Istituto Affari Internazionali

Space and the Future of Europe as a Global Actor: EO as a Key Security Aspect

by Jean-Pierre Darnis, Xavier Pasco and Paul Wohrer

FONDATION pour la RECHERCHE STRATÉGIQUE

ABSTRACT

Earth Observation (EO) data has become a strategic asset for the European Union. It is a backbone of the European Union external projection capabilities, enabling the monitoring of maritime, land and atmospheric environments, and climate change projections. It is also instrumental in conducting two non-scientific missions, providing emergency management and security services. The economic benefits provided by Copernicus have been estimated to 13.5 billion euro in less than ten years. However, new technologies and data management capabilities may hinder the benefits it provides to European service companies: most Copernicus data are exploited by non-European industries, able to leverage most of the benefits thanks to a robust data storage and analysis infrastructure. Increased economic and security benefits could be extracted from Copernicus data thanks to technological and policy solutions. The technological solution would consist in a European Cloud infrastructure providing storage and analytical capacities to European small and medium enterprises. The policy solution should push for better space data regulation, to guarantee their integrity and use, especially for security services. This paper explores the emerging need of a European space and digital security posture, able to ensure continuity and growth of EU space-based capabilities. While European Space Agency (ESA) EO programmes are growing, the new European Commission DG "Industry, Defence and Space" shall play a key role to reinforce this framework.

This research has been supported by a grant from the European Space Agency.

Space policy | *Earth observation* | *Satellite* | *Space security* | *European Union satellite cooperation*

keywords

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

ISSN 2280-6164

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

Space and the Future of Europe as a Global Actor: EO as a Key Security Aspect

by Jean-Pierre Darnis, Xavier Pasco and Paul Wohrer*

Methodology

This study is a qualitative analysis performed by FRS/IAI team based on existing literature and interviews to stakeholders. It included two dedicated workshops in Paris and Rome involving representatives from EU space and security stakeholders (European Space Agency, European Commission, European Satellite Centre, Ministry of Defence, Government, Space and service companies, think tanks), where prospective analysis for European Earth Observation (EO) and security has been discussed following "Chatham House" rules.

Introduction

For multiple reasons, space-based EO is a highly strategic asset. It was developed historically as a component for nuclear defence, when observation satellites enabled the identification of potential targets for nuclear strikes. On the civilian side, optical and radar satellites have been a key technology in the development of applications for meteorological forecasting such as the Meteosat programme. Even if these applications still exist, EO has evolved into a whole set of systems able to provide a great deal of data for monitoring the planet. In the past few decades, we have observed a significant development of EO systems, with important public programmes. The 21st century has also seen the growth of private actors: even if public funds still represents the main source of revenue for the sector, private companies are directly proposing their services and addressing new markets for monitoring. The "new space economy" paradigm summarises this vision of trying to foster an investment and technological development loop around space technologies.

* Jean-Pierre Darnis, Associate Professor at the University of Nice Sophia-Antipolis, is Scientific Advisor and Head of the Tech-IR Programme at the Istituto Affari Internazionali (IAI). Xavier Pasco is Director of the Fondation pour la recherche stratégique (FRS). Paul Wohrer is Research Fellow at FFRS. The research team would like to thank Dr. Antonio Ciccolella for his support all along the research study.

. This study has been prepared by the the Istituto Affari Internazionali (IAI) and the Fondation pour la recherche stratégique (FRS) and has been supported by a grant from the European Space Agency.

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

Still, even in the very business-oriented United States, public funding shapes the sector. One should also be cautious in considering what could turn out to be a speculative bubble, as business models still have to prove themselves. However, the EO activity has clearly found new development opportunities in the United States with an increased interest manifested by well-established Big Tech or new info-tech companies able to exploit streams of data and willing to address new market-driven information technology ecosystems. For this reason, the rapid evolution of information-based activities can be considered potentially as a new growth factor for the EO domain.

The position of Europe towards those changes tends to be more conservative, in part due to the rigidity of a system involving several public institutions to determine space policy: member states (MS) and their national agencies, the European Space Agency (ESA), the European Commission (EC). This rigidity is often perceived as a strong barrier for growth and innovation: indeed, it raises a series of concerns in terms of pan-European efficiency when compared to the US. Additionally, the level of support offered by the European information-based industry can hardly compare with the one existing in the US.

One should not, however, underestimate the resiliency of this European fragmented system and its ability to maintain and develop technology within different territories and institutional frameworks.

In the European context, EO has illustrated this evolution. National public investments have matured since the 1970s when the French "Système Probatoire d'Observation" (SPOT) programme was launched. Since then, we have seen the deployment of several programmes, both in the civilian and in the defence/security realm. EO applications providing territorial monitoring information have been immediately related to security needs. This explains the specific interest from security organisations which benefit from EO data or eventually develop and manage EO systems, such as Ministry of Defence in France, Italy, Germany and Spain.

Furthermore, the EU has developed an EO "flagship programme", Copernicus. This global environmental capability not only does provide a range of services to users, but it also illustrates the European will to use the technology policy to pursue larger political objectives. Through this EO flagship programme, the EU has established itself as a global data provider and an important EO data source for all applications around the world, a success also due to its free and open access policy. This evolution has to be understood in parallel with the European Union's Global Strategy (EUGS), with EO data emerging as a relevant capability to support the world-class status enjoyed by Europe in the field of science and technology. In this respect, EO can be fully regarded as an enabling technology for supporting and enlarging the European External Action Service (EEAS).

The consolidation of EU capabilities in EO has developed in parallel with the emergence of a series of challenges. This has been particularly the case in the

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

domain of security, which has always been considered apart from all other applications primarily because of the will of key MS to limit the "Europeanisation" of that particular dimension of EO and keep a national control over such activities. As a result, EO security applications have most often been managed separately, including in the context of Copernicus. In the meantime, new players have entered the EO market, and EO data have progressively earned a more strategic dimension when included in new data value chains and information-based architectures. Such emerging trends have of course to be taken into account when thinking about the future of EO in Europe, especially when its security dimension is considered.

1. Emerging trends for EO in Europe

1.1 EO for security

EO observation in Europe was developed within the framework of public-funded programmes. France's SPOT programme and ESA's European Remote Sensing (ERS) can be viewed as some of the most relevant examples of EO satellites developed during the last decades of the 20th century with the goal of creating remote sensing capabilities. These programmes were, however, developed following a logic of civilian "research and application".

The Balkan conflicts of the 1990s have sounded as a wake-up call for Europe: in strategic terms, a conflict was taking place on European soil after decades of peace. This conflