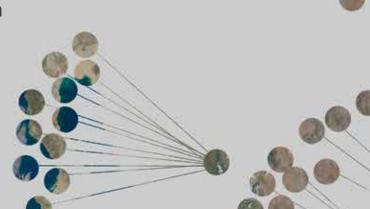
Reinhard Schulte-Braucks

Head of Copernicus, European Commission



Observing the land beyond



Reinhard Schulte-Braucks joins *International Innovation* to explain how the EC's Copernicus programme will provide sustained and reliable Earth observation information, enabling European public authorities, commercial businesses and the scientific community to have a continuous picture of our ever-evolving world for the benefit of society



To begin, could you outline the purpose of the Copernicus programme? What are the main objectives of this venture?

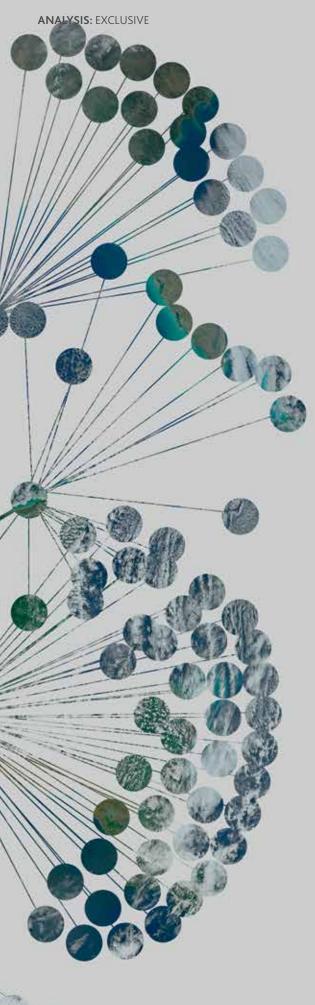
Copernicus – formerly called Global Monitoring for Environment and Security (GMES) – is a strategic programme for the EU. It supports the EU 2020 objectives and also underpins important EU policies. It not only enables informed policy decisions to be made but is also a tool for job creation and growth.

Copernicus consists of elements to gather observations of the environment and a set of core services to process them and generate and distribute a comprehensive set of maps, products and information that can respond

to stated end-user requirements. Hence it is a tool for sustainable development, through which the monitoring of the environment can be used to stimulate downstream applications, both public and commercial, and stimulate growth and create jobs. Exploiting the natural synergies between ecological, humanitarian and economic objectives constitutes the basis of the programme.

How did you become involved with Copernicus? Could you describe your role within the organisation?

I am the Head of the GMES/Copernicus Unit, part of the European Commission's Directorate-General for Enterprise and Industry, managing



a multidisciplinary team, some with a technical background and others with the skills necessary for the Commission's day-to-day work. The Unit is in charge of establishing the governance of the Copernicus programme, dealing with the development of its Initial Operations, building up the operational Services and the management of the associated infrastructure. Among our responsibilities, we coordinate all actors involved in the venture: the European Space Agency of course, but also the Member States, the Joint Research Centre, the European Environment Agency and other partners who deal with specific components of this unique Programme.

In what manner do you utilise satellite technology? How will data from satellites be collected and utilised through the programme?

Satellites provide the major observational inputs to the programme. This involves a set of satellites dedicated to Copernicus (the so-called Sentinels) as well as existing satellites in the Earth observation domain. Five Sentinel satellite missions are in the advanced stage of planning, with the first of them due for launch later this year. Data from satellites, used alongside in situ data, serve a very wide range of applications. In particular, I would like to stress how data collected by satellites will not only affect space-related industry but will also result in the development of a lot of downstream applications of a wide variety. Many examples of these have already been demonstrated by the pre-operational Copernicus Services, illustrating how the public and private sector businesses can use those datasets to address their primary function and also to develop or widen their market sector. To mention just a few cases, we can think about precision agriculture, water transport and non-life insurance sectors.

What are the main Earth subsystems that will be monitored? How and what do you hope to achieve from this monitoring?

The Programme will include three specific Services addressing the needs of users with interests in monitoring the sea, the land and the atmosphere, as well as two cross-cutting Services covering security and emergency management. In addition to these five services, a climate change service is under construction. The envisaged achievements are mainly related to the provision of sustained and reliable information, which would enable European public authorities, commercial businesses and the scientific community to have a continuous picture of our evolving world. It is important to stress that Europe will be the first to have such a unique information pool and, thanks to a free and open data policy, the potential is virtually limitless.

The Earth's resources are finite and need securing for future generations. In what way will the programme aid the protection of natural resources?

Monitoring the environment in order to support its protection and sustainable use is the main *raison d'être* of Copernicus. Again, the availability of up-to-date indicators about the state of the environment – in its different components – can provide the raw material for a lot of applications, including those related to sustainable resource management and biodiversity preservation. As examples of how the information will be used, we can imagine sectoral areas such as soil moisture, vegetation state, water quality and quantity, while resource-saving applications may range from precision agricultural techniques to forest management; marine resource management to pollution control.

How will Copernicus protect citizens from natural disasters such as weather driven hazards, geochemical hazards and other humanitarian crises? Will it help to improve security?

As mentioned, Copernicus includes an Emergency Management Service. This Service, which is activated by the detection of natural or manmade disasters, has been operational since 1 April 2012 and has already been activated many times. There have been 25 so-called 'Rush Mode' (highest level of emergency) activations. Of these, 72 per cent concerned EU continental territory. For instance, shortly after the serious earthquake that hit the Italian region of Emilia Romagna, new reference maps were available. This facilitated the work of the emergency teams.

