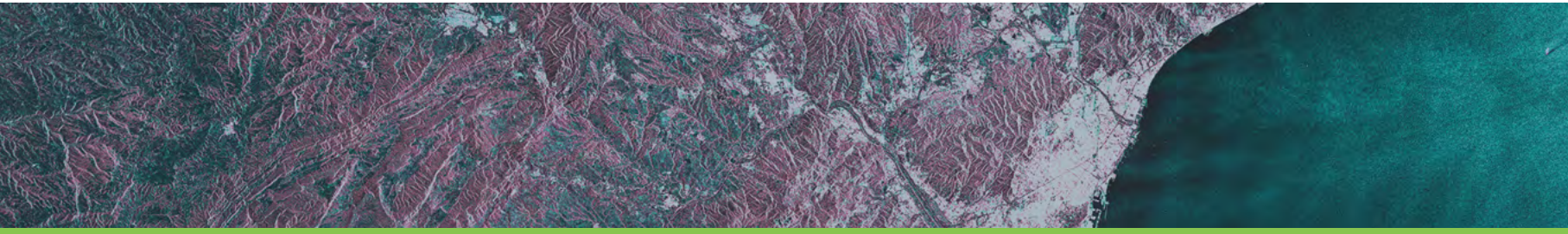
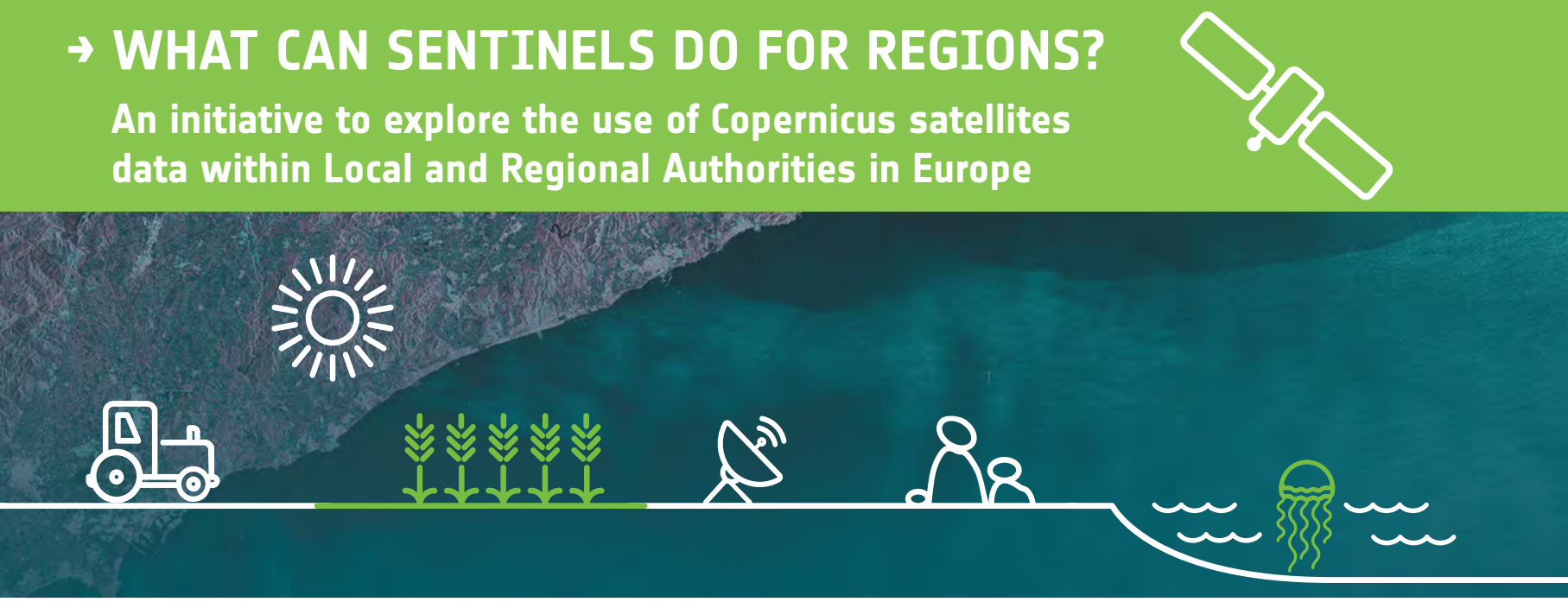
nereus
network of european regions using space technologies

esa
European Space Agency



→ WHAT CAN SENTINELS DO FOR REGIONS?

An initiative to explore the use of Copernicus satellites data within Local and Regional Authorities in Europe



Copernicus

European Commission

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The views expressed in this report are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency.

Dear Reader,

We are delighted to present you the outcomes of our joint initiative regarding the use of Sentinel data by local and regional administrations in Europe.

Regional authorities, in charge of implementing public policies, are key stakeholders for Copernicus. They can get significant benefits from the Sentinels, through regular extensive monitoring and in support to informed decision-making. In addition, they can play an important role to stimulate the development of a widely spread and effective downstream EO market, fostering economic growth and employment all around Europe. However, they require specific and concrete solutions to truly incorporate these data within their working practices. This implies that even if smart Sentinel-based solutions are available, actual deployments within public administrations necessarily require their full involvement and awareness. At European scale, this is certainly an ambitious objective. But with 4 satellites in orbit at the time of writing, the Copernicus era has just started and time seems mature for a change of pace.

As part of the current initiative, we setup an active dialogue with a range of structurally diverse cooperating regions. Taking stock from their specificities, we developed a thematic interregional approach that proved effective to stimulate cooperation and further awareness. We are glad to share the lessons we learnt, in the hope to contribute to an impelling, much broader debate.

Volker Liebig
Director of Earth Observation Programmes, ESA

Nichi Vendola
President, NEREUS

ABOUT

Copernicus Sentinels

The Sentinels are a family of Earth observing satellites developed by ESA as part of the EU Copernicus Programme in support to environmental monitoring and emergency management. Since April 2014, 4 satellites have been launched and 2 have already started delivering data in support to various applications. Additional satellites of the family are being progressively launched, gradually increasing the operational capabilities through 2020. Sentinel data are made available open and free.

Useful links **www.copernicus.eu** and **https://sentinels.copernicus.eu**

Regions

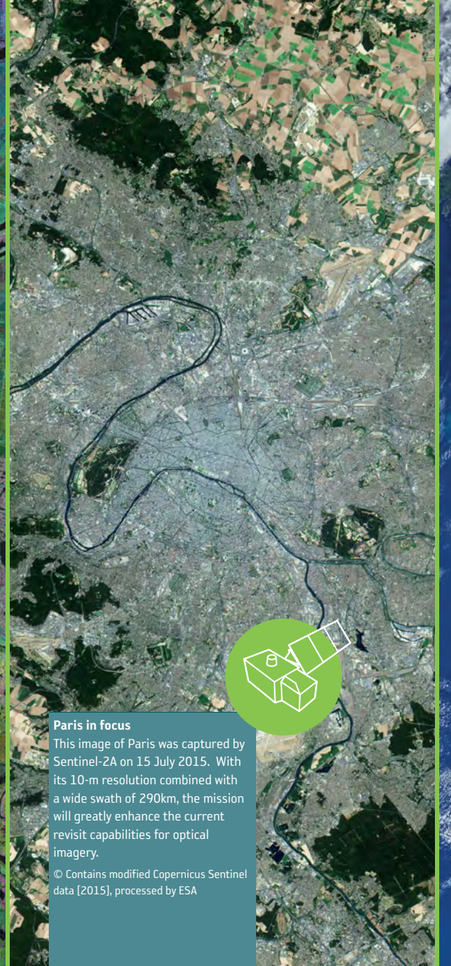
There are 276 regions in Europe (NUTS 2). NUTS 2 is the basic level relevant for the application of regional policies. NUTS 2 regions are eligible for support from EU cohesion policy, European Regional Development Funds and European Territorial Cooperation (INTERREG platform). In many EU countries, the Local or Regional Authorities (LRAs) are responsible for policy areas linked to the Europe 2020 strategy such as education and training, entrepreneurship, labour market, infrastructure or energy efficiency.
They are among Copernicus core users.

Copernicus core users <include> Union institutions and bodies, European, national, regional or local authorities entrusted with the definition, implementation, enforcement or monitoring of a public service or policy in the areas of atmosphere monitoring, marine environment monitoring, land monitoring, climate change, emergency management and security.

Copernicus Regulation (EU N0377/2014),
Extract from Articles 2 and 3

Danube Delta interferogram
The image features an interferogram created by combining two Sentinel-1A radar scenes from 2 and 14 March 2015 over the Danube Delta in Romania. On April 25, 2016, a second satellite of the constellation has been launched.

