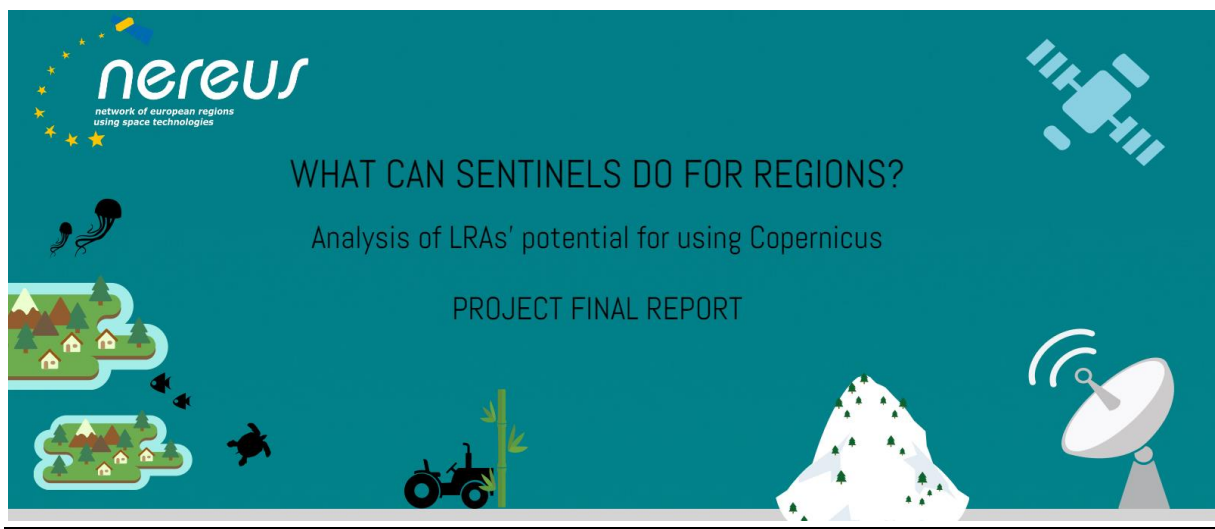




Improving Copernicus take up among Local and Regional Authorities (LRAs) via dedicated thematic workshops

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1 Introduction

1.1 Background

Local and Regional Authorities (LRAs)¹ are recognised as being among the key potential customers of products and services based on information derived from the European Copernicus Programme² as stated in the EU Regulation establishing the Copernicus Programme:

*“Copernicus users’ means (a) **Copernicus core users**: Union institutions & bodies, European, national, regional or local authorities entrusted with the definition, implementation, enforcement or monitoring of a public service or policy in the areas [atmosphere monitoring, marine environment monitoring, land monitoring, climate change, emergency management and security]”* Regulation (EU) No. 377/2014, Article 3 Definitions §(9)

The reason for this is that LRAs can draw significant benefits from using products and services tailored to their specific needs. However, the use of space based Earth Observation (EO) services is still not common amongst European LRAs and in order to ensure that LRAs take up future services, a strategic deployment of Copernicus is needed. As stated in the Copernicus Regulation

“...their [users] input should be actively sought through regular consultation with end-users from the public and private sectors” Regulation (EU) No. 377/2014, §(45)

With the overall objective of improving Copernicus take up among LRAs, this collaborative project between the European Space Agency (ESA) and the Network of European Regions Using Space Technologies (NEREUS) organised a series of dedicated thematic Workshops to launch a dialogue between LRAs and service providers. The goal was to understand LRAs’ needs (demand) and the potential for service provision at the local and regional level (supply) as well as identify the LRAs’ experience with EO and potential roadblocks for deployment. By encouraging LRAs to define and voice their needs, this project analyses the extent to which Copernicus responds to the needs of LRAs and the level of awareness amongst LRAs. The workshops focused on applications and services derived from Sentinel 1, 2 and 3 data³ since these are the first missions to be launched.

¹ LRAs are officially defined as

“Public institutions with legal personality, component of the State structure, below the level of central government and accountable to citizens. Local Authorities are usually composed of a deliberative or policy-making body (council or assembly) and an executive body (the Mayor or other executive officer), directly or indirectly elected or selected at local level. The term encompasses different tiers of government, e.g. villages, municipalities, districts, counties, provinces, regions, etc. Local and regional authorities are also responsible bodies in charge of certain public policies of managerial tasks of territory management e.g. Port Authorities, Environment agencies etc.” COM (2013) 280 final

² The Copernicus programme is a European system for monitoring the Earth which is coordinated and managed by the European Commission. The space component of Copernicus consists of over 30 national and European “contributing” missions and a family of new, dedicated space missions called “the Sentinels”, commissioned to European industry by the European Space Agency (ESA). The in-situ component (ground stations, airborne and sea-borne sensors) are the responsibility of the European Environment Agency and Member States.

³ The first Sentinel (of five) is a radar imaging mission for land and ocean services: Sentinel-1A was launched in April 2014. Planned launches for 2015/2016 include Sentinel-1B, Sentinel-2 (high resolution optical imagery for land applications) and Sentinel-3 (high-accuracy optical, radar and altimetry data for marine and land services). Other Sentinels (4, 5, 5P and 6) are currently under development.



1.2 Scope of this Document

This report provides a final analysis based on the activities conducted within the ESA/NEREUS collaborative project. In particular, it provides

- An analysis of the project organisation and achievements, including an assessment of its suitability for meeting the project objectives (Section 2)
- An analysis of the level of uptake of Copernicus in participating regions as emerged during the project (Section 3), and
- Recommendations for improving the take up of Copernicus amongst LRAs (Section 4).

1.3 Workshop Topics and Regions

The first stage of this project involved an online consultation of LRA's across Europe to identify potential interest areas as well as awareness of the Copernicus programme. The preliminary analysis resulted in an "Online Consultation Analysis" (AD3)⁴ which provided a snapshot of regional interests and awareness. The overall aim was to provide recommendations for the choice of thematic workshops based on a statistic analysis of the online consultation results. Additionally, clusters of LRAs with common areas of interest were listed in order to identify groups of regions with potential for collaboration. This was compared with the findings in previous publications (RD1 and RD2).

The online consultation provided a very clear indication of the topics which were of most interest to the participating LRAs across Europe. The three most selected topics were Spatial Planning, Environmental Planning & Management and Natural Resource Management which were chosen by 81% of all responding LRAs.

Based on the preliminary analysis and subject to certain political limitations affecting some regions' ability to host a workshop, the following workshops were organised:

1. "The use of sentinel data for supporting land and marine spatial planning and management. Specificities of small oceanic islands" Ponta Delgada, Azores, 28th September 2015
2. "A trip from Mountains to Valley: Copernicus satellites as "sentinels" of environmental and economic changes" Milan, Lombardy, 20th October 2015
3. "Natural Resource Management using Copernicus Services and Data" Munich, Bavaria, 12th November 2015

⁴ Some of the results from the Online Consultation Analysis, particularly those concerning the importance of native languages and overall awareness among LRAs, are highlighted in Appendix I.

1.4 Reference Documents/Websites

RD #	Name of Reference Document
RD1	“The Growing Use of GMES/Copernicus across Europe’s Regions”, ESA-NEREUS, 2012 http://esamultimedia.esa.int/multimedia/publications/NEREUS/
RD2	“25 uses of GMES in the NEREUS Regions”, NEREUS, 2010 http://www.nereus-regions.eu/nereus_publications
RD3	“Downstream Observatory organised by Regions active In Space – Network (DORIS_NET)”, A NEREUS Flagship project funded by EU (FP7) and implemented by 13 NEREUS partners, February 2011-February 2013. http://www.doris-net.eu/
RD4	Report on Segmentation of User Needs (D3-5), Downstream Observatory organised by Regions Active in Space (DORIS_Net), Coordination and support action (Coordinating) FP7 SPA.2010.1.1-07, 2 nd February 2013
RD5	The original RCO database created under the “Doris_Net” project can be found at http://www.earthobs-services.eu/
RD6	Sentinels website https://sentinels.copernicus.eu/
RD7	Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: “Empowering Local Authorities in partner countries for enhanced governance and more effective development outcomes” COM (2013) 280 final, 15.5.2013
RD8	“Local and Regional Government in Europe: Structures and Competencies” Council of European Municipalities and Regions, September 2012, http://www.ccre.org
RD9	ESA’s Copernicus website http://esa.int/copernicus
RD10	Copernicus website http://copernicus.eu
RD11	Azores Government website http://www.azores.gov.pt
RD12	Copernicus in Portugal with reference to the inter-ministerial working group on Earth Observation promoting the use of Copernicus in public administrations http://aninov.pt/portugal-space-day-2015/
RD13	Bavarian regional government http://www.bayern.de/staatsregierung/
RD14	Bavarian Environment Institute organigram http://www.lfu.bayern.de/wir/doc/organigramm_lfu_engl.pdf
RD15	Bavarian Institute for Agriculture http://www.lfl.bayern.de/schwerpunkte/gruenland/index.php

RD #	Name of Reference Document
RD16	Bavarian Institute of Forestry, organigram http://www.lwf.bayern.de/mam/cms04/service/dateien/organigramm-lwf-2014.jpg
RD17	Lombardy region http://www.regione.lombardia.it/
RD18	Mazovia region http://www.mazovia.pl/
RD19	Cerema (Midi Pyrenees) http://www.cerema.fr/IMG/pdf/plaq_cerema_GB-3.pdf
RD20	Walloon Government departments http://www.wallonie.be/fr/guide/guide-services/1133
RD21	Baden-Württemberg Environment Institute https://www.lubw.baden-wuerttemberg.de

1.5 Applicable Internal Documents

AD #	Name of Applicable Document
AD1	Statement of Work for this ESA/NEREUS project, EOP-CO/SOW/COM0002ITT, 15th October 2013
AD2	Project Proposal, NEREUS, 3-134034/13/I-BG-, 21st March 2014.
AD3	Online Consultation Analysis, NEREUS, 18th March 2015
AD4	Azores Workshop Report, NEREUS/ Secretaria Regional do Mar, Ciência e Tecnologia, Governo Regional dos Açores, 25th November 2015
AD5	Lombardy Workshop Report, NEREUS/ Lombardy Region-DG University, Research and Open Innovation 9th December 2015
AD6	Bavaria Workshop Report, NEREUS/ bavAIRia e. V., Copernicus Office Bavaria, 9 th December 2015
AD7	Supporting material from workshop organisers to NEREUS: workshop presentations, lists of participants

1.6 Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
AD	Applicable Document
AIS	Automatic Identification System
ARPA	Agenzia Regionale per la Protezione dell'Ambiente (Regional Environmental Agency)
ASI	Agenzia Spaziale Italiana (Italian Space Agency)
CBA	Cost Benefit Analysis
CIVISA	Centre for seismic/volcanic information and surveillance
CLC	Corine Land Cover
CNR-IREA	Consiglio Nazionale die Recerche - Istituto per il Rilevament elettromagnetico dell'ambiente (National Research Council)
COM	Communication
DEIMOS	Deep Imaging Multi Object Spectograph
DG	Direzione Generale (general directorate in Lombardy regional government)
DLR	Deutsches Zentrum für Luft- und Raumfahrt (German Aerospace Centre)
DNF	Department de la Nature et de Forets
Doris_Net	Downstream Observatory organised by Regions active In Space – Network
EO	Earth Observation
ESA	European Space Agency
EU	European Union
EU	European Union
FP7	Framework Programme 7
GIS	Geographic Information System
GMES	Global Monitoring of Environment and Security
GTOT	Portuguese Working Group on Earth Observation
H2020	Horizon 2020
InSAR	SAR Interferometry
ISSeP	Institut Scientifique de service public (Scientific Institute for Public Services)
LRA	Local & Regional Authority
NEREUS	Network of European Regions Using Space Technologies
p.(pp)	Page(s)
PEST	Political, Economic, Social, Technological
RCO	Regional Contact Office
RD	Reference Document
SAR	Synthetic Aperture Radar
SOW	Statement of Work
SPOT	Système Pour l'Observation de la Terre
SPW	Service public de Wallonie
Ver.	Version
VMS	Vessel Monitoring Service

2 Analysis of Regional Thematic Workshops

The organisation, content and results of the workshops are described in detail in the individual workshop reports.⁵ This chapter analyses the effectiveness of the workshops with respect to the objectives of this collaborative NEREUS/ESA initiative to improve Copernicus take up among LRAs and the regions’ own goals. This is done by analysing the

1. participation in workshops,
2. impact of the workshops and
3. effectiveness of organisational aspects and lessons for the future.

2.1 Workshop Participation

2.1.1 Overall

Originally, the workshops were envisaged to involve not more than 50 participants in order to enable specific discussions in splinter groups as well as more general discussions involving the whole audience. However, at the registration phase, all hosting regions experienced much more interest than anticipated and decided not to restrict participation. As depicted in the figure below, Bavaria came closest to the originally envisaged size of workshop with 63 people attending but participation levels in the Azores workshop was higher with 100 participants and even more in the Lombardy workshop with 131 physical participants as well as an additional 102 people who followed the Lombardy workshop through real-time streaming.⁶

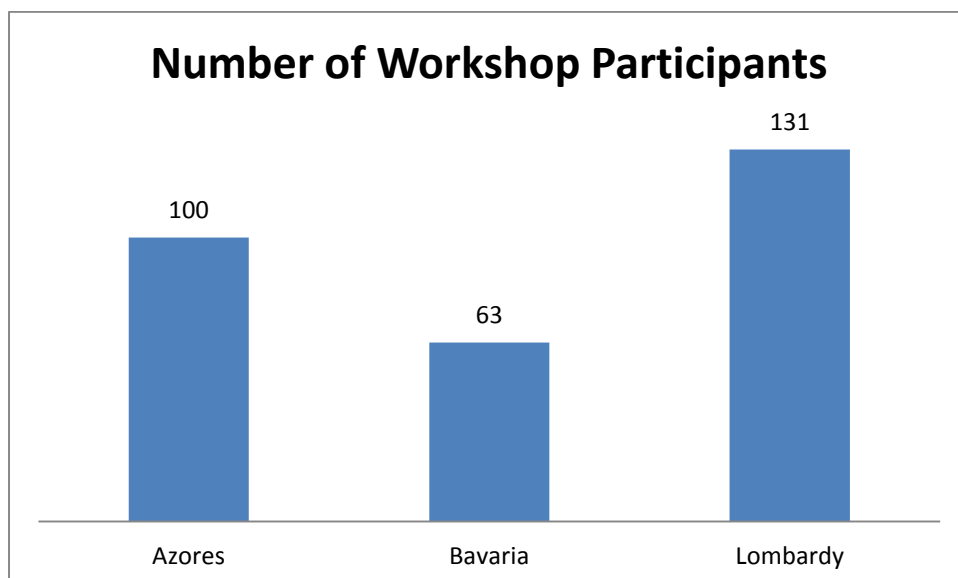


Figure 1 Overall workshop participation

⁵ See references AD2, AD4 and AD5.

⁶ All figures concerning workshop participation are derived from analysis of the “List of Participants” files provided by the hosting regions to NEREUS.

2.1.2 Composition

The differences in the composition of participants between the regions are illustrated by below:

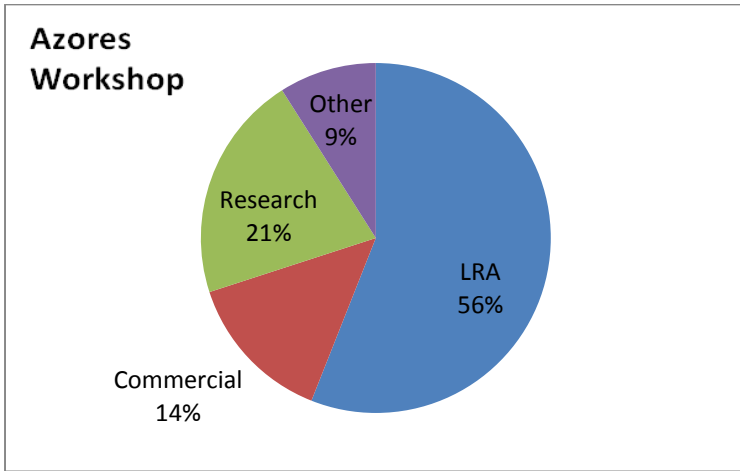


Figure 2 Composition of participants: Azores

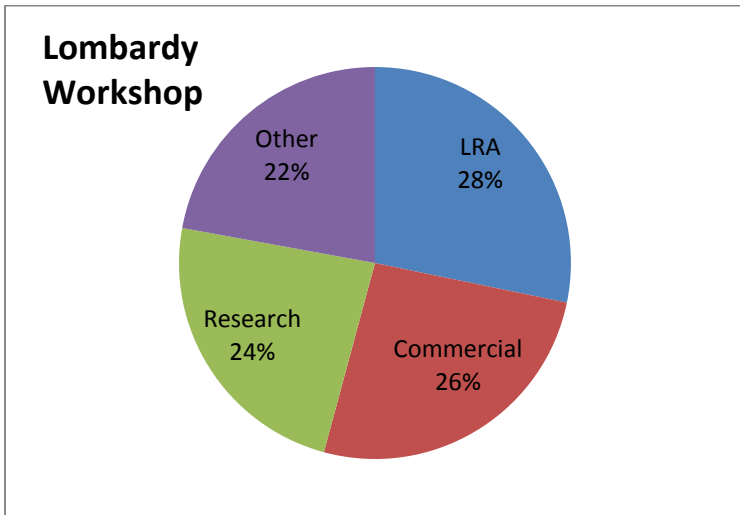


Figure 3 Composition of participants: Lombardy

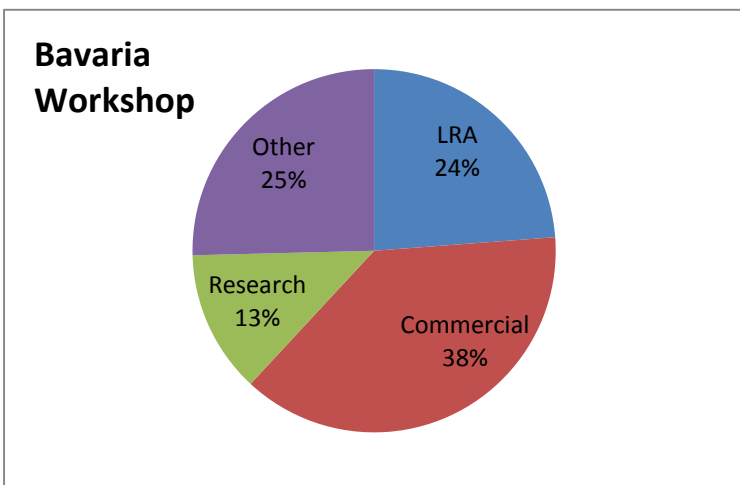


Figure 4 Composition of participants: Bavaria



It should be noted that the categories for the type of participant differ slightly to those reported in the individual workshop reports because they have been harmonised to allow for a consistent comparison. The categories used in this report are defined as follows:

1. LRA = LRAs
2. Commercial = commercial service providers (EO value adding companies) and other commercial entities that could integrate EO/Copernicus data/services into their own products/services in the future
3. Research = universities and scientific/research institutes
4. Other = All other organisations including national space agencies, EC, ESA, NEREUS, Regional Clusters, private individuals and media.

LRAs represented over half of the participants in the Azores workshop (56%) but only around a quarter in Lombardy (28%) and Bavaria (24%). The fact that there was a much higher proportion of participants from LRAs meant that **the discussion was notably centred on the needs and issues facing LRAs for using Copernicus data and services in the Azores workshop.**

The highest group of participants in Bavaria was the private sector (38%) which is not surprising considering the notably strong EO service provider presence in Bavaria. As a result, **the Bavaria workshop provided a platform for strengthening the dialogue between the commercial sector and LRAs in the region.**

Participation from the different categories was more evenly spread in the Lombardy workshop. The LRA, scientific/research and commercial sectors are almost equally represented in the Lombardy workshop. **For Lombardy, the workshop played an important role for raising general awareness across all stakeholders and the resulting political recognition in the Lombardy regional government.**

2.1.3 Regional spread

The majority of the participants in the Azores and Bavaria workshops came from the hosting regions themselves (70% and 64% respectively). In the case of the Lombardy workshop, just less than half (47%) of the participants came from the hosting region and there were a larger number of participants from other regions (as compared with the workshops in Azores and Bavaria). The other regions participating in the Lombardy workshop were predominantly Italian. The origins of stakeholders from the LRA, commercial and research sectors⁷ that participated in the workshops are summarised in the table overleaf.

Most of the participants from regions other than the hosting region attended the workshops because they were invited to present, moderate, participate in round table discussion or were in some other way involved with the ESA/NEREUS collaborative project. However, there were also participants from another 10 regions that attended just out of interest (these regions are written in italics). Participants from 2 of the regions (Canary Islands and Basque) that attended out of interest were LRAs but the majority of participants from other regions attending out of interest were from the research and commercial sectors.

⁷ The regional origins of participants in the category “other” have been excluded here.

Azores Workshop	Bavaria Workshop	Lombardy Workshop
Azores (70% of participants)	Bavaria (64% of participants)	Lombardy (47% of participants)
Bremen (Germany)	Azores (Portugal)	Azores (Portugal)
Lombardy (Italy)	Baden-Württemberg (Germany)	<i>Basque (Spain)</i>
Lisbon (Portugal)	<i>Brussels (Belgium)</i>	Apulia (Italy)
Madeira Islands (Portugal)	<i>Nord-Rhein-Westphalen (Germany)</i>	Piedmont (Italy)
Porto (Portugal)	<i>Saxony (Germany)</i>	Midi-Pyrénées (France)
Alentejo (Portugal)	Walloon (Belgium)	Emilia Romagna (Italy)
<i>Canary Islands (Spain)</i>	<i>Brandenburg (Germany)</i>	<i>Île-de-France (France)</i>
Veneto (Italy)	Hesse (Germany)	Basilicata (Italy)
		Mazovia (Poland)
		Walloon (Belgium)
		<i>Lazio (Italy)</i>
		<i>Tuscany (Italy)</i>
		Veneto (Italy)
		<i>Abruzzo (Italy)</i>

Table 1 The regional origin of workshop participants from the LRA, commercial and research stakeholder categories.

2.1.4 Summary

Despite the originally small numbers envisaged and the regional nature of the workshops, **the three workshops were attended by 277⁸ participants from 28 different European regions in 7 countries.** (This compares with a total of 175 valid responses to the initial online consultation from LRAs in 60 regions).

⁸ This figure is reduced so that participants who attended more than one of the workshops are not counted twice.

2.2 Impact of Workshops

The overall “flavour” of each workshop reflected the individual regions’ situation concerning possible Copernicus take up and of course the composition of participants. **This is an important feature of a regional workshop (as opposed to a national or European workshop for public sector users) since the regional language, working culture and interests automatically tailor the workshop to the regions’ specific needs.** The differences in the composition of stakeholders (research, LRA and commercial sector) and the level of EO uptake in the regions (awareness, experience) as well as different thematic interests would naturally lead to differences in the content in terms of types of presentations and discussion topics.

Apart from the various impacts of the regional thematic workshops described in the subsections below, the most distinctive achievement specific to each hosting region was:

1. for the Azores **significant awareness raising** about the many potential applications of EO and especially access to Copernicus which could be used (also in a collaborative way) by a number of the local and regional authorities in the Azores region;
2. in Lombardy, the workshop has **acted as a catalyst and provided political recognition** for the process launched by the workshop organisers aiming at involving colleagues from other LRA departments (DGs) in innovation policies: the presence of European, high-level speakers granted the legitimacy for what has been done and strengthened the next steps;
3. in Bavaria, where a strong service provider industry already exists and applications have already been demonstrated to some LRAs, **the relations between LRAs and service providers were significantly strengthened** especially through joint preparation and presentation at the workshop.

In general, all of the workshops provided an ideal platform for networking and awareness raising in the hosting region and facilitating exchange both within and between the LRAs, stakeholders from the research community developing applications and the commercial sector providing services as well as representatives at a European level from ESA and NEREUS and EC.

2.2.1 Inter-departmental exchange within the hosting region

In all three hosting regions, LRAs in the form of governmental departments and public institutes from the hosting regions attended the workshop. **These LRA departments/institutes would not normally have met in an event addressing their common interest in the use of Copernicus.**

Azores

In the Azores region, there are various regional departments that use Copernicus data and/or are potential users of Sentinel data. The Azorean departments that presented how they use or could use Copernicus data were

- Regional secretariat for the sea, science and technology,
- Regional secretariat for tourism and transport
- Regional secretariat for agriculture and environment
- Azores delegation of the Portuguese Institute of sea and atmosphere



The lack of dedicated local value adding companies providing tailor made products has resulted in most departments developing in-house infrastructure individually with differing degrees of Earth observation data usage. There was however a representative from the department responsible for culture/heritage present in the audience who explained that they use information from Copernicus development by other departments and would like to learn more about how Copernicus data could be used for their tasks. Other government departments, either on the same level or sub-departments or regional public agencies (still classified as LRAs) from the Azores represented in the audience included:

- Regional directorate supporting investment and competitiveness
- Ports Authority, Azores
- Regional Directorate for organization and public administration
- Environmental management and nature conservation agency, Azores
- Regional Directorate for social solidarity
- Regional directorate for forest resources
- Regional directorate for education and culture
- Centre for seismic/volcanic information and surveillance, Azores
- Astronomy Observatory, Azores

To understand how these LRAs fit in the overall regional governance structure, the presenters (and some of the LRAs participating in the audience) came from sub-departments of 3 out of the 6 “Regional Secretariats” which form the current Regional Government of the Azores. In addition, other departments/public institutes of 2 other Regional Secretariats participated in the audience.

In total, 13 LRAs from 5 out of 6 Regional Secretariats of the Azores region (and in some cases with more than one person) attended the workshop which proved to be an important platform for inter-departmental exchange on the use of EO/Copernicus within the Azores region.

Lombardy

As well as the hosts themselves, another 6 departments or regional entities from the Lombardy Region attended the workshop. The participating LRAs from the Lombardy region included

- DG University, Research and Open Innovation
- DG Civil Protection and Territory,
- DG Urban and Soil Conservation and
- DG Welfare as well as
- the Regional Entity for Agricultural & Forestry Services,
- the regional environmental agency (Arpa Lombardia) and a
- Inter-regional authority responsible for the basin of the River Po flowing through Lombardy amongst as well as other regions (Autorita di Bacino del Fiume Po).

The hosts and the Po river basin authority gave presentations but the other departments were in the audience with an interest in the use of Copernicus data.

In total, 7 LRAs from the Lombardy region participated in the workshop (again, often with more than one person from a particular LRA).



Bavaria

In the case of Bavaria, the hosts (BavAiria e.V) were not an LRA themselves but a regional cluster organisation. BavAiria e.V's mandate is to foster the regional development of space based applications and services through encouraging exchange between the public sector, private sector and scientific community. The Bavarian regional government is made of ministries and 4 (out of 17 ministries in total) were involved in the workshop:

- Ministry of Environment
- Ministry of Finance for Regional Development
- Ministry of forestry and Agriculture
- Ministry of Economic Affairs, Media, Energy & Technology

Each of the ministries has various departments and/or institutes which are responsible for supporting and implementing policy. The actual participants in the workshop came from departments of different Bavarian LRAs:

- Innovation, Research & Technology department (Ministry of Economic Affairs)
- Bavarian Institute of digitalization, broadband and surveying (Ministry of Finance for regional development)
- Bavarian Environment Institute (Ministry of Environment)
- Bavarian Forestry Institute (Ministry of forestry and agriculture)
- Bavarian Institute for Agriculture (Ministry of forestry and agriculture)

The Forestry Institute, the Environment Institute and Institute for Agriculture were involved in presentations and the representative from the Institute of digitalization, broadband and surveying took part in the round table discussion. The LRA representative from a department of the Ministry of Economic Affairs spoke in the opening session on behalf of the region of Bavaria.

In total, **5 different Bavarian LRAs participated in the workshop** again, often with more than one person from a particular LRA.

2.2.2 Inter-regional exchange

NEREUS Regions

The ESA/NEREUS collaboration **facilitated the presence of NEREUS regions in their role as workshop organisers, co-hosts or invited speakers and experts in each of the workshops**. Through their own experiences as well as the willingness to learn from other hosting regions, these participants played an active role in discussions. **NEREUS regions with similar thematic interests** were invited to present at the workshops. The Azores invited Bremen to present research on EO for maritime security since this could be of potential interest to LRAs in the Azores. Lombardy invited an LRA from Midi-Pyrenees to present how EO can be used for environmental monitoring and risk management (flood, fire etc) and an LRA from Mazovia to present the role of regional authorities in Mazovia for the same theme. Bavaria collaborated with Walloon due to their common thematic interest in land motion, forestry and agriculture not only during the preparation of the workshop and through presentations but also during a follow-up meeting the following day to discuss future cooperation.



