



# The Copernicus Full, Free and Open Data Policy

Dr. Peter Breger, DHoU Copernicus  
European Commission, DG GROW



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[www.copernicus.eu](http://www.copernicus.eu)

Space





Copernicus

# Content

- Copernicus – short introduction
- Open Data and Linked Open Data
- The Copernicus FOF data policy and its delivery
- Copernicus Socio-economic benefits
- How is Copernicus shaping up?
- Where are we going next?



Maros Sefcovic and Elzbieta Bienkowska, right, presented the European Commission's new space policy in late October. It focuses on improving people's daily lives and boosting Europe's competitiveness.



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# COPERNICUS IN BRIEF

- **Copernicus, a flagship programme** of the European Union:
  - Monitors **the Earth**, its environment and ecosystems
  - Prepares for **crises, security risks** and **natural or man-made disasters**
  - Contributes to the **EU's role as a global soft power**
- Adopts a **full, free and open data policy**
- Is a tool for **economic development** and a driver for the **digital economy**







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# COPERNICUS – a multi-component system

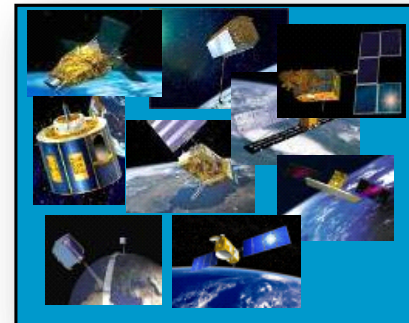
Space-based



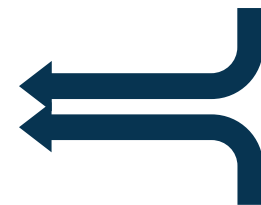
## Sentinels



6 services use Earth Observation data to deliver timely and reliable geo-information



## Contributing missions



Adopted budget appropriations 2014-2020

Space component - **3.394 M€**  
Service & In-situ component - **897 M€**



## ...added-value products



ground-based

## in-situ



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# THE SENTINELS

## Sentinel Mission and Status

## Key Features

FULL, FREE AND OPEN



**SENTINEL-1:**  
4-40m resolution, 3 day revisit at equator

2 sats in orbit ✓

Polar-orbiting, all-weather, day-and-night radar imaging



**SENTINEL-2:**  
10-60m resolution, 5 days revisit time

1 Sat in Orbit ✓

Polar-orbiting, multispectral optical, high-res imaging



**SENTINEL-3:**  
300-1200m resolution, <2 days revisit

1 Sat in Orbit ✓

Optical and altimeter mission monitoring sea and land parameters



**SENTINEL-4:**  
8km resolution, 60 min revisit time

1st Launch in 2020

Payload for atmosphere chemistry monitoring on MTG-S



**SENTINEL-5p:**  
7-68km resolution, 1 day revisit

Launch in 2017

Mission to reduce data gaps between Envisat, and S-5



**SENTINEL-5:**  
7.5-50km resolution, 1 day revisit

1st Launch in 2021

Payload for atmosphere chemistry monitoring on MetOp 2<sup>nd</sup>Gen



**SENTINEL-6:**  
10 day revisit time

1st Launch in 2020

Radar altimeter to measure sea-surface height globally



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# The Six COPERNICUS SERVICES

*Monitoring the State of the Earth System Environment ...*

Land Monitoring

Operational (2 red checkmarks)

Marine Environment Monitoring

Operational (1 red checkmark)

Climate Change

In ramp up (1 yellow checkmark)

Atmosphere Monitoring

Operational (1 red checkmark)

Emergency Management

Operational (2 red checkmarks)

Security

In ramp up (3 checkmarks: 2 red, 1 yellow)

*... Six cross-cutting Thematic Services*

✓ = operational

✓ = in ramp up

# The value of open data: Open Data and Linked Open Data



User Uptake

- What is it?
- What are the expected benefits?





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# Linked Open Data

- Open Government & Open Government data (2009-2011)
  - Free access to information
  - Offer possibility to freely use and re-use data/information
  - Lower barrier to ensure widest re-use
  - Promote a "look, take and play" approach
- "Open" translates to data being
  - complete, primary (not only aggregated), timely, accessible, machine processable, non-discriminatory access, non-proprietary format, license-free, permanent, no usage cost
- Linked Open data – takes exploitation to new levels
  - Based on clear definitions, with URI identification, linked to other context data





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# The economic value of Open Data

- COM study: economic value of opening up and re-using public sector information are about 40 bn per year in EU (Vickery 2011)
- And for UK : 1,8 bn (Deloitte)
- 2<sup>nd</sup> most important type of data that executives see as most valuable for strategy decisions

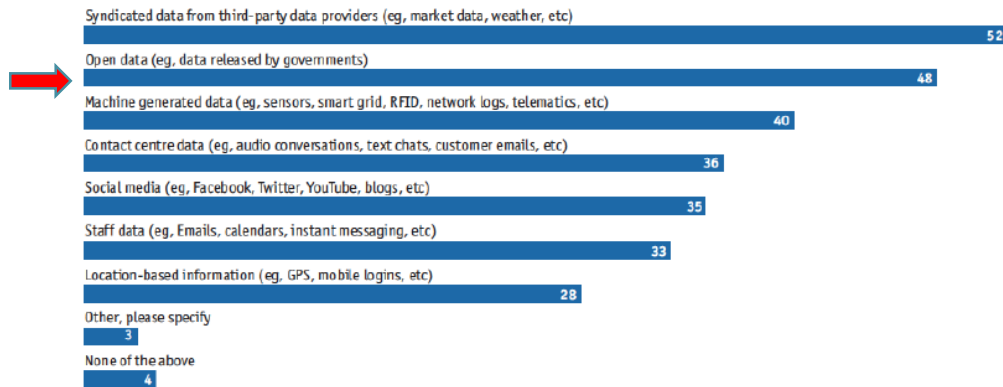


Figure 1: % respondents to the question: "Which of the following types of data would your company benefit from the most in deciding on changes of strategy or developing new strategies?" Source: The Economist Intelligent Unit (2013), p. 41.

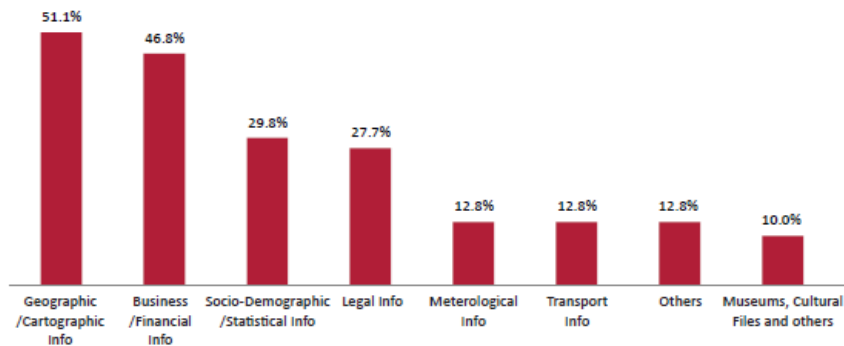


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# Popularity of Open Data Domains

- Open data drives growth by stimulating creation of firms that reuse such gov data in innovative ways (150 companies focused on Spain on infomediary sector)
- Geographic and Cartographic info is an important favourite

Figure 4: Most Popular Open Data Domains: Percentage of companies working with specific domain of Open Data (n=150), Spain, 2012



Source: Spanish Open Data Portal Annual Report, "Characterization Study of the Infomediary Sector", July 2012

“

*In countries where organizations have moved to marginal/ zero cost charging models, the number of re-users increased by between 1,000% and 10,000% leading to an increase in revenues.*

”

# Copernicus Data Policy:

## Full – Free – and Open

- What conditions apply?
- How is practically implemented?
- For which components of Copernicus?