Other interventions dealt with floods, forest fires and earthquakes using Copernicus satellite images. These achievements show how Copernicus has already helped emergency management; it will continue this vital role in the future, helping to protect citizens and guide rescue and recovery actions.

Other examples include hazards such as those related to geochemical materials and polluting chemicals. Copernicus data could help trace contaminant spills, thus helping in protecting/restoring the environment and identifying the sources.

As far as security is concerned, a specific Copernicus Security Service is being established, which is dedicated to maritime security and border surveillance.

Could you describe how Copernicus systems receive input from space and how they will provide careful analysis of gaps in provision?

As I have described already, there is both a satellite-based element of the observation infrastructure and an *in situ* element. The satellites play a key role in the observation of the environment and the Services interpret the raw data into a form most useful for downstream applications.

It is important to note that in the past, much of this Earth observation data has come from satellites operating in an R&D mode. The Sentinels will provide a sustained and assured supply of data, thus reducing the risks of lack of continuity and addressing gaps in data provision. Copernicus will be user-driven and hence, if gaps are identified by users, the programme will be geared to respond – for example, to create new products as necessary.

How would you distinguish the Galileo programme from Copernicus? In what way will Galileo assist navigation?

Although both Galileo and Copernicus are EU flagship space programmes, they are quite different. Galileo is about navigation, while Copernicus concerns Earth observation and environmental monitoring. Galileo is a new independent European satellite navigation system, offering more accurate usage than the existing GPS. In the same way that GPS has become an essential part of the everyday lives of so many users, so Galileo will stimulate many new, highly accurate satellite navigation applications. Galileo is new and is an advance on existing satellite navigation capabilities, whereas Copernicus is both new and unique.

Copernicus hopes to generate business prospects for Europe. What kind of business will be attracted to the development? Will SMEs benefit from the new opportunities?

There are a wide range of industrial sectors that may benefit from Copernicus. In particular, five sectors have been analysed by a recent study: water transport, oil and gas, non-life insurance, power generation from renewable sources, and agriculture. Examples of practical applications are solar power site selection and plant monitoring, damage assessment for insurance claim management, precision farming and oil pipeline encroachment monitoring. These and many other examples of the use of EO data demonstrate that free and open Copernicus data provision is an essential driver for the creation of new business opportunities.

It is true that big businesses already have the opportunity of buying very high resolution data because they can afford this type of investment and enjoy subsequent returns, but the case for SMEs is different. Copernicus will provide them with data of sufficiently high resolution to develop new business without the need for big, risky investments.

In what way do you estimate Copernicus could assert guidance on policy making in Europe?

Having continuous, reliable and high quality indicators is crucial to the development of well-focused and efficient policies. A wide range of Services at the EC are involved in this process, as well as their corresponding institutions at national or local level. What is also important is that Europe will have its own source of information, not being obliged

to rely on Third countries' data. Policy building, in particular in the areas of environmental protection, and adaptation and mitigation to climate change, will certainly benefit from Copernicus. Another important public task that will benefit from the programme is the monitoring of compliance with EU policy directives and the identification of non-compliances. Moreover, this information will be open to citizens as well, providing them with transparent access to the political process.

How will you influence the space manufacturing? Will this be important to European industrial policy?

The existence and deployment of the programme has already brought resources to R&D in the space sector, together with FP7 research funds, and to the development of applied research and new technologies. The satellite-building aspect is just one part of what can be developed in terms of innovation. We must not forget the huge spillover potential that space research and the space industry have always demonstrated in pushing the development of other sectors. This would mean growth possibilities for European industry and positive impacts on the life of citizens.

Copernicus recently investigated the potential for downstream job activities through sectoral analysis. Could you outline the results of this study and its implications for economic growth?

Initial results show that Copernicus is not only a monitoring tool for institutional needs, but can also stimulate economic growth and employment in a wide range of industrial sectors, leading to the creation or maintenance of approximately 20,000 direct jobs in Europe by 2030 if enabling factors are put in place. With highly skilled jobs in this sector typically impacting employment in other sectors, the economic stimulus provided by Copernicus could also result in a wider economic effect with an additional 63,000 indirect jobs secured or created by 2030. Overall, the impact on employment from Copernicus by that time is estimated at approximately 83,000 jobs in Europe.

Finally, which communities will be involved with the programme, and in what way will these different sectors collaborate to make use of the subsystem information?

Copernicus will involve a very large and enormously diverse community in its upstream data providers, core services and myriad downstream users. Copernicus is, of course, a European-funded programme and so its main focus will be on creating benefits for the European citizen. However, by virtue both of its free and open data policy and the global nature of many of its observation sources, there is potential for a worldwide audience and consequently for profound benefit to the widest possible global community.

Collaboration within the user community obviously has the potential to further enhance the benefits. For example, collaboration between individual users can widen the local benefits into a regional or national context; doing so across different societal areas and within cross-cutting ventures can result in significant added value. We should always bear in mind that our environment is best characterised when we are able to consider all of its facets. Copernicus will facilitate this.

Dr Reinhard Schulte-Braucks joined the European Commission in 1981 and has worked in a number of areas such as anti-trust, completion of the internal market, information society and space research. In June 2012 he took up his present position as head of the GMES Unit in the European Commission's Enterprise and Industry Directorate-General. GMES — or Copernicus as it will now be called — consists of the development of Earth observation services in the areas of land observation, emergency, oceanography, atmosphere, international security and climate change monitoring.

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