National or geographically close Regions

The hosting regions also invited and benefited from the participation of LRAs from other regions (mostly national or geographically close) with similar thematic interests who made valuable contributions to the discussions and presentations. In the Azores, these were LRA representatives from Madeira and the Canary Islands who moderated a round table discussion and participated in discussion as the audience. Cooperation between the “Macaronesian” regions regarding the use of Sentinel data based services was left open for future contracts between Madeira, the Canary Islands and the Azores regions. In Lombardy, speakers were invited from a number of other Italian regions including South Tirol, Emilia Romagna and Piedmont to present their experiences with EO. The Bavarian hosts invited an LRA from Hesse to present their use of EO for mapping.

2.2.3 The research community

Azores

Presentations were also made by the research community in the Azores but also from other regions: Bremen (the research arm of the German Space Agency, DLR), Porto (University) and Evora (University) to show the LRA representatives what may be of interest and possible using Copernicus data. In some cases, these researchers have worked together with their region but do not of course provide operational services to the regions. **The exploratory nature of scientific research has an important role which is valued by LRAs as the first step in investigating the possibilities of Copernicus data.** The research community formed just over a fifth (21%) of the total participants.

Lombardy

Similarly, the research community in Lombardy played an important role through presentation of EO examples, participation in the final round table discussion, the preparation of posters as well as forming almost a quarter (24%) of the total participants. One particular public research institute in attendance (CNR) is the RCO for Lombardy and therefore played an important role in the round table discussion, especially by sharing the experiences and conclusions of the EU FP7 Doris_Net project.

Bavaria

The research community formed a small proportion of the total participants in Bavaria (13%) and apart from some attendants from the research community in Walloon, consisted mainly of participants from the research arm of the German Space Agency (DLR) based in Bavaria.

2.2.4 The commercial sector

Azores

Even though there is no well established EO value adding sector in the Azores, 14% of the participants were from the commercial sector. Two presentations from the commercial sector (which were strictly speaking national players) gave presentations on the receiving station on Santa Maria Island, Azores and participation in the EU Copernicus ocean service for data access and integrated processing. Especially since the presentations were in Portuguese, these provided however an overview of relevant Copernicus possibilities to the LRAs in the Azores. The rest of the



participants from the private sector were predominantly companies from the Azores with an interest in the provision of geographic information services which is exactly the right type of stakeholder to potentially integrate Copernicus data into existing information streams.

Lombardy

The Lombardy region has a commercial sector dedicated to space applications which were all present together with the other main EO service providers in Italy. Commercial sector participants made up 26% of total participants and were predominantly members of the audience. **Although the commercial sector was less present for presentations it has worked with LRAs in Lombardy developing EO applications** and one particular company was also involved in the workshop organisation with the organising DG from the Lombardy Region.

Bavaria

The commercial sector formed the largest group of participants (38%) in the Bavaria workshop which reflects the fact that Bavaria probably has the most developed EO value added service provision sector in Germany and one of the strongest in Europe. All of the thematic presentations involved the commercial sector providing examples of EO applications developed for a particular LRA. This included the presentations from the Walloon region. However, it was made clear that this is not a “quick and easy” process since **the development of a service is often very specific and created through much iteration considering the feasibility (cost, infrastructure), suitability and acceptability**. It is clear that a long term relationship between the LRA user and commercial sector service provider has to be developed and this workshop helped to strengthen this.

2.2.5 ESA/EU Copernicus Programme and the Region

Azores

ESA's presentation about the Copernicus programme was met with great enthusiasm at the Azores workshop. Some participants were relatively new to the programme and those which were already familiar were keen to learn more. ESA's demonstration of online access to Copernicus data was also very well received and followed by questions on access rights, data sizes and infrastructure requirements. The benefit was mutual: LRAs in the Azores region understood more about the Copernicus programme and ESA understood more about this particular public sector user group. **The workshop provided the ideal platform for outreach and awareness raising.**

Lombardy

As well as speakers from ESA and the EU explaining technical aspects of the Copernicus programme's space and service components respectively, the Lombardy region dedicated a one hour long session to a set of high level speakers including speakers from ESA, the EU and the Italian Space Agency (ASI) as well as the NEREUS president and a regional minister from the Lombardy region. Such a long session with so many high level speakers was not originally envisaged for these workshops but it served the hosting LRA's need for political recognition and support to encourage Copernicus take up amongst LRAs in the Lombardy Region. This kind of **political push, encouragement or approval is very much needed by LRAs** in order to allocate resources for investigating and using this new,



alternative or additional source of information. The presence of high level European speakers in this workshop played an important role in this process.

Bavaria

The Bavaria workshop invited speakers from the EC and ESA to present the Copernicus programme. This undoubtedly contributed to increased awareness amongst LRAs present in the audience. Given the fact that a major proportion of the audience was from the commercial sector one would think that these very knowledgeable EO service providers would benefit little but this is not necessarily the case, especially when considering that from the very few “satisfaction questionnaires” returned at the end of the workshop, the EC and ESA presentations were voted the “best” most often. In addition, **ESA and EC presentation of the Copernicus programme helped the commercial sector’s relationship with LRAs by confirming free and open access as well as long term continuity of the programme and guaranteed provision of data in the future.**

2.3 Organisational Aspects

The workshop organisers were briefed with the objectives of the workshops well in advance by NEREUS. There were also some core contractual requirements concerning the content and organisation to be adhered to. These included for example the need for simultaneous translation from the hosting regions' language into English, presentations of Earth Observation (EO) applications particularly relevant for LRAs and most importantly, the opportunity for LRAs to provide statements on their potential take up of Copernicus data and services. However, the workshop organisers were free to plan the details and as a result, each workshop differed on:

- Presentation scope and contents
- Discussion
- Language

The previous section on Workshop Impact highlighted the achievements in each workshop and this section completes the analysis of the effectiveness of the workshops by evaluating each of these organisational aspects in turn.

2.3.1 *Presentation scope and contents*

Scope

The non-technical, introductory presentations included similar presentations by NEREUS, ESA and the hosting LRA. In the case of Lombardy and Bavaria, there were also speakers from the EU describing Copernicus Services and the Italian Space Agency (ASI) and the Germany Aerospace Centre (DLR) providing information on national infrastructure for data dissemination. Such speakers may also have been useful in the Azores workshop – especially a Portuguese national representative, perhaps from the Portuguese inter-ministerial working group on Earth Observation (GTOT) whose main objective is to foster the use of EO by public administrations in Portugal.

The range of technical presentations was broad in all workshops, especially in the Azores workshop with presentations on maritime issues, spatial land planning, seismic activity, climate and agriculture. The Lombardy workshop was a little narrower with presentations dealing with agriculture as well as environmental issues and natural risks. The Bavarian workshop topic of natural resource management is also a broad topic covering environmental issues such as flooding and land motion, agriculture and forestry. As a result, **the workshops were perhaps less “thematic” and more “regional”** addressing various EO applications in the region relevant for LRAs in the hosting region.

Content

All the workshops were rich in content and relevant to the objectives of the workshop. The **presentations from an LRA or with an LRA as one of the authors were extremely informative** for Copernicus programme representatives from the EU and ESA since they provided a taste of how LRAs have used EO data so far and how/why they may or may not be able to use Copernicus data in the

future. This is a core objective of the ESA/NEREUS collaboration and therefore an analysis of these presentations will be the subject of the next chapter in this report.

Other technical presentations were delivered by the private and scientific/research sectors. In cases where the speakers actually had experience or are currently working with LRAs as users, the presentations were highly relevant and informative. Presentations with examples of EO application from the private and scientific/research sectors were interesting for representatives of LRAs to obtain a glimpse of research in the area and to identify possible areas of interest. However, **not all of the applications presented are operational and may not always be able to meet LRA needs or may even be difficult for LRAs to implement.** Some of the resulting discussions were able to highlight this and is reported in the following chapter providing an analysis of LRAs' uptake of Copernicus data and services.

2.3.2 Discussion

The workshops were envisaged as workshops and not conferences and therefore the discussion was a very important element of the outcome. The effectiveness of discussions was influenced by the slots for discussion as well as time allocated, moderation and audience participation. In all cases, the **moderators were well informed about the objectives of the workshops and were able to steer the discussion to maximise relevance and encourage participation.**

The most efficient time allocation was to allow short questions just for clarification during the presentations and then to have a round table discussion directly after a small group of presentations (not lasting more than 60-90 minutes). This had the advantage of providing more than one occasion for a round table discussion and spreading the opportunities for discussion over the whole duration of the workshop. The result was **a more focused discussion for each round table and increased audience participation.**

The round table discussions that were kept for the end of the whole workshop day were more general in nature and suffered from lower audience participation as participants had to leave to catch transport connections.

2.3.3 Language

The first language of the workshops was the regional language and the workshop organisers were required to provide simultaneous translation into English or from English into the local language. This was because all the workshops also had a few international participants who were either involved in this ESA/NEREUS collaboration, guest speakers from the EU or ESA or representatives from other NEREUS regions with similar thematic interests or an interest in encouraging Copernicus take-up among LRAs in their own region.

The simultaneous translation worked well and the translators did a very good job but care had to be taken that speakers (particularly during discussion where the audience also participated) always spoke into a microphone otherwise translation could not take place. There was also a technical problem towards the end of one of the workshops due to insufficient battery power on the headsets. Another problem was the language used in presentation slides. No particular requirements were made and as a result, some presentation slides were in English but others in another language. This

posed a problem for those participants that could not understand all languages. The same is true for the presentations made available on the internet following the workshops – some are in English and some are in other native languages. This potentially restricts the outreach to stakeholders beyond those that could attend the workshop.

All the workshop organisers confirmed that **native language use was a very important element of the regional workshop**. However, **for international participation, dissemination and outreach to other regions, translation services for presentations and all supporting material are vital**.

2.4 Concluding remarks about organisational aspects

In summary, when considering **organisational aspects**, the flexibility given to the hosts implied that each workshop was organised in a different way and different models were used. Based on the observed results, the following remarks can be made:

- The autonomy left to the organisers in the organisation of the workshops had the advantage of creating **real “regional” workshops** where the **issues most useful to the hosting region** were addressed
- **LRAs should be either authors or co-authors of presentations** to ensure the relevance and focus of EO/Copernicus applications to the needs of the LRA and to improve relations between LRAs and the research/commercial sector
- **The workshops were more regional than thematic**: the two types of workshops are best separated where regional workshops are in the local language with a broad range of themes to maximise participation across the region but thematic workshops have a narrow focus with participation from relevant stakeholders in other regions as well as relevant European or national policy organisations and perhaps trade associations where relevant
- **The moderator plays a key role** and should therefore be well informed about the objectives of the workshop
- **Panel discussions are more effective at the end of sessions** (every 60-90 minutes) rather than at the end of the workshop day
- **The use of native language is essential for a wide and active participation from LRAs**. Although LRA staff members often have a good understanding of English, the possibility to express themselves in their native language allows them to take an active participation to the debates.
- **In order to also favour an inter-regional exchange, translation is vital and should be extended to all presentation material/handouts**.

3 Analysis of Copernicus uptake by participating LRAs

This chapter analyses Copernicus uptake by LRAs that either participated themselves or were mentioned by research/commercial sector participants as past/current users during the workshop presentations and discussions. The analysis starts with a structured overview of the examples of LRA use of EO/Copernicus as presented during the workshops (without providing the details that can be found in the individual workshop reports AD4, AD5 and AD6). This is followed by a cross-cutting analysis of selected key facts which includes a comprehensive analysis of the roadblocks to Copernicus uptake as identified and discussed during the workshops.

3.1 Examples of EO/Copernicus use

The workshops provided a number of presentations showing how LRAs have used EO data in the past and /or how they may be able to use EO and in particular, Copernicus data, in the future. This section provides a series of Tables with concrete examples of the areas in which a particular LRA may use, used or still uses EO data to facilitate its tasks. These tables do not provide technical details about the applications/services described during presentations but rather present very brief summaries of the LRAs as EO users and their experience with EO/Copernicus data. The more general presentations detailing the various possibilities of EO that might be of interest to LRAs are not reported here but abstracts of all presentations can be found in the individual workshop reports.

Each summary table provides key facts using information provided in the presentations and background research:

Name of LRA (refers to the LRA presenter, co-author or referred to during the presentation)	
Presentation	<i>Title, authors, workshop where presentation took place</i>
Type of LRA/position in overall regional governance	<i>Regional government authority, public research institute, environment agency, RCO</i>
Task(s)	<i>Thematic topic(s)and other relevant responsibilities</i>
Current EO use (or experience so far)	<i>Type of data, applications</i>
Operational status	<i>The level of EO (no use of EO so far, initial investigations/research, one off demonstration/pilot study, pre-operational, operational use) and the way in which it is implemented (in-house, commercial service provision, collaboration with research institution)</i>
Potential for integrating EO/Copernicus: benefits & obstacles	<i>The potential is reported from the presentation or inferred from further analysis. Only the benefits and obstacles mentioned during the presentation are reported here.</i>

Table 2 Summary Table Layout

The summary tables are presented region by region in the subsections below.

3.1.1 Azores

Regional Fisheries Inspection – Regional Secretariat for the Sea, Science and Technology	
Presentation	“The use of earth observation data for monitoring, inspection and fisheries management activities in ocean areas” Rogerio Ferraz, Azores Regional Fisheries Inspection, Azores Workshop
Type of LRA/position in overall regional governance	Regional government authority: The Regional Fisheries Inspection is the responsibility of the Regional Secretariat for the Sea, Science and Technology which is one of the 6 secretariats that form the Azores regional government.
Task(s)	Maritime Spatial Planning for Fisheries Management
Current EO use (or experience so far)	Some exploratory investigations have been made using SAR images to cross check SAR information with AIS and VMS. It is not yet used on an operational basis.
Operational status	Initial investigations/in-house research
Potential for integrating EO/Copernicus: benefits & obstacles	Investigations show that using EO SAR data in addition to other satellite information sources (AIS/VMS) can increase the level of ship detection and therefore improve the work of the Regional Fisheries Inspection. The integration of EO SAR data would also decrease the reliance on video surveillance /autonomous aerial vehicles which are expensive and cannot always be implemented in conditions of bad weather (strong winds). EO SAR data from Copernicus Sentinel 1 could be used in the future.

