improve the environment for present and future generations, proposing and implementing policies that ensure a high level of environmental protection and preserve the quality of life of EU citizens. It also makes sure that Member States apply EU environmental law correctly and represents the European Union in environmental matters at international meetings" (http://ec.europa.eu/dgs/environment/index_en.htm).

The DG ENV contact points are: (i) Mr Frank Vassen, from Unit D3 – Nature conservation; Directorate „Natural Capital“, who was, amongst other things, involved in the CLMS local component's Natura 2000 product definition, and (ii) Mr Peter Löffler from Unit D1 – Land Use & Management, Directorate D „Natural Capital“, responsible for all Forest topics in Unit D1 and for the Forest Information System for Europe (FISE). DG ENV is interested in future developments of the pan-European CLMS, with specific focus on the HRL GRA (Unit D3) and HRL FOR (Unit D1). The Coordinator GAF has had several teleconferences and meetings with DG ENV already (see section 3.2.2).

EC DG INTERNAL MARKET, INDUSTRY, ENTREPRENEURSHIP AND SMEs (DG GROW)

The Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) is responsible for delivering the EU's space policy via the two large-scale programmes Copernicus (European Earth observation satellite system) as well as Galileo (European global navigation satellite system). DG

GROW is as well responsible for research actions to spur technological innovation and economic growth on the field. The main contact person for Copernicus at DG GROW is Mr Michel Massart, and ECoLaSS had interactions with multiple further staff of DG GROW, such as Ms Virginia Puzzolo or Ms Catharina Bamps.

Moreover, DG GROW's responsibilities contain: "completing the Internal Market for goods and services; helping turn the EU into a smart, sustainable, and inclusive economy by implementing the industrial and sectorial policies of the flagship Europe 2020 initiative; fostering entrepreneurship and growth by reducing the administrative burden on small businesses; facilitating access to funding for small and medium-sized enterprises (SMEs); and supporting access to global markets for EU companies. All of these actions are encapsulated in the Small Business Act; generating policy on the protection and enforcement of industrial property rights, coordinating the EU position and negotiations in the international intellectual property rights (IPR) system, and assisting innovators on how to effectively use IP rights" (https://ec.europa.eu/growth/about-us_en). DG GROW is based in Brussels and has approximately 1,400 staff members.

EC DG FOR AGRICULTURE AND RURAL DEVELOPMENT (DG AGRI)

The Directorate-General for Agriculture and Rural Development (DG AGRI) has the overall mission "to promote the sustainable development of Europe's agriculture and to ensure the well-being of its rural areas". This comprises:

- "helping farmers to produce sufficient quantities of safe food, produced respecting EU norms on sustainability, environmental rules, animal welfare, traceability, etc.
- providing farm businesses with support systems to help stabilise their incomes in the face of less predictable production conditions
- facilitating investment in a sustainable, modern farming sector
- maintaining viable rural communities, with diverse economies and
- creating and maintaining jobs throughout the food chain" (https://ec.europa.eu/info/topics/agriculture_en)

As part of this mandate, DG AGRI is responsible for the CAP. The CAP still represents one of the largest EU budget shares even though it has gradually decreased over the last few years. However, the current reform of the CAP requires changes in the way the current Controls with Remote Sensing (CwRS) system is being implemented. Prior to Copernicus, CwRS was one of the largest EO based operational system in Europe and there is now increasing political willingness to better integrate these activities within Copernicus. The main contact person in DG AGRI is Mohamed El Aydam, and further meetings have taken place with Barthélemy Lanos, Piotr Wojda and Louis Mahy.

EC DG FOR CLIMATE ACTION (DG CLIMA)

The Directorate-General for Climate Action (DG CLIMA) leads the European Commission's efforts to fight climate change at EU and international level and takes a leading role in international negotiations on climate. It helps the European Union to deal with the consequences of climate change and supports meeting its climate targets. Furthermore, it formulates and implements climate policies and strategies such as the EU Emissions Trading System (EU ETS), monitors national emissions by EU member countries, and promotes low-carbon technologies and adaptation measures.

Specifically the Unit C3 "Land Use and Finance for Innovation" deals with the implications of land use and land use change on carbon emissions, following the six broad Intergovernmental Panel on Climate Change (IPCC) categories of land use (i.e. forest land, cropland, grassland, wetlands, settlements, and other land). Main focus is on Europe, as this is DG CLIMA's reporting responsibility towards the international climate conventions. The main point of contact is Mr Rene Colditz, and a dedicated ECoLaSS meeting with him and further colleagues at DG CLIMA took place on 07.12.2017. As a follow-up, the WP 21 user requirements questionnaire was filled in. In the second round of the user requirements assessment Mr Colditz also handed in a filled in questionnaire.

EC DG FOR REGIONAL AND URBAN POLICY (DG REGIO)

The Directorate-General for Regional and Urban Policy (DG REGIO)'s vision is a European Union where people in all our regions and cities can realise their full potential. We aim for lasting improvement in the economy and quality of life for everybody, wherever they live. DG REGIO's mission is to perform GIS analyses producing regional, territorial and urban indicators for supporting EU cohesion policy. The main contact point is Hugo Poelmann. DG Regio work with the Member states, regions and other stakeholders to assess needs, finance investments and evaluate the results from a long-term EU perspective. Together DG Regio ensure that the money is well spent. The use of geospatial data is essential to fulfil its missions to perform GIS analyses producing regional, territorial and urban indicators for supporting EU cohesion policy. The main contact point is Mr Hugo Poelman and a dedicated ECoLaSS meeting with him took place on 14 March 2018 and a WP21 questionnaire was filled in. Mr Poelman also participated in the second round of the WP21 user requirements assessment by handing in a filled in questionnaire.

EC DG FOR INTERNATIONAL COOPERATION AND DEVELOPMENT (DG DevCo)

The Directorate-General for International Cooperation and Development (DG DevCo) oversees development cooperation policy in a wider framework of international cooperation, adapting to the evolving needs of partner countries. This encompasses cooperation with developing countries at different stages of development, including with countries graduated from bilateral development assistance to cover the specific needs of these countries during the transition period between low-income countries and upper middle-income countries. As such, DG DevCo is the main user and instigator of the CLMS Global Component Hot Spot Monitoring service. The main contact point is Dr Philippe Mayaux with whom an informal meeting took place in April 2018 in Brussels, but he indicated that any technical discussions with respect to ECoLaSS and future Copernicus service evolutions should be held with Michel Massart at DG Grow.

2.2 National Stakeholders

The following national stakeholders – being relevant decision makers and national coordinating entities on Copernicus matters in key Member States (MS), e.g. Germany and France – were selected in the process of the user requirements analysis as part of WP 21 as proxies for the bigger EEA39 national stakeholder community undertaken during the project lifetime. This has been complemented by a series of webinars addressing the entirety of EEA39 MS and additional stakeholders (see section 3.2.3). The ECoLaSS team is aware that this activity cannot be representative for gathering all pan-European national user requirements, since within the scope of ECoLaSS there are not the right means and budget to address all EEA39 MS individually. Therefore, as referred to in section 2.3, a closer interaction with EIONET (as a federating body) was on the project's agenda, in order to ensure a sufficient consideration of the MS requirements and feedback on the project's developments. This interaction could be realized successfully by addressing the EIONET NRCs Land Cover with a specific webinar asking for feedback regarding the existing and potential new CLMS products (incl. technical specifications).

GERMAN FEDERAL AGENCY FOR CARTOGRAPHY AND GEODESY (BKG)

The mandate of the German Federal Agency for Cartography and Geodesy ("Bundesamt für Kartographie und Geodäsie" – BKG) is to provide geo-information and geo-services and advice to German Federal Ministries and agencies. Specifically the Unit GI 7 – "Entwicklung und Fernerkundung" is in charge of informing on Copernicus Land Service activities. In particular, Mr Hovenbitzer acts as German national thematic coordinator ("Fachkoordinator") for Copernicus Land Services. Furthermore, since February 2017, BKG has been assigned the role of a Copernicus Relay. As needed, the BKG may also accompany the German delegate (i.e. DLR) to the Copernicus User Forum. BKG itself performs various ongoing projects using Copernicus satellite data. The BKG point of contact for ECoLaSS is Mr Ralph Gehrke.

GERMAN ENVIRONMENT AGENCY (UBA), GERMANY

The German Environment Agency (“Umweltbundesamt” = UBA) acts as Deputy thematic coordinator (“Fachkoordinator”) for the Copernicus Land Service in Germany. This position is currently held by Dr. Thomas Schultz-Krutisch. UBA was recently also nominated as member of the Copernicus Relay network. Further activities in Copernicus comprise: (i) UBA is the EIONET NFP for Land Cover and (ii) the EIONET NRC for air quality and land cover, responsible for CORINE Land Cover (CLC) updates and contact point for EEA (in terms of CLMS pan-European and local component). The UBA point of contact for ECoLaSS is Mr Christian Schweitzer.

DEUTSCHES ZENTRUM FÜR LUFT- UND RAUMFAHRT (DLR) RAUMFAHRTMANAGEMENT

The German Aerospace Center (DLR) Raumfahrtmanagement (Space Administration) is entrusted by the German Federal Ministry of Transport and Digital Infrastructure (BMVI) with the implementation of Copernicus in Germany. It has supported the setup of the German Copernicus Strategy which has recently been approved by the German government. The DLR Space administration has established interfaces between the European Copernicus programme and German national users through dedicated thematic coordinators („Fachkoordinatoren“) for the six thematic Copernicus services. E.g. Copernicus Land is represented by UBA and BKG. Another task of DLR is to represent Germany in the Copernicus User Forum and the Copernicus Committee together with the thematic Copernicus coordinators. Furthermore, DLR organizes the German National Copernicus Forums every 1.5 years. The German information website on „Copernicus in Deutschland“ (Copernicus in Germany) is run by DLR as well. The implementation of the German Copernicus National Ground Segment CODE-DE is also procured by DLR. Additionally, DLR procures various funding programmes for Copernicus implementation to German public entities and industry. The DLR Space Administration’s main point of contact for ECoLaSS is Mr Michael Bock.

ENVIRONMENT AGENCY AUSTRIA (EAA)

The Environment Agency Austria – EAA (Umweltbundesamt – UBA) is the Austrian EIONET NRC for Land Cover. The person of contact is Mr Andreas Littkopf, from the Soil and Land Management Department.

The Agency leads the European Topic Centre on Urban Land and forest Systems and is directly supporting the Copernicus team at the European Environment Agency. Long-term cooperation with EAA is expected also to continue beyond 2020 e.g. in the frame of (future) European Topic Centres. The EAA advocates Copernicus services being used for national applications and further developments related to land and biodiversity monitoring.

GENERAL OFFICE FOR SUSTAINABLE DEVELOPMENT (CGDD) OF THE FRENCH ENVIRONMENT, ENERGY AND SEA MINISTRY

The General Office for Sustainable Development (CGDD) of the French Environment, Energy and Sea Ministry - Commissariat Général du Développement Durable du Ministère de l'Environnement, de l'Énergie et de la Mer represents the French position to the Copernicus User Forum and steering group and is in charge of liaising with French stakeholders. Its main role is to provide feedback from French institutional needs. Persons of contact are: Mr Vincent Pircher from CGDD/ Direction de la Recherche et de l'Innovation (DRI) who is also the French representative at Copernicus User Forum; Mr Benoit David from CGDD/DRI who is in charge of the Satellite National Plan; and Ms Frédérique Janvier who is the French EIONET NRC representative on Land Cover.

CGDD/French Observation and Statistical Service (SOEs) is the French EIONET NRC and oversees the implementation of CLC for France as well as other Copernicus land products. It also develops statistical indicators based on Copernicus and other geospatial products for the French government. Regarding future activities, CGDD/DRI will provide input to future requirements from French institutions as part of the Copernicus steering group and user forum whilst SOEs will provide more technical input/feedback as part of the EIONET NRC meetings/activities and will address the national expression of need for environmental statistics, and the needs of other end users.

NATIONAL COUNCIL FOR GEOGRAPHIC INFORMATION (CNIG)/ FRENCH MAPPING AGENCY (IGN) AND FRENCH ASSOCIATION FOR GEOGRAPHICAL INFORMATION (AFIGEO)

The National Council for Geographic Information (CNIG)/ French Mapping Agency (IGN) and French Association for Geographical Information (AFIGEO) are two organisations focusing on the development of Geographical Information in France. Main ECoLaSS person of contact is Mr Pascal Lory, who is in charge of the user interface for Copernicus Land services.

A workshop was recently organised involving French institutions and service providers, making use of Copernicus data, to present their solutions. This information was gathered at an information day organised by the French CNIG/IGN and AFIGEO on 30 March 2017 to foster exchanges between the Copernicus programme and the needs of end-users. Producers of in situ data (i.e. mainly IGN) also presented their vision regarding the complementarity between Copernicus and national infrastructure. The main activities towards these users are: Promote the Copernicus services offer, improve the relationship between these services and users' expectations, identification of opportunities for private sector, support the users to position themselves in the added value chain, coordination of geographic information actors in France, recommendations to the Copernicus point of contact for France, recommendations at European level (EC, ESA, EEA, etc.), notably concerning favourable development conditions for service companies.

INSTITUTE FOR SOIL, CLIMATE AND WATER OF THE AGRICULTURE RESEARCH COUNCIL (ARC) - SOUTH AFRICA

The Agriculture Research Council has the governmental agency for agriculture research in South-Africa and the Institute for Soil, Climate and Water is in charge of the agriculture monitoring including the development and the annual implementation of the Producer Independent Crop Estimate System (PICES) with its partners SiQ and GeoTerralimage since 2005 to improve grain crop area estimates. The contact persons are George Chirima and Terry Newby who coordinates the remote sensing activities in the institute.