User Uptake



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# Commission Delegated Regulation 1159/2013



- establishes registration and licensing conditions and defines criteria for restricting access
  - Consistency with INSPIRE Directive (compliance), Charter of Fundamental Rights, Open Data Policy Directive (Digital Agenda for Europe)
  - *Supports free and open data policy intentions expressed by COM, ESA*
  - *Third countries/international organisations to have access*
  - *Reiterates Copernicus as European contribution to GEOSS*
  - Free of charge in order to capitalise on social benefits
  - Protects/maintains IPR and License conditions of third party inputs
  - Restrictions re privacy, security interests of the Union (MS are key players)
  - *Priority of access to users from countries/orgs contributing to programme*
  - *Rights of redistribution, adaptation, modification and combination*
  - *Distinguishes discovery, view and download*
  - *Registration at level of download*





# Increased demand following lowered charges

## ABOUT GMES AND DATA : GEESE AND GOLDEN EGGS

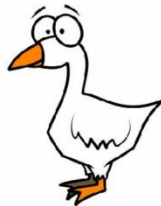
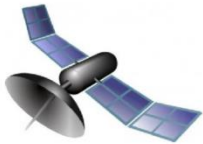
by Geoff Sawyer and Marc de Vries  
*Under an assignment from the European Space Agency*  
2012

A Study on the Economic Benefits of a Free and Open Data Policy for Sentinel Satellite Data

Study examines the chain of economic effects of lowered PSI re-use charges

| Case study                         | PSI domain                                                                                                                                  | Price cut re-use charges                                                                        | Increase in demand                                                                                                                                                                     |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Austrian Cadastre (POPSIS + Koski) | Topographical data                                                                                                                          | Up to 97%                                                                                       | Factor 2 – 7 in number of downloads <sup>34</sup>                                                                                                                                      |
| DECA (POPSIS)                      | Danish address data                                                                                                                         | almost 100%                                                                                     | Factor 100 in number of re-users                                                                                                                                                       |
| KNMI (POPSIS)                      | Dutch meteo data                                                                                                                            | 80%                                                                                             | Factor 10 in number of re-users, 90% of them being SMEs                                                                                                                                |
| MET.NO (POPSIS)                    | Norwegian meteo data                                                                                                                        | 100%                                                                                            | Factor 30 in numbers of unique weekly re-users, majority being SMEs                                                                                                                    |
| Spanish Cadastre (POPSIS + Koski)  | Spanish topographical data                                                                                                                  | 100%                                                                                            | <ul style="list-style-type: none"> <li>- Factor 80 – 100 in numbers of downloads</li> <li>- Factor 25 in numbers of re-users</li> </ul>                                                |
| Houghton study                     | Australian: <ul style="list-style-type: none"> <li>- Topographical data</li> <li>- Statistical data</li> <li>- Hydrological data</li> </ul> | <ul style="list-style-type: none"> <li>- almost 100%</li> <li>- 100%</li> <li>- 100%</li> </ul> | <ul style="list-style-type: none"> <li>- 172%</li> <li>- Factor 3 in product downloads</li> <li>- Factor 100 in data requests</li> <li>- Factor 2 for extractions of re-use</li> </ul> |

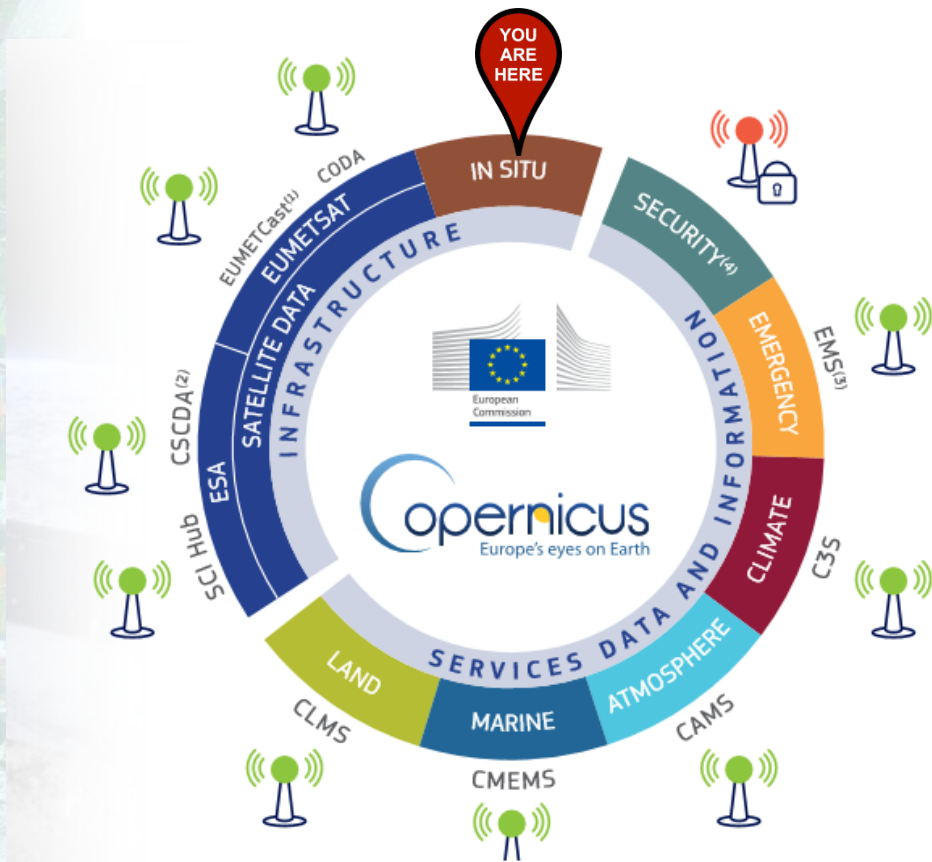
Figure 3-4: Overview of increases in demand following lowered PSI re-use charges





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# Implementation – Access to different parts



## Services Data and Information =

- Added value products, indicators
- Models
- Archives, Near Real Time and Forecasts products

Note: Copernicus *in situ* component provides *in situ* data access internally to Copernicus services. **It is not delivering in-situ data to the end-users.**

## Satellite Data =

- Access to images in NRT
- Sentinel and contributing missions
- Access to archives

Note: Copernicus **contributing mission data** retains provider IPR, hence **different license conditions as regards end-user.**



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# Access to Satellite Data

4 data access points:

- 2 managed by ESA:
  - Scientific Data Hub (SCI Hub) : <https://scihub.copernicus.eu/>
  - Copernicus Space Component Data Access (CSCDA): <https://spacedata.copernicus.eu/>
- 2 managed by EUMETSAT:
  - EUMETCast: [www.eumetcast.com](http://www.eumetcast.com)
  - Copernicus Online Data Access (CODA): Soon available



Third party Space Data is distributed respecting providers' License conditions









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# Access to Services Data and Information

## 6 Thematic Copernicus Services:

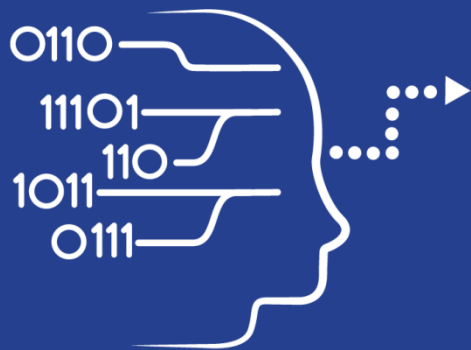
### INSPIRE compliance

- 5 are under Full, free and open access:
  - Land (CLMS) 
  - Marine (CMEMS) 
  - Atmosphere (CAMS) 
  - Climate (C3S) 
  - Emergency (EMS) 
- 1 restricted access for MS authorities
  - Security 



Ingested Third Party Data is distributed (or not distributed) respecting providers' License conditions





User Uptake

# How is Copernicus shaping up?

- Satellite data uptake
- Services Data and Information uptake

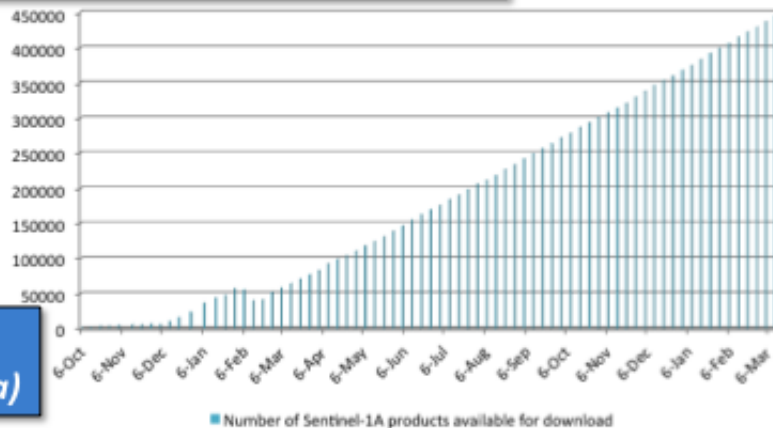


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# Sentinels Data – Systematic Production