Table 3 Regional Fisheries Inspection, Regional Secretariat for the Sea, Science and Technology Azores

Regional Directorate for Public Works and Communications/ Directorate for Cartographic Services and Geographic Information – Regional Secretariat for Tourism and Transport	
Presentation	“The potential of Copernicus data for future Corine Land Cover in Azores”, Raquel Madeiros, Marlene Autunes, Vanda Marcos, Elisabete Mendonca, Joana Nava, Regional Directorate for Public Works and Communications, Azores Workshop.
Type of LRA/position in overall regional governance	Regional government department: The directorate for cartographic services and geographic information is a department in the regional directorate for public works and communications which is the responsibility of the Regional Secretariat for Tourism and Transport which is one of the 6 secretariats that form the Azores regional government.
Task(s)	Corine Land Cover (CLC) for the Azores
Current EO use (or experience so far)	CLC was executed between 2011 and 2013 using LANDSAT and SPOT images with auxiliary data such as aerial photos.
Operational status	One off activity done in-house. Updates to the CLC are routinely implemented using aerial images.
Potential for integrating EO/Copernicus: benefits & obstacles	Copernicus sentinel 2 data can be integrated and will benefit future CLC for Azores because the frequent re-visit time will allow land cover changes to be detected more frequently. Technical problem of cloud cover will be reduced by the increased possibility of obtaining cloud free images.

Table 4 Regional Directorate for Public Works and Communications/ Directorate for Cartographic Services and Geographic Information – Regional Secretariat for Tourism and Transport, Azores

Planning Cabinet – Regional Secretariat for Agriculture and Environment	
Presentation	“The role of Geographic Information Infrastructures on supporting management and availability of information: the case of the regional Secretariat for Agriculture and Environment” Ana Moreira, Joana Pombo, Planning Cabinet, Azores Workshop
Type of LRA/position in overall regional governance	Regional government department: The planning cabinet is the responsibility of the Regional Secretariat for Agriculture and Environment which is one of the 6 secretariats that form the Azores regional government.
Task(s)	In charge of policies related to agriculture and livestock, rural development, agricultural training and extension, forestry, environment, land and water resources of the Azores. This LRA is responsible for developing and maintaining a spatial data infrastructure compiling data from all related agencies.
Current EO use (or experience so far)	Landsat 7 satellite images were used for the Azores Land Cover Map 2007
Operational status	One off activity done in-house
Potential for integrating EO/Copernicus: benefits & obstacles	Copernicus data can be integrated in the spatial data infrastructure with the main benefit being free access to satellite data. A technical concern was raised about the size of Copernicus data files and the possible problems for storage as well as transfer between the different public agencies.

Table 5 Planning Cabinet – Regional Secretariat for Agriculture and Environment, Azores

Azores delegation of the Portuguese Institute of Sea and Atmosphere (Portuguese Ministerial department of Agriculture and Marine Resources)	
Presentation	“Sentinel applications and products for Atmosphere and Climate monitoring: the importance of the Azores” Diamantino Henriques, Azores Delegation of the Portuguese Institute of Sea and Atmosphere, Azores Workshop
Type of LRA/position in overall regional governance	A regional public institute set up by and serving the needs of the national Portuguese Ministry of Agriculture and Marine
Task(s)	Atmospheric and climate monitoring
Current EO use (or experience so far)	Operational use of EO imagery, current use of Copernicus Global Land service for Land Surface Temperature
Operational status	Operational: routine use of EO images in-house
Potential for integrating EO/Copernicus: benefits & obstacles	Potential for integrating further Sentinel data from Sentinel 3 to monitor mean sea level rise as a result of climate change. Sentinel data is and will be integrated on an operational basis.

Table 6 Azores delegation of the Portuguese Institute of Sea and Atmosphere (Portuguese Ministerial department of Agriculture and Marine Resources)

Centre for seismic/volcanic information and surveillance, Azores (CIVISA)	
Presentation	“Sentinel and Copernicus in support of geological hazards monitoring and emergency management” Teres Ferreira, Joao Luis Gaspar, Gabriela Queroz, Centre for seismic/volcanic information and surveillance (CIVISA), Centre for Volcanology and Geological Risks Assessment (CVARG), Azores University, Azores Workshop
Type of LRA/position in overall regional governance	A regional public institute set up by and serving the needs of regional government in areas of environmental and civil protection
Task(s)	Monitoring and mapping seismic/volcanic activity in the Azores region
Current EO use (or experience so far)	Operational use of EO (SAR) imagery, Sentinel 1 data has already been used
Operational status	Operational: Routine use of EO images and research cooperation with the University of the Azores.
Potential for integrating EO/Copernicus: benefits/obstacles	Sentinel 1 data is already integrated and has the advantage of increased frequency of image acquisition and a future long time series due to the planned continuity of the Copernicus programme.

Table 7 Centre for seismic/volcanic information and surveillance, Azores (CIVISA)

3.1.2 Baden-Württemberg

Landesanstalt für Umwelt, Messungen und Naturschutz (LUBW) Baden-Württemberg (Environment Institute)	
Presentation	“Inland Water Monitoring: Satellite Services for Water Agencies” T. Heege, EOMAP, GmbH & Thomas Wolf LUBW, Baden Württemberg, Bavaria Workshop
Type of LRA/position in overall regional governance	Regional public institute. The Baden-Württemberg Environment Agency is an independent regional institute mandated with advising relevant ministries of the regional government (4 are listed on their homepage) on environmental issues. The Environment Agency is split into 6 departments and the contact person (T.Wolf) is from the Institute for Lake Research under the “water” department.
Task(s)	Monitoring and reporting inland waters (rivers, lakes) to fulfil requirements of EU Water Framework Directive and Bathing Directive
Current EO use (or experience so far)	Low to high resolution EO data is already integrated and prepared by the commercial service provider EOMAP and then used by the LRAs
Operational status	Operational routine service from commercial service provider
Potential for integrating EO/Copernicus: benefits & obstacles	The medium resolution Landsat 5, 7 & 8 data will be replaced by sentinel-2 a/b in the future. The advantage of using EO data is increased efficiency for monitoring and reduced costs. From the commercial service provider point of view the main obstacles are the time it takes to develop a concept and execute and service and the administrative procedures when dealing with an LRA. The time needed for the LRA to accept and use a commercial service is often too long for a commercial service provider.

Table 8 Environment Agency: Ecology of Lakes (LUBW), Baden-Württemberg

3.1.3 Bavaria

Bayrisches Landesamt für Umwelt (Environment Institute)	
Presentation	“Monitoring impervious surfaces” C. Henshold, Bavarian Environment Institute, S. Weinberger, ESRI, Bavaria Workshop
Type of LRA	Regional public institute. The Bavarian Environment Institute is the responsibility of the Bavarian Ministry for the Environment & Consumer Protection. The Environment Agency is itself split into 11 departments and 77 units. The contact person (C. Hensold) at this LRA is from one of these units
Task(s)	To record the proportion of impervious areas in Bavaria
Current EO use (or experience so far)	The LRA commissioned a study to the University of Würzburg to use EO data to estimate impervious areas (9 Landsat scenes were used). The results of the study were very positively received.
Operational status	One off pilot project contracted to the University of Würzburg and will only be repeated if the proportion of impervious areas in Bavaria needs to be recorded again.
Potential for integrating EO/Copernicus: benefits & obstacles	A commercial service provider, ESRI Deutschland, has continued work in this area and tested the monitoring of impervious areas using sentinel 2 data with promising results. However, a routine service to the LRA is not possible if the LRA does not require it. The demand will only arise if the LRA is either required by law to monitor impervious areas using EO data or has another interest in doing so.

Table 9 Environment Agency: Sustainability, Indicators and Intermedia Environmental Protection, Bavaria

Bayerische Landesanstalt für Wald- und Forstwirtschaft (Forestry Institute)	
Presentation	“Forest Vitality Change” R. Seitz, Bavarian Forestry Institute, A. Müller, DLR, e.V, Bavaria Workshop
Type of LRA/position in overall regional governance	Regional public institute. The Bavarian Institute of Forestry is the responsibility of the Bavarian Ministry of Nutrition, Agriculture and Forests. The Forestry Institute is itself split into 8 departments with ca. 180 employees. The contact person (R. Seitz) at this LRA has a senior position and leads one of the 8 departments (Information Technology)
Task(s)	Monitoring: forest inventories & registration of tree top conditions
Current EO use (or experience so far)	EO is being investigated for large area monitoring through projects using optical EO data with improved spectral and spatial resolution for automatic registration of the vitality status of forest trees. This is conducted in collaboration with the DLR research institute in Bavaria. EO data is also being investigated for fast detection of forest damage following storms (funded by the national Copernicus programme).
Operational level	Pre-operational: the research is at a pilot phase and the operational use of EO is foreseen.
Potential for integrating EO/Copernicus: benefits & obstacles	Sentinel 1 and 2 data is foreseen to detect forest storm damage. The main benefits of using EO are for large area coverage. It is quite likely that EO/Copernicus data will (continue) to be integrated in this LRA because there is EO knowledge, especially in the key department of IT, which responsible for the integration of EO data for use by many other departments in the institute.

Table 10 Forestry Institute, Bavaria

Bayerische Landesanstalt für Landwirtschaft (Agriculture Institute)	
Presentation	“Land use monitoring for resources management” G.Kuhn, Bayerische Landesanstalt für Landwirtschaft, H.Bach, VISTA GmbH, Bavaria Workshop
Type of LRA/position in overall regional governance	Regional public institute. The Bavarian Institute of Agriculture is the responsibility of the Bavarian Ministry of Nutrition, Agriculture and Forests. The Institute itself is split into a further 7 institutes and the LRA contact in this presentation (G. Kuhn) leads a working group in one of these 7 institutes.
Task(s)	Land use monitoring and decisions for agricultural use and ecosystem services.
Current EO use (or experience so far)	Within the framework of an EU FP7 project “Melodies”, land management services providing information on crop yield potential and the ecological potential of land were developed for LRAs as well as farmers by the commercial service provider VISTA using Landsat and Copernicus data.
Operational status	Operational routine service from commercial service provider
Potential for integrating EO/Copernicus: benefits & obstacles	Sentinel 2 data has already been integrated where the higher spectral resolution is advantageous for separating the chlorophyll concentration and biomass content of the vegetation.

Table 11 Institute for Agriculture, Bavaria

Bayerische Landesanstalt für Landwirtschaft (Agriculture Institute)	
Presentation	“Green fodder crop prediction” S.Hartman, Bayerische Landesanstalt für Landwirtschaft, R. Siegmund, GAF AG, Bavaria Workshop
Type of LRA/position in overall regional governance	Regional public institute. The Bavarian Institute of Agriculture is the responsibility of the Bavarian Ministry of Nutrition, Agriculture and Forests. The Institute itself is split into a further 7 institutes and the LRA contact in this presentation (S. Hartman) leads one of these 7 institutes.
Task(s)	Land use monitoring and decisions for agricultural use and ecosystem services. LRA has to provide annual reports on crop prediction and estimated yield. It also uses this information for negotiation purposes in political decisions (eg optimisation of grants, immediate aid in case of flood/drought, plausibility of fertiliser use etc)
Current EO use (or experience so far)	Radar data (Cosmo Skymed, TerraSar-X) were initially used to develop a service estimating and predicting green fodder by the commercial service provider GAF AG. This is a project funded by the national Copernicus programme.
Operational status	Pre-operational routine service by commercial service provider: the research is at a demonstration phase and routine use is foreseen.
Potential for integrating EO/Copernicus: benefits & obstacles	Ongoing investigations are using Sentinel 1 and 2 data. The advantages of using EO/Copernicus data include the ability to obtain <ul style="list-style-type: none"> - Reliable, all-weather observation of green areas - Large area detection of changes - Significant cost reduction

Table 12 Institute for Agriculture, Bavaria

3.1.4 Bremen

German Aerospace Centre (DLR), Maritime research facility, Bremen	
Presentation	“Satellite products for maritime safety and security” Susanne Lehner, DLR Research facility in Bremen, Azores Workshop
Type of LRA/position in overall regional governance	Regional research institute: the Bremen region contributed funds to enable the establishment of a Maritime Research Facility in Bremen which is run by the national research institute, DLR (German Aerospace Centre). Although DLR is not directly mandated by the Bremen regional government to perform specific research, the area of maritime research is of interest in the region.
Task(s)	Research in EO for the Maritime sector
Current EO use (or experience so far)	DLR conducts research in all aspects of Earth Observation and the Bremen facility specialises in EO for the maritime domain. The presentation gave project examples which included research in ship detection, icebergs, oil spill, wind and wave products using EO SAR images.
Operational status	Initial investigations/research conducted by research institute
Potential for integrating EO/Copernicus: benefits & obstacles	Copernicus could easily be used by the research centre since the expertise for interpretation is present. Uptake by LRAs in Bremen is more challenging since DLR is not a downstream service provider.

Table 13 German Aerospace Centre (DLR), Maritime research facility, Bremen

3.1.5 Emilia-Romagna

ARPA Emilia-Romagna (Environmental Agency for Emilia-Romagna)	
Presentation	“Moses: a Horizon 2020 innovation action on irrigation water procurement and management” Vittorio Marletto, ARPA Emilia Romagna, Lombardy Workshop
Type of LRA/position in overall regional governance	Regional Environmental Agency: one of many regional agencies for the protection of the environment established by the Italian ministry of the environment.
Task(s)	Environmental monitoring through collation of physical, chemical and biological data on air, water, soil and biota, Pollution control, Technical support to LRAs in Emilia Romagna
Current EO use (or experience so far)	Regional hydro-meteo-climate service started in 1984 uses meteosat data. Agricultural and mapping applications/services have used UK-DMC2, DEIMOS-1 and Landsat images
Operational status	Operational routine regional hydro-meteo-climate service. Other agricultural and mapping applications are typically developed through projects and lead to operational products/services provided routinely. The current EO project is “Moses” developing crop mapping products as well as irrigation water monitoring and forecasting products.
Potential for integrating EO/Copernicus: benefits & obstacles	Quite likely that future projects/investigation will use Copernicus data, especially since ARPA Emilia-Romagna has a dedicated Remote Sensing Lab with expertise in EO.