Following their Sen2Agri system experience in 2016, they are looking for Copernicus to provide DIAS environment to allow running operationally the Sen2Agri system for South-Africa and to exploit the full potential of Sentinel time series.

WALLOON CENTER FOR AGRICULTURAL RESEARCH (CRAW) - BELGIUM

The Centre wallon de Recherches Agronomiques (CRAW) has the governmental mandate to support the agriculture development in the Southern part of Belgium. The contact persons, i.e., Dr. Jean-Pierre Goffart, deputy director, and Viviane Planchon, head of research unit, are in charge of the exploitation development of Copernicus data and in particular Sentinel-1 and -2. This also includes the research to use Copernicus Sentinel data to support the new CAP regulations on the monitoring.

NRCs

The EIONET NRCs Land Cover are nominated by the EIONET member and cooperating countries. Their main task is coordinating tasks related to Land Cover and providing respective data and expertise in support to EEA. The NRCs are mostly located in organisations, which are working in context to environmental issues, monitoring and modelling, and data collection/supply of environmental data on national level. In the second round of the User/Stakeholder Requirements Assessments, the NRCs were contacted in the frame of a webinar asking for desired improvements of existing and implementation of new CLMS products including the technical specifications.

2.3 Other Stakeholders

This section gives an overview of further stakeholders, which are considered relevant for ECoLaSS, the rationale for which is given in the following.

EIONET

EIONET is a partnership network under the coordination of EEA, consisting of EEA itself, currently six European Topic Centres (ETCs) and a network of around 1000 experts from 39 countries in over 350 national environment agencies and other bodies dealing with environment information. These are the NFPs and the NRCs. EEA and EIONET contribute to the European SEIS (see section 2.1).

A compiled questionnaire focusing on the technical and contextual specifications for future improved or new Copernicus Land Services was created, targeting the beginning of the second reporting period within WP 21 and WP 51. Via EEA the compiled ECoLaSS questionnaire was distributed to the Member States. In this context a webinar took place in October 2018 which aimed to introduce the participants to the project in general and furthermore ask for constructive feedback regarding the CLMS products and their technical specifications. The webinar was recorded and made available to the participants online.

EARSeL

EARSeL is a scientific network of European remote sensing institutes, coming from both academia and the commercial/industrial sector. The main scientific efforts of EARSeL are concentrated in Special Interest Groups (SIGs), which form the foundation of the activities of EARSeL. They aim to encourage co-operation and foster innovative applications of remote sensing at highest scientific and state-of-the-art level. The SIGs are commonly considered very valuable to the scientific community as a means to understand and evaluate the major remote sensing related issues to be tackled in the future by the scientific community. SIGs can as well be instrumental in the design and the definition of future space missions. The SIGs organise workshops and specialist meetings, the reports and proceedings of which are published. The conclusions and specific recommendations are presented to the sponsoring agencies and other relevant institutions. Currently established SIGs of interest for ECoLaSS are the SIGs on Temporal Analysis of Image Data, Forestry, and Coastal Zones.

Some of the project partners of ECoLaSS are also members of EARSeL and are therefore well aware of the scientific state of the art in remote sensing based land monitoring applications. The contacts will be used, to further benefit from this awareness of the state-of-the-art for the benefits of the ECoLaSS developments. The ECoLaSS prototypes as outcomes of Task 4 were already presented to a large audience at the 38th EARSeL Symposium in Chania, Crete, from 9 – 12 July 2018. The targeted session was within the 3rd EARSeL SIG LU/LC and NASA LCLUC joint Workshop programme.

EARSC

The European Association of Remote Sensing Companies (EARSC) is a European non-profit organisation promoting the use of Earth Observation (EO) technologies and fostering the development of the European EO geo-information services industry. It is recognised as the representative of the European remote sensing value-adding industry. Its members are private-sector companies established in Europe, which offer Earth Observation related products, services and consultancy. EARSC provides its members with various sources of EO related information as well as business intelligence about the sector. The association aims to increase awareness on EO among stakeholders and potential customer groups, reinforce the use of EO products and services, identify new business opportunities and establish new markets, and network with other relevant players in the sector. GAF is a founding member of EARSC and SIRS has joined the association in 2017.

Amongst others, EARSC regularly organises or co-organises well-attended thematic workshops (typically in Brussels) and Copernicus-related events, bringing together relevant actors, stakeholders and political decision makers on various EO related aspects. Having a permanent secretariat office in Brussels and excellent connections to top decision makers at the EC and ESA, EARSC is uniquely placed to facilitate

dialogue between policy and industry, as well as to bring together relevant actors of Copernicus in a unique fashion. This has already enabled valuable information exchange on stakeholder needs and industrial capabilities in the recent past, specifically on Copernicus.

As one of the elected EARSC Directors, the ECoLaSS project member Markus Probeck (GAF) is the main point of contact with EARSC. He is ensuring that the ECoLaSS team stays well informed about all political framework conditions and requirement changes in view of Copernicus future operations and implementation plans. Once all Task 3 Deliverables and Task 4 Deliverables and datasets are published, it is planned to actively advertise them via an EARSC blog, for access to a wider community of companies and service providers in the EO industry.

COPERNICUS COMMITTEE AND COPERNICUS USER FORUM

The Copernicus Committee and the Copernicus User Forum are key consulting and decision making bodies for the future of the whole Copernicus programme. Unfortunately they are not directly addressable by ECoLaSS or any of its project partners, since participants are typically (with few exceptions) from member states' public agencies and institutions responsible for national Copernicus coordination or implementation. However, through EARSC and the national delegates of the project partners' countries of establishment (DE, FR, BE, AT), there are connections to the delegates of both gremia so that a certain information flow may take place in cases where needed.

Likewise, there are well-established connections to national Copernicus user fora, such as the German "Nationales Forum für Fernerkundung und Copernicus", which are conducted in regular 1 - 1.5 year intervals. Both are deemed to facilitate the stakeholder consultation process undertaken by WP 51.

CLMS RELATED OPERATIONAL IMPLEMENTATION AND R&D PROJECTS

Various ongoing operational implementation projects as well as parallel research and development projects with a clear relation to the CLMS (such as under the Horizon2020 programme or ESA-funded projects) are considered additional relevant stakeholders to ECoLaSS.

These are, on the one hand, the current Copernicus Land High Resolution Layer (HRL) 2018 production projects which are in their initial stage and concern, amongst others, the production of the HRL Imperviousness (IMP), HRL Forest (FOR) and HRL Grassland (GRA) for the reference year 2018.

On the other hand there are related H2020 research projects addressing future developments in the Copernicus Land context: e.g. Sensagri (<http://sensagri.eu/>) and MULTIPLY (<http://www.multiply-h2020.eu/>). Moreover, ongoing ESA-funded projects such as Sen2Agri (<http://www.esa-sen2agri.org/>) and Sen4CAP (<http://esa-sen4cap.org/>), with participation of the ECoLaSS consortium member UCL, target synergies with ECoLaSS regarding a potential future agricultural Copernicus land service.

3 Stakeholder Interaction Process

This Chapter features explanations on various stakeholder interaction activities involving all stakeholders described in Chapter 1. Section 3.1 details activities carried out for the stakeholder consultation process, section 3.2 describes the purpose and results of meetings and teleconferences, section 3.3 elaborates on conferences and workshops where targeted stakeholder consultation or networking was carried out as well as dissemination of the project's results to facilitate the interaction with stakeholders and communicate the contents and progress of the ECoLaSS project.

3.1 Consultation Process

In order to collect stakeholder requirements, which aims at confirming, adjusting or potentially newly initiating the products and services that are envisaged for development and demonstration as part of ECoLaSS, a stakeholder consultation process with key representatives of EEAs and the most relevant stakeholders and groups of stakeholders is considered of utmost importance to:

- regularly inform relevant Copernicus Land stakeholders and decision makers on the status of ongoing research and development activities in the project;
- gather their feedback on the project's technical developments, thematic evaluations, service/product maturity assessments and the suggested candidate products for later operational implementation;
- receive advise on current/evolving priorities and/or emerging adaptation needs for the continuation of work in the next project phase(s);
- support 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.

Starting early in the project, i.e. at T_0+7 , a dedicated stakeholder consultation process has been put in place by WP 51, building on WP 21 results and initiated Task 3 method developments. Towards the end of the first reporting period at T_0+18 and beginning of the second project phase, the focus was on communicating outcomes from Task 3 (method developments) and Task 4 (prototypes) as well as gathering further user and stakeholder requirements in the frame of WP 21.

The WP 51 is led by GAF who is taking care of organising the consultation process with EC DGs, EEA, federating stakeholder organisations and German national stakeholders. Specifically with EEA, GAF can build on the good and long-time relation and contacts established in the course of several recent Copernicus Land operational projects, amongst them the Copernicus Land HRL 2015 production. UCL with the assistance of SIRS is in charge of organising the consultation process for the global Copernicus Land developments, i.e. primarily with JRC and other EC DGs.

Of high importance for communicating with the stakeholder community is the distribution of the Deliverable "*D21.1a – Service Evolution Requirements Report*" to all stakeholders participating to the user requirements assessments in the frame of WP 21. Stakeholders univocally appreciated to receive the final report and are in general very interested to stay in touch with ECoLaSS on future developments.

Visits to several stakeholders (especially the EEAs and EC DGs) have been arranged where dedicated ECoLaSS meetings have been set up. Consultation is arranged preferably back-to-back with other events where participation is foreseen (section 3.3), or by organising dedicated teleconferences or physical meetings on ECoLaSS matters (section 3.2).

Further, the EIONET group as well as the EC DGs were addressed by organising two webinars targeting a compiled questionnaire on technical and contextual requirements for future improved or new Copernicus Land Services. Either directly or via EEA the compiled ECoLaSS questionnaire was distributed to the Member States. The webinars were recorded and made available online. The replies to the questionnaire allowed to incorporate the MS, however, not at a level representative for all Europe. Moreover, good personal contacts and experience exists in the consortium; e.g. GAF has been regularly participating and presenting to previous EIONET meetings.

3.2 Consultation Teleconferences and Meetings

Meetings and teleconferences have been conducted with key representatives of the main European stakeholders (section 3.2.1) as well as with DGs of the EC (section 3.2.2), representatives of national users and stakeholders that implement or coordinate Copernicus activities (section 3.2.3), federating stakeholder entities (section 3.2.4), and other projects with relevance to CLMS and in connection to stakeholders (section 3.2.5).

3.2.1 Consultation with EEA and JRC

Various dedicated meetings and teleconferences on ECoLaSS matters as well as interactions during workshops and symposia with the EEs EEA and JRC took place as follows:

MEETINGS WITH EEA AND JRC:

Dedicated H2020 meeting with EC, EEA and JRC:

- REA has organized a joint meeting on 15 November 2018, with participation of the EC, the Entrusted Entities EEA and JRC and the four relevant H2020 projects for developing prototypes for potential future Copernicus Land services: ECoLaSS, Sensagri, MULTIPLY, and EO4Agri (see section 3.2.5.1).

Dedicated ECoLaSS meeting with EEA (15 December 2017):

- A dedicated ECoLaSS meeting with EEA took place at EEA premises in Copenhagen on 15 December 2017. The aim of this meeting was to inform EEA of the latest outcomes of ECoLaSS and to discuss with EEA the future path of the project, to be in line with the requirements of EEA as main European stakeholder. The present key representatives from EEA were Mr Hans Dufourmont, Mr Tobias Langanke and Mr Matteo Mattiuzzi. ECoLaSS was represented by Ms Linda Moser and Mr Markus Probeck (GAF) and Mr Christophe Sannier (SIRS). The meeting was particularly useful in getting feedback from EEA on the initial project results thus providing guidance for future work. The meeting proved very fruitful and timely, and EEA stated that they were very satisfied with the chosen direction of the project and that some project results could already directly feed into some upcoming CLMS product procurements. Further regular exchange was agreed.

Meetings with EEA back-to-back with other events:

Several short interactions with EEA representatives, including exchanges on ECoLaSS related or relevant issues, took place back-to-back to other meetings and conferences,

- **Meetings at the Baveno Manifesto Event – 20/21 June 2018:**
The Copernicus 20th anniversary celebration event in Baveno, Italy, from 20th to 21st June 2018 (see more details in section 3.3.2), provided an excellent opportunity for short side-/ coffee break meetings and exchanges with various important stakeholders of ECoLaSS, such as Mr Michael Cherlet (JRC, responsible for the global CLMS component) and some of his colleagues (Mr Marc Dowell, Mr Peter Strobl, Ms Nadine Gobron). In discussions together with the ECoLaSS project Officer Mr Massimo Ciscato (REA), plans have been re-iterated for a joint JRC-EEA-ECoLaSS meeting. This opportunity was also briefly explored with Mr Hans Dufourmont (EEA, responsible for the continental and local CLMS components) and the Head of the Space Project Management Sector at REA, Ms Virginia Puzzolo.
- **HRL 2015 Final Technical Meeting -03 May 2018:**
Since GAF and SIRS are involved as main partners in the operational implementation of the HR Layer (HRL) 2015 products, they participated also to the related Final Technical Meeting on 3rd May 2018, where the final results, achieved accuracies and lessons-learned for the HRLs Imperviousness, Forest, Grassland, Water & Wetness and Small Woody Features were presented by the consortia of Lots 1-5. The meeting provided a platform specifically for exchanging on the related first operational experiences with Sentinel-1 and Sentinel-2 time series-based processing

chains, and for discussing future service and product evolution potential. The latest recognitions based on ECoLaSS developments were contributed to this discussion by SIRS and GAF. From the discussions, it appeared that EEA may already go some further steps towards next-generation HRL processing chains, but that ECoLaSS is still targeting further advanced developments. With the publication of the next ITT on the HRLs 2018 presumably shortly ahead, EEA expressed their gratitude for sharing all the lessons learnt, which would (at least partially) feed into the process of setting up the next ITTs.

- Meetings at the **Copernicus for Agriculture Conference** in March 2018 took part with JRC, catching up with Hans Dufourmont and Tobias Langanke on updates related to ECoLaSS, which was presented in a short presentation by Virginia Puzzolo (REA) with focus on agricultural aspects.
- Meetings at the **WorldCover 2017 Conference** in Frascati, where dedicated conversations during the event as well as the poster session at the ECoLaSS poster took place with Tobias Langanke from EEA.

Participation of EEA at the ECoLaSS Kick-Off Meeting:

- Tobias Langanke, the EEA key representative for the pan-European CLMS implementation, participated in the KO Meeting and held the presentation: “Update and feedback from pan-European Copernicus land monitoring service”, formulating the current status of CLMS products, future plans and the desired role of ECoLaSS.
- JRC had been invited to the Kick-Off, but couldn’t participate; related Global Land requirements were however discussed with JRC directly before and after the KO Meeting.

Meetings with JRC dedicated to a future pan-European Agricultural service

- On February 2017 a meeting took place with the Food Security team at JRC (Olivier Léo, Guido Lemoine) in Ispra regarding the upcoming pan-European CLMS Agricultural service, with presence of the consortium partners UCL and SIRS. An interview protocol was filled and reviewed as part of the user and stakeholder analysis on service evolution requirements in WP 21.
- UCL, SIRS and GAF are trying to plan a follow-up meeting at the JRC in Ispra with regard to the future pan-European Agricultural service specifications. However, this is now on hold as a revised concept note for JRC has yet to be published, but JRC provided indications that they do not see an immediate need for a dedicated Copernicus thematic service and that this type of service would be more up to the member states to implement.

Meetings with JRC back-to-back with other events:

- Meetings at the **Baveno Manifesto Event**, which was the Copernicus 20th anniversary celebration event in Baveno, Italy, from 20th to 21st June 2018 (cf. section 3.3.2), took place with JRC stakeholders, amongst others. As already mentioned above, in the frame of the short side-/ coffee break meetings and exchanges with various important stakeholders of ECoLaSS took place. Amongst others, the future of the Copernicus agricultural service and specifically the related necessities of cloud processing and DIAS in the frame of the CAP reform were discussed with Mr Guido Lemoine and Mr Pär Johan Åstrand (JRC/MARS).
- Meetings at the **GEOGLAM Data and Service Requirements Workshop** hosted by JRC on the 17-18 April 2018 in Ispra, with Betina Baruth (JRC-MARS) and Terry Newby (ARC, South Africa) about the forthcoming challenges related to Sentinels exploitation for agriculture monitoring. ECoLaSS represented by UCLouvain questioned further Betina Baruth about her vision of EO-based agriculture metrics, obviously including yield and area indicators but emphasizing the need for indicators quantifying the environmental and climate impacts of agricultural activities. Terry Newby confirmed the South-African decision to continue to exploit the Sen2Agri system and expressed its concerns about the small holders agriculture landscapes with mixed cropping systems.
- Meetings at the **Copernicus for Agriculture Conference** in March 2018 took part with JRC, catching up with Guido Lemoine on issues related to ECoLaSS and a possible ECoLaSS meeting at JRC. ECoLaSS was presented in a short presentation by Virginia Puzzolo (REA) with focus on agricultural

aspects. The JRC concept note on a future agricultural Copernicus service, still to be published soon, was presented by Guido Lemoine.

- Meetings at the **MARS Conference** in November 2017 in Gormanston, Ireland could be established with JRC and were dedicated to ECoLaSS. The main contact person was Guido Lemoine who discussed with the consortium on recent ECoLaSS outcomes, the JRC concept note on a future agricultural service as well as the HRL Grassland 2015. Further short interactions took place with Philippe Loudjani (JRC).
- **Meetings at the ISRSE conference** from in May 2017 in Tshwane, South Africa, a meeting with JRC (Michael Cherlet), main representative of the CLMS Global Component implementation, was conducted by SIRS. An interview questionnaire was filled, in the light of the user and stakeholder analysis on service evolution requirements, as part of WP21.

TELECONFERENCES WITH EEA AND JRC:

- A teleconference between EEA (Tobias Langanke) and GAF and SIRS was set up in May 2017, in the light of the user & stakeholder interview on service evolution requirements, as part of WP21, followed by discussions and refinements of the information received from EEA.
- A teleconference with JRC (Michael Cherlet) was conducted by GAF in June 2017, in order to explain the background, objectives and ongoing activities of the ECoLaSS project. The purpose was to foster closer interaction of the JRC with ECoLaSS. JRC communicated strong interest in the ECoLaSS project and intentions for closer collaboration starting from October 2017 onwards.
- A teleconference with Philippe Loudjani of the JRC, Directorate D - Sustainable Resources, Food Security D5 Unit, MARS CAP Land group took place in September 2017, with the aim to communicate (i) the objectives of ECoLaSS with focus on a future pan-European agricultural service, and (ii) the interest to participation at the 23rd MARS Conference, in Gormanston, Ireland, on 28 and 29 November 2017. Interest from the side of JRC was shown and ECoLaSS was invited to give a short oral presentation and in addition, advertise the project by participating with a poster in the poster session.
- A teleconference with EEA (Hans Dufourmont, being responsible for the Copernicus Land programme at EEA) was conducted in September 2017, where EEA proposed the participation of ECoLaSS as oral presentation at the upcoming CCI+/LC/LU workshop, tentatively on 16 November 2017 in Brussels, which has subsequently indeed been attended by the former ECoLaSS project coordinator, Markus Probeck (GAF).

3.2.2 Consultation of EC DGs

The EC Directorates-General on Enterprise, Industry, Entrepreneurship and SMEs (DG GROW) and Environment (DG ENV) and Agriculture and Rural Development (DG AGRI) are considered the main EC DGs of relevance for ECoLaSS and have therefore been primarily addressed in the first phase of the project. Consultations with further DGs, e.g. DG CLIMA, DG DEVCO are planned (see section 2.1).

PARTICIPATION OF DG GROW IN THE ECOLASS INTERIM PROGRESS MEETING – 19 OCTOBER 2017, BRUSSELS, BELGIUM

Michel Massart, Copernicus responsible from DG GROW, took part in the ECoLaSS Interim Progress Meeting 1 on 19 October 2017 in Brussels.

MEETING WITH DG GROW REPRESENTATIVES BACK-TO-BACK WITH OTHER EVENTS – 29-31 MAY 2018, OSTEND, BELGIUM

A meeting at the PROBA-V Symposium in May 2018 took place with Michel Massart and with ESA Sentinel-3 team, catching up with the forthcoming DIAS infrastructures, their expected availability in the various EU and Copernicus contexts and the current status of Sentinel-3 synergy products. ECoLaSS concerns about the Sentinel-3 delay for the Synergy products were specifically risen with the ESA team reporting

challenging issues related to the OLCI and SLSTR combination for advanced cloud masking. Fabrizio Niro from ESA confirms that only beta version of Sentinel-3 synergy product will be made available in the coming months.

A meeting of GAF with DG GROW (Mr Michel Massart) where GAF shortly presented the ECoLaSS contents and objectives to DG GROW took place back-to-back with the WorldCover conference in March 2017 at ESA/ESRIN in Frascati. The ECoLaSS poster was shown during the poster sessions.

MEETING WITH DG DEVCO – 12 APRIL 2018, BRUSSELS, BELGIUM

An informal meeting was held with Philippe Mayaux (DG DevCo) and Christophe Sannier (SIRS) during which the ECoLass project and objectives were discussed. DG DevCo is the main user for the CLMS Global Component Hot Spot Service providing detailed Land Cover information in relation to projects where DG DevCo is involved. The service initially focused on protected areas in Africa, but is now increasingly used for other projects outside of Africa.

DEDICATED ECOLASS MEETING WITH DG REGIO – 14 MARCH 2018, BRUSSELS, BELGIUM

A dedicated ECoLaSS meeting was organised with DG Regio on 14 March 2018 and was attended by Hugo Poelman from DG Regio, Annkatrin Metz-Marconcini (DLR) and Baudouin Desclée (SIRS). The WP21 questionnaire was filled in. The main interest of DG Regio is in the Urban Atlas for which it was the first user and is considered by DG Regio as “the best products for EU urban and sub-urban analyses, not only for the content but with the appropriate level of details and because of its harmonised production “. They also have a keen interest in the HRL Imperviousness but would require more coherent change detection. One of the key use is to disaggregate population density. Another interest is in the development of the UA STL product and the upcoming HRL SWF. One of the key new service they would like to have is an adapted wall-to-wall LC/LU product with the resolution of UA. As such they are very interested in the development of CLC+.

DEDICATED ECOLASS MEETING WITH DG ENV – 2 MARCH 2018, BRUSSELS, BELGIUM

Two complementary, dedicated meetings between ECoLaSS and DG ENV took place in Brussels at the DG ENV premises on 2 March 2018: One meeting dedicated to ECoLaSS was arranged with Mr Frank Vassen and Ms Angelika Rubin (Unit D.3 – Nature Conservation), who showed specific interest in the HRL Grassland 2015 and the development of a grassland prototype. Specifically the possibilities of reliably discriminating grassland from cropland parcels via Sentinel-2 and Sentinel-1 time series, the further characterisation of grassland use intensity and future potential access to LPIS data were discussed. DG ENV’s main interest is related to monitoring of the Natura 2000 sites.

A second meeting took place thereafter with Mr Hugo de Groof (Unit E.4 – Compliance and Better Regulation) on general topics of the Copernicus Land Monitoring Service, the CAP reform and related ECoLaSS developments, as well as environmental compliance assurance and grassland topics. The meeting proved very fruitful and a follow-up meeting at a later stage was discussed. Actually, ECoLaSS was invited in the aftermath to contribute to a dedicated session on “Environmental Compliance Assurance, ECA - GEOINT supporting environmental compliance assurance in rural areas” at the INSPIRE Conference from 18th to 21st Sept. 2018 in Antwerp, chaired by Mr Hugo de Groof (DG ENV). An ECoLaSS paper was submitted and accepted for oral presentation.

DEDICATED ECOLASS MEETING WITH DG AGRI – 1 MARCH 2018, BRUSSELS, BELGIUM

A dedicated ECoLaSS meeting was arranged on 1 March 2018 at DG AGRI with the main contact for Copernicus, Mohamed El Aydam, as well as Barthélemy Lanos, Piotr Wojda and Louis Mahy. The project objectives and contents were presented, with a special focus on crop mask and crop type mapping. Requirements and fields of interest from DG ENV's side were another main topic of the meeting. Requirements have been minuted and will form input into WP 21 in the second reporting period.

DEDICATED ECOLASS MEETING WITH DG CLIMA – 17 DECEMBER 2017, BRUSSELS, BELGIUM

A first short contact took place between the former ECoLaSS project coordinator Markus Probeck and Mr René Colditz from the Directorate-General for Climate Action (DG CLIMA)'s C3 Unit "Land Use and Finance for Innovation" in end-September 2017, back-to-back with another meeting at DG GROW. It seems that the DG CLIMA Unit C3 is well aware of the Copernicus Land Monitoring Service products currently offered, but does currently not yet have much information about the intended further development of the CLMS and has not yet used the CLMS products for their reporting obligations. A physical meeting has been envisioned for October 2017 to assess current contribution potential of the CLMS and explore DG CLIMA's requirements towards a future CLMS.

This dedicated ECoLaSS – DG CLIMA meeting finally took place on 17th December 2017 at the DG CLIMA premises in Brussels. It was attended by Mr René Colditz and Ms Christine Muller (DG ENV) and Mr Markus Probeck and Ms Anna Schärtel (GAF). DG CLIMA is interested to engage in the Copernicus programme, specifically in CLMS and Copernicus Climate Change Service (C3S) products, however limited staff and technical capacities have so far hindered the uptake of Copernicus services. Specifically the Unit C3 aims to explore the use of high-quality CLMS products for Land Use, Land Use Change and Forestry (LULUCF) monitoring, and the HR Layers are of key interest for that purpose. In the future, CLMS products are deemed to play an important role in the LULUCF implementation, in particular in view of the recent agreement on a key legislative proposal for implementing the EU's 2030 climate objectives on accounting of emissions from LULUCF.¹ Together with the subsequently agreed effort sharing regulation for implementing the EU's 2030 climate target,² these are deemed central building blocks in the EU's climate policy and the efforts to drive Europe's transition to a low-carbon economy. DG CLIMA deems particularly the HRLs and a future CLC+ to become key input datasets. DG CLIMA aims to also increasingly engage with DG GROW for defining services needed for assuring policy compliance.

DEDICATED PHYSICAL MEETING WITH DG ENV – 05 JULY 2017, BRUSSELS, BELGIUM

A further physical meeting was conducted with DG ENV Unit D1 (Mr Peter Löffler, Policy Officer Forest Protection) as a follow-up of the previous user requirements analysis. Mr Löffler is the responsible for coordinating all Forest topics in DG ENV. The former ECoLaSS project coordinator Markus Probeck met with him bilaterally on 5 July 2017 in Brussels in order to:

- i. further exchange information on latest developments in the CLMS, and specifically to further inform DG ENV which free & open Copernicus data are already produced and freely available via the CLMS (specifically by the pan-European and local Land components);
- ii. discuss further developments in view of the upcoming migration of the Forest Information System Europe (FISE) from JRC to EEA.

A high interest was identified by DG ENV specifically in the HR Forest Layer and the upcoming (improved) HR Grassland 2015, which may serve already some of the current DG ENV reporting needs, and seem to have potential also for further applications and value-adding. The future evolution of these two HRLs are of particular interest to DG ENV; therefore, further consultations are foreseen to be continued in that sense.

¹ cf. http://europa.eu/rapid/press-release_STATEMENT-17-5286_en.htm

² Cf. http://europa.eu/rapid/press-release_STATEMENT-17-5382_en.htm

TELECONFERENCES WITH DG ENV:

DG ENV participated in the user requirements analysis as part of the WP 21 activities. Separate teleconferes took place with two key DG ENV units: D3 Nature Protection (Mr Frank Vassen) and D1 Land Use & Management (Mr Peter Löffler) (see section 2.1).

FURTHER INTERACTION WITH DG GROW:

Policy Survey of DG GROW:

An exchange of information with DG GROW (Ms Virginia Puzzolo) in the framework of the survey on “Project Contribution to EU Policies” was carried out in June 2017. The goal was to analyse whether and how the ECoLaSS project is contributing or will contribute to the implementation of EU policies. Information gathered within the policy questions of the user analysis interviews in WP 21 partially served as input to the survey.

WEBINAR WITH EC DGs:

In early December 2018, members of the ECoLaSS team at GAF held a webinar for the DGs and key national stakeholders in order to introduce the participants to the stakeholder requirements assessment (WP 21). In this context the project background was explained as well as the questionnaire that they were subsequently asked to fill out. The following representatives of the DGs and key national stakeholders handed in some feedback that was included in the second issue of the WP 21 report:

Table 1: Participating DGs and key national stakeholders within the second round of the User/Stakeholder Requirements Assessment

ORGANISATION	CONTACT POINT	ROLE OF ORGANISATION IN COPERNICUS
DG Regional and Urban Policy (DG REGIO)	Hugo Poelman	European Entrusted Entity (EEE) for Copernicus implementation
DG Climate Action (DG CLIMA)	Rene Colditz	European Entrusted Entity (EEE) for Copernicus implementation
German Environment Agency (UBA)	Andreas Littkopf	key national coordinating Copernicus entity and user

3.2.3 Consultation of National Stakeholders

TELECONFERENCES AND MEETINGS WITH GERMAN NATIONAL STAKEHOLDERS

- BKG (Mr Ralph Gehrke) participated in the ECoLaSS KO meeting and presented BKG’s current use of CLMS products and requirements towards a future CLMS. BKG also participated in the user requirements analysis as part of WP 21. GAF conducted a teleconference and a follow-up revision of the interview protocol with BKG. GAF has stayed in contact with BKG on ECoLaSS matters since. This is also facilitated by GAF leading the LaVerDi (LandschaftsVeränderungsDienst) project in Germany which has been contracted by BKG, where the development of Sentinel-2 based automated processing chains for land cover change analysis in Germany are of main interest.
- UBA (Mr Christian Schweitzer) participated in the user requirements analysis as part of WP 21. GAF conducted a teleconference and a follow-up revision of the interview protocol with UBA. GAF plans to remain in contact with UBA on ECoLaSS matters in the future.
- DLR Raumfahrtagentur (Mr Michael Bock) participated in the user requirements analysis as part of WP 21. GAF conducted a teleconference and a follow-up revision of the interview protocol with DLR Raumfahrtagentur. GAF plans to remain in contact with DLR Raumfahrtagentur on ECoLaSS matters in the future.

TELECONFERENCES AND MEETINGS WITH FRENCH NATIONAL STAKEHOLDERS

- Several meetings took place with representatives of the French Ministry of Environment (main contact: Mr Serge Flamenbaum, Ms Marie-José Lefevre-Fonollosa) back-to-back with (i) the French National Workshop on the Evolution of Copernicus Services; (ii) a French national workshop for Copernicus evolution needs related to vegetation applications organised by the French Space Agency together with relevant ministries, which aimed to collect requirements from science and industry. The consultations particularly focused on user requirements for Copernicus Evolution related to vegetation applications. Further specific thematic workshops are planned on this topic.
- SIRS participated to the AFIGEO Copernicus information French national workshop which is a French national event with different stakeholders (CNIG, IGN and AFIGEO). In the frame of this, side-meetings took place with the French stakeholders (e.g. Mr Pascal Lory) on their user requirements towards Copernicus services and use of Copernicus products in downstream services. This dialogue is intended to be continued alongside the next INSPIRE conference in Strasbourg.

TELECONFERENCES AND MEETINGS WITH AUSTRIAN NATIONAL STAKEHOLDERS

- A meeting was conducted between Joanneum and the Environmental Agency Austria (EAA)'s Soil and Land Management Unit (ECoLaSS point of contact: Mr Andreas Littkopf) in the frame of the user requirements assessment process of WP 21, assessing the EAA's needs in view of future CLMS services.

WEBINAR WITH THE EIONET NRCs LAND COVER

A participation of ECoLaSS to one of the EIONET meetings had been discussed between the ECoLaSS team and EEA in the early stage of the first Reporting Period, to allow ECoLaSS to comprehensively address member state representatives of the EEA39 countries via this federating body. Such was generally considered very useful, in order to inform Member States of the open user requirements collection and stakeholder consultation process. Actually, a participation had already been agreed for the EIONET NRC Land Cover meeting in Copenhagen on 09/10 October 2017, however was cancelled by EEA shortly before the meeting due to potential confidentiality and conflict-of-interest issues in relation to CLC+ which was one of the main agenda items of the meeting. At that time, it was agreed to target an ECoLaSS participation at a later stage, when also more project outcomes would be available. In recent discussions with EEA it turned out that EEA actually prefers a more targeted separate addressing of the EIONET group rather than via an NRC meeting participation and presentation. This will make it more difficult for ECoLaSS as it will inhibit a direct personal interaction, but feedback from the group would be definitely an asset for the project. Therefore, a simplified user requirements questionnaire has been prepared by the ECoLaSS team, targeting to capture the EIONET NRC delegates' technical and contextual requirements for future improved or new Copernicus Land Monitoring Service products. It was issued to the EIONET member states by EEA in October 2018, gathering feedback for WP 21. Subsequently, a webinar was organised to explain the project background and what the questionnaire is needed and will be used for. The webinar was also recorded and made available online. The feedback was collected in form of a questionnaire, which was filled out by the following NRCs:

Table 2: Participating EIONET NRCs Land Cover within the second round of the User/Stakeholder Requirements Assessment

ORGANISATION	CONTACT POINT	ROLE OF ORGANISATION IN COPERNICUS
Space Research and Technologies Institute at the Bulgarian Academy of Sciences, Bulgaria	Ventzeslav Dimitrov	Eionet National Reference Centre
Czech Environmental Information Agency, Czech Republic	Lenka Rejentová	Eionet National Reference Centre
Federal Agency for Cartography and Geodesy (BKG), Germany	Friederike Emig	Eionet National Reference Centre
Croatian Agency for Environment and Nature, Croatia	Branimir Pavlinec, Bojan Karaica, Tamara Kirin	Eionet National Reference Centre
Environmental Protection Agency, Ireland	Gavin Smith	Eionet National Reference Centre
Malta Environment and Planning Authority, Malta	Stephen Conchin	Eionet National Reference Centre
Wageningen Environmental Research, Netherlands	Gerard Hazeu	Eionet National Reference Centre

3.2.4 Consultation of Federating Stakeholder Entities

For a Horizon2020 like ECoLaSS, with clearly defined tasks and resources, it is generally not possible to individually interact with too many stakeholders on a single basis. Therefore, the ECoLaSS team has taken on the approach of consulting with federating entities of relevant stakeholder segments. These allow to comprehensively address, or interact with, a group of stakeholders in an efficient manner. In that sense, the following federating stakeholder entities have been / are being addressed:

EARSC ANNUAL GENERAL MEETINGS

Besides regularly organising various earth-observation and Copernicus related events and workshops, EARSC also conducts dedicated information exchange and discussion workshops between industry and decision makers in the frame of its Annual General Meeting (AGM), which typically take place for two days in June/July in Brussels each year. For example in 2015, this was the first occasion ever to publically bring together the Entrusted European Entities (EEEs) of the six thematic Copernicus Services in one public forum, and discuss the future evolution and potential industrial role of Copernicus services in detail.

In 2017, the AGM took place on 4/5 July in Brussels. The workshops associated to the AGM dealt with the industrial involvement in GEO and GEOSS, as well as with an internationalisation strategy. Specifically the latter has been of interest to ECoLaSS as it was dealing with exploring opportunities to export European knowledge and service capacities to other parts of the world, e.g. in terms of roll-out of established operational products such as the various Copernicus Land services. The related workshop was conducted with strong support of ESA and featured, amongst others, information on upcoming opportunities to Japan. The EARSC AGMs are regularly attended by the former ECoLaSS project coordinator Markus Probeck in his role as EARSC Director; thus a proper and continuous information exchange is ensured.

In 2018 two relevant Copernicus-related EARSC workshops in Brussels have been attended, associated with the AGM 2018: a workshop on the recently launched Data and Information Access Services (DIAS) on 26 June 2018, and a high-level strategic workshop on the “Future of European EO Services and Copernicus” on 27 June 2018 (see more details in section 3.3.2). Once the first complete set of Task 3 Deliverables and Task 4 Deliverables and datasets are published, it is planned to actively advertise them via the EARSC blog, for access to a wider community of companies and service providers in the EO value-adding industry.

From 2019 onwards the AGM was replaced by the so called EXPANDEO annual event that took place from 20-21 June 2019 in Brussels, Belgium, for the first time. This event brings together the Earth Observation market, i.e. institutional stakeholders, people working in the EO industry and others who are affiliated with

the EO sector. During the two-days several EO service related workshops were held together with the “A day with EO” conference, where the general benefits of EO were recapitulated in several talks on different topics.

3.2.5 Other relevant Projects

Apart from the already described European-level, national and other stakeholders (see chapter 2), a number of projects with relevance for ECoLaSS were included in the stakeholder consultation process, namely the H2020 Land “sister” projects (section 3.2.5.1), CLMS Continental Component operational implementation projects (section 3.2.5.2), and ESA-funded projects regarding relevant agricultural topics (section 3.2.5.3).

3.2.5.1 H2020 Land related projects

A teleconference between the Project Coordinators of three parallel H2020 “sister” projects in the Land domain has been held in April 2017, facilitated by REA. This comprised:

- **Sensagri:** Project Coordinator Mr Antonio Ruiz Verdú, deputised by Mr José Moreno (University of Valencia);
- **MULTIPLY:** represented by its Project Coordinator Mr Peter von Bodegom (University of Leiden);
- **ECoLaSS:** represented at that time by the Project Coordinator Markus Probeck and the Scientific Coordinator Linda Moser (GAF).

The goal of the teleconference was to introduce the projects’ objectives and discuss potential areas of synergies, amongst others, the interaction with stakeholders.

ECoLaSS and Sensagri identified the following common areas of interest:

- (i) crop type/classification;
- (ii) potentially LAI (ECoLaSS aims for a service providing multiple indices, potentially also from biophysical parameters, to be decided further) and
- (iii) experimental prototypes from Sensagri (e.g., irrigation areas, tilling) might also be of interest for future HRLs (e.g., grassland, water/wetness).

ECoLaSS and MULTIPLY were found to be rather complementary projects with different approaches and methods but no direct duplication of work. A further information exchange was agreed on the processing power/mirror site needs for Sentinel products.

The three projects identified areas of potential future synergies and collaboration:

- sharing information or documents on end-user or stakeholder requirements, bridging the gap to be close to Copernicus stakeholders while individually keeping the main responsibilities for the respective end-user (e.g. for a potential future agricultural Copernicus Land Service);
- exchange test site locations, information on Sentinel data access / processing infrastructure and
- exchange information in future teleconferences, e.g. coordinate in advance in case of attendance to relevant workshops on the topic.

After this teleconference, representatives from these three research projects and the European institutions (e.g., DGs, CAP Payment agencies), regional or national governments have met in several occasions, to foster knowledge transfer and strengthen potential synergies. A dedicated meeting between MULTIPLY, Sensagri and ECoLaSS took place in November 2017, with the participation of REA coordinators of these initiatives and DG GROW, then another exchange meeting took place between Sensagri, ECoLaSS and MULTIPLY projects, taking advantage of the workshop organized by the MULTIPLY project in February 2018, and two dedicated meetings in November 2018 and April 2019, the latter including the participation of several projects in the JRC workshop in checks and management of agricultural land in the Integrated Administration and Control System (IACS) the following day. Moreover, several back-to-back meetings between ECoLaSS and Sensagri took place at various events, e.g. the MARS conference in November 2017,

the Copernicus for Agriculture – Industry workshop in February 2018, and the IGARSS conference in July 2018. In the November meeting in 2018, relevant stakeholders in the ECoLaSS project, this is to say EEA and JRC, plus the EC representatives, were present. In addition to the three above mentioned research projects, present from the beginning in these exchanges, the EO4Agri H2020 project participated. The most recent H2020 project meeting took place in April 2019 in Valladolid, Spain, hosted by ITACYL and co-organized by the Sensagri project coordinator, Antonio Ruiz from the University of Valencia. In the following paragraphs, a brief summary of the participants in each of these meetings is given and the main outcomes are described.