© Contains modified Copernicus Sentinel data [2015]/Processed by Terrasigna



Paris in focus
This image of Paris was captured by Sentinel-2A on 15 July 2015. With its 10-m resolution combined with a wide swath of 290km, the mission will greatly enhance the current revisit capabilities for optical imagery.

© Contains modified Copernicus Sentinel data [2015], processed by ESA

Iberian Peninsula
Featuring Spain, Portugal and North Africa, this is one of the first images from the Sentinel-3A satellite. The image was taken by the satellite's Ocean and Land Colour Instrument on 1 March 2016.

© Copernicus Sentinel data [2016]

PROJECT OVERVIEW

The initiative builds on collaboration between the European Space Agency and the Network of European Regions Using Space Technologies (NEREUS).

It develops on the NEREUS regions which volunteered to organize thematic workshops featuring the use of Sentinels data in support to applications of specific regional interest - from environmental planning to coastline monitoring, from smart cities to air quality, from civil protection to crop yield prediction.

An on-line consultation was used to support the selection of the topics of interest for the administrations and to learn about their general awareness about Copernicus/Earth Observations applications.

Three regional workshops were eventually organized in the Azores, Lombardy and Bavaria. The workshops, intended to mobilize the local communities, were organized by the hosting regions and held in the local language. Nevertheless, in order to promote sharing of best practices, interpretation to/from English was available and networking strongly encouraged.

This resulted in partner regions (i.e. Bremen, Midi Pyrénées, Mazovia, Wallonie) offering presentations during the workshops, and in representatives from additional regions spontaneously taking part to the events, especially taking advantage from the geographical proximity and the use of the local language.

The workshops were characterized by lively and open discussions, where senior staff from LRAs, but also researchers and commercial service providers, could debate about the prospects for actual deployment of satellite-based solutions within the public administrations.

The project findings were presented in a dedicated event hosted at the European Parliament on June 28, 2016.

28 September 2015
Ponta Delgada, Azores (PT)
Land and Marine planning and management using Sentinel data. Small Oceanic Islands as a Model

#1

#2

20 October 2015
Milan, Lombardy (IT)
A Trip from Mountains to Valleys: Copernicus satellites as “sentinels” of environmental and economic changes

12 November 2015
Munich, Bavaria (DE)
Copernicus Data and Services to manage Natural Resources

#3

FINAL EVENT

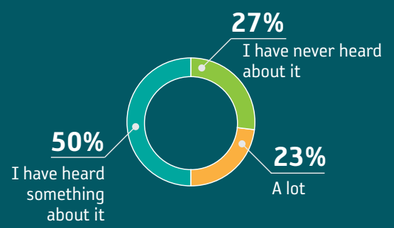
28 June 2016
European Parliament, Brussels

THE ONLINE CONSULTATION

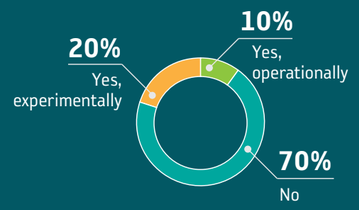
The online consultation was launched in September 2014 and got 256 responses, of which only 175 were considered “valid” (coming from senior staff within LRAs). The answers came from representatives from 60 regions of 13 European countries.

The online consultation included a set of optional questions addressing general awareness about Copernicus and EO. The answers, provided by only half of the respondents (84), highlighted a generally poor level of awareness and uptake of EO data.

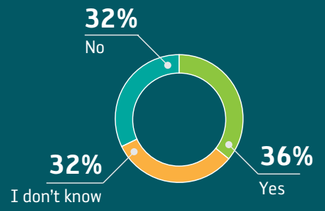
To what extent are you aware of the Copernicus Programme and its potential?



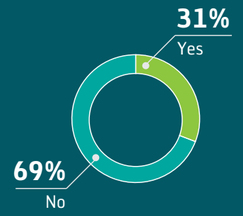
Does your administration use any Copernicus services or space based EO technology?



Did you face any problem using Copernicus services or space based EO technology?