***In 2015 an average of 3 TB of core products was generated daily***

***By end 2016 this figure has increased to more than 8 TB a day*** available for download



***Full Sentinel-1 production is available online: > 1 million products (>1PB of data)***

***Sentinel-3A Level-1 products gradual release to all users started in Q4-2016***

***Full Sentinel-2A production is available online: >560,000 products (>500 TB of data)***

Statistics: 7 February 2017



Space Component

# Download statistics

**Approx. 4,6 MILLION products were downloaded during Q4-2016 corresponding to 4,6 PB of data**

- Sentinel 1 (A&B)**

**Approx. 1.6 million products were downloaded during Q4-2016 (2.7 PB of data)**

**Exploitation ratio - 1:10**  
on average each product published has been downloaded 10 times

- Sentinel 2**

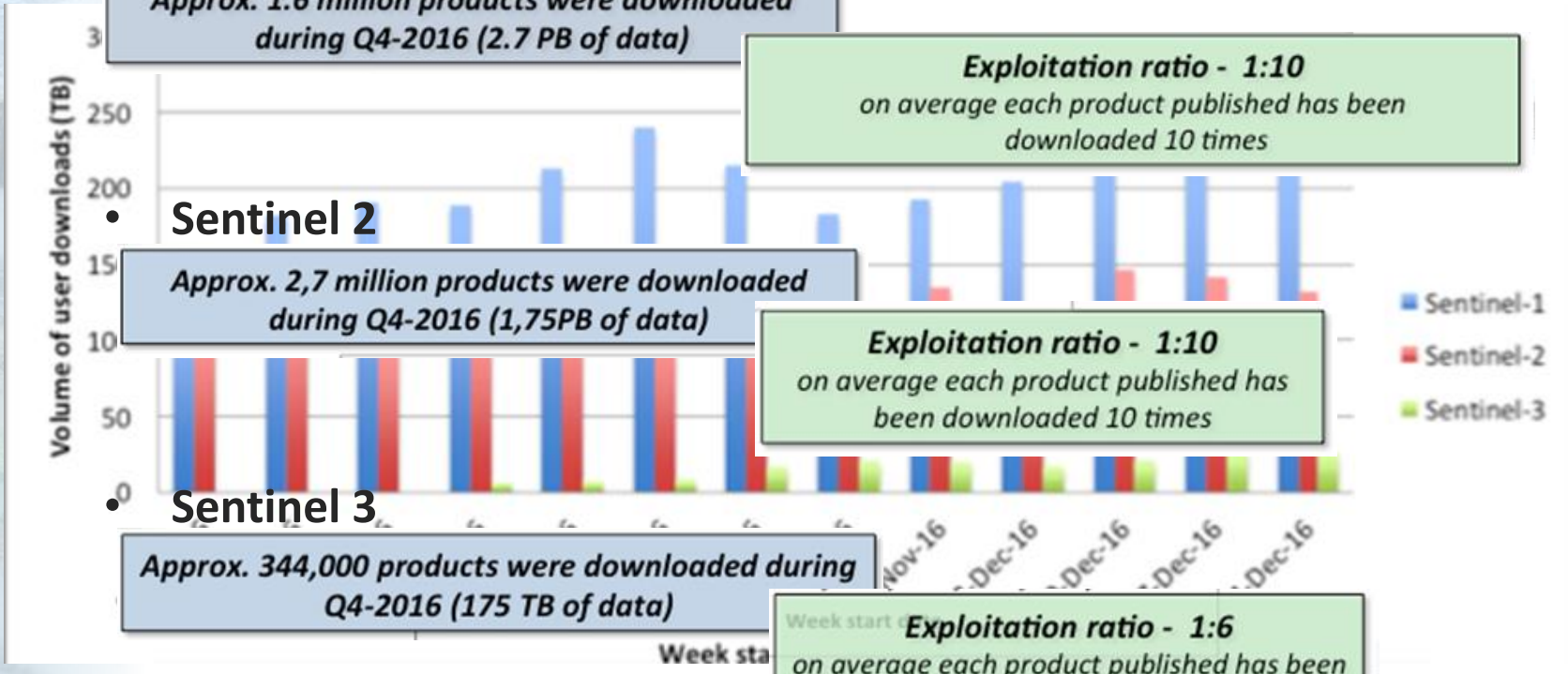
**Approx. 2,7 million products were downloaded during Q4-2016 (1,75PB of data)**

**Exploitation ratio - 1:10**  
on average each product published has been downloaded 10 times

- Sentinel 3**

**Approx. 344,000 products were downloaded during Q4-2016 (175 TB of data)**

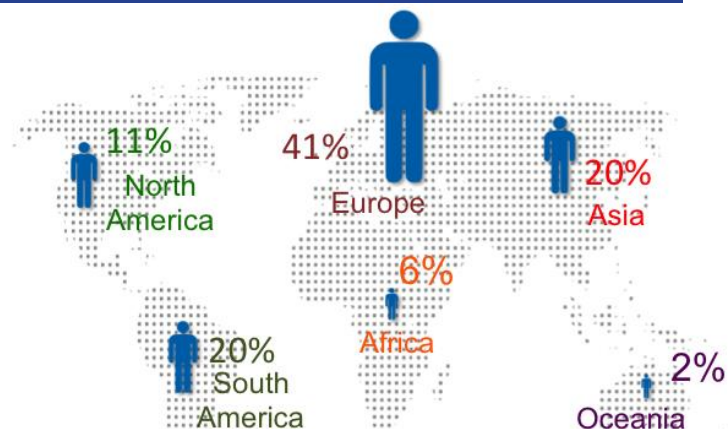
**Exploitation ratio - 1:6**  
on average each product published has been downloaded 6 times





# Sentinels Data Access Statistics – Global View

| Continent                    | Active Users during Q4 2016 - all missions | % change since Q3 2016 | S1 Active Users during Q4 2016 | S2 Active Users during Q4 2016 | S3 Active Users during Q4 2016 |
|------------------------------|--------------------------------------------|------------------------|--------------------------------|--------------------------------|--------------------------------|
| Europe                       | 4,237                                      | +37%                   | 2,341                          | 2,734                          | 130                            |
| Africa                       | 302                                        | +101%                  | 160                            | 194                            | 3                              |
| Asia*                        | 1,542                                      | +45%                   | 1,085                          | 712                            | 11                             |
| North America                | 843                                        | +35%                   | 485                            | 495                            | 9                              |
| South America and Antarctica | 1,016                                      | +92%                   | 424                            | 749                            | 1                              |
| Australia                    | 150                                        | +56%                   | 75                             | 104                            | 1                              |



Major % increase of users from Asia and South America

## Top 5 European Countries for registrations and user downloads

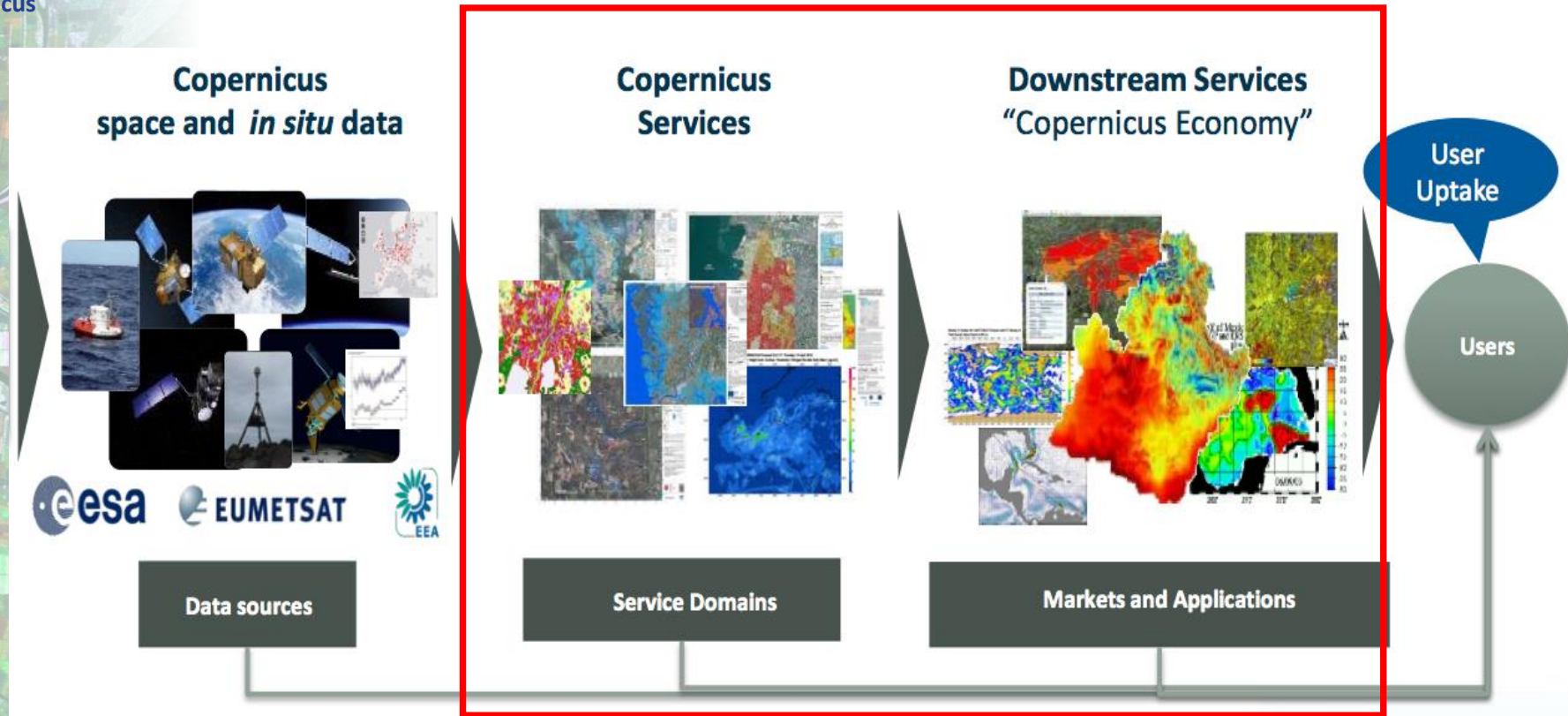
| Registrations since the start of operations |       |            | S1 Downloads in Q4 2016 |        | S2 Downloads in Q4 2016 |         | S3 Downloads in Q4 2016 |    |
|---------------------------------------------|-------|------------|-------------------------|--------|-------------------------|---------|-------------------------|----|
| Country                                     | #     | % increase | Country                 | #      | Country                 | #       | Country                 | #  |
| Germany                                     | 4,270 | 15%        | The Netherlands         | 72,198 | Slovenia                | 332,868 | UK                      | 32 |
| UK                                          | 3,247 | 7%         | Italy                   | 70,186 | France                  | 284,682 | France                  | 27 |
| Italy                                       | 2,545 | 2%         | France                  | 53,865 | Austria                 | 112,934 | Austria                 | 23 |
| France                                      | 1,752 | 7%         | UK                      | 39,193 | UK                      | 71,622  | Italy                   | 23 |
| Spain                                       | 1,655 | 20%        | Denmark                 | 31,404 | Poland                  | 51,605  | Germany                 | 20 |