MULTIPLY – SENSAGRI – ECOLASS MEETING, 17 NOVEMBER 2017, BRUSSELS, BELGIUM

A joint H2020 meeting with members of all three related projects was set up by Massimo Ciscato from REA, who is the project officer for all three projects. The participants were: Massimo Ciscato, Virginia Puzzolo (REA), Michel Massart (DG GROW), MULTIPLY: Joris Timmermans (Univ. Leiden), ECoLaSS: Markus Probeck (GAF), Baudouin Desclée (SIRS), Sensagri: Milena Planells (CESBIO) - Vanessa Paredes-Gomez (ITACYL). Each of the project concepts and key tasks were presented, followed by questions and answers. Potential synergies between the projects were identified, documents exchanged and follow-up actions agreed. In particular, it became clear that all three projects had different thematic focuses topics without critical overlaps. Potential synergies were identified in developing a future Copernicus agricultural service (specifically between ECoLaSS and Sensagri), and Sentinel time-series derived indicators (ECoLaSS and MULTIPLY). Furthermore, a common approach towards DIAS was discussed – however from a mid-2018 perspective appears obsolete as the five parallel DIASes offer manifold options to engage with. However, exchanging experiences on this topic could have been an asset in future meetings.

THE MULTIPLY WORKSHOP, 6 – 8 FEBRUARY 2018, FRASCATI, ITALY

From 6 – 8 February 2018 a MULTIPLY project workshop took place at ESA/ESRIN in Frascati. The MULTIPLY consortium members were present, as well as several invited external members from both academic institutions and the private industry. Linda Moser (GAF) and Sophie Villerot (SIRS) from ECoLaSS were present, as well as Francesco Mattia (CNR-ISSIA) from the Sensagri project. The MULTIPLY platform and their structure and components was presented, followed by interactive demonstrations and practical assignments. Several discussions took place, enhancing the workshop character. An oral presentation as well as poster session was carried out, where ECoLaSS was presented. This workshop served as a great platform for the interaction between the three projects, for defining synergies as well as other researchers on the field of biophysical parameter retrieval.

DEDICATED H2020 MEETING WITH EC, EEA AND JRC – 15 NOVEMBER 2018, BRUSSELS, BELGIUM

REA has organized a joint meeting on 15 November 2018, with participation of the EC (represented by Virginia Puzzolo, Monika Kacik, Massimo Ciscato and Sabri Mekaoui), the Entrusted Entities EEA (represented by Tobias Langanke and Hans Dufourmont) and JRC (represented by Greet Maenhout, Mr Peter Strobl, Michel Massart and Michael Cherlet) and the four relevant H2020 projects for developing prototypes for potential future Copernicus Land services: ECoLaSS (Markus Probeck, Katharina Schwab, Christophe Sannier, Sophie Villerot, Pierre Defourny, Jolan Wolter) Sensagri (Antonio Ruiz-Verdú, Gérard Dedieu, David Alfonso Nafría García, Michele Rinaldi and Anna Balenzano), MULTIPLY (Peter van Bodegom), and EO4Agri (José Lorenzo Mon, Gerhard Triebnig, Mieguel Ángel Esbri Palomares, Laurent Clergue, Martin Egger). It was a follow-up to the previous fruitful exchange meeting in November 2017 (see above). Several attendees from EC, EEA, JRC, and some DGs were also present at the meeting, which led to numerous constructive discussions on the current status and the future progress of the respective projects.

EXCHANGE MEETING OF COPERNICUS PROJECTS AND IACS – 9 APRIL 2019, VALLADOLID, SPAIN

A new Exchange Meeting back-to-back with the IACS workshop Valladolid from April 10th - 11th (see chapter 3.3.3) took place in order to do a follow up of the projects and continue with the collaboration among

them. This event brought together representatives from MULTIPLY, Sensagri, ECoLaSS, Sen4CAP, EO4Agri and NIVA as well as from JRC, EC (DG AGRI), and local institutions. Attendees were as follows: Antonio Ruiz Verdú (University of Valencia, Sensagri Project Coordinator), Pierre Defourny (University of Louvain, SEN4CAP Project Coordinator), Eva Sevillano Marco (GAF, ECoLaSS Project Coordinator), Mariano Navarro (NIVA H2020 Project), Isidro Campos Rodríguez (DG AGRI), Miguel Ángel Esbri (EO4Agri H2020 Project), David Sánchez (ITACYL, Sensagri Project), Vanessa Paredes (ITACYL, Sensagri Project), Philippe Loudjani, Pavel Milenov and Wim Devos from JRC (MARS Group), Owen Jones, Ana Brncic, Jean-Luc Widlowski and Jerome Walsh from DG AGRI. It was a good opportunity of exchange and sharing of experiences, especially with the recently started projects like NIVA (2019-2022). EU institutions and REA addressed the topic of agriculture in the frame of CAP and other related policies evolution and application. In this context, ECoLaSS findings, made within the tests and prototypes in context of agriculture (WP 33, WP 44), have shown that they provide a sound ground from a realistic implementation point of view regarding a possible future implementation of an HRL Arable Land product. A very relevant topic towards the agriculture developments approached by the CLMS H2020 projects is the reference data availability, mainly LPIS/IACS data and especially their crucial role in terms of timeliness of mapping production. Current access limitations to LPIS for the CLMS have been already indicated to the responsible DGs (mainly DG AGRI) and to EEA in the course of the ECoLaSS stakeholder interaction process.

3.2.5.2 CLMS Continental Component operational implementation projects

Additionally, the operational implementation projects of the Copernicus Land Pan-European High Resolution Layers (HRLs) are considered direct important stakeholders to the ECoLaSS project.

The HR Layers 2015 have served as basis for the ECoLaSS methodological developments, e.g. for change detection (WP 34). The following HRL projects/products and respective project coordinators were considered the most relevant HRL stakeholders during the first ECoLaSS project phase:

- HRL Imperviousness, coordinated by GeoVille. The coordination has been established mainly via Christophe Sannier (SIRS) in the frame of SIRS's involvement as a main mapping partner and via Linda Moser (GAF) in the frame of GAF's responsibility for product validation.
- HRL Forest, coordinated by GAF. A very close and direct coordination has been ensured through the HRL FO project coordinator, Mr David Herrmann (GAF), who directly supports the development work in ECoLaSS.
- HRL Grassland, coordinated by GAF. Likewise, a very close coordination has been ensured through the HRL GRA project coordinator, Ms Regine Richter (GAF), who also directly supports the development work in ECoLaSS.

A continuous exchange from the HRL 2015 projects towards ECoLaSS has indeed taken place, but also the other way round: Some provisional ECoLaSS experiences and lessons-learned have been combined and presented together with the extensive HRL 2015 lessons-learned at the HRL Final Technical Meeting in Copenhagen on 03 May 2018 (cf. section 3.2.1).

In early 2019 the production of the HRLs 2018 has started. With GAF and SIRS involved in the update of the HRLs Grassland, Forest, and Imperviousness a close exchange between the projects is being continuously ensured.

3.2.5.3 ESA-funded projects regarding relevant agricultural topics

SEN2AGRI

The Sen2Agri project aimed at developing and demonstrating the large-scale exploitation of the Sentinel-2 time series for agriculture applications. This 4-year project made available to all and for any applications the open source Sen2Agri system to derive in near real time four basic agriculture products in a seamless and mostly automatic way at national scale. After the demonstration in 2016-2017 for 3 countries and 6 sites around the world, a community of Sen2Agri users has been established and coordinated by UCLouvain. The Sen2Agri system was explicitly mentioned in the JRC recommendations for the Copernicus service development for agriculture. In particular, the products accuracy of Sen2Agri were found instrumental to highlight in the early days of Sentinel-2 exploitation the performances of Sentinel-2 time series for mapping the cropland and the main crop types at national scale. Some IT cloud infrastructures already offer installed Sen2Agri system as an agriculture service. The Sen2Agri system outcome serves as a baseline for the agriculture products development activities in the ECoLaSS project.

SEN4CAP

The 3-year Sen4CAP project was requested by DG AGRI and implemented by ESA to investigate the feasibility of the monitoring approach for the new CAP regulations and the forthcoming CAP 2020+ reform thanks to the Copernicus data. In close partnerships with the Paying Agencies of 6 countries, the consortium led by UCLouvain is developing and testing methods to meet the very specific requirements of the Paying Agencies. It is indeed expected that the Paying Agencies and their respective partners will make an intensive use of the Sentinel-1 and 2 for their control and later to inform the farmers about their eligibility. The forthcoming Copernicus service might also include some parts of the CAP 2020+ monitoring activities as support to the Paying Agencies based on the Sen4CAP outcome but also based on the ECoLaSS findings regarding grassland and agriculture products.

3.3 Workshops and Events

In cases where this is feasible, consultation with stakeholders for ECoLaSS is arranged back-to-back with other events where participation of the consortium partners is foreseen, e.g. at international Earth Observation conferences and workshops (section 3.3.1), Copernicus-related events (section 3.3.2), and other events and workshops with relation to stakeholder interaction for Copernicus Land developments (section 3.3.3).

The following three sections will detail the objectives of attending the respective event, briefly explain the contents of the event, focus on the stakeholders that ECoLaSS consortium partners interacted with, and summarise the outcomes of the stakeholder interactions.

3.3.1 International Earth Observation Conferences

25TH MARS CONFERENCE – 26-28 NOVEMBER 2019, PRAGUE, CZECH REPUBLIC

Actions are currently being taken to present ECoLaSS at the 25th MARS conference from 26-28 November 2019 in Prague, Czech Republic. The event that is organized by JRC, DG AGRI and the Czech Republic Paying Agency for Agriculture functions as a platform for exchange and discussion on the topic IACS, including the actual status as well as future developments, technical interaction and implementation experiences of different member states. By then, the final ECoLaSS Agriculture prototypes (i.e., crop mask, crop types, and phenology products) are planned to be presented.

MUNICH REMOTE SENSING SYMPOSIUM 2019 – 18-21 SEPTEMBER 2019, MUNICH, GERMANY

The ECoLaSS Project Coordinator (GAF) presented some of the prototypes in the Munich Remote Sensing Symposium 2019 (MRSS19) which was held in conjunction with Photogrammetric Image Analysis 2019 on September 18th-20th, 2019 in Munich, Germany. The final versions of the Grassland, Agriculture and Forest prototypes in the Central demonstration site were presented in a poster, and communicated in the oral presentations at the Land Cover dedicated session. This event was supported by the International Society for Photogrammetry and Remote Sensing (ISPRS), the German Society for Photogrammetry, Remote Sensing and Geoinformation, the Remote Sensing and Photogrammetry Society, European Association of Remote Sensing Laboratories, the International Association of Geodesy, EuroSDR, the International Federation of Surveyors, Gesellschaft für Geodäsie, Geoinformation und Landmanagement, and DLR. The ECoLaSS poster received many consultations. Interactions with academic institutions and representatives took place face to face and some posterior contacts have been made by email. Among the most frequent questions to be remarked was the request of the availability of such products at the pan-European and global scales in the CLMS portfolio. There was an important interest and recognition of the improvements achieved in ECoLaSS.

JOINT URBAN REMOTE SENSING EVENT 2019 – 22-24 MAY 2019, VANNES, FRANCE

The Joint Urban Remote Sensing Event is a conference that occurs every other year and is one of the most important conference dedicated to the application of remote sensing to the monitoring of the urban environment.

The Conference was attended by SIRS. Although there was no specific presentation of ECoLaSS, as participation was decided at a later stage, it was possible to set-up a booth. It was an excellent opportunity to interact with members of the scientific community, to learn about the latest development in terms of urban monitoring from remote sensing and to make them aware of the latest developments performed by ECoLaSS in relation to the evolution of CLMS products.

LIVING PLANET SYMPOSIUM – 13-17 MAY 2019, MILAN, ITALY

The Living Planet Symposium (LPS) is an international conference on Earth Observation that is organised by ESA every 3 years. With several thousand attendees, it is one of the biggest conferences on EO worldwide.

In 2019, the event took place in Milan, Italy, organized by ESA and the Italian space agency ASI. This year's objectives were understanding the earth system, space 4.0 and Earth Observation, benefits for a resilient society, and the interactions between public and private sector. The conference brought together not only scientists but also members of private sector with the opportunity to explore how emerging technologies are revolutionizing the use of Earth observation and how business and the economy can benefit from this new epoch.

ECoLaSS was represented by all consortium partners there. Furthermore, the project was introduced in an oral presentation by Markus Probeck (GAF) (*"Prototypes of Future Copernicus Land Monitoring Products - The ECoLaSS Project"*) within the theme: A.3.09 Biosphere: Next Generation Land Cover Monitoring Services: Towards a Flexible, User-Oriented Approach. Furthermore, the outcomes on the topic agriculture were summarized in a poster (*"A Candidate for Next-generation Copernicus High Resolution Layers: Agriculture"*).

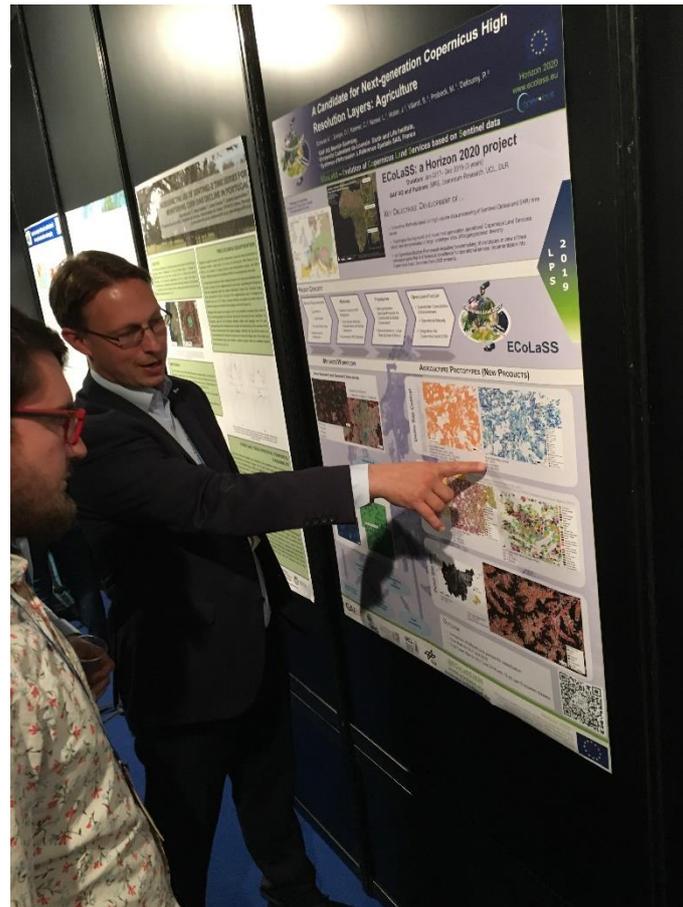


Figure 1: Vivid exchange at the ECoLaSS poster about the latest outcomes of the agriculture tests and prototypes.