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

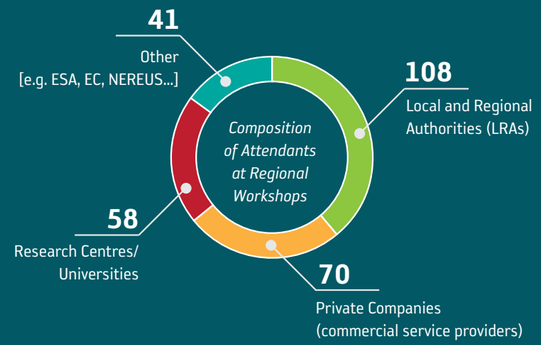


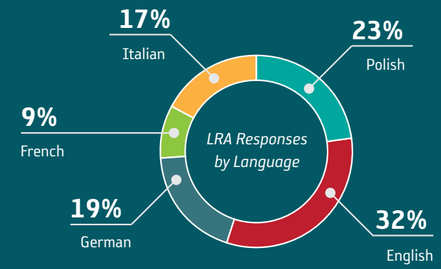
THE PROJECT RECORDS

Overall, the regional workshops attracted **277 participants** (of which 108 staff from regional administrations) from 29 regions of 7 European Countries (some additional 100 followed via web-streaming).

The regional workshops were held in Portuguese, Italian and German. This was considered instrumental to allow local administrators to fluently express themselves and take active part during the debates.

The online consultation was initially available only in English but other languages (French, Italian, German and Polish) were later added as feasible. This had a substantial effect on the overall response rate, confirming the importance of using native languages when dialoguing with regional administrations.





Azores: The use of sentinel data for supporting land and marine spatial planning and management – specificities of small oceanic islands

28 September 2015 | Ponta Delgada, Azores (PT)

The workshop in the Azores was intended to catalyse and facilitate the emergence of local projects exploiting Sentinel data. Attracting representatives from the area, but also from Portugal mainland and from abroad, the workshop confirmed that the advent of the Sentinels marks a new era for territorial management. The small, fragmented, tectonically active, oceanic nature of these islands makes them theatre of very specific needs that were depicted by representatives from various Directorates of the Regional Secretariat. Still, for many applications, commonalities were identified with other regions, suggesting opportunities for thematic cooperation concerning the exploitation of Sentinels data.

The workshop was characterized by open and lively debates, where representatives of public administrations from various European regions could share their perceptions and experiences. Different implementation models were discussed, comparing solutions based on in-house developments with respect to commercial procurements. In this respect, it was noted that the free availability of Sentinels data is expected to enable companies to provide more affordable services, but that improved awareness within the administrations would still be needed... The possible optimization of internal efforts via the creation of dedicated regional offices providing cross-cutting expertise within the governments was debated. The value of networking and sharing of best practices with other regions was highlighted, leading to the conclusion that inter-regional thematic clusters should ideally be organized, possibly involving additional partners across Europe.

> *"The awareness raising effort done for the workshop has surely reached all the departments of the Regional Government of the Azores. Further efforts have been made to involve local and regional Administrations in a more intensive discussion process on the implementation of Copernicus across regional competences, both at political as well as operational level."*

Nelson Simões | Director of the Regional Secretariat of Sea, Science and Technology

Azores islands
This Sentinel-1A radar image was processed to depict water in blue and land in earthen colours. The image highlights the differences in the relief of the islands, with volcanoes and mountains clearly standing out.

PARTICIPANTS – Total: 100 | LRAs: 56 | Private Companies: 14 | Research: 21 | Others: 9

A Trip from Mountains to Valleys: Copernicus satellites as “sentinels” of environmental and economic challenges