Copernicus

# Copernicus as a driver for economic growth

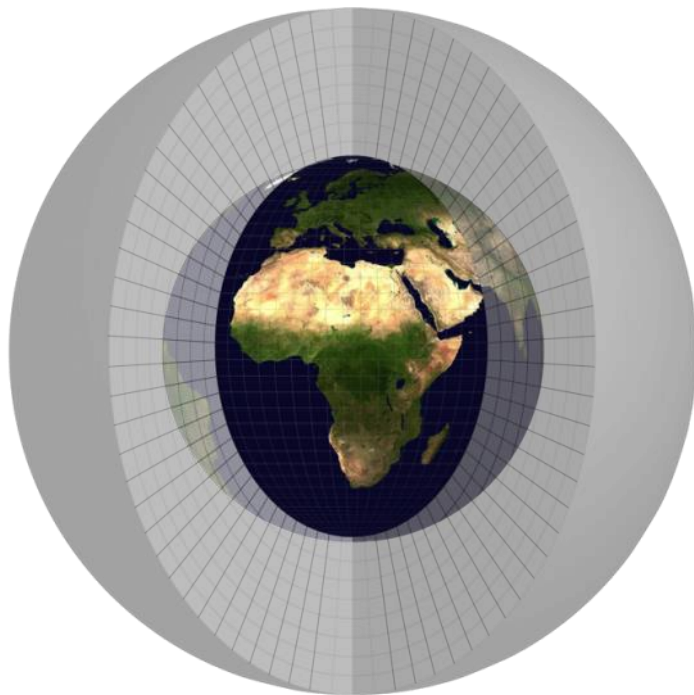


Source: GMV/SpaceTec partners/FDC/NOVELTIS

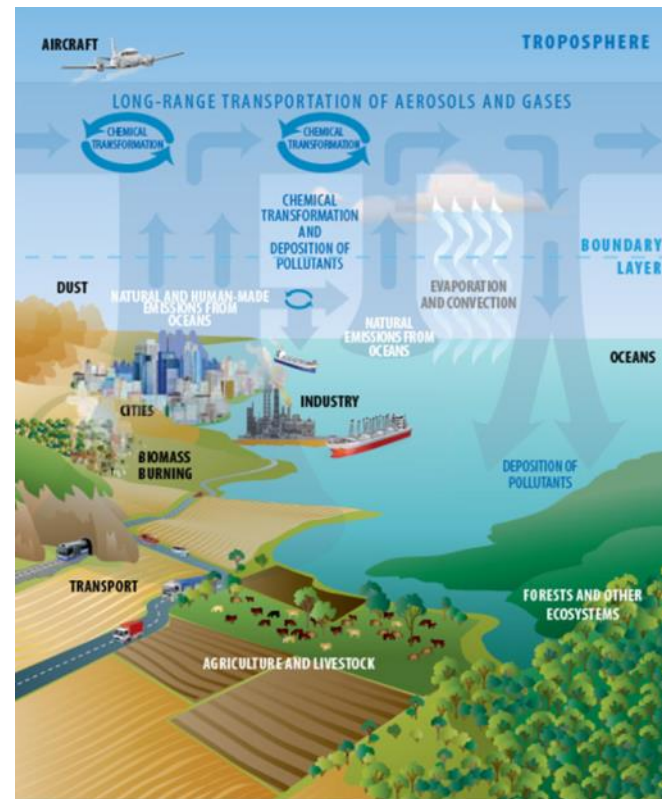


Atmosphere  
Monitoring

# WALKING IN THE STEPS OF WEATHER PRED.



Combining observations and numerical models allow delivering analyses (“maps with no gaps”) and forecasts





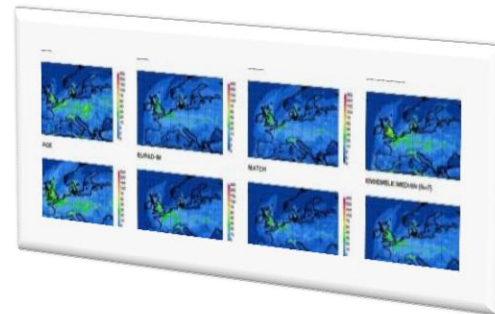
# Atmosphere Monitoring Service

Atmosphere Monitoring



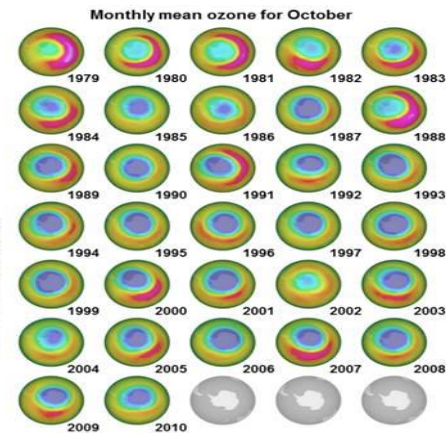
Air Quality forecast

and (Re-)Analysis



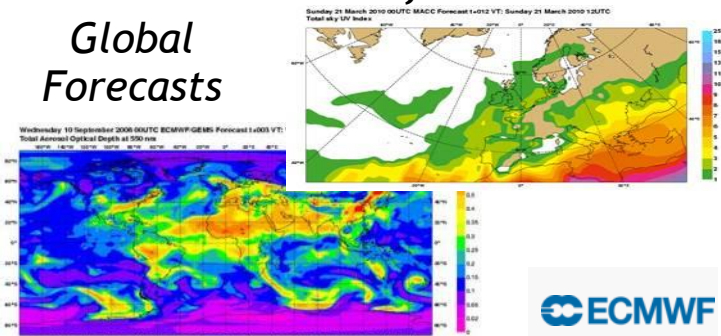
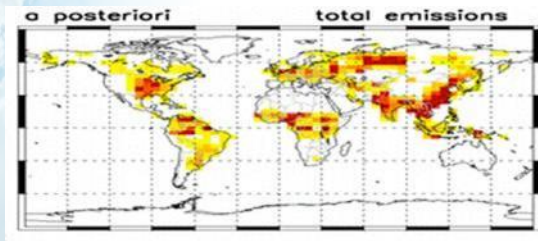
Stratospheric Ozone

UV Information



Emissions

Global Forecasts

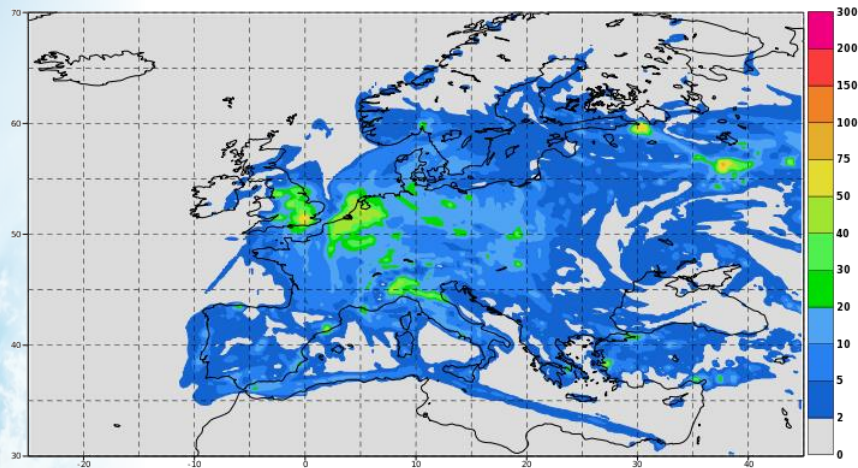






# CAMS PORTFOLIO: REGIONAL PRODUCTS

Monday 14 November 2016 00UTC CAMS Forecast t+000 VT: Monday 14 November 2016 00UTC  
Model: ENSEMBLE Height level: Surface Parameter: Nitrogen Dioxide [  $\mu\text{g}/\text{m}^3$  ]