BIG DATA FROM SPACE CONFERENCE – 19-21 FEB. 2019, MUNICH, GERMANY

Big Data from Space was organised by ESA in Munich, Germany (<https://www.bigdatafromspace2019.org/QuickEventWebsitePortal/2019-conference-on-big-data-from-space-bids19/bids-2019>) focused mainly on state-of-the-art machine learning techniques such as deep learning applied on Earth Observation datasets, and on the availability of serverless environments such as research computing clouds (or DIASes). Gernot Ramminger (GAF) showed the DIASes potential in the frame of ECoLaSS during the oral presentation “Production of Copernicus High Resolution Layers 2018 –A Cloud Native Land Cover Mapping Environment on MUNDI for Large Scale Processing”.

At the dedicated poster session, a poster was presented by the ECoLaSS team (SIRS with Antoine Masse and Sophie Villerot supported by GAF with Markus Probeck, Katharina Schwab and Eva Sevillano Marco) on the work done in the first project phase on the Imperviousness layers, in particular related to the change layers between 2015 and 2017 on the South-West testsite. The accent was put on the satisfying results of the production of status layers using Sentinel data, as well as on the improved workflow to ensure the compatibility of new status layers with the time series of HRLs available and its automation.



Figure 2: ECoLaSS representatives in front of the poster presented at the BiDS'19, on the 20th February 2019.

THE 24TH MARS CONFERENCE – 21-22 NOVEMBER 2018, DUBROVNIK, CROATIA

The JRC, the DG AGRI and the Croatian Paying Agency for Agriculture Fisheries and Rural Development (APPRRR), have organised the 24th MARS Conference in Dubrovnik on 21st and 22nd November 2018. The annual conference provides a platform. On the one hand, the conference provided a forum to meet stakeholders. On the other hand, it gave the opportunity to discuss Member States' experiences and recent developments regarding the monitoring approaches within the IACS, focussing on the future objectives of the European CAP and technology developments.

SIRS (Jean-Paul Gachelin) presented the latest results of the agricultural prototypes produced in the first phase of the project, in particular the crop type map and the crop mask that were calculated for two European and one African demonstration site.

ESA Φ -WEEK – 12-16 NOVEMBER 2018, FRASCATI, ITALY

The yearly Φ -Week organised by ESA is an event focusing on EO Open Science and FutureEO. The objective is to review the latest developments in Open Science trends providing talks, workshops, roundtables, etc. Experts with different backgrounds (e.g. EO researchers, data scientists, non-space corporates, tech leaders, or entrepreneurs) get the opportunity to connect and network and to get insights to the latest trends in the field of EO. Antoine Masse (SIRS) represented ECoLaSS there.

FORESTSAT CONFERENCE – 2-5 OCTOBER 2018, MARYLAND, USA

The Association for Forest Spatial Analysis Technologies (ForestSAT) organises a conference every two years bringing together researchers, practitioners and stakeholders working in the context of the observation and analysis of forests. In 2018, the main themes were global forest observation, new approaches to forest ecosystem modelling, the revolution in remote sensing fusion, forest mapping and inventory, and forest management and policy. The ECoLaSS consortium was represented there by SIRS (Christophe Sannier).

INSPIRE CONFERENCE – 18-21 SEPTEMBER 2018, ANTWERP, BELGIUM

ECoLaSS was presented at the INSPIRE conference in Antwerp, Belgium, from 18-21 September 2018. The conference subtitle “Inspire Users: Make it work together” implies (i) showing the added value and benefits of INSPIRE for both the technical experts and the end-users, (ii) creating a stronger basis for implementation by the data providers, (iii) shifting the mindsets from a perceived legal burden to one that offers opportunities for more effective business models in a 'user-centric' digital service community, (iv) discussing the potential and need for greater synergies between European, national, regional and local strategies, programmes and initiatives, and (v) discussing difficulties in implementing and using INSPIRE and exchanging of views on the nature of the problems encountered and the possible solutions.

Upon an invitation from DG ENV, the project’s contribution was shown in the session on “GEOINT for Environmental Compliance Assurance in rural areas/agriculture”, alongside with talks from DG ENV, JRC, and further H2020 projects like Sensagri, amongst others, addressing related relevant topics in the framework of, e.g., Copernicus, land monitoring, crop mapping, CAP monitoring, water abstraction and protection, Sentinel data etc. ECoLaSS was represented by Omar Ali Mohamed (UCL). Focus was laid on ECoLaSS results in the fields of agriculture and grassland, and the INSPIRE conformity of provided data products in ECoLaSS as well as for Copernicus land products. More information on the programme (see Figure 3) is available here: <https://inspire.ec.europa.eu/conference2018/overview>.

18/09/2018

08:00	Exhibition Hall	Registration
09:00	Room A	Tools and technologies
	Room B	Best practices
	Room C	Management of natural resources
	Room D	Spatial planning (land – maritime – coastal zones)
	Room E	More Practical INSPIRE Practice
	Room F	Priority datasets for eReporting
	Room G	Introductory INSPIRE training
10:30	Exhibition Hall	Coffee
11:00	Room H	Opening Plenary
12:30	Exhibition Hall	Lunch
14:00	Room A	Helping to make INSPIRE work – MIWP actions and tools
	Room B	National approaches and strategies
	Room C	GEOINT for Environmental Compliance Assurance in rural areas/agriculture
	Room D	Other applications
	Room E	Publishing INSPIRE services with GeoServer and HALE
	Room F	Is INSPIRE really working?
	Room G	Training education in GI and EO sectors
15:30	Exhibition Hall	Coffee
16:00	Room A	The future of INSPIRE Monitoring and Reporting
	Room B	ISA2 Programme, connecting public administrations at national, regional and local level
	Room C	GEOINT for Environmental Compliance Assurance in rural areas/agriculture
	Room D	Local – Regional cooperation
	Room E	Publishing INSPIRE services with GeoServer and HALE
	Room F	Promotion of best practices for national environmental information systems and tools for data harvesting at EU level
	Room G	Training education in GI and EO sectors

Figure 3: Agenda of the first day (18 September 2018) of the INSPIRE Conference 2018, including two sessions on GEOINT Symposium.

IGARSS – 23-27 JULY 2018, VALENCIA, SPAIN

The ECoLaSS prototypes on Forest and Agriculture was presented at the International Geoscience and Remote Sensing Symposium, IGARSS 2018, (<https://www.igarss2018.org/>) from 23 – 27 July 2018. This was the 38th annual symposium organised by the Institute of Electrical and Electronics Engineers (IEEE) Geoscience and Remote Sensing Society (GRSS). The local host is the University of Valencia, who is

coordinating the H2020 related-project Sensagri. The special title for 2018's IGARSS is "Observing, Understanding And Forecasting The Dynamics Of Our Planet". Being the largest remote sensing conference in the world, IGARSS covers multiple topics regarding state-of the art methods and applications using all kinds of EO data supported by geodata. The latest methods, products and novelties are presented at IGARSS, often before being known or published elsewhere.

ECoLaSS was presented in the session "WE4.R4: Remote Sensing for Estimation of Biophysical Parameters II". The project uses this platform to advertise ongoing developments and interaction with, in particular, the scientific community.

EARSel SYMPOSIUM AND EARSel/NASA LULC WORKSHOP – 9-12 JULY 2018, CHANIA, GREECE

The ECoLaSS prototypes as outcomes of Task 4 was presented to a large audience at the 38th EARSel Symposium in Chania, Crete, from 9 – 12 July 2018. The European Association of Remote Sensing Laboratories (EARSel) – a scientific network of European remote sensing institutes, coming from both academia and the commercial/industrial sector – organizes this annual event. The targeted session is within the 3rd EARSel SIG LU/LC and NASA LCLUC joint Workshop programme.

ECoLaSS was presented in WSS-3: EARSel/NASA LULC Workshop Session II, which was chaired by Dinka Dinkova of the European Commission (DG GROW). The audience comprised participants from space agencies and research centres like NASA JPL, ASI and DLR, national institutes and authorities, private companies and universities. The workshop provided an opportunity to interact with land use/cover specialists in relation to sustainability research. This also was a great opportunity for discussions between European and American researchers, promoting future collaborations.

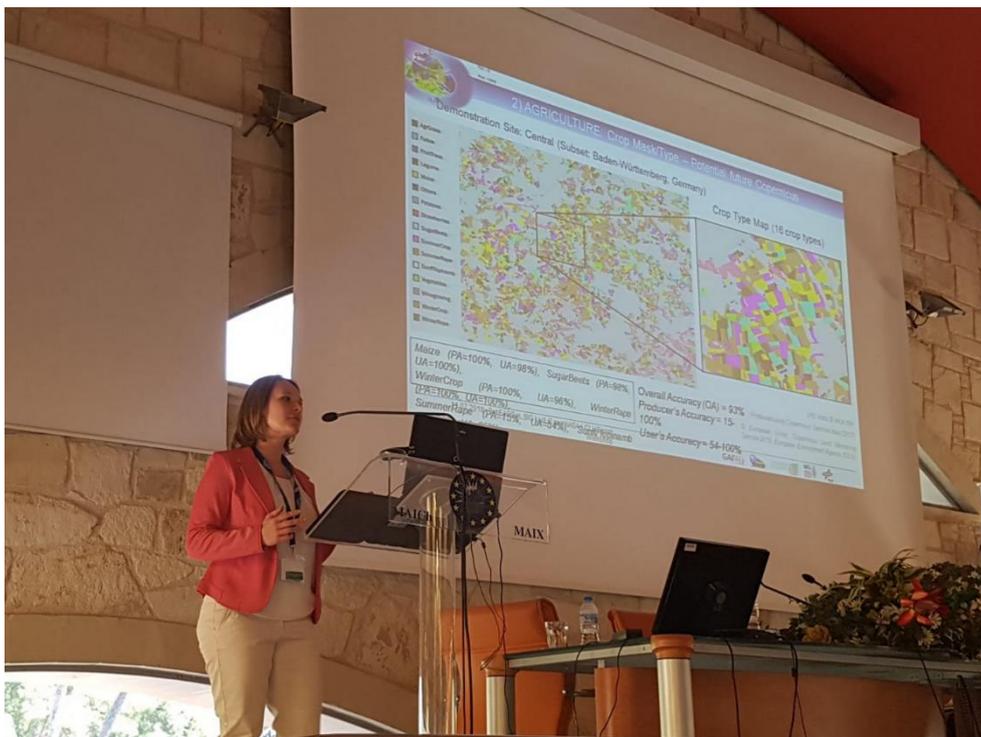


Figure 4: ECoLaSS being presented by Linda Moser (GAF) at EARSel Symposium, with the EARSel/NASA LC/LU Workshop (in purple) on 11 and 12 July 2018.

PROBA-V SYMPOSIUM – 29-31 MAY 2018, OSTEND, BELGIUM

The PROBA-V Symposium is organized every three years to gather most of the PROBA-V research and operational users for a scientific conference. ECoLaSS was represented by UCLouvain allowing to take part to the discussion about the choice of various constellation or the possible Copernicus future medium

resolution missions. In particular the possible scenarios to meet daily global observation requirements have been discussed thoroughly in the context of the Copernicus program in addition to Sentinel-3 mission.

SÉMINAIRE DATA, DATA SCIENCE ET BIG DATA – 14 MARCH 2018

The French CGDD is one of the key stakeholders in France in relation to CLMS and an internal meeting was organised in which SIRS was requested to present the CLMS Pan European Component and evolutions resulting from the use of the sentinels and big data in general.

BIG DATA FROM SPACE CONFERENCE – 28-30 NOVEMBER 2017, TOULOUSE, FRANCE

Big Data from Space was organised by ESA in Toulouse, France and as indicated on the conference web site “refers to the massive spatio-temporal Earth and Space observation data collected by a variety of sensors ranging from ground based to space-borne and the synergetic use of data coming from other sources and communities. This domain is currently facing sharp development with numerous new initiatives and breakthroughs from intelligent sensors to data science. These developments are empowering new approaches and applications in various and diverse domains influencing life on earth, from sensing cities, monitoring human settlements and urban areas to climate change and security”. This conference presented a unique opportunity to get acquainted with the latest development in terms of the use of the state of the art tools and methods related to automatic feature extraction and deep learning methods. The conference happened at a key moment in relation to the finalisation of task3 and the implementation of Task 4 of ECoLaSS to make sure that the methods implemented as part of the prototypes included the latest and most promising development.

THE 23RD MARS CONFERENCE – 28-29 NOVEMBER 2017, GORMANSTON, IRELAND

The MARS conference is organised annually by JRC, in collaboration with the Directorate-General for Agriculture and Rural Development (DG AGRI) and the Irish Department of Agriculture, Food and the Marine (DAFM), and took place from 28 to 29 November 2017 in Gormanston, Ireland. The conference provides a platform to present and discuss Member States’ experiences and general observations regarding the IACS, including developments in shared management. ECoLaSS participated with the consortium members UCL, GAF and SIRS, and presented the ECoLaSS concept and first outcomes with focus on agriculture and grassland. The MARS Conference is a great platform for interacting with stakeholders from the agricultural domain and to assess and discuss the requirements and specifications of a future CLMS agricultural service. An agenda as well as all presentations are available here: <https://ec.europa.eu/jrc/en/event/conference/23rd-mars-conference>.