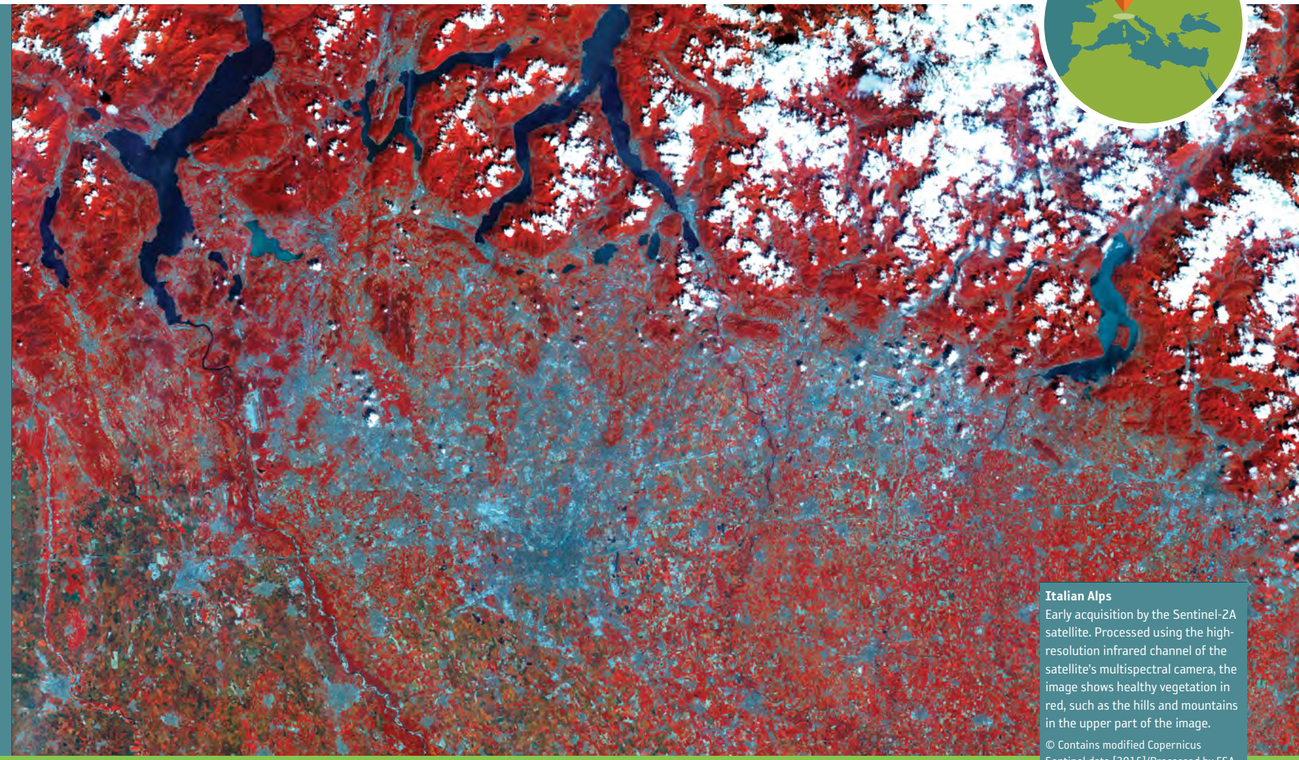
20 October 2015 | Milan, Lombardy (IT)

The workshop in Lombardia gathered together regional environment agencies and administrations having different degrees of experience with EO data. Numerous space–based solutions were presented in support to water management, agriculture and emergency management, along with the challenges inherent to the management of mountainous areas and of large river basins. Some of the presented applications were locally specific (e.g. rice cultivation in the Padana plain) but others were presented by various regions (e.g. support to flooding). The fundamental role of the private sector in providing fit-for-purpose solutions was addressed via a dedicated poster exhibition.

The portrayal of examples of use of EO data by public institutions committed to deliver public policies allowed participants to exchange upon concrete cases. The first experiences with Sentinels data were considered positive “in terms of data quality, frequency and readiness”, and the free, long-term availability of the data highlighted as an enormous incentive to use them. The coordinating role of national entities was recalled, as well as the importance of high-level awareness and political “mandate”, at least to back-up bottom-up attempts to introduce EO-based technologies. Difficulties related to the lack of adequate resources were highlighted: regional administrations are often completely absorbed by their institutional tasks and have little room for parallel research activities. Thus, technology transfer should be systematically foreseen as part of R&D projects when targeting an operational use at the administrations.

> *“The Future is part of us, it will emerge when we create ties based on information exchange and sharing of objectives. Copernicus and space applications/services are a chance to prove it. The workshop in Lombardy distinguished itself for being a forum for public administrators working in different regional environment agencies; it benefited from the efforts made by Lombardy Region in mobilizing public administrators across departments in innovation policies delivering concrete solutions to LRAs and final end users.”*

Fabrizio Sala | Vice President Lombardy Region



Italian Alps
Early acquisition by the Sentinel-2A satellite. Processed using the high-resolution infrared channel of the satellite’s multispectral camera, the image shows healthy vegetation in red, such as the hills and mountains in the upper part of the image.