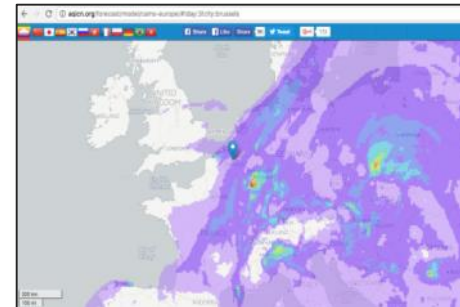


For regulatory pollutants ( $\text{O}_3$ ,  $\text{NO}_2$ ,  $\text{SO}_2$ ,  $\text{PM}_{2.5}$ ,  $\text{PM}_{10}$ ...) and other key species:

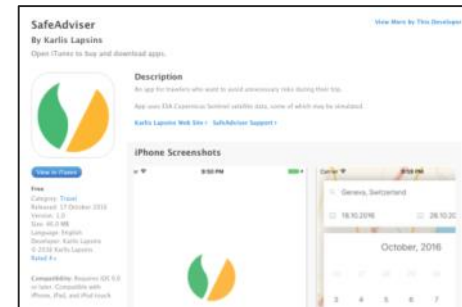
- Real-time analyses and forecasts (4-day)
- Interim reanalyses (shortly after the end of each year)
- Reanalyses based on validated observations (when Airbase is updated)

## Some users

aqicn.org (International)



SafeAdviser (Latvia)



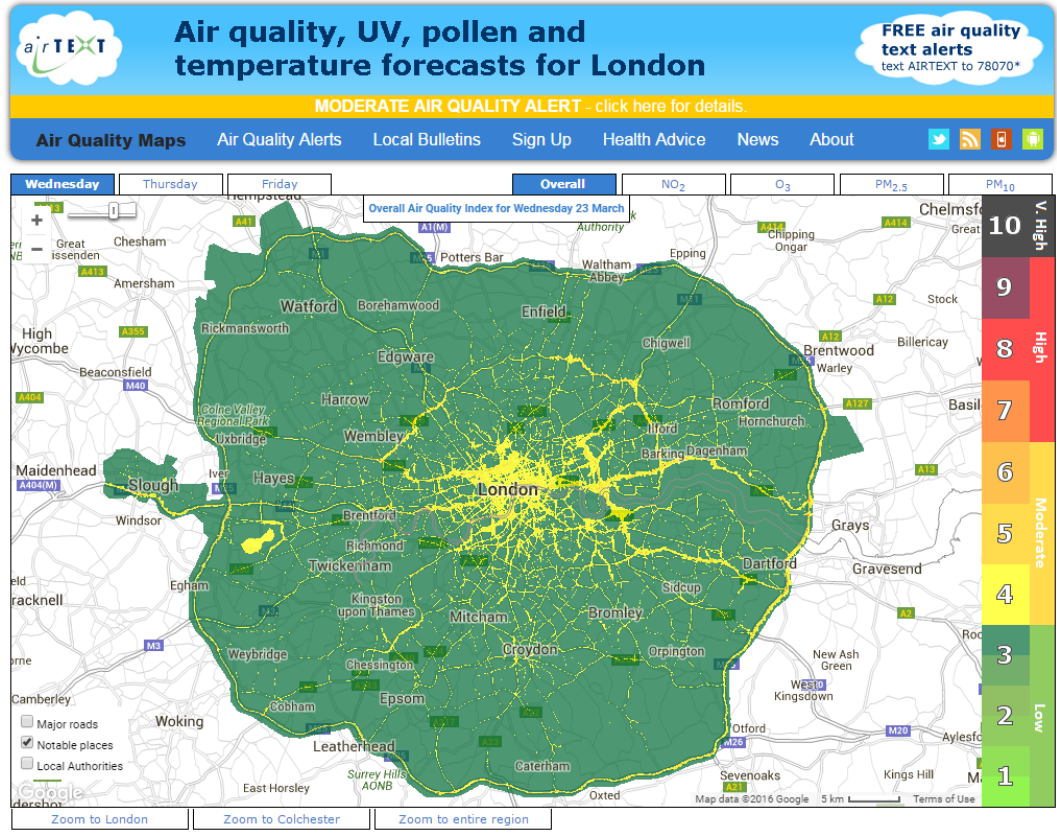
...





Atmosphere Monitoring

# ... to local product: *airTEXT* AIR QUALITY



Free air pollution, UV, pollen and temperature forecasts for Greater London and the South East.

**Currently provides free air quality alerts to more than 15,000 subscribers**





## ... to local product: *Case Study NUMTECH*

Based on ADMS URBAN  
developed by CERC

Cities already  
equipped with  
Urban Air in  
France

(Source:

[www.numtech.fr](http://www.numtech.fr))



Agglomération du Grand Nancy



Agglomération de Metz Métropole



An operational Urban Air in the city of Nancy (France)

(Source: [www.numtech.fr](http://www.numtech.fr))

## COPERNICUS

### Market report

November 2016



Prepared by PwC for the European Commission

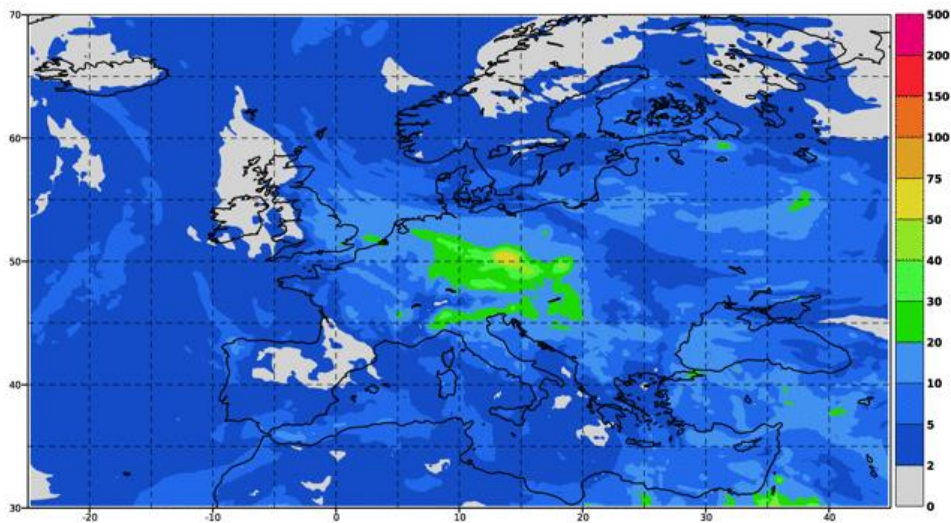
About **10%** of the data used in Urban Air stem from **Copernicus**. In particular, it represents **most of the data used to analyse the background pollution**, which makes it one of the key inputs of Urban Air. NUMTECH expects from €1 to 10M of annual revenues on the Env&You project, so **Copernicus should generate from €100K to €1M of annual revenues on this project.**

On its initial market, Urban Air should enable NUMTECH to **double their turnover in the short term on markets abroad, where the lack of background information on air quality is an obstacle.** Copernicus should generate revenues from **new markets** by selling environmental data to new types of clients (sports, real estate parties, etc.) **10 job positions will thus be created.**



# Bringing results to citizen – impact on personal behaviour → health → public health expenditures

Thursday 09 February 2017 00UTC CAMS Analysis t-024 VT: Wednesday 08 February 2017 00UTC  
Model: ENSEMBLE Median Height level: Surface Parameter: PM2.5 Aerosol [  $\mu\text{g}/\text{m}^3$  ]



Example:

High pollution event  
(esp. PM 2,5 affecting  
Brussels  
8-12 Feb 2017)





Atmosphere  
Monitoring

Bringing results to citizen - impact on  
personal behaviour → health → public  
health expenditures

Thursday 09 February 2017 00UTC CAMS Analysis t-024 VT: Wednesday 08 February 2017 00UTC  
 Model: ENSEMBLE Median Height level: Surface Parameter: PM2.5 Aerosol [  $\mu\text{g}/\text{m}^3$  ]

https://air.plumelabs.com/en/sources

HOME MAP BLOG

# PLUME AIR REPORT

MAKING THE AIR MORE TRANSPARENT

Twitter Facebook

## OUR SOURCES

Contains modified Copernicus Atmosphere Monitoring Service information 2017

Neither the European Commission nor ECMWF is responsible for the use of the data done by Plume Labs

South America Model : GMAI/CPTEC/INPE

AEROS (Japan)

AIR BREIZH (France)

AIR C.O.M. (France)

AIR Lorraine (France)

Agência Portuguesa do

Ambiente (Portugal)

Air Now (USA)

Air Quality Ontario (Canada)

HLUG (Germany)

Ilmanlaatu nyt (Finland)

Ingurumen eta Lurralde

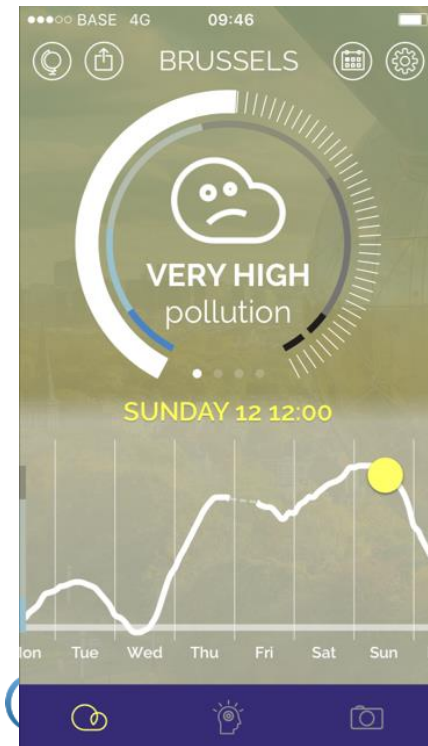
Politika Saila (Spain)