Table 14 ARPA (Environment Institute) Emilia-Romagna

3.1.6 Lombardy

ARPA Lombardia (Environmental Agency for Lombardy)	
Presentation	“Taking forward the environmental monitoring in Lombardy through Earth Observation” Giuseppe Sgorbati, Enrico Zini, ARPA Lombardia, Lombardy Workshop
Type of LRA/position in overall regional governance	Regional Environment Agency: one of many regional agencies for the protection of the environment established by the Italian ministry of the environment.
Task(s)	Environmental monitoring & inspections, support to environmental policies, advice on environmental permits, support to the management of environmental emergencies
Current EO use (or experience so far)	Numerous services (using EO data) have been developed: snow water equivalent estimate (Terra-MODIS), Glaciers Monitoring (IKONOS), Potential Crop Evapotranspiration Estimate (Terra MODIS), Land Consumption Monitoring (Landsat 8), Constructions Sites Monitoring (Airborne Camera, Altimeter), Flood Monitoring (Radarsat, Cosmo-Skymed), Soil Subsidence and Tectonic Movements Mapping (Radarsat, Cosmo-Skymed)
Operational status	Operational routine use of EO images
Potential for integrating EO/Copernicus: benefits & obstacles	<p>Snow water equivalent estimate (Sentinel 2 & 3), Potential Crop Evapotranspiration Estimate (Sentinel 2 & 3), Land Consumption Monitoring (Sentinel 1 & 2), Constructions Sites Monitoring (Sentinel 1 & 2), Flood Monitoring (Sentinel 1), Soil Subsidence and Tectonic Movements Mapping (Sentinel 1).</p> <p>The first experiences with Sentinels are positive concerning the image quality, frequency and readiness. Free and open access is an enormous incentive to use them.</p> <p>Potential obstacles:</p> <ol style="list-style-type: none"> 1. Complexity of public administrations: intrinsic complexity of environmental systems, requirements set by environmental laws & regulations, complexity of operation procedures. 2. Efforts and cost of obtaining essential auxiliary data 3. Limited human and economic resources (when use of EO is not a priority for mandatory tasks)

Table 15 ARPA (Environment Agency), Lombardy

Consiglio Nazionale die Recerche - Istituto per il Rilevament elettromagnetico dell'ambiente - CNR-IREA (National Research Council)	
Presentation	“Towards downstream services for crop monitoring at regional level with EO data – The experience of FP7 ERMES and Regione Lombardia SPACE4AGRI” Mirco Boschetti, CNR-IREA, Lombardy Workshop
Type of LRA/position in overall regional governance	Public research institute with the mandate to promote EO in Lombardy and facilitate public sector use of EO. CNR-IREA is the Regional Contact Office (RCO) for Lombardy.
Task(s)	Implement agro-environmental policies / Rice monitoring / Agricultural information services
Current EO use (or experience so far)	The presentation focused on EO applications for the LRAs: DG Agriculture, Lombardy / Ente Nazionale Risi, Milano / Ente Regionale per i Servizi All’Agricoltura e alle Foresta EO data analysis development for agricultural monitoring in cooperation with National Research Institute, Milan (CNR). “Space4Agri” and “ERMES EU FP7” led to pre-operational services: <ul style="list-style-type: none"> - Rapid Response: moisture condition, crop growth anomaly - Crop mapping, rice mapping and agro practices, rice monitoring - Agro-bulletins: abiotic risk assessment, yield assessment
Operational status	Operational routine services and one off services
Potential for integrating EO/Copernicus: benefits & obstacles	Sentinel 1 data already used. Use of sentinel 2 data in future. There are potential obstacles to take up unless there is sufficient analysis of cost and benefits, awareness raising, political mandates and capacity building.

Table 16 Consiglio Nazionale die Recerche - Istituto per il Rilevament elettromagnetico dell'ambiente - CNR-IREA (National Research Council), Lombardy

ARPA Piemonte (Environmental Agency for Piedmont)	
Region	“Copernicus Earth Observations to monitor the environmental and natural risks: past, current and ongoing experiences” Roberto Cremonini, ARPA Piemonte, Lombardy Workshop
Type of LRA/position in overall regional governance	Regional Environment Agency: one of many regional agencies for the protection of the environment established by the Italian ministry of the environment.
Task(s)	Civil Protection for natural risks, responsible for monitoring and forecasting weather, rivers’ status, landslides, seismic activity, management of the meteorological, hydrological and air quality networks.
Current EO use (or experience so far)	Experience with ESA and ASI funded projects as the end user for air quality products and for flood and fire risk information services. Copernicus Emergency Service has been used and other EO applications include soil moisture estimations, snow cover, crop residue burning products for emissions and air quality evaluations, land cover changes
Operational level	Routine use of EO data
Potential for integrating EO/Copernicus: benefits & obstacles	Copernicus Emergency Service is already used and quite likely that sentinel data will also be used in the future with the main benefit of cost reduction and long term availability (which will reduce non-homogenous coverage in the future).

Table 17 ARPA (Environment Agency), Piedmont

3.1.7 Mazovia

Department of Geodesy and Cartography, Office of the Marshal of Mazowieckie Voivodeship (Masovia Region) in Warsaw	
Presentation	“The role of Regional Authorities in environment monitoring and risk management” Ewa Janczar, Deputy Director of Department of Geodesy and Cartography, Office of the Marshal of Mazowieckie Voivodeship (Masovia Region) in Warsaw, Lombardy Workshop
Type of LRA/position in overall regional governance	Regional Government Department (one of 16 government departments in the region)
Task(s)	Land use planning, environmental protection, water management including flood protection and public safety. Setting the region’s development strategy , including environmental policy Provision of public access to information
Current EO use (or experience so far)	EO data used for -flood management in 2010 and to create products based on information produced then for future flood management. -fire monitoring
Operational status	Operational in-house development and routine use
Potential for integrating EO/Copernicus: benefits & obstacles	Very likely because Mazoweickie voivodship self government is actively involved in the development of space technologies and applications.

Table 18 Department of Geodesy and Cartography, Mazovia

3.1.8 Midi-Pyrenees & Aquitaine

CEREMA/Direction territoriale Sud-Ouest (South West territorial management)	
Presentation	“Access and use of space data to observe crisis” Christell Bosc, CEREMA, Lombardy Workshop
Type of LRA/position in overall regional governance	Public body supporting the definition, implementation and evaluation of public policies carried out by local and regional authorities. Cerema is the Regional Contact Office (RCO) for the Midi-Pyrenees and Aquitaine regions.
Task(s)	Risk Management (Action 5 of the French Satellite Application Plan, Dec 2011: promote the development of satellite applications to manage natural and technological risk).
Current EO use (or experience so far)	Data from International Charter on Space and Major Disasters and Copernicus Emergency Management Service, Pleiades 1A, 1B, GeoEye-1, World View 1&2, Ikonos, RadarSat
Operational level	Operational routine use of EO data
Potential for integrating EO/Copernicus: benefits & obstacles	Copernicus Emergency Service already used.

Table 19 CEREMA/Direction territoriale Sud-Ouest (South West territorial management)

3.1.9 Po River Basin Region

Autorita di Bacino del fiume Po (Po River Basin Authority)	
Presentation	“The point of view of the PO: one journey, different environments, different regions” Francesco Puma, Secretary General, Autorita di Baciono del fiume Po, Lombardy Workshop
Type of LRA/position in overall regional governance	Regional public authority working together with LRAs (both regions and municipalities) in the geographic area of the Po Basin. The area of the Po River Basin is in the following regions: Piedmont, Aosta Valley, Lombardy, Veneto, Liguria, Trentino-Alto Adige, Friuli-Venezia Giulia
Task(s)	Reduction of flood risk, improvement of water quality, rebalancing water balance, reconstitution of habitat
Current EO use (or experience so far)	None
Operational status	Although no use of EO is currently made, continuous monitoring is needed (and not just reaction to disasters)
Potential for integrating EO/Copernicus: benefits & obstacles	Potential is currently low because EO is not yet used but there are relevant applications which could use sentinel data and perhaps be more efficient for monitoring activities. Low awareness and general reluctance to use remote tools and unknown technologies are obstacles.

Table 20 PO River Basin Authority, Inter-regional LRA

3.1.10 Walloon

Department de la Nature et de Forets (Forestry Department), Service public de Wallonie (SPW)	
Presentation	“Forest Management in Walloon” Ph. Ledent, Spacebel, B. Delfosse, Department de la Nature et de Forets (DNF), Service public de Wallonie (SPW), Bavaria Workshop
Type of LRA/position in overall regional governance	Regional government level department. The Walloon government (SPW) is split into 8 general directorates and the DNF (Depart of Nature and Forests) is one of 9 departments under the responsibility of “direction générale opérationnelle de l'Agriculture, des Ressources naturelles et de l'Environnement” (General directorate for agriculture, natural resources and the environment)
Task(s)	Ecological management of the natural environment throughout Walloon and the management of public forests
Current EO use (or experience so far)	Project with the private service provider SPACEBEL to investigate the use of EO for services in forest management
Operational status	Pre-operational: research, feasibility and demonstration completed but operational service provision does not yet exist.
Potential for integrating EO/Copernicus: benefits & obstacles	Data from sentinels 1 and 2 can be integrated with the major advantage of no cost of data. Spacebel have had the experience of demonstrating useful applications but where the cost of data has made the overall cost too high for an LRA. The cost of data plays a major role for going from the demonstration to the operational phase. Potential obstacles to the use of EO by government departments: <ul style="list-style-type: none"> - Lack of technical infrastructure, eg no access to webservices for some/most end-users - Lack of support, knowledge about EO services - Human resources scarcity - Budget reduction

Table 21 Department de la Nature et de Forets (Forestry Department), Service public de Wallonie, Walloon

Scientific Institute for Public Services (ISSeP), Walloon	
Presentation	“Land Motion Monitoring in Walloon” N. Stephenne, Institut scientifique de service public, Ch. Barbier, CSL-Liege Space Centre, Bavaria Workshop
Type of LRA/position in overall regional governance	Public scientific institute supporting public authorities
Task(s)	Adaption of the EU Mining Directive in Walloon: assessment of serious risks to humans or the environment related to past mining activities.
Current EO use (or experience so far)	Radar data (InSAR) has been used to study land movement
Operational status	Research, demonstration, one-off applications by research institute: Liege Space Centre (CSL)
Potential for integrating EO/Copernicus: benefits & obstacles	<p>Sentinel 1 data can be used for applications using EO (SAR) data. The main obstacles of low awareness, the inadequacy of data and lack of budget need to be overcome through</p> <ul style="list-style-type: none"> - Identifying potential LRAs - Creating platforms/working groups for exchange - Facilitating transformation of needs into services - Initiating the administrative process by law - Illustrating existing tools/services (demonstrations of best practice/experience from other regions) - Identifying research budgets to develop pilot services to be integrated into existing work flows.

Table 22 Scientific Institute for Public Services (ISSeP), Walloon

3.2 Cross-cutting Analysis

This section analyses the information in the summary tables further by complementing it with a more detailed, cross-cutting analysis highlighting the following:

1. Types of LRA and their position in overall regional governance
2. Operational levels of EO/Copernicus use
3. Organisational models of employing EO/Copernicus data/services
4. Perceived benefits of EO and Copernicus
5. Roadblocks to LRA take up

3.2.1 Types of LRA and their position in overall regional governance

There were different types of LRAs with different positions and mandates that participated in the workshops. At the highest level were the political representatives but the majority of LRA participants were from the technical/working level.

Political LRA representatives

The political representatives presented the political interest, ideas, proposals and past commitments of the regional government for using Copernicus and EO derived data and services in the opening sessions of each workshop. The political representatives of the hosting regions and the level of political commitment is summarised below:

1. **Fausto Brito e Abreu, Regional Secretary for the Sea, Science and Technology for the Azores:** one of 6 Regional Secretaries which, together with the Presidency, form the **Azores Regional Government**. Mr. Brito e Abreu explained that the regional government finances 75% of scientific investigation and in environmental monitoring, earthquake monitoring and prevention of natural disasters – areas in which EO/Copernicus data is relevant. The Regional Secretary anticipated job/business creation as a result of the development of operational applications and services using EO/Copernicus.
2. **Mario Melazzini, Regional Minister for Enterprise, Research and Innovation for Lombardy:** one of 14 regional ministers which, together with the president, form the **Regional Government of Lombardy**. Their main function is to propose legislation. A speech was given on behalf of Mr. Melazzini and mentioned specific initiatives and commitments by the Lombard government: the establishment of the Technology Cluster in Lombardy, the adoption of the Smart Specialisation Strategy with a priority on Aerospace during the period 2014-2020 and a collaboration agreement signed in July 2015 between the Italian Space Agency (ASI) and the Lombardy region for the joint development of space applications addressing climate change, scarce resources and security issues.
3. **D. Schneyer leads the Aerospace & Environment technology section of the Department of Innovation, Research & Technology.** This department is one of the 9 departments of the **Bavarian Ministry of Economic Affairs & Media, Energy and Technology**. Mr. Schneyer explained that he was the person responsible for space issues in the Ministry and the “Space Strategy 2020” outlines increasing activity in the space sector. Bavaria’s past experience in GNSS will be transferred for Copernicus and a “Copernicus Centre” was created in 2008. The Ministry also funds the aerospace cluster organisation “BavAira”.



The declaration of political support in the form policies or mandates as well as financial support for capacity building in the region is an important prerequisite for the development of EO/Copernicus applications and services and to encourage LRAs to use them.

Technical LRA representatives

All of the presentations linking LRAs to the use of EO/Copernicus data and services involved LRAs from a particular department or public institute under the responsibility of the first level ministries/DGs of the regional government like those described above. These **technical LRA representatives have the task of supporting the definition and implementation of regional policies and laws through the provision of necessary information.** In this sense, these LRA representatives are the working partners for any development of EO/Copernicus applications to be used by the LRAs.

The technical LRA representatives come from different regional public authorities, institutions, governmental departments as well as agencies and it is not always obvious to other stakeholders such as research institutions and commercial service providers who their contact points are. In the regional environmental agencies in Italy (ARPA) there is widespread Copernicus awareness and often EO knowhow in specialised remote sensing departments. However, the ARPA confirm that the same is not true for regional government departments and the level of awareness and knowhow and the ability and willingness to use EO/Copernicus for their work varies. This is evident from some of the other examples described in section 3.1. Some research from the Bavarian LRA websites (RD 13-16) revealed that the LRA representatives were sometimes the head of one of many thematic institutes or leads a specific department or working group within a public organisation. Only in the case of the Bavarian Forestry Institute was the speaker the head of a department that has “remote sensing” as one of its named functions. Although the governance structure in the Azores is much smaller than Bavaria, the participating technical LRA representatives with experience of EO/Copernicus data in the Azores region were also spread across various departments under different regional secretariats.