PARTICIPANTS – Total: 131 | LRAs: 37 | Private Companies: 34 | Research: 31 | Others: 29

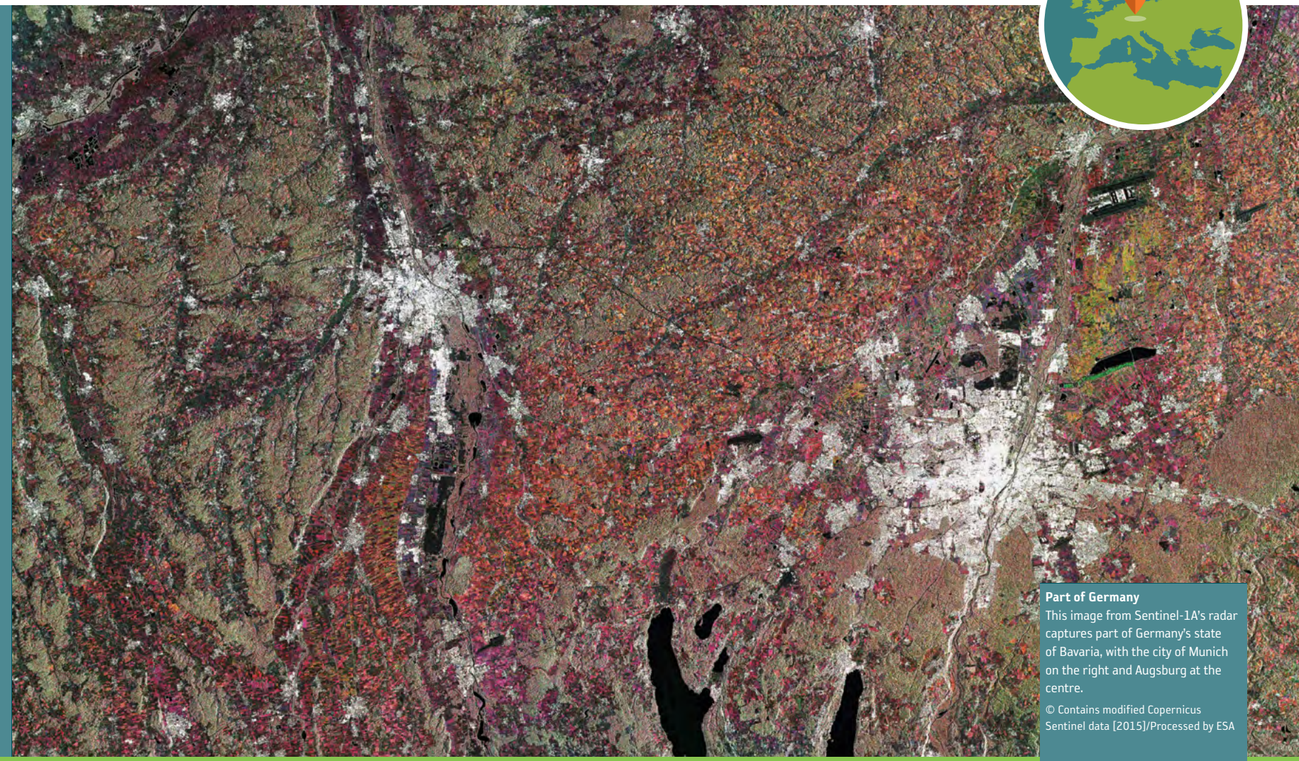
Natural Resource Management using Copernicus' Services and Data

12 November 2015 | Munich, Bavaria (Germany)

The objective of the workshop in Bavaria was to familiarize the personnel of Regional Agencies responsible for monitoring and management of natural resources with the potential of Copernicus in supporting them in their undertakings. Such potential had already been explained in a 2012 study, especially for well-identified areas such as forest vitality change, safety of animal feed, green fodder prediction, land use changes, ground stability monitoring for mining pits and inland water quality. Each topic was presented by couples of representatives from public administration paired with commercial service providers, showcasing an existing solution for each public need. This presentation formula proved very effective for the audience and also had the collateral benefit of strengthening the cooperation between the presenters. Overall, the featured applications appear in a well-developed state and have a clear potential to become operational, with local service providers fully mastering the necessary "know-how" and proper readiness for use in place within the public administrations. Such maturity, heritage of former efforts from both industry and public administrations, lead to lively general discussions about what is the "ecosystem" that can facilitate Copernicus uptake (e.g. business and management models, political commitment, gap of skills and lack of awareness among public administrators). One thing that was made clear was that there is no "quick and easy" solution: the development of services for a regional or local administration is often very specific and needs long iterative processes to be made operational, requiring initial investments that are hardly affordable by small and medium enterprises.