Ontario Ministry of

Environment and Climate

Change (USA)

Portail de l'Environnement du







Atmosphere  
Monitoring

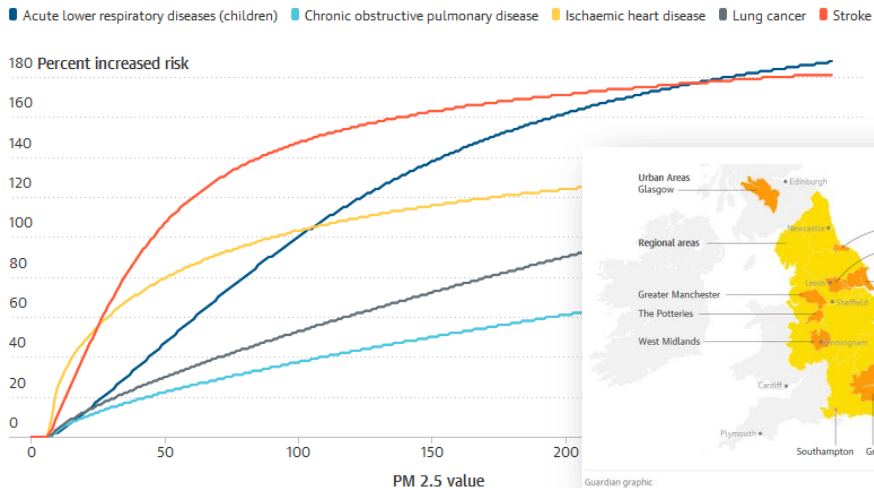
# Health risks and associated costs

- E.g. PM 2.5 value of 40 = 20% increased risk Chronic obstructive pulmonary disease
- Benefit at individual's level also translates to avoided costs associated to sick leaves, healthcare – See *The Guardian* Feb 14 & 15, 2017:

About 50,000 Britons die prematurely each year from respiratory, cardiovascular and other illnesses associated with pollutants such as NO<sub>2</sub>, particulate matter (PM) and ozone.

## Increase in risk of death by cause, compared with a clean air scenario

A 100% risk increase means your chances of contracting that disease have doubled



The public health costs have been estimated at £20bn a year, with 6m working days lost each year as a result of the externalised costs of polluting emissions.



Climate  
Change

# Copernicus Climate Change (C3) service

to be an authoritative source of climate  
information for Europe

**How is the  
climate  
changing?**

*Observations  
&  
Re-analysis*

**What are the  
societal  
impacts?**

*Climate  
indicators &  
Sectoral  
information*

**What is the  
rate of  
change?**

*Forecasts &  
Projections*

<http://climate.copernicus.eu/>



Climate  
Change

# Roadmap of products

## Consistent Climate Data Store - ~ 33 ECVs & indicators - Observed, re-analyzed and model projected products

### ATMOSPHERE

Surface Air Temperature  
Surface Precipitation  
Water Vapor  
Surface Radiation Budget  
Earth Radiation Budget  
Carbon Dioxide & Methane  
Ozone & Aerosols  
Cloud properties  
Wind Speed & Direction  
Upper Air Temperature  
Other Long-Lived GHGs

### OCEAN

Ocean Color  
Sea Ice  
Sea Level  
Sea Surface Temperature  
Global Ocean Heat Content

CO2 partial pressure  
Ocean Activity  
Sea Surface Salinity  
Current Salinity

### LAND

Snow Cover  
Glaciers & Ice Caps  
Albedo  
FAPAR  
Fire Disturbances  
Ice Sheets

Lakes  
Permafrost  
Land Cover  
Leaf Area Index  
Soil Moisture



Climate  
Change

# How can climate data **benefit** you?

Copernicus: Open data for Planning | Policy-making | Products

Copernicus is the EU's Earth observation programme providing data and information services for use by policy-makers and public authorities, businesses, citizens and scientists alike.

Anyone can access it **at no cost**.

## AGRICULTURE & FORESTRY

- Develop agriculture products
- Protect food supply

## ENERGY

- Predict energy yields
- Optimise solar power plants
- Plan hydroelectric dam placement

## COASTAL AREAS

- Build adaptation strategies
- Mitigate climate risk

## WATER MANAGEMENT

- Control flood and drought risk
- Shape environmental policy
- Validate research

## HEALTH

- Protect people and ecosystems
- Gain advance knowledge

## TOURISM

- Improve tourism management
- Protect coasts and mountains
- Plan for tourism impacts

## INSURANCE TRANSPORT INFRASTRUCTURE DISASTER RISK REDUCTION

- Improve resilience planning
- Reduce disaster risk

Climate data in action >>





Climate  
Change

EDgE bridges the gap between the data generated by climatological and hydrological models and the information needed by decision-makers.

### Set climate change reference

- RCP = Representative Concentration pathway (chosen IPCC trajectory , e.g. radiative forcing)
- GCM = Global Climate Model
- Hydrodrological model

### Simple presentation

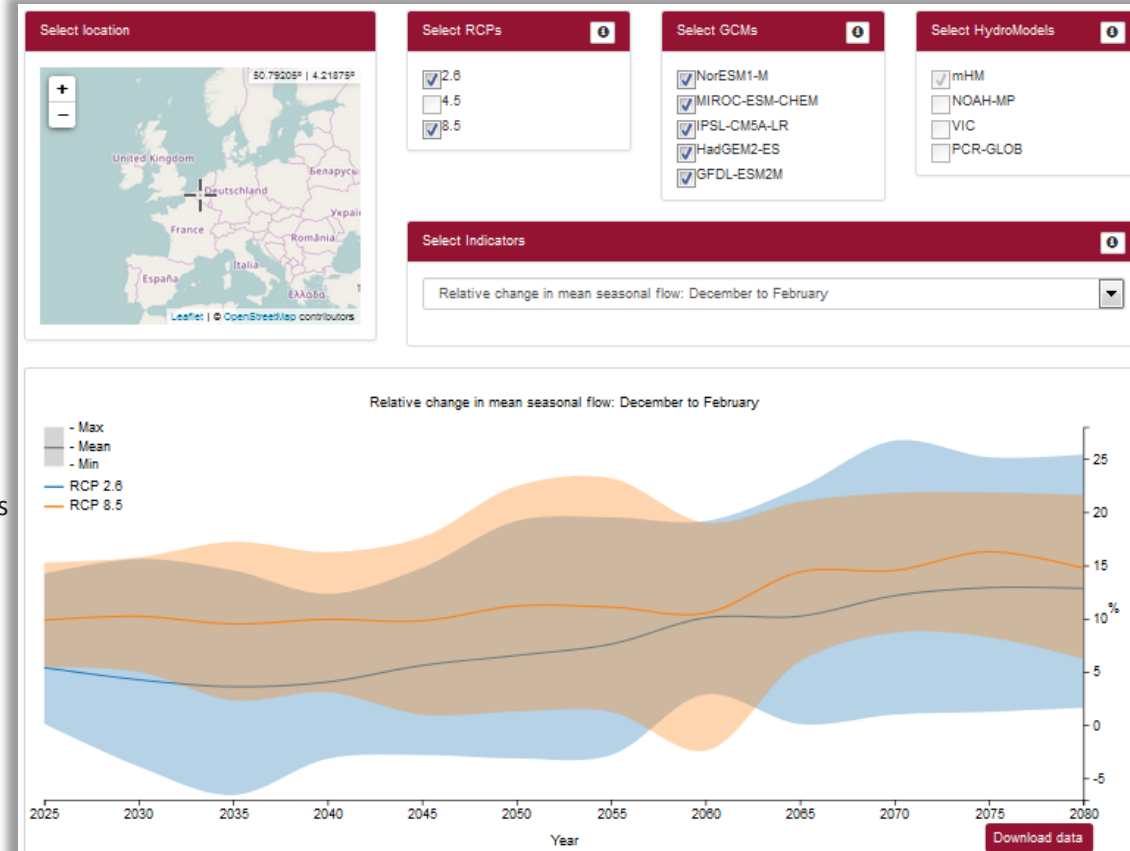
- Maps and time-series plots
- Narrative films

### Uncertainty and model skill

- For seasonal forecasts & long-term projections
- How best to visualise/ disseminate?

### Access to underlying data

- Subset of point data
- Gridded data to drive models
- NetCDF/ csv files/ GIS format





Climate Change

# Service delivery as expert consultation

## How Copernicus data can transform the water sector

Companies in the water sector across Europe are already experiencing the effects of climate change. It will be essential for the industry to be able to plan in advance in order to adapt and grow.