3.2.2 Operational levels of EO/Copernicus use

The summary tables in section 3.1 provide a snapshot of the LRAs’ experience with EO/Copernicus data as presented during the Workshops. These are of course not representative of European LRAs. For example, there is some clear **“positive bias” due to the fact that these LRAs are all from NEREUS regions and were specifically asked to present their experience of EO/Copernicus use.** Consequently, when one looks at the different levels of take up in the table below, there is a bias towards the success examples of EO/Copernicus use which are already operational⁹.

⁹ The term operational here is used to refer to practices in which EO data has been and continues to be routinely used.

No use of EO so far	Initial investigations/ research	Pilot project /one-off demonstration	Pre-operational	Operational use
Po River Basin Authority, Lombardy	Regional Fisheries Inspection, Azores	RD for Public Works & Communications, Azores	Dept. of Nature & Forest, Walloon	Azores delegation/Institute of Sea & Atmosphere
		Planning Cabinet, Azores	Bavarian Forestry Insitute	CIVISA, Azores
		Bavarian Environment Agency	Bavarian Institute of Agriculture	ARPA, Lombardia
		ISSeP, Walloon		ARPA, Emilia-Romagna
				ARPA, Piemonte
				Department of Geodesy & Cartography, Mazovia
				Bavarian Environment Agency
				Bavarian Institute of Agriculture
				CEREMA, Midi Pyrenees & Aquitaine
				CNR-IREA, Lombardy

Table 23 Overview of presenting entities organised according to the level of maturity in the usage of EO data. The “operational use” level is the most mature and corresponds here to the cases were EO data have been used in the past and continues to be routinely used.

In reality, **even within active NEREUS regions, there are still many LRAs that do not routinely use EO/Copernicus data for their work.** The discussions during the workshops confirm that the take up by LRAs in NEREUS regions is still low. Furthermore, the results of the “Copernicus Awareness” questions in the Online Consultation (AD3) indicate that **70% of LRAs responding from all over Europe do not use any Copernicus services or EO technology.**

3.2.3 Organisational models of employing EO/Copernicus data/services

The use of EO/Copernicus data and services by LRAs varies according to expertise and capacity in the region and the management or organisational structures that have been put into place (or lack of them). LRAs typically employ EO/Copernicus data/services in one or a combination of the following ways:

- LRA uses EO/Copernicus data and develops applications in-house,
- LRA procures a commercial service which employs EO/Copernicus data, or
- LRA appoints a public body or technical institute which may develop applications or use services involving EO/Copernicus data to provide information supporting the work of the LRA.

These are described in the following subsections, using the practices of the participating regions for illustration.

LRA uses EO/Copernicus data and develops applications in-house

This is done by many of the departments in the Azores regional government that presented at the Azores workshop. However, it has often only involved one-off projects and not led to the routine operational use of EO/Copernicus services and data.

Another example of in-house development was presented in Bavaria where the Bavarian Forestry Institute is currently investigating applications using EO/Copernicus data together with research partners at the German Aerospace Centre (DLR) in Bavaria. The head of department that presented in Bavaria is in charge of IT infrastructure (information systems, GIS and remote sensing data) for the whole Forestry Institute and so it is the most relevant department for integrating EO/Copernicus data into the existing information systems used by the Forestry Institute. In a case like this, where the technical capacity and infrastructure are present, information and services using EO/Copernicus data could be routinely used by the LRA.

As stated earlier, the regional environmental agencies in Italy (ARPAs) are similar in that there is widespread Copernicus awareness and often EO knowhow in specialised remote sensing departments.

The department of geodesy & cartography in the region of Mazovia has capitalised on their use of EO data for an application in a specific area in the past (flooding) to continue using the information created and updating it for monitoring purposes. Again, EO data is integrated into the regional department's existing information system. The amount of work done in-house is limited due to the lack of know-how within the department and so some of the work to maintain the information system is procured to service providers.

Using EO/Copernicus data to develop applications and create information in-house requires a sufficient amount of high level of technical know-how in the LRA as well as the capacity to receive and process EO data.

LRA procures a commercial service which employs EO/Copernicus data

In regions where the service provider industry has a strong, established presence it is often most efficient for an LRA to purchase EO/Copernicus based information as a service from private industry. Examples of this were given by presenters from Bavaria, Walloon and Midi-Pyrenees. However, the service from the commercial service provider is never an "off-the-shelf" product. In all cases, the LRA and service provider spend many years developing an understanding of needs and possibilities and then conducting pilot studies before an operational routine service can exist. From the service provider view, EO value adding companies are typically small and cannot afford to invest too many resources into business development and therefore require funding from public organisations in order to work with LRAs to develop EO/Copernicus applications and services for the LRA. During the workshop discussions, a few commercial service providers stated that in general, LRAs were rarely "lucrative" business opportunities because of the lack of commitment and slow administrative processes leading to a long term before a service could become operational.

The use of EO/Copernicus data through commercial services requires a high level of commitment by the LRA as well as financial and human resources. There might also be the need for some technical know-how although the level depends on the relationship with the service provider and the type of service to be offered.



LRA appoints a public body or technical institute which may develop applications or use services involving EO/Copernicus data to provide information supporting the work of the LRA

Examples of this organisational structure were presented by Walloon, Midi-Pyrenees and Lombardy where a dedicated public body or research institute has been established and mandated by the regional government to support policy making and implementation by utilising scientific research and innovative technologies.

In the case of Walloon, the goal of the scientific institute ISSeP is to bridge the gap between EO science and operational services by facilitating the use of EO in public services. The example presented at the workshop was the case in which an EU directive required member states to assess serious risks to human or environment related to past mining activities. The Walloon regional government department responsible requested support from ISSeP for the implementation of this directive and ISSeP used EO data in combination with other data to supply this information. ISSeP conducts its own research and surveillance but also works together with other research centres and private companies.

The role of the public body CEREMA in Midi-Pyrenees is very similar in that it supports the definition, implementation and evaluation of public policies carried out by local and regional authorities. Following a request for geographic information within the “Satellite Application Plan, 2011” from the French Ministry of Environment, the presentation by CEREMA explained that the Action to promote the development of satellite applications to manage natural and technological risks is implemented by Cerema.

A similar structure for the public sector use of EO/Copernicus data and services can be found in Lombardy where an existing institute: the regional arm of a national research institute (CNR-IREA) has been mandated by the regional government to research, develop and facilitate the use of EO technology within the region. CNR presented a few examples of how it has developed EO applications and services for particular public authorities in Lombardy.

Both Midi-Pyrenees and Lombardy were partners in the EU DORIS_Net project (RD3) and the institutes described above were appointed as Regional Contact Offices (RCOs).

With this kind of organisational structure, **if public institutes provide a high degree of value added information rather than just data, relatively little EO technical know-how is required by government department officials.** However, **these public institutes also act as facilitators and bridge between the public authorities and private service providers** who can often provide an operational service more efficiently. To increase the uptake of operational EO/Copernicus based services, **awareness raising in the public sector and capacity building in the private sector is necessary.**

3.2.4 Selected benefits of EO/Copernicus as reported during the workshops

Sentinel derived information, and Copernicus in general, was recognised to have great potential as a valuable tool to support public administrators in undertaking tasks such as environmental monitoring, territorial management, understanding climate change and managing natural disasters. The benefits of using EO/Copernicus data, mentioned during presentations by LRAs, were met with general agreement by the workshop participants. A few specific aspects were pointed out in various presentations:

- Decreased reliance on other non-EO methods which are expensive, difficult to administer or not entirely appropriate
- Independent of the ground weather
- Large area coverage
- Cross-border coverage
- Regular, repeated observations over time
- Increased efficiency and reduced costs for monitoring tasks

The above points reflect the technical nature of presentations since they are all direct benefits which need to be demonstrated prior to the decision to employ EO/Copernicus data. This suggests that a thorough analysis a more complete list of the direct benefits, both monetary and non-monetary, is an important element of any demonstration or pilot study.

The Sentinel era is just at the beginning. At the time of the workshops in autumn 2015 only data from Sentinels 1A and 2A had been released to the public¹⁰. Consequently, only a few of the results presented during the workshops were based on real Sentinel data and initial pilot tests with data from contributing missions and Sentinels 1A and (limitedly) 2A where available. This has definitely contributed to the low levels of preparedness observed. However, the workshops provided a perfect framework to reflect on the new potential brought from the Copernicus Programme. The following elements in particular were highlighted during the workshops:

- Free and open access to (Copernicus) data will reduce cost of data and provide an incentive to use it
- Long term availability and the assurance of continuity of the programme will enable forward planning and the possibility to build consistent time-series.
- The frequent re-visit times will enable more frequent (land cover) updates and improve chances of obtaining cloud free images
- Technical measurement capabilities: improved spectral and spatial resolution for automatic registrations.

It was however generally agreed that many more of the benefits of using EO/Copernicus are *indirect* or *social benefits* mainly because the products and services which make use of this additional source of information will enable LRAs to improve their services to citizens. **The social benefits need to be identified and communicated to raise political awareness and obtain political support.**

¹⁰ Sentinel-1A data have been available on <https://scihub.copernicus.eu> since October 2014. Sentinel-2A data were made available in October 2015. Sentinel-3A and Sentinel-1B (launched on February 16 and April 25, 2016 respectively) are currently under commissioning from ESA.

3.2.5 Roadblocks to the uptake of EO/Copernicus data

The analysis of roadblocks to the uptake of EO/Copernicus data within LRAs uses the business/strategic analysis tool “PEST” which categorises the obstacles as **Political, Economic, Social** and **Technological**.

Political

Political obstacles concern the lack of support which could arise from a given mandate, regional strategy and/or legislation.

Even if EO/Copernicus data may be useful for implementing certain EU directives or complying with legislation, the use of this data is not mandatory and often not investigated. The lack of a mandate or political support to employ EO/Copernicus data and services for the tasks of LRAs was often voiced as one of the main obstacles to

- (i) creating an interest in the LRAs about the possibilities of using this technology and
- (ii) using EO/Copernicus technology to either replace existing techniques or to enhance the work of the LRA.

“...the business is concentrated on mandatory tasks required by law”

E. Zini, ARPA (Environment Agency) Lombardia (Lombardy Workshop)

It is difficult for LRA departments to pursue the investigation of the possibilities and appropriateness of EO/Copernicus data and services in the absence of the implementation of a governmental strategic plan such as those mentioned by the political LRAs at the workshops:

- Midi-Pyrenees: “Satellite Application Plan, Dec 2011” Midi Pyrenees
- Lombardy: Smart Specialisation Strategy with a priority on Aerospace, 2014-2020 and a collaboration agreement between ASI and Lombardy for the joint development of space applications, July 2015
- Bavaria: “Space Strategy 2020”

The lack of a mandate or political support contributes to a lack of interest within departments and institutes of LRAs and therefore the willingness to explore and adopt new working practices. Even if there is knowledge and an interest in using EO/Copernicus data/services by technical staff, proposals may be blocked at higher levels of the hierarchy. **Low awareness concerning the social value of EO/Copernicus among high level regional government directors is the root of the problem.**

“We need to continually raise awareness and show solutions to the higher level”

D. Costa, Director of geographic information services and cadaster, Regional Government of Madeira (Azores Workshop)

Economic

Economics concerns the efficient allocation of resources (financial, human and time) to perform the mandated tasks and given that these are scarce in most LRAs, they can cause hindrances in the uptake of EO/Copernicus data.

In the past, and for some applications still today, the data cost is a high proportion of the cost of using EO and in the end prevents many LRAs from pursuing applications of EO for their work. This was stated by a number of LRA departments and service providers who had demonstrated services to potential LRA users. The fact that Copernicus data is available free of charge will change this and was confirmed as very positive by all speakers at the workshops. However, many LRAs stated that **there are still significant costs involved for processing, adding value to the data and turning into useful information**. For all of this, appropriate budgets have to be approved.

“..the fact that Copernicus data is available at no cost is a big step forward but it is not true that using EO based data is not expensive for public administrations: they have to at least invest in human resources and the “revolution” still has to take place”

Round Table Discussion, Lombardy Workshop

The **lack of qualified human resources** is indeed another obstacle. Most LRAs do not have sufficient qualified staff that can either procure EO services or interpret EO data themselves. This was mentioned several times during presentations and confirmed during discussions.

“If it is a permanent service for the LRA you need a permanent know-how in the LRA – there needs to be a basic knowledge within the department”

Service Providers EOMap & GAF (Bavaria Workshop)

On the other hand, the high costs appear also as the result of the way in which the use of EO has developed in many LRAs. **The scattered distribution of individuals in LRAs that either have an interest, experience or use EO/Copernicus data/services** is problematic for commercial service providers but could also create inefficiencies for the regions themselves when it comes to coordinating infrastructure and data acquisition which may be duplicated.

In order to explore the use of new technologies for routine work by LRAs there is also an investment in time needed, a resource which is also limited. The time needed to define their needs and to assess the relevance of EO/Copernicus data is something that most LRAs are unable to invest in. Even if the LRA outsources the work to a commercial service provider there is still **a lot of time and energy needed to define and develop the services with the service provider**. Furthermore, the typically long procurement processes associated with public authorities cost time, labour and money.

“A major problem for agencies and administrations is the first uptake of satellite based projects and the cooperation with service providing companies”

Bavaria Workshop Report

Social

Social obstacles concern the reluctance to accept a (new) technology and change working practices.

The social acceptance of a new technology and changing working practices is low, especially amongst civil servants working in LRAs. The possible efficiency gains, overall cost savings or improvement in public services of using a new technology are rarely investigated in some LRAs.

“Cultural problem of worrying about using remote tools and unknown technologies”

F. Puma, Po River Basin Authority (Lombardy Workshop)

The **willingness to use EO data and services is not only hampered by a general reluctance to new technology but also unfortunate experiences in the past**. A speaker from Walloon gave the example of how government departments had in the past turned to universities for EO data and were supplied with relatively raw data (little processing) which could not be used by the LRAs.

Past experiences have also lead to worries about the cost, reliability, frequent availability and continuity of data sources. An LRA from Bavaria explained that EO data cannot be fully implemented in internal information systems if at least continuity of data supply could not be guaranteed. The fact that the Copernicus programme is a public commitment for the provision of EO data by the EU/ESA is still not clear to many potential users.

Technological

Technological obstacles concern the lack of infrastructure for processing, storage and transfer, data access and the need to build competencies for operational service provision.