> *"As representative of the Bavarian Ministry for Economic Affairs, I am interested in the economic success of space applications. Regional workshops as initiated by this ESA/NEREUS initiative foster the cooperation between regional agencies, service providers and companies and, in the long run, strengthen the commercial use of Copernicus data."*

Mr. Dietmar Schneyer | Unit Head, Aerospace, Research and Innovation, Bavarian State Ministry of Economic Affairs and Media, Energy and Technology



Part of Germany
This image from Sentinel-1A's radar captures part of Germany's state of Bavaria, with the city of Munich on the right and Augsburg at the centre.

PARTICIPANTS – Total: 63 | LRAs: 15 | Private Companies: 24 | Research: 8 | Others: 16

KEY FINDINGS

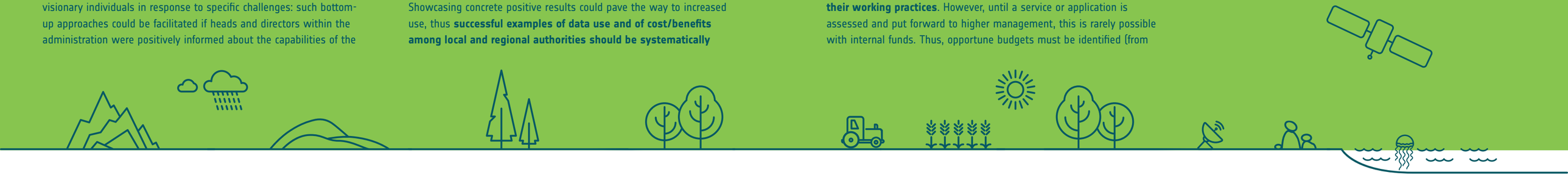
The project findings **confirm the potential of Sentinels data as a supporting tool for European local and regional authorities to undertake their tasks**. Their long-term and free availability, coupled with their operational nature, can possibly revolutionize the monitoring capabilities offered by Earth Observation satellites in support to policy making. However, the project also confirmed the risk that this outstanding potential remains locked for long. This was attributed to several reasons, of political, social, economic and technical nature: they are summarised hereafter together with possible solutions.

The **lack of a mandate or political support** was voiced as one of the main obstacles to create an interest at the administration about the possibilities of using EO/Copernicus technology to enhance the work performances or to replace existing working practices. This is attributed to a general **low awareness, at the high levels, concerning the social value of EO/Copernicus**. For instance, examples were presented in which the new technology had been introduced from visionary individuals in response to specific challenges: such bottom-up approaches could be facilitated if heads and directors within the administration were positively informed about the capabilities of the Programme. **The creation of high-level task forces involving decision makers** could help to address this aspect. **Networking and sharing of best practices** are recognized as a powerful tool to learn, circulate ideas and get useful contacts at all levels. Valid initiatives in this respect range from the **organization of inter-regional thematic workshops** - to aggregate different regions sharing similar interests or concerns, to **the organization of local workshops** - to facilitate local administrators meet with local providers. In order to foster the engagement of regions, the **network of Regional Contact Offices** (that provide a dedicated interface for EO support within and outside the administration) has been recognized as a solution of particular interest, but this is today too limited and too scarcely exploited.

People's acceptance of new technologies and their availability to replace current working practices is generally low, especially among LRAs. In some cases, unfortunate experiences from the past (e.g. high costs or lack of data continuity) add a negative bias to be overcome. Showcasing concrete positive results could pave the way to increased use, thus **successful examples of data use and of cost/benefits among local and regional authorities should be systematically sought and better advertised**. The **lack of trained staff** was also identified as an obstacle: some permanent know-how should be created in the administrations, even if the service is procured externally, and this could be achieved through the organization of **focused thematic trainings for the administrative staff**.

Although the Sentinels open and free data policy is recognized unanimously as a big step forward, **resources are still needed for processing, adding value to the data and turning it into useful information**. This could be done in-house or procured via private companies. In this respect, some providers expressed their confidence that Copernicus would allow them to sell affordable solutions. However, it is unlikely that commercial off-the-shelf solutions can fit the needs: more often, administrations and private companies must engage in a long dialogue in order to come out with solutions that can be really adapted (and accepted) to the needs. **Regional authorities need to secure appropriate budgets for the incorporation of EO data into their working practices**. However, until a service or application is assessed and put forward to higher management, this is rarely possible with internal funds. Thus, opportune budgets must be identified (from regional, national and European funding sources) to ensure that proven technologies can be transferred, e.g. from research institutes and private companies, and be effectively rolled-out.