IUFRO 125TH ANNIVERSARY CONGRESS – 18-22 SEPTEMBER 2017, FREIBURG, GERMANY

This congress, held in September 2017, was attended by SIRS and had the focus on “Interconnecting Forests, Science and People” and it particularly relevant for improvements of the HRL forest. See more information at: <http://iufro2017.com/>.

MULTITEMP – 27-29 JUNE 2017, BRUGES, BELGIUM

The Belgian Science Policy Office (BELSPO) and the Flemish Research Institute VITO Remote Sensing hosted the MultiTemp 2017 conference in Bruges, Belgium from 27-29 June 2017. The MultiTemp is a bi-annual scientific conference with the primary objective to advance the knowledge on using EO time series to address a wide range of applications. See more information at: <https://multitemp2017.vito.be/>. It was attended by SIRS, UCL and GAF staff, and proved very useful for networking and identification of suitable methods for CLMS Evolution in view of massive Sentinel-1, Sentinel-2 and Sentinel-3 time series processing.

ISRSE – 8-12 MAY 2017, TSHWANE, SOUTH AFRICA

The 37th International Symposium on Remote Sensing of Environment (ISRSE) took place in Tshwane, South Africa 8 to 12 May 2017. The theme was “Earth Observation for Development and Adaptation to a Changing World”, see more information at: <http://isrse37.org/>. The conference was attended by SIRS in order to identify relevant initiatives from the conference and collect a synthesis of user requirements for Copernicus Evolution related to Global applications. Likewise, it was used for organising specific meetings with the EEE representatives for CLMS Global, i.e. JRC. Specifically, a consultation took place with Mr Michael Cherlet, being responsible for the CLMS Global component in JRC. This exchange was followed up by a later telephone conference and a dedicated meeting (see section 3.2.1).

WORLD COVER – 14-16 MARCH 2017, FRASCATI, ITALY

The WorldCover 2017 conference in ESA/ESRIN from 14 to 16 March 2017 was hosted by the European Space Agency together with GEO, FAO and the EU. The whole Land Monitoring community met for three days in order to present their work and deduct, e.g., multi-user requirements (climate modellers, geographers, scientists, environmentalists, commercial participants) for high and low resolution land cover mapping – from country to continental and global scale. For the programme and more information please see: <http://worldcover2017.esa.int/index.php>. Being a topical key conference in 2017 it was attended by all five consortium partners GAF, SIRS, JR, UCL and DLR, which also presented their work and results from other ongoing projects on the Land topic and Copernicus. The poster contribution of ECoLaSS was shown in two poster sessions; the abstract and poster can be downloaded from the ECoLaSS website: <https://www.ecolass.eu/news-events-1>.

Interactions with various European stakeholders (e.g. EC and EEA), scientists from research institutes, commercial partners, project coordinators and the European Space Agency took place. The community showed strong interest in the ECoLaSS project, and, in relation to that, the new HRL 2015 products which were presented as well by GAF. Several discussions on the topics of Validation, use of SAR in Copernicus, time series applications in Copernicus, future CLMS services etc. took place.

The most important stakeholders, which the consortium interacted with, or which showed interest in ECoLaSS, were:

- EEA – Mr Tobias Langanke: Since the consortium has been in contact previously, it will continue to update him about ECoLaSS development and invite him to future review meetings as stakeholder.
- JRC – Mr Jean-Francois Pekel: The purpose of the interaction was to explain the contents of ECoLaSS and to discuss the new 30m global water layer in contrast to the HRL Water and Wetness. Knowing J.F. Pekel already since a longer time, ECoLaSS plans to remain in contact with him, in framework on a future HR water layer as part of the Copernicus land global component.
- EC DG GROW – Mr Michel Massart: The objective of the interaction was a short ~10 minutes overview of the ECoLaSS project objectives and contents. Since the consortium has been in contact previously it will continue to update M. Massart about ECoLaSS development and invite him to future review meetings as stakeholder.
- ESA – several of ESA’s leading technical officers and staff were introduced to the project ECoLaSS: Ms Bianca Hörsch, Ms Susanne Mecklenburg, Mr Steven Briggs, Mr Olivier Arino, Mr Michael Rast, Mr Marc Paganini, Mr Michael Berger, Mr Marcus Engdahl, and Mr Zoltan Bartalis. Some ESA project officers showed great interest in future developments as proposed by ECoLaSS. Particularly Susanne Mecklenburg, the Sentinel-3 mission manager, is very interested to be updated about future developments regarding synergies of Sentinel-2 and -3. Since all ECoLaSS consortium members have good contacts to ESA, ECoLaSS will stay in contact and provide updates on the project.
- United Nations Convention to Combat Desertification (UNCCD) secretariat, Bonn – Ms Sara Minelli: The interaction was an interesting discussion on land degradation from remote sensing, a topic in relation but not directly tackled by ECoLaSS.

- World Resource Institute (WRI) – Ms Michaela J. Weisse: The objective of the interaction was to present ECoLaSS and the new HRL Forest to Ms. Weisse, who presented on operational land cover systems: lessons learned from the Global Forest Watch.
- H2020 Project Sensagri – Mr David A. Nafria (Agricultural Technological Institute of Castilla and Leon, Spain) was visited during the poster session, where he presented a first poster of the H2020 project Sensagri, which was awarded a Grant in the same call as ECoLaSS on the same topic of Copernicus Land Service Evolution. While ECoLaSS tackles various layers, Sensagri concentrates on a future agricultural layer. Contacts with Sensagri were further continued by arranging a teleconference between the project coordinators of both projects (see section 3.2.5).
- Copernicus Land High Resolution Layers 2015 – Ms Linda Moser (GAF): A presentation on the HRL 2015 status and developments was held by the ECoLaSS scientific coordinator from GAF, which – besides the consortium partner SIRS which is as well consortium partner in the HRL production – is anyway in contact with the project coordinators of all five currently produced HRLs, and synergies are exploited in the ECoLaSS project.
- Copernicus Land Global component – Mr Marcel Buchholz (VITO) presented a side-product of the current CLMS global component on a 100m scale on dynamic land cover. The interaction consisted in a short presentation on ECoLaSS and an exchange of state of the art methodological ideas on time series analysis. Further contacts with M. Buchholz followed.
- Several further research institutes, universities and companies – that cannot all be named in the framework of this report – presented projects of relevance for ECoLaSS or future LC/LU mapping and land monitoring in general.

3.3.2 Copernicus-related Events (National & European)

COPERNICUS DATA ACCESS AND CONTRIBUTING MISSIONS WORKSHOP – 2 APRIL 2019, BRUSSELS, BELGIUM

On April 2nd 2019 the EC held a workshop with the focus on access to Copernicus Sentinel data, service information, contributing mission and in-situ data. One of the aims of this workshop was to collect Member States and industry views on the present and future developments of Copernicus data and information access (DIASes). Data and information access challenges and evolutions as well as the status of the Copernicus Data Warehouse and Contributing Missions were addressed. Another focus area was Artificial Intelligence (AI). The workshop was attended by Markus Probeck (GAF).

CEREMA COPERNICUS DAY – 11 FEBRUARY 2019, TOULOUSE, FRANCE

The Cerema Copernicus Day was organised by the French Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement (Cerema) and partners in order to provide a platform for the exchange between industry and science about the potential use of satellite imagery in context to climate change. Antoine Masse (SIRS) attended the event.

GERMAN NATIONAL COPERNICUS USER FORUM – 27-29 NOVEMBER 2018, BERLIN, GERMANY

The German National Forum on Remote Sensing and Copernicus is conducted every 1.5 years. The last event took place from 27-29 November 2018 in Berlin. ECoLaSS was represented there by GAF. This event further enhanced the interaction with and feedback from German national stakeholders.

COPERNICUS WORKSHOP “EUROPEAN LAND MONITORING AT ITS CROSSROADS: OPPORTUNITIES AND CHALLENGES” – 8-9 OCTOBER 2018, INNSBRUCK, AUSTRIA

This event, entitled "European land monitoring at its crossroads - opportunities and challenges" was organised under the Austrian presidency of the Council of the European Union and took place in Innsbruck on 8 and 9 October 2018. It provided an overview of the status of the Copernicus Land Monitoring Service to date and provided an opportunity to discuss the challenges and opportunities for the near future, including the increasing international competition. The high-level event was opened by the Federal

President of the Republic of Austria, Mr Alexander Van der Bellen, and was attended by various high-level representatives and decision makers from EEA, EIONET, ESA, by users of Copernicus from the public and private sector as well as by various international experts from the science domain and industry. The event particularly saw also various practical use cases of Copernicus services, presented in several joint presentations by public entities' user representatives and EO service providers. Also the ECoLaSS partners GAF and SIRS took part in these joint presentations, in order to support strengthening and further propagating the use of the Copernicus Land Monitoring Service, though with cases other than from ECoLaSS. This Copernicus workshop provided many opportunities for interacting with the key Copernicus stakeholders in the Land domain and discussing the expected future developments, and was a must to attend.

COPERNICUS EVENT "20 YEARS BAVENO MANIFESTO" – 20-21 JUNE 2018, BAVENO, ITALY

The European Commission had invited the European Copernicus and Earth Observation community to a high-level Copernicus event in Baveno at the shores of the Lake Major, Italy, from 20th to 21st June 2018, to commemorate and celebrate the 20th anniversary of the signature of the Baveno Manifesto in 1998, which had constituted the foundation of the Global Monitoring for Environment and Security (GMES)/Copernicus. High-level keynote speeches on the achievements and future prospects of Copernicus and discussion contributions were given by of the EC Commissioners for Internal Market, Industry, Entrepreneurship and SMEs, Ms Elżbieta Bieńkowska, the EC Commissioner for Education, Youth, Sport and Culture, Mr Tibor Navracsics, and the Director-Generals of relevant EU agencies and institutions such as Mr Jan Wörner (ESA), Mr Hans Bruyninckx (EEA), Mr Alain Ratier (Eumetsat), Ms Florence Rabier (ECMWF), Mr Pascal Legai (EU Satellite Centre), Mr Pierre Bahurel (Mercator Ocean) as well as several EC Directors and Unit Heads, Member State ministers and government officials, and high-level industry representatives (EARSC, Eurospace)³. The event was attended by approximately 350 participants from all parts of the European Earth Observation sector. From the ECoLaSS team, Markus Probeck (GAF) participated to the two-day event.

Besides providing deep insights and inspiring reflections on the history, current role and future development of Copernicus, the event also featured the official kick-off of the five Data and Information Access Services (DIAS). Representatives of all five DIAS teams, i.e. of "CreoDIAS" (led by CloudFerro), "mundi" (led by ATOS), "ONDA" (led by SERCO), "sobloo" (led by Airbus), and "WEkEO" (led by EUMETSAT, ECMWF and Mercator Ocean), presented an overview of the operational setups, capabilities and specific characteristics of the five DIASes. Additionally, there was a booth exhibition where all five DIASes showed practical hands-on experiences and examples how to practically work with these platforms. A bit surprising to many event participants, it turned out that "the fifth DIAS" (WEkEO) which is led by public institutions, aims to compete with the other (fully industrial) DIASes in all of the thematic Copernicus service domains, including also those topics where a strong industrial service heritage has been established over the last years (i.e. mostly the CLMS, but also the CEMS and the CSS).

Anyway, it became obvious that the current DIAS platform developments are progressing very fast. With GAF and DLR, two of the ECoLaSS partners are very close to the developments as they are partners in the ATOS-led mundi DIAS. This will also facilitate doing some tests of ECoLaSS processing chains in the second Reporting Period, preferably on mundi, which is the most familiar one to the consortium, and also provides the presumably best trade-off between required input data and cost for the kind of services aimed for. But also the other four DIASes, will be closely reviewed and their capabilities and commercial conditions be investigated. All plenary presentations and discussions, as well as the complete DIAS kick-off, were broadcast via internet livestream and have also been made publically available after the event for reviewing.⁴ Alongside the event, short meetings with several ECoLaSS stakeholders took place, as described in more detail in section 3.2.1.

³ Detailed agenda at: http://www.copernicus.eu/sites/default/files/documents/News/Agenda_Baveno_vf.pdf

⁴ Available at: <https://www.pscp.tv/CopernicusEU/10yJAQmmZ0oJb/>

COPERNICUS FOR AGRICULTURE - INDUSTRY WORKSHOP – 5 FEBRUARY 2018, BRUSSELS, BELGIUM

The aim of the workshop was to address the possible role of the private (downstream) sector for possible solutions, integrating Copernicus data and Copernicus services' information, in support of the agricultural end-users at the different levels: international, European and Member States' level (<http://copernicus.eu/agriworkshop>). The audience and presenters consisted of EU DGs and entities such as DG AGRI, DG ENV, DG JRC, REA, EEA as well as global players such as the UN FAO and UN World Food Programme (WFP), several national paying agencies, and some representatives from industry, however, with only two industry presentations carried out by GeoVille und Vista. Presentations and Minutes of the workshop are available at the event webpage.

ECoLaSS was presented within the framework of a presentation on ongoing H2020 projects with relevance to Copernicus for agriculture, presented by Virginia Puzzolo (DG GROW). Updated information on ECoLaSS was exchanged in short meetings set up with the following stakeholders: Virginia Puzzolo, Michel Massart and Catharina Bamps (DG GROW), Tobias Langanke, Hans Dufourmont (EEA), Guido Lemoine (JRC), Mohamed El Aydam, Frank Vassen (DG ENV), Rogerio Bonifacio (UN WFP), Benjamin Kötz, Susanne Mecklenburg (ESA) and Antonio Ruiz (University of Valencia, H2020 Sensagri Project Coordinator).