Problems of infrastructure for data processing, storage and transfer were raised at the Azores workshop where the integration of EO data is in-house and the technical capabilities are within the departments. Currently, GIS infrastructure is development by government departments separately and there is little technology transfer between the departments. Presently, a centralised GIS is under development and will serve all government departments eliminating duplication of efforts. However, concern was raised about the large bandwidth required to receive sentinel data, the high storage capabilities needed and the communication costs associated with data transfer between government departments. When some workshop participants from the private sector recommended the use of cloud technology and increased use of private sector services this was not so easily acceptable for the LRAs present. As mentioned in the “Social” obstacles section earlier, it is difficult for LRAs to change working practices by using new technology. In answer to the question “Is cloud technology a good replacement for current infrastructure?” one of the answers was

“A different regional directorate deals with the IT issues and do not necessarily understand our needs and the technical characteristics of sentinel data. LRAs need to ask the IT department if they can use cloud technology”

Round Table Discussion (Azores Workshop)

Data access was mentioned a couple of times at all workshops. There were varying degrees of knowledge on how to access sentinel data and the type of data (formats) that can be accessed. The interest and questions that followed a live demonstration of how to access sentinel data through the ESA website at the Azores workshop showed a general lack of knowledge on data access. Even in

Lombardy and Bavaria, where at least service providers have knowledge about data access problems in the provision of data through national space agencies were mentioned.

“Presently the access to Copernicus data is still difficult. The role of the Collaborative Ground Segment to serve the users should be explained more clearly.”

Round table discussions, Bavaria Workshop Report

Other technological obstacles concern the structure of the EO landscape in a particular region. A problem mentioned at the Lombardy workshop is the lack of inexpensive user-friendly software for working with EO data. LRAs that have few trained staff do not have the opportunities to experiment and use data. This also has an implication for the use of EO in schools where future LRA staff could have had their first introduction to EO.

Where there are very few service providers able to provide EO based products and services in a region like the Azores, outsourcing is not an option even though private companies in the business of geo-information may be in better position to adopt the necessary new technologies and automated techniques for a cheaper, more efficient solution. Discussions during both the Lombardy and Bavaria workshops confirmed that pilot projects, demonstrations or other first experiences of EO for the LRAs were usually in collaboration with a research institute but for the use of EO based information to become routine and operational, a service provider has to provide it. Although some research institutes do provide EO based services to public authorities on a regular basis, most are not in a position to be able to do this and need a commercial service provider to make a project operational. However, **if commercial service providers are not involved or it is not known whether the service in question is commercially viable, the initial demonstration project will end with no follow up as is so often the case.**

The roadblocks to EO/Copernicus take up were summarised as follows for use in a questionnaire designed to provide feedback to workshop participants. Unfortunately, the lack of resources for promoting the questionnaire resulted in an inadequate rate of response for analysis. The full Questionnaire is provided in Appendix II.

<p style="text-align: center;"><u>Political</u></p> <ul style="list-style-type: none"> • There is a lack of political mandate / support to using EO data • There is low awareness at political level concerning the social value of EO data 	<p style="text-align: center;"><u>Economic</u></p> <ul style="list-style-type: none"> • The cost / effort of processing satellite data to turn it into useful information is high • The cost / effort to procure space-based services from providers is high • There is a lack of awareness within LRAs on the potential uses of satellite data
<p style="text-align: center;"><u>Social</u></p> <ul style="list-style-type: none"> • There is resistance / difficulty with changing working practices within LRAs • There are doubts about the continuity and reliability of the data • There are doubts about the real gains and benefits of using EO data 	<p style="text-align: center;"><u>Technological</u></p> <ul style="list-style-type: none"> • There is insufficient technical infrastructure in LRAs • There are problems with accessing Sentinel data • There are technical problems in processing Sentinel data to transform it into useful information • There is a lack of available solutions fitting the needs of LRAs

Figure 5 Political, Economic, Social and Technological Roadblocks to EO/Copernicus take up among LRAs

4 Recommendations for encouraging Copernicus uptake amongst LRAs

The workshops resulted in fruitful discussions where the various stakeholders (LRAs, research institutions and commercial service providers) provided many opinions, ideas and examples of best practice for improving Copernicus uptake amongst LRAs. Even though each type of stakeholder has its own restrictions and goals, there was an admirable willingness to work together for the broader objective of increasing the use of Copernicus data and services as a public good – paid for by European citizens and for the benefit of European citizens.

There was wide consensus that **raising awareness is key** to eliminating the roadblocks described in the previous chapter. This can be achieved by setting up **platforms for exchange** at different levels and creating a portfolio of supporting and convincing **documentation**. On a practical level there is a need for **capacity building** to develop and use regional Copernicus applications and last but not least, an efficient method of **facilitation** for implementing all of these measures to encourage Copernicus uptake among LRAs is needed. All of these recommendations are based on an analysis of the presentations and discussions at the workshops and are detailed in Section 4.1 below.

4.1 Platforms for Exchange

4.1.1 Workshops

As analysed in section 2, the thematic workshops organised by the ESA/NEREUS collaboration were very well received by all participants and there is a clear demand for more. Lessons learned from past workshops indicate that there should be two separate types of workshops: regional and inter-regional workshops.

Regional workshops

The regional workshops should be organised locally, conducted in the local language and be limited to stakeholders within the region so that it can concentrate on the region's priorities and needs. It would allow various government departments and public institutes/agencies within the region to exchange their experiences and promote coordination in their use of Copernicus. Furthermore, local service providers have an opportunity to showcase their services and/or understand the needs and requirements of LRAs in their region in order to develop new services.

Inter-regional workshops

The presence of participants from other regions proved to be beneficial and inter-regional workshops focusing on a specific, not too broad, theme would allow a platform for regions to exchange their experiences in terms of their specific strategic interests and political goals, sources of funding, supporting measures in the region (eg setting up an RCO or the work of clusters), technical applications, working practices in terms of internal infrastructure and procurement practices. The regions are developing the public sector use of Copernicus at different rates and in different ways and there is a lot that they can learn from each other.



The type of participants in inter-regional workshops that are very focused on a particular theme can also include more specific stakeholders such as those from relevant EU or national institutes and trade organisations. This would allow conclusions on appropriate technical solutions for specific political obligations that can be applied on a regional level.

Inter-regional workshops would have to be in English or provide simultaneous translation facilities. It is important to ensure that any presentation slides prepared in native languages are also made available in English (as handouts for participants and later as online presentations for further outreach).

4.1.2 High level Task Force

A task force was suggested as a way of reaching the high level political representatives of LRAs and providing political stakeholders a platform for discussing how to encourage the adoption of public data and services from the Copernicus programme within their regions. This would be an inter-regional task force but focussing on specific thematic sectors that have similar requirements in meeting either national laws or EU directives. If Copernicus data and services can be demonstrated as an appropriate and cost effective contribution to the information needed to implement policies, it can be encouraged or recommended to the various LRA departments, institutes and agencies in the regions.

In addition, many stakeholders stressed the need for continuous monitoring and preventive action even if it is not required by law. If the long term benefits (both tangible and social) of pursuing such actions in the area of, for example, flood monitoring, are demonstrated to policy makers then it can become part of regional strategy to collect this information using Copernicus as one of the data sources.

4.2 Documentation

4.2.1 Cost Benefit Analysis

Cost Benefit Analysis (CBA) is extremely important for

- Demonstrating the social value of Copernicus data and services to the political representatives of LRAs and
- Demonstrating to technical representatives of LRAs in charge of preparing information and implementing regional regulations and strategies whether the use of Copernicus data and services is cost effective when compared with existing working practices

The results of CBAs for specific thematic sectors can be distributed to relevant public authorities, presented at workshops and used as input for the high level task force.

4.2.2 Showcase Examples

The NEREUS/ESA publication “The Growing Use of Copernicus in the Regions” (RD2) has proved to be very useful for illustrating how EO has been employed in the regions. Documented examples of Copernicus use by LRAs are also important awareness raising aids for distribution to relevant LRAs, at relevant regional workshops and for illustration to the high level task force.

4.3 Capacity Building

4.3.1 *Technical Resources*

The integration of EO/Copernicus into existing information systems used by LRAs was unanimously seen as the best way to encourage take up within LRAs. The Bavaria workshop (AD6) report stresses the need to enhance and demonstrate the link between GIS and Copernicus data since GIS is often used by LRAs for territorial management.

Discussions in both the Lombardy and Bavaria workshops also stressed the importance of integrating Copernicus data/services for use in mobile devices which are often used by LRAs when conducting field work.

Access to Copernicus data should be made clearer to regional stakeholders – especially small service providers that were not involved in the development of the Copernicus core services. It became apparent during the workshops that many workshop participants were unaware of their access rights and how to implement them.

4.3.2 *Human Resources*

A recommendation (or rather requirement) mentioned many times by all stakeholders was the need for trained personnel in the LRAs. Since public authorities typically employ staff as civil servants with permanent contracts there is usually little staff turnover and existing staff members would require training. This training would vary from an initial introduction to EO and its possibilities to courses on using EO within information systems available to the LRAs. The level of LRA staff training required depends on the organisational approach used in the LRA (see discussion in section 3.2.3). Copernicus specific education on data access, formats and other technicalities may be needed for LRAs using EO data in-house. For LRAs intending to procure information needs to service providers, a minimal amount of training is needed but some basic knowledge about the possibilities with using EO will ensure the initial interest and motivate application/service development together with service providers.

Basic training for an introduction to EO may be linked to regional workshops, as suggested in the Azores workshop report (AD4) or in the form of other networking tools such as “business breakfasts” used in the NEREUS regions East Midlands and Bavaria.

4.3.3 *Financial Resources*

LRAs need to secure appropriate budgets for the investigation of how the use of EO can help their work. However, until a service or application is investigated, assessed and put forward to higher management, this is rarely possible with internal funds. The LRAs (or public bodies created by LRAs for technical support) need to identify what regional, national and European funding sources are available for investigating innovative working methods with research institutes and SMEs as partners since funding streams are rarely aimed at public authorities directly. Collaboration with research institutes can encourage application development which is of particular interest to LRAs. The identification of funds will encourage local SME start ups, support existing service providers or allow existing geo-information companies in the region to enter this market. In an analysis of LRA needs and the building of a service catalogue the Doris_Net project (RD4) found that not all LRA needs can be met by services currently available implying there is room for expanding the service provider industry if they can build working relationships with LRAs and guarantee a revenue stream.



From the funding bodies' perspective, financial support is needed for building relationships between potential service providers and LRAs and the condition of funding should be a clear business/management model explaining how the service will be sustainable and operational in the future to ensure that the investigation does not end after the initial pilot study.

4.4 Facilitation

4.4.1 Regional Contact Offices (RCOs)

The recommendations described so far need active stakeholders to take the initiative and implement them. The most ideal “facilitator” would be an organisation which is **mandated by the region to promote the use of EO/Copernicus within the region and amongst LRAs**. This organisation should not only have access to LRAs in the region but also other stakeholders in scientific and commercial sectors. There are a number of successful examples that already exist in the regions in the form of Regional Contact Offices (RCOs) such as those created during the DORIS_Net project and to a certain extent also “cluster organisations” like BavAiria (Bavaria) and Skywin (Walloon) and others such as those named “Ambassador Platforms” under ESA’s IAP programme which also have a regional outreach. All of these examples have similar objectives and have initiated and organised regional workshops, analysed the LRA needs of the region and supported the local service provider industry. The success of regional facilitators is evident from the level of EO awareness and use in the region.

Since an RCO or cluster organisation is a public, non-profit making organisation, they need support from the regional government in order to function. If the RCO is an LRA itself, then sufficient staff & budget should be allocated so that the RCO can perform its duties. If a dedicated cluster is established as part of the region’s strategy, then this cluster also needs sufficient financial support from the regional government for activities in the promotion of EO/Copernicus uptake.

Improving Copernicus take up on a local and regional level can only be effectively achieved with the help of a regional facilitator in the form of an RCO for example. LRAs throughout Europe have different levels of autonomy, budget, expertise and requirements and the composition of regional scientific and commercial stakeholders vary significantly from region to region – even within one country. Thematic interests can also vary within one country, especially if the country is large with differences in physical landscape. On the other hand, there can be commonalities between regions internationally. The inter-regional aspects of the workshops illustrated how **European regions may have common thematic interests** due to a common geographic feature. Bavaria and Walloon’s common interests in forestry and land motion monitoring are one of many examples. Some of the possible clusters of (international) regions have been noted in previous analyses (see AD3, RD1).

The regional facilitators are necessary to bring different stakeholders within a region together and act as an **interface** on the national level with government departments, space agencies and other national bodies as well as on the European level with organisations such as NEREUS, EU and ESA. **In order to reach the LRA users, the Copernicus governance structure needs to go the extra mile and incorporate regional facilitators to complement national and European organisations.** To encourage inter-regional collaboration, the facilitators should also stay connected in network(s) as envisaged in the RCO network created by the EU FP7 project Doris_Net. This is to a large extent enabled through NEREUS activities but the RCOs are not formally managed by NEREUS.

The above **recommendations** were grouped into 4 categories as from the figure below for use in the questionnaire (see Appendix II).

<p><u>Platforms for Exchange</u></p> <ul style="list-style-type: none"> • Support local workshops in native languages • Organise inter-regional thematic workshops with translations • Create high level task forces to raise awareness among regional decision makers 	<p><u>Documentation</u></p> <ul style="list-style-type: none"> • Showcase successful examples of how LRAs make use of Sentinel data • Showcase concrete examples of costs / benefits of using Sentinel data • Build a catalogue showcasing the needs of LRAs, available solutions and service providers 	<p><u>Capacity Building</u></p> <ul style="list-style-type: none"> • Improve the potential for integrating high level Sentinel products / information within standard GIS environments • Provide LRAs with access to low cost hosted processing platforms • Organise focused, thematic training courses for LRA staff • Foresee LRA technology transfer funds in R&D projects • Make access to Sentinel data "closer to LRAs" (e.g. with national/regional language, appearance, product types) • Improve the timeliness of Sentinel data availability
<p style="text-align: center;"><u>Facilitation</u></p> <p style="text-align: center;">Foster knowledge sharing through networks of Regional Facilitators</p>		

Figure 6 Recommendations for improving the take up of Copernicus among LRAs

5 Conclusion

The collaborative project between ESA and NEREUS involved organising regional thematic workshops to understand European LRAs' experience and the current level of EO usage, intentions for the future and the obstacles that need to be overcome in order to encourage EO/Copernicus use. This has been very effective because it enabled the analysis presented in this document and more importantly contributed to improving Copernicus uptake amongst the participating LRAs.