Technological challenges are also to be addressed: in particular, the **lack of adequate infrastructure at the user's side** – which is necessary to process high-volume, dense EO data files - was perceived as a problem that the provision of access to low-cost hosted-processing platforms could potentially alleviate. Data access and usability could be improved with solutions intended to "**bring the data closer to regions**", for instance in terms of software implementations that could be more readily integrated within Geographic Information Systems and mobile applications but also in terms of portals appearance (e.g. with local language and ancillary data sets).



CONCLUSIONS

The initiative ***"What can Sentinel do for Regions?"*** investigated the potential use of Copernicus Sentinel data within local and regional authorities in Europe.

Involving overall 277 participants (of which 108 staff from regional administrations) from 29 regions of 7 European countries, the project has successfully stimulated a focused, inter-regional debate.

Although the Sentinels era is just started, the project findings basically confirm the Sentinels' potential as a valuable tool to support regional authorities in their undertakings. During three dedicated workshops, numerous applications have been showcased for example in support to maritime safety in the North Sea, monitoring of volcano deformations in the Azores, monitoring of mining pits in Wallonie, rice crop forecasting in Lombardy, forest management and inland water quality monitoring in Bavaria and emergency management in Mazovia and Midi-Pyrénées. However, only a few of these solutions are ready to be actually deployed at the public administrations. This "gap", lively and openly debated, was attributed to various difficulties encountered by the public administrations to incorporate these data within their working procedures. Difficulties span from the need to focus on core institutional tasks to a certain resistance to change established practices in favor of a technology that is sometimes perceived as remote and complex. Possible solutions were suggested. On top of these, awareness raising was considered key: efforts would be undertaken by administrations only if motivated by expectations of real benefits and if, ideally, backed by a political mandate. Trainings, technical solutions to improve the usability of Sentinels data, improved attention on technology transfer are also considered important, as well as clustering and sharing of best practices among regions that have similar areas of concern (and, notably, for cross-border instances).

The enthusiasm with which participants openly took part to the discussions was taken as an indication that the dialogue could and should be fruitfully expanded involving additional partners across Europe. A dedicated strategy should be defined that comprehensively involves all stakeholders at European, national, regional and local level: through bottom-up and top-down approaches, both the technical level as well as the political level of public administrations need to be addressed and potential synergies between their strategies be explored.

The enclosed electronic package includes (in English) the project report, the workshop reports, the slides presented during the workshops from Inspeção Regional das Pescas - Secretaria Regional do Mar, Ciência e Tecnologia (Azores), Direção Regional das Obras Públicas e Comunicações - Secretaria Regional do Turismo e Transportes (Azores), Gabinete de Planeamento - Secretaria Regional da Agricultura e Ambiente (Azores), Delegação dos Açores do Instituto Português do Mar e da Atmosfera (Azores), German Aerospace Centre (DLR), EDISOFT SA, DEIMOS Engenharia, University of Oporto, University of Azores, University of Evora, Regione Lombardia - Direttorato per l' impresa, la ricerca e l' innovazione, Italian Space Agency (ASI), ESA, European Commission DG AGRI, EC DG-GROW, EC JRC, EURAC/Euromontana, Midi Pyrénées Presidency of Research and Higher Education, Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement (CEREMA), Autorita' di bacino del Fiume Po (Po River Basin Authority), Agenzia Regionale Protezione Ambientale (ARPA) Lombardia, Agenzia Regionale Protezione Ambientale (ARPA) Emilia Romagna, Agenzia Regionale Protezione Ambientale (ARPA) Piemonte, Italian National Council for Research (CNR-IREA), GaiaG S.r.l, Office of the Marshal of Mazowieckie Voivoderhip in Warsaw, German Aerospace Centre (DLR), EC, ESA, Bundesanstalt für Kartographie und Geodäsie , IABG, Bayerisches Landesamt für Umwelt, ESRI, EOMAP GmbH, Service public de Wallonie Département de la Nature et des Forêts, Spacebel, Institut Scientifique de Service Public (ISSeP), Centre Spatial de Liège Space, Bayerische Landesanstalt für Wald und Forstwirtschaft, Bayerische Landesanstalt für Landwirtschaft , VISTA GmbH , GAF AG.

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In cooperation with:

Governo dos Açores
Secretaria Regional do Mar, Ciência e Tecnologia

Bavarian Ministry of Economic Affairs and Media, Energy and Technology

Regione Lombardia

LANGUEDOC ROUSSILLON
LA RÉGION MIDI PYRÉNÉES

Freie Hansestadt Bremen

RÉGION WALLONNE

Mazovia.
heart of Poland