5. The consultant's feedback helps the Copernicus Climate Change Service further develop climate indicators and tools for use by more businesses and sectors.

4. The consultant's analysis of the data and their modelling of potential scenarios enables companies to reduce risk and develop sustainable business plans.

1. A business recognises the changing climate could impact their revenue, facilities or long term plans and want to know more.

2. They bring in an expert consultant to help them solve the problem, who recognises the need for data that can inform a business decision. The consultant knows about the Copernicus Climate Change Service which can provide both historic and predictive data across Europe.

3. The consultant accesses the Copernicus Climate Change Service's freely available data and tools to extract and visualise relevant information, tailoring and re-purposing it for the client's needs.



Copernicus can provide data and tools to ensure resilience, develop policy, protect health, unlock growth and understand the climate.





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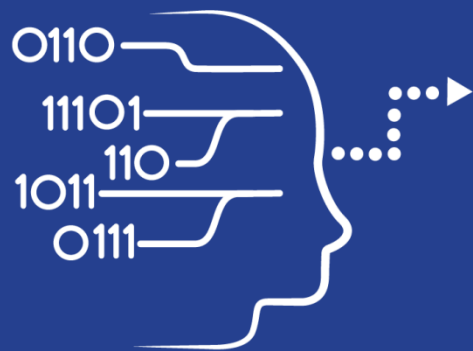
# Consultation on "Space Strategy for Europe" (2016)



Maros Sefcovic and Elzbieta Bienkowska, right, presented the European Commission's new space policy in late October. It focuses on improving people's daily lives and boosting Europe's competitiveness.

- 52% of respondents expressed an interest in Copernicus data:
  - environment, pollution & climate (28%)
  - agriculture and land use (23%)
  - emergency services (16%),
  - security and defence (14%),
  - maritime applications (13%), forestry (13%), Transportation (13%),
  - renewable sources of energy (10%)
- 53% consider data access as a moderate to serious difficulty
- Access to all Copernicus data is deemed most relevant (68%)
- Access to tools is considered the second most important element (33%)
- Access to a market place seems least relevant (17%).

424 online replies



User Uptake

# Copernicus

## The Expectations and Observed Impacts





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## Early findings from impact study (2012)

- Data Policy has the potential to create employment and growth through the development of value adding GMES services
  - While this could potentially benefit industry in third countries to the detriment of European industry, experience in both individual Member States and the US suggests that opening up data markets will contribute to developing the market by tapping into latent demand
  - Can serve as a major catalyst for the development of the downstream sector through the policy of free and open data access, to encourage value added integrators and wider downstream users to develop customised data products, services and applications for users
  - offers significant opportunities for SMEs: The policy of full and open access within both GMES and Galileo will encourage SMEs to enter the market and lower market entry barriers since commercial high-resolution EO data is very costly.
- » Impact of European Space Policy on European Space Manufacturing and the Services Industry; Executive summary; July 12th 2012.



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# Benefits expected from Copernicus

- Support the vital task of monitoring the environment (public sector)
- Create new jobs and business opportunities (enterprises – service and space manufacturing)
- Create indirect benefit through accurate earth observation supply to economic segments such as transport, oil and gas, insurance and agriculture

## Copernicus cost-benefit assessment predicted:

- **Cost per EU inhabitant will be ~€1.07 per year**
- Expected cumulative **financial benefit** by 2030 is **~€30 Bn** - comparable to 0.2% of the EU GDP
- For every €1 spent we get a **return of ~€3.2**
- An estimated minimum of **~48,000 jobs** will be created – over the period 2015 -2030
- Estimated downstream market potential turnover will be **~€1.8 Bn** by 2030



Copernicus

# Final evaluation (2016) of GMES Initial Operations 2011-2013

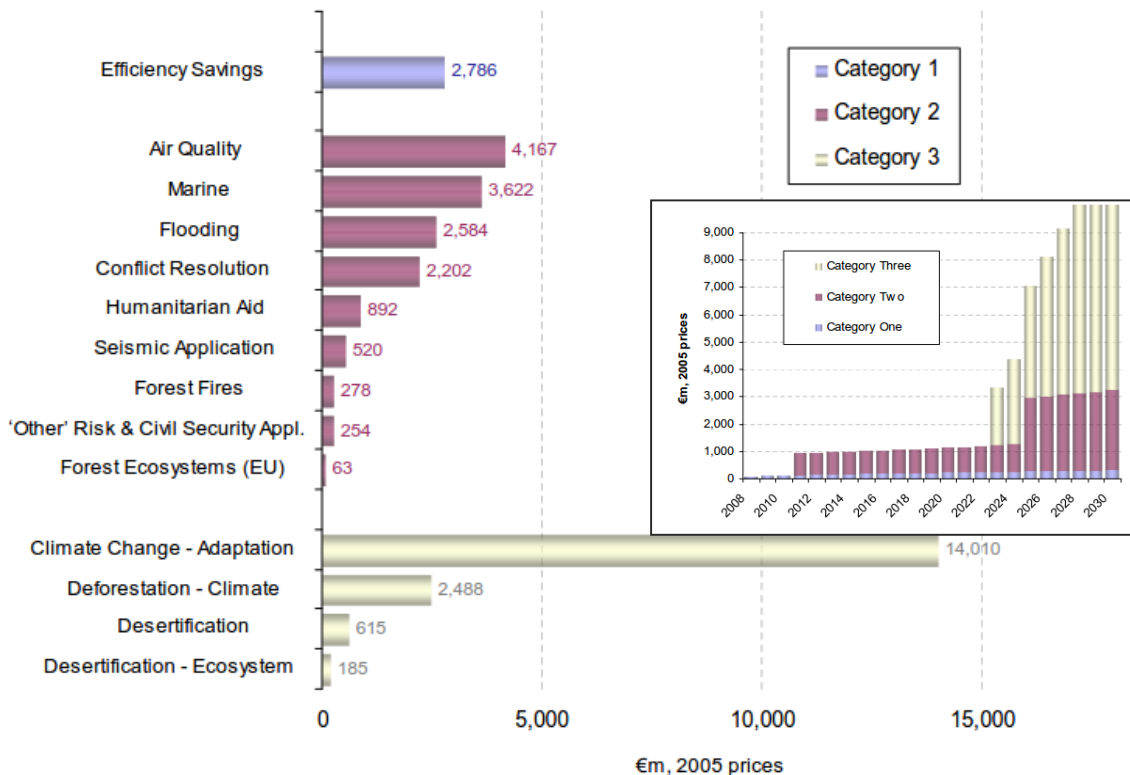
- Around 90% of our GMES user respondents stated that the relevant data would not have been available without FOF policy
  - For just less than half of this group, respondents indicated that there would have been no usable substitute for their data requirements.
  - GMES services are delivering reasonably high levels of additionality, perhaps on the order of 30-50%.
- figures that suggest some users may be able to save around €100,000 a year from using GMES-derived services,
  - resulting from productivity gains (same or better information service with the same or fewer staff), or
  - a reduction in external purchases of data.
- small number of survey respondents indicated that they had seen an increase in their annual income as a result of their use of GMES-related services, and that this ranged from €50,000 to €700,000 a year.



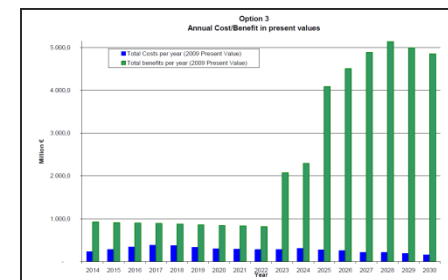
Copernicus

# Economic Benefits through better Policies – 2006 impact assessment PwC

Figure 7-1: Summary of the Main GMES Benefits by Policy Issue



- Cat 1 = efficiency gains during implementation of policies
- Cat 2 = availability of better data at EU level during policy formulation
- Cat 3 = availability of better data during policy formulation at global level, eg. Climate change



Source: PwC analysis  
Note: Excludes Terminal Values

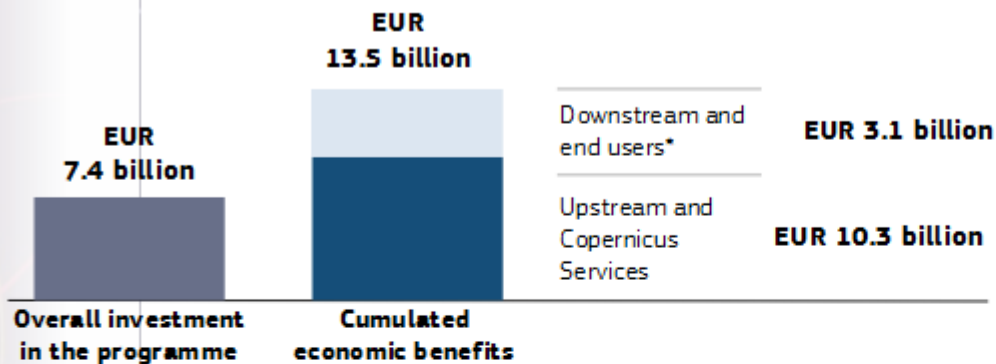




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# Overall benefits – Market study Nov 2016