CLC+ WORKSHOP – 16 NOVEMBER 2017, BRUSSELS, BELGIUM

EEA is currently discussing future CLC+ specifications within EIONET. An EIONET NRC Land Cover meeting had taken place in Copenhagen on 09/10 October 2017, where ECoLaSS would have also liked to attend in order to present The ECoLaSS project goals and stimulate feedback, however due to the potentially commercially relevant discussion on CLC+, participation was unfortunately not admissible. However, the EC (supported by the Copernicus Support Office) organised in the follow-up a public user consultation workshop on CLC+ in Brussels on 16th November 2017, where future plans for CLC+ were made public in more detail. The ECoLaSS team was represented there by SIRS and GAF in order to assess the further development needs and implications for the work in ECoLaSS. EEA had set up the meeting in a format whereby participants could provide direct feedback to dedicated questions on the potential range of service and products specifications via an online voting tool. This appeared to be very useful for adding also industry's technical expertise (to the typically quite demanding stakeholder and user requirements) and help the CLC+ specifications converge into a technically viable direction. In that sense, ECoLaSS partners were able to provide also several discussion contributions. Two crucial issues on the workshop were noted by the ECoLaSS participants:

- The CLC+ concept as presented by EEA and the EIONET EAGLE group showed still some weaknesses in explaining the relations (in terms of input/output data flows) between the various CLC+ components, i.e. between the CLC Backbone (foreseen for industrial implementation) and the subsequent value-adding steps up to the final CLC+ and CLC Legacy products. It was agreed that further conceptual work would be necessary.
- There was open disagreement as to which input data should be used on a pan-European level to support the setting-up of the so-called hardbones as part of the CLC Backbone product. Whereas EEA clearly favoured using Open Street Map (OSM) for generating a first “skeleton” of linear elements such as road and rail networks, the Eurogeographics representatives insisted that national in-situ data be used for that purpose. EEA argued that pan-European availability as well as (time and spatial) consistency were paramount considerations in the CLC+ concept, and therefore OSM would be the dataset to be used at the current moment where in-situ data availability from EEA39 member states is still very heterogeneous and fragmented. This position was also backed by industrial participants.

EUROGEOGRAPHICS LAND MEETING – 15 NOVEMBER 2017, BRUSSELS, BELGIUM

One day before the CLC+ user consultation workshop in Brussels (see above), a LC/LU workshop on “Land use/Land cover products: challenges and opportunities” was conducted in Brussels on 15th November 2017. The meeting was jointly chaired by Eurogeographics, EEA and EC, and was foreseen as a dedicated

preparation meeting to the CLC+ workshop. The meeting was attended also by ECoLaSS representatives from GAF and SIRS.

Despite an initial keynote by EEA on the concept and portfolio of the Copernicus Land Monitoring Service and an introduction to the EAGLE LC/LU concept, the agenda was slightly dominated by presentations of national Eurogeographic members, showcasing a huge variety (and diversity) of national LC/LU dataset approaches. These were perceived by the ECoLaSS team members as being predominantly of experimental or at least not large-area operational and/or consistent nature, as well as partially focussing more on downstream aspects of national LC/LU. The later lines of argumentation of using European-wide consistent data versus using national in-situ data in a bottom-up approach for CLC+ (as became obvious in the CLC+ user consultation workshop the following day), were already becoming visible. Otherwise, the meeting proved rather inconclusive and unfortunately not adding much value for ECoLaSS.

CCI+ INFORMATION DAY – 6 JULY 2017, FRASCATI, ITALY

The European Space Agency had organised an Information Day on the upcoming next phase of the ESA Climate Change Initiative (CCI+) on 6 July 2017 in Frascati, informing potential bidders and stakeholders on future procurement plans under the CCI programme element over the period 2017-2020. Eligible participation to the bids is limited to the 18 ESA Member States having subscribed to the programme. Amongst others, the countries of origin of all five ECoLaSS project partners are eligible.

For the ECoLaSS project, the CCI+ Information Day was specifically relevant in terms of the intended tender for the **ECV Land Cover**, which was published end-August 2017. High-resolution maps of land cover and its changes (10-30m spatial resolution) are considered relevant for enabling proper climate modelling, mitigation and adaptation activities, as they are partially determined by regional climate and may thus indicate climate change.

The upcoming CCI+ ECV Land Cover specifically aims to address:

- Understanding land cover classification variability across spatio-temporal scales (specifically between medium and high-resolution);
- Understanding how the Land Cover ECV products at moderate resolution relate to the map products needed for mitigation and adaptation at local scales including forest monitoring and reporting activities in the frame of the REDD+ mechanism;
- Timeframe to be considered: 1992-2015.

These development activities aim at bridging the current product scale gap between the medium- and high-resolution domains. Such convergence is increasingly addressed by the Global component of the CLMS, toward the high-resolution Continental CLMS component, which is specifically relevant for the further evolution of the HR Layers products. Potentially, ECoLaSS partners may be involved in bids for the CCI+ Land Cover (to be confirmed), which could ensure a direct connection and exchange of experiences. Anyway, a coordination of development activities with the later CCI+ project should be established on project level.

COASTAL MONITORING WORKSHOP, 29 JUNE 2017, BRUSSELS, BELGIUM

On 29 June 2017, a Copernicus workshop on Coastal Monitoring had been conducted in Brussels, co-organised by the CLMS and the Copernicus Marine Environment Monitoring Service (CMEMS). It aimed at analysing mid-term (2018-2020) and long-term (post-2021) priorities for the potential evolution of the CLMS and the CMEMS in coastal areas, addressing user needs in view of coastal zone management and monitoring. The workshop addressed the following main topics:

- Overview of user needs and challenges (Session I);
- Current Copernicus offer in terms of data and service information (Session II);
- Draft proposal for the evolution of CLMS and CMEMS in response to the user needs (Session III).

The coastal zone monitoring topic had been considered of potential relevance for ECoLaSS in terms of either future CLMS continental component services or in view of the developments towards a future CLC+.

Relevant recognitions from the workshop comprise:

- The needs for coastal zone monitoring are very heterogeneous; many stakeholders are involved.
- It seems that the CLMS and the CMEMS may, for the time being, continue to work individually to fine-tune their respective current products to coastal needs.
- Specifically the CLMS plans to add a coastal zone product to the Local CLMS component group (of which a considerable part would be already covered by Urban Atlas, Riparian Zones and Natura 2000 products)
- Elevation issues (in terms of a more precise DEM for coastal applications) need to be addressed
- Open questions seem to exist in terms of service boundary definition, e.g. European vs. national and land vs. marine services.

The presentations are available online at <http://workshop.copernicus.eu/coastal/>.

ATELIER SUR L'ÉVOLUTION DES SERVICES COPERNICUS – 14 JUNE 2017

This workshop was aimed to collect material on future requirements and feedback on existing services toward the evolution of Copernicus Services. SIRS was invited to make a presentation on CLMS Pan-European and Local components and ECoLaSS.

3.3.3 Other Events and Workshops with relevance to ECoLaSS

EEA WORKSHOP ON VEGETATION PHENOLOGY, PRODUCTIVITY AND DROUGHT IMPACT ASSESSMENT – 4-5 JUNE 2019, COPENHAGEN, DENMARK

On 4th-5th June 2019, EEA hosted the first workshop with thematic focus on Phenology and Drought Monitoring in Copenhagen, bringing together scientific experts, public stakeholders, decision makers, and public and private sector service providers. The aim of the workshop was an assessment of the state-of-the-art in monitoring phenology and productivity over large areas as well as in monitoring and assessing drought impacts worldwide with Earth Observation. EEA had conducted several own analyses based on medium resolution EO data and is very interested in extending the scope of the services to the pan-European scale. The various presentation shown exhibited a significant need for further basic research and standardization which is expected to be partially addressed by the upcoming HR Vegetation Phenology and Productivity Service as part of the Copernicus pan-European component. The workshop was attended by Markus Probeck, presenting some operational downstream service applications related to phenology and drought monitoring.

IACS WORKSHOP – 10 - 11 APRIL 2019, VALLADOLID, SPAIN

The JRC was the organising institution of the IACS workshop on checks and management of agricultural land that took place in early April in Valladolid, Spain. During these two days, aspects of the introduction of monitoring as means to substitute on-the-spot check were addressed, as well as the current developments of data sharing and some hints on the CAP2020+. Presentations of H2020 projects targeting the CAP took place. In this context, ECoLaSS was presented by the Project Coordinator Eva Sevillano Marco (GAF). In addition, Guido Lemoine (JRC), Piotr Wojda (DG AGRI), Mohamed El Aydam (DG AGRI), and Katalin Toth were also present. Back-to-back to this workshop a separate exchange meeting with other H2020 projects and representatives from EC DG AGRI, JRC, and local institutions took place (see section 3.2.5.1).

THEIA WORKSHOP – 16-18 OCTOBER 2018, MONTPELLIER, FRANCE

From 17-18 October 2018 the Theia workshop was held in Montpellier with the focus on geoinformation services for the management of natural areas. It was organised for attendees from public and private sector as well as for groups interested in an exchange with the scientific community and in the latest developments in Theia. ECoLaSS was represented there by SIRS.

INTERGEO – 16-18 OCTOBER 2018, FRANKFURT, GERMANY

The INTERGEO is the worldwide leading trade-fair for geo-information technology, geodesy and land management. It provides an excellent opportunity to get informed of the latest technical developments and technologies in the dynamic geo-IT environment. In 2016, more than 17,000 geo-information professionals from > 500 companies, state and international authorities and regional administrations of 37 countries have been counted. Copernicus has been one of the key topics addressed both, by a dedicated EC Copernicus/Galileo booth, and by the parallel INTERGEO congress.

In 2018, the INTERGEO took place from 16th to 18th October 2018 in Frankfurt/Main. Like in 2017, GAF provided a Copernicus CLMS expert to the European Commission’s Copernicus booth.

INTERGEO – 26-28 SEPTEMBER 2017, BERLIN, GERMANY

For the INTERGEO 2017, the former ECoLaSS project coordinator Markus Probeck had been designated as the CLMS thematic expert for the Copernicus booth (see Figure 5) by EC in the frame of another project activity. This opportunity was used not only to inform the community of the latest state-of-play of Copernicus and the CLMS, but also to create awareness of the ongoing investigations on the further CLMS evolution in the frame of ECoLaSS, and get in contact with further potential stakeholders from public entities and industry.



Figure 5: Copernicus/Galileo booth at the INTERGEO 2017 (© M. Probeck, GAF)

This opportunity was particularly also used to disseminate flyers on ECoLaSS at the official EC Copernicus/Galileo booth, and inform interested entities about their contribution possibilities (see Figure 6).



Figure 6: ECoLaSS flyer (right) disseminated by Copernicus Support Office together with Copernicus brochures and CLMS & other thematic Copernicus service fact sheets at the Copernicus/Galileo booth, INTERGEO 2017 (© M. Probeck, GAF)

4 Summary and Conclusions

The H2020 programme built a great platform for stakeholder interaction. In this context, and summarising the project's achievements in stakeholder consultation, substantial and fruitful interactions have been taking place with all major relevant European (in particular with EEA), and many national stakeholders, as well as with a multitude of further stakeholder groups. This was facilitated by the consortium partners' collective unique positioning in the Copernicus and Land Monitoring community. It has also been possible thanks to a sophisticated stakeholder consultation concept, built on a dual strategy of targeted stakeholder meetings and using mostly every opportunity for back-to-back meetings.

Furthermore, the project's wide range of thematic topics enabled the exchange with many different user and stakeholder groups, which showed continuously deep interest in the ECoLaSS achievements and developments throughout the project's lifetime (e.g. EEA, with which the close and fruitful exchange is planned to be continued). Especially regarding the increased discussions on the future of Copernicus, ECoLaSS could contribute with methodological developments towards potential new products and services, which were presented to and exchanged upon with experts and decision makers. The feedback gathered from these interactions has been continuously discussed within the consortium and taken into account for the technical developments and prototypes targeted in Task 3 and Task 4, as well as for the benchmarking and operationalization activities in Task 5. Therefore, the consortium considers the WP 51 to be carried out in a successful way.

Some improvement potential had been recognised already in the first half of the first Reporting Period in view of the intensity of the exchange with the JRC unit responsible for the global CLMS component (i.e. the team of Michael Cherlet). A dedicated focus had been put on it throughout the first half of the project and every opportunity was used to meet with the respective JRC colleagues alongside Copernicus-related workshops and events with the aim of establishing a dedicated JRC-(EEA)-ECoLaSS meeting. In late 2018 a dedicated exchange meeting with the H2020 sister projects and representatives of EEA, JRC, EC DGs and the EC was held in Brussels, Belgium. Since this meeting was very much appreciated by everybody involved a follow-up meeting could be scheduled for early April 2019, organised by the Sensagri project team.

Another aspect for improvement that was recognised during the first project phase (M1-18) was the fact, that there was still room for more interaction with national stakeholders. This was successfully addressed by designing and executing a webinar dedicated to the EIONET NRCs Land Cover, which was held on 18 October 2018. In the same context, the addressed NRCs were encouraged to provide their specific needs regarding the already available and potential future CLMS products, which was included in the user and stakeholder requirements assessment (WP 21; "D21.1b – Service Evolution Requirements Report (Issue 2)"). In this manner, the project team gained many valuable insights from a user's and stakeholder's point of view with respect to future CLMS product developments and the perception, use and further needs with respect to the CLMS products. In the second round of prototype development, those requirements were taken into account where possible.