The workshops provided a **platform** for

- Raising awareness amongst mainly technical representatives but also political representatives of LRAs
- Different LRAs within a region to share their experiences of using EO/Copernicus
- Initiating inter-regional collaboration and sharing best practice models adopted by regions
- Improving the relations between LRAs and service providers and thereby encouraging business

The flexibility and autonomy given to workshop organisers had the advantage of creating **real “regional” workshops** where the **issues most useful to the hosting region** were addressed and the corresponding **positive impacts** achieved:

1. In the Azores discussion was notably **centred on the needs and issues facing LRAs for using Copernicus data and services and there was significant awareness raising** about access to Copernicus and the many potential applications of EO which could be used (also in a collaborative way) by a number of the LRAs in the Azores region;
2. For Lombardy, the workshop played an important role **for raising general awareness across all stakeholders and acted as a catalyst providing political recognition** for the process launched by the workshop organisers aiming at involving colleagues from other LRA departments (DGs) in innovation policies: the presence of European, high-level speakers granted the legitimacy for what has been done and strengthened the next steps;
3. In Bavaria, where a strong service provider industry already exists and applications have already been demonstrated to some LRAs, **the relations between the service providers were significantly strengthened**, especially through joint preparation and presentation at the workshop.

A notable aspect of the regional workshop organisation is that **the use of native language is essential** for a wide and active participation from LRAs and simultaneous **translation of presentations and all supporting material is vital to enable inter-regional exchange**. Despite the originally small numbers envisaged and the regional nature of the workshops, the three workshops involved **the physical attendance of 277 participants from 28 different regions in 7 European countries**. The high level of interest alone indicates a successful initiative.

The methodology for analysing EO/Copernicus take up among LRAs as discussed during the workshops involved selecting and summarising a total of 20 presentations which provided examples of LRA use of EO/Copernicus in 10 European regions and then performing a cross-cutting analysis of some key aspects across all regions.

The LRAs that presented how they have used EO in their region illustrated **differences in approach for the employment of EO/Copernicus data**. These approaches ranged from

- using EO in-house,
- procuring contracts to a commercial service provider and
- allocating technical tasks to a dedicated public body or technical institute whose mandate is to provide technical support to LRAs for policy definition and implementation.

The approach adopted implies **different degrees of technical knowledge required by LRA members of staff**. One or a combination of these approaches is typical of LRAs using EO across Europe.

There was widespread agreement that **LRA take up, even among participating regions, is in fact low and limited to the research/pilot study level**. This is confirmed by the results of the “Copernicus Awareness” questions in the Online Consultation (AD3) which indicated that 70% of LRAs responding from all over Europe do not use any Copernicus services or EO technology. This is partially explained by the fact that the Copernicus programme is still at an early stage but key features such as free and open access and long term data availability through continuity as well as numerous other benefits discussed during **the workshops confirmed the potential of Copernicus data/services as a supporting tool for the work of LRAs**.

One of the key aims of the project was to identify the possible **roadblocks to EO/Copernicus take up**. Following the discussions in workshops these were grouped into Political, Economic, Social and Technological obstacles in this report. A notable outcome from the debate was that in order to improve take up at the technical, working level, **the declaration of high-level political support in the form regional policies or mandates as well as financial support for capacity building in the region are important prerequisites**.

The analysis of EO/Copernicus take up among LRAs and the roadblocks in particular led to **recommendations** which are grouped into 4 categories:

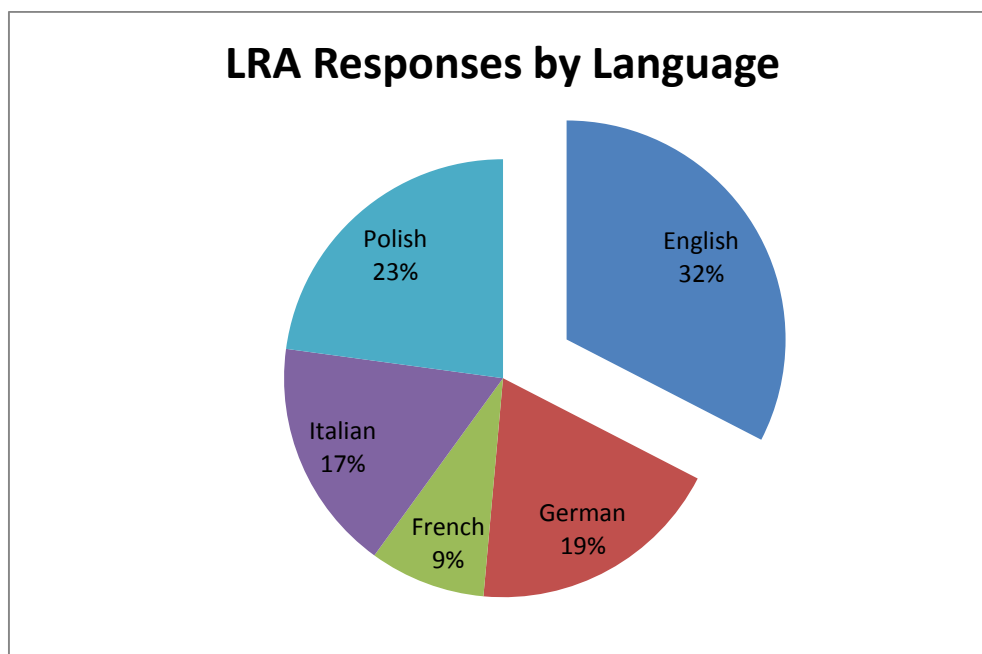
- **Platforms for Exchange** such as regional workshops and working groups/task force to raise awareness and understanding, improve stakeholder relations and to enable political dialogue
- **Documentation** intended to promote outreach and demonstrations of regional benefits of Copernicus
- **Capacity Building** including technical solutions dedicated to improve the usability of Sentinel data but also technology transfer to LRAs, and
- **Facilitation** ideally through regional facilitators who have a mandate to enable the above recommendations through cross cutting measures intended to “put oil in the system”

In summary, this ESA/NEREUS collaborative project is considered to have successfully achieved the objective of improving Copernicus take up among LRAs. The various presentations and discussions confirmed the great potential of Sentinel data in support to LRAs but various roadblocks were identified that might hamper deployment within the administrations. Possible solutions were elaborated to allow the formulation of recommendations for future actions. The debates also significantly contributed to increasing the level of awareness at local level as well as facilitating inter-regional networking for the deployment of Copernicus data and services. The enthusiasm of LRAs as potential end users was clearly evident at the workshops but it was also apparent that without organising local workshops and other targeted measures with themes that meet the local needs in their native language and culture, it will be difficult to improve Copernicus uptake among LRAs. The regional dimension is therefore considered vital for promoting the use of Copernicus and maximising the benefits of national and European Copernicus related initiatives to European citizens.

Appendix I – Online Consultation Analysis

This Appendix highlights selected results concerning the importance of native languages and the low level of Copernicus awareness among LRAs from the Online Consultation Analysis (AD3) conducted as part of this NEREUS/ESA collaborative project. These initial results confirm the conclusions from discussions at the workshops which followed the online consultation.

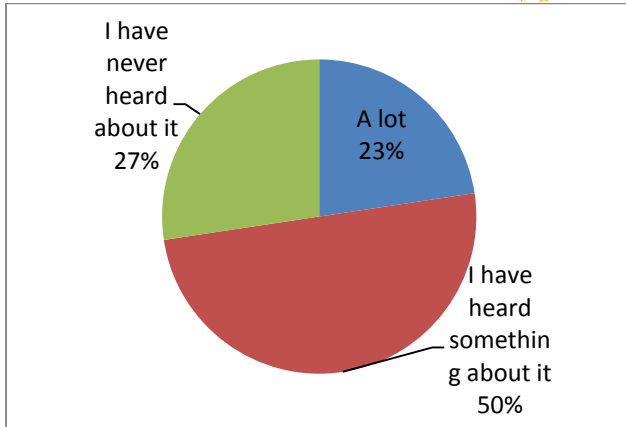
The NEREUS Secretariat designed a simple questionnaire and uploaded it onto the NEREUS website on 24th April 2014. It closed on 15th December 2014 after being online for almost 8 months. Initially, the online consultation was only available in English but in order to encourage response the NEREUS secretariat added other languages using in-house resources and the budget available. The other languages introduced were French, Italian, German and Polish. **The introduction of other languages had a notably positive impact on the response rate and eventually led to 256 responses of which 175 were considered to be valid responses from LRAs in 60 different regions in 13 European countries.**



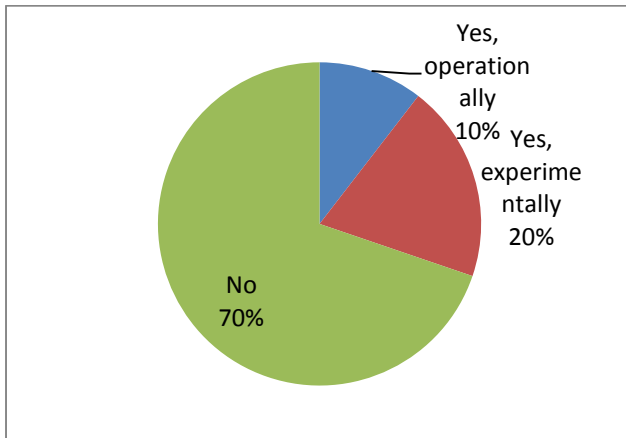
The online consultation was composed of 2 sections:

1. regional areas of interest which led to the selection of regional workshop topics
2. an optional section addressing regional awareness of the Copernicus programme.

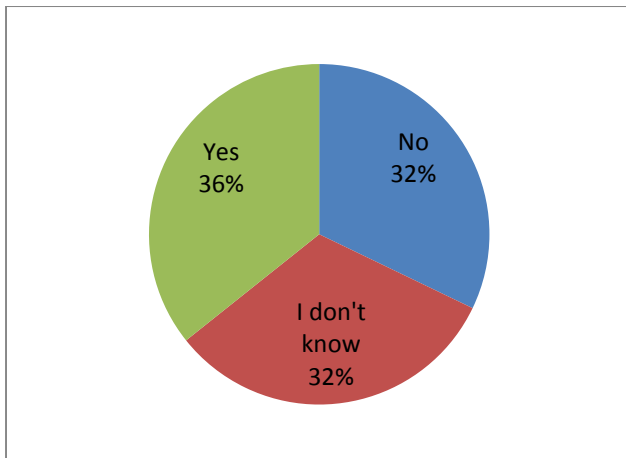
Although only about half of the valid responses also answered the optional section, the results indicate a generally low level of Copernicus awareness and use of EO data and services. This is illustrated by the figures below.



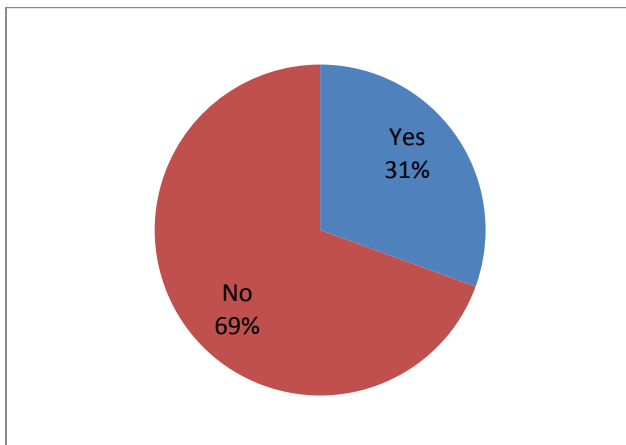
Q1: To what extent are you aware of the Copernicus Programme and its potential?



Q2: Does your administration use any Copernicus services or space based EO technology?



Q3: Did you face any problems using Copernicus services or space based EO technology?



Q4: Are you aware of Copernicus or space based services available in your region?

Appendix II – Feedback Questionnaire

In order to provide feedback to the workshop participants and to give them the opportunity to react to the project conclusions, a questionnaire was designed using the results of the analysis in this report. Unfortunately, the lack of resources allocated to promote the questionnaire and the short period available (3 weeks) led to a very limited response so the results have not been analysed. The main elements of the questionnaire are provided below for information.

Tell us about yourself. *This information will be kept confidential and used only for statistical purposes.*

- I work in a Local or Regional Administration (LRA)
- I am a commercial service-provider
- I work in a University or Scientific Research centre
- Other, please specify

Did you take part in one of the thematic workshops organized by NEREUS and ESA during the project?

- Yes, please specify which one(s)
- No

There are roadblocks to the uptake of Sentinels in Local and Regional Administrations (LRAs). **Please choose the 5 most significant roadblocks:**

- There is a lack of political mandate / support to using Earth Observation (EO) data
- There is low awareness, at political level, concerning the social value of EO data
- The cost / effort of processing satellite data to turn it into useful information is high
- The cost / effort to procure space-based services from providers is high
- There is a lack of awareness within LRAs on the potential uses of satellite data
- There is resistance / difficulty with changing working practices within LRAs
- There are doubts about the continuity and reliability of the data
- There are doubts about the real gains and benefits of using EO data
- There is insufficient technical infrastructure in LRAs
- There are problems with accessing Sentinel data
- There are technical problems in processing Sentinel data to transform it into useful information
- There is a lack of available solutions fitting the needs of LRAs

If you have any additional comments on roadblocks to Sentinel uptake among LRAs in Europe, please leave them below (optional)

There are some useful actions which could improve Sentinel uptake among Local and Regional Administrations (LRAs). **Please choose the 5 most important actions to be implemented:**

- Support local workshops in native languages
- Organise inter-regional thematic workshops with translations
- Create high level task forces to raise awareness among regional decision makers
- Showcase successful examples of how LRAs make use of Sentinel data
- Showcase concrete examples of costs / benefits of using Sentinel data
- Build a catalogue showcasing the needs of LRAs, available solutions and service providers
- Improve the potential for integrating high level Sentinel products / information within standard GIS environments
- Provide LRAs with access to low cost hosted processing platforms
- Organise focused, thematic training courses for LRA staff
- Foresee LRA technology transfer funds in R&D projects
- Foster knowledge sharing through networks of Regional Contact Offices
- Make access to Sentinel data "closer to LRAs" (e.g. with national/regional language, appearance, product types)
- Improve the timeliness of Sentinel data availability

If you have any additional comments on other useful actions to improve Sentinel Uptake among LRAs in Europe, please leave them below (optional)