## Cumulated impacts over 2008 - 2020



**12,450** job years supported in the downstream and end user markets



**15,580** jobs years supported in the upstream

## Examples of existing Copernicus benefits

**70%**



Cost reduction of a precision farming service in Austria, thanks to Copernicus

**€ 60k**



Yearly savings for each construction company using a work progress monitoring app

**60%**



Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality

**5%**



Productivity gain for fish farmers, by monitoring toxic algal blooms

**50%**



Copernicus-based forecasts generate 50% more benefits to solar energy producers than traditional forecasts

**€ 186M**



Benefits of Copernicus on the insurance market in 2015

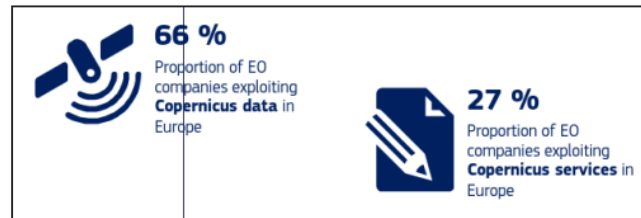


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- Economic benefits in value chains



- Proportion of data from Copernicus



- Benefits in millions

- Percentage of revenues generated by Copernicus in 2015

- Expected annual growth rate of benefits by 2020

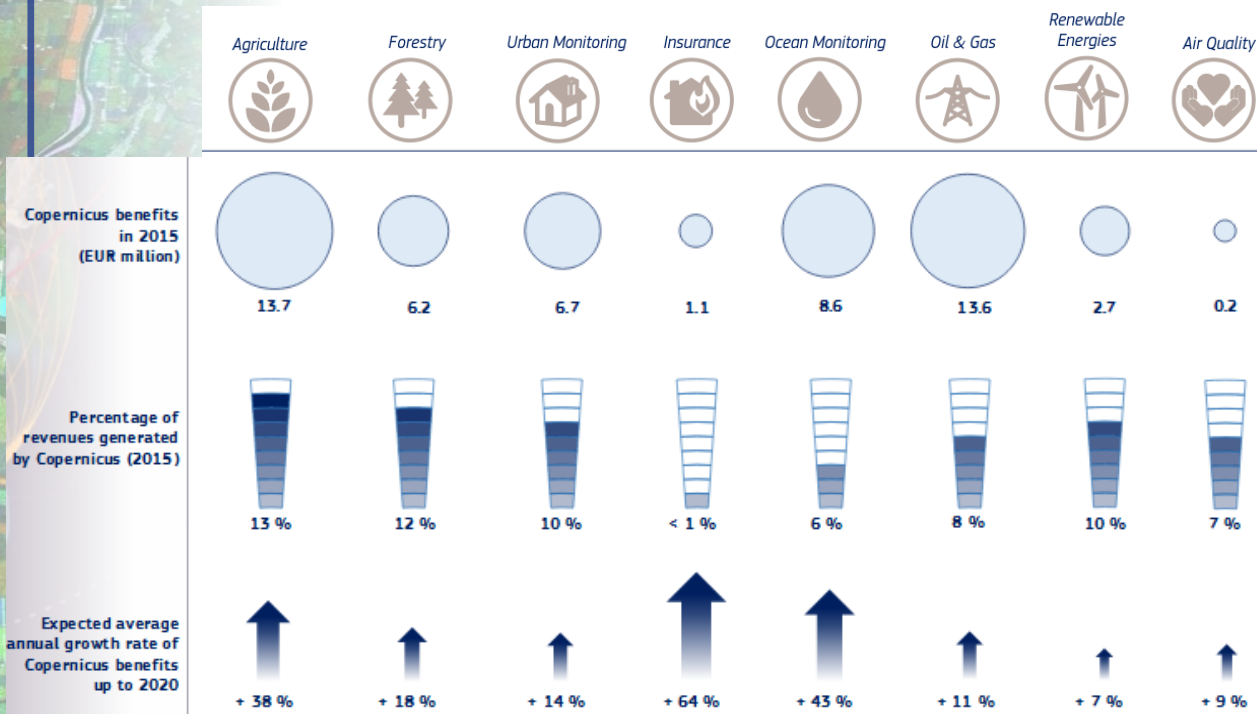
- For intermediate users
- For end users



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# Economic benefits – Market study Nov 2016

- Economic benefits in value chain – e.g. intermediate users



- Agriculture
  - Most promising market
  - Range of players
  - Highest penetration rate

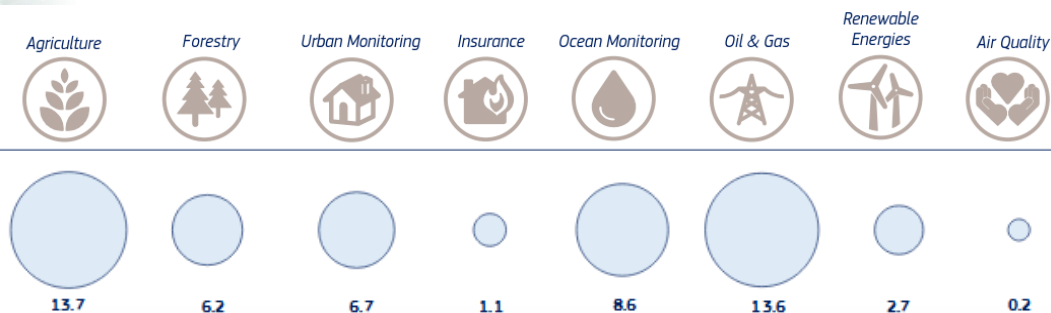
- Air quality
  - Relatively new
  - Public agencies, associations & authorities
  - Low willingness to pay



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# Economic benefits – Market study Nov 2016

- Economic benefits in value chain – e.g. intermediate users



- Agriculture
  - Most promising market
  - Range of players
  - Highest penetration rate

Copernicus benefits in 2015 (EUR million)

Percentage of revenues generated by Copernicus (2015)

Expected average annual growth rate of Copernicus benefits up to 2020

In 2013 around **5.5 million people died as a result of air pollution**. Its economic impact is significant: in **2010, it represented EUR 15 billion from lost work days, EUR 4 billion from healthcare costs and EUR 1 billion from damage to buildings in the EU alone.**

air quality  
 very new  
 agencies, associations  
 authorities  
 willingness to pay

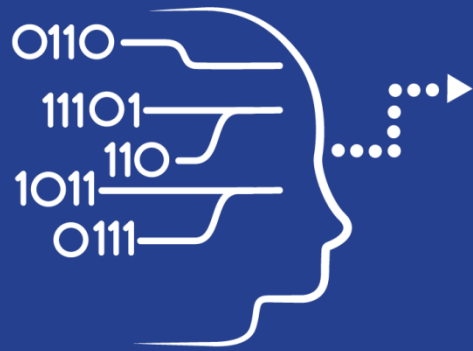




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## Dependence on Space – Impact of Loss

- An alternative way to look at benefits in an illustrative way
- Looking at economic interdependence between economic sectors
- Starts from premise that space is a tool – a loss would propagate and dependencies would materialise through negative impacts at the level of each economic actor of dependence chain
- To assess asset loss propagation in European economy
  - Elaboration of dependence characterisation – direct or indirect
  - Includes sector dependence on foreign vs. European infrastructures
  - Comprehensive segmentation of mutually exclusive sectors
  - Prime users characterised by: adoption rate, reliance severity, mitigation capacity through alternatives
  - Econometric modelling based on input-output interdependencies of sectors



User Uptake

# Copernicus Data: What next?



Copernicus

## Practical considerations to apply & Next steps

- Restrictions: "Security interests shall be balanced against **the interest of the users** and the **environmental, societal and economic benefits** "
- Data that is not exploited is as good as no data
- Costs arising should rather be an investment into the innovative process
- Next step of dissemination to focus on ease of transaction, clarifying ontologies used (INSPIRE!), working on linking of data



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# COPERNICUS BIG DATA APPROACH

- Imminent launch of a **Data Access and Information Service (DIAS)**
- Intention to procure parallel services from three suppliers:
  - **3 platforms** to provide equal access to the basic data and services
  - **Run by 2 entrusted entities:** EUMETSAT (1 platform) and ESA (2 platforms)
- Overall **ensuring that Copernicus data is easily accessible and used!**







In situ

## Success story - In-situ data ingestion

- In-situ (incl. meteo) data providers' networks are very often organised as membership organisations
- Often a partnership with a network entails a cumbersome and time-consuming procedure where the network needs to close individual agreements with each of its members
- *Thank you for an important breakthrough: ECOMET and EUMETNET General Assemblies have agreed to a general overarching and comprehensive license agreement (instead of multiple licenses for multiple operators) [as of spring 2017]*
- This is a good example which can be used to engage/encourage other networks to apply the same efficiency approach.



Thank you

All data is  
accessible via  
copernicus.eu



Space



Copernicus EU



Copernicus EU



Copernicus EU



[www.copernicus.eu](http://www.copernicus.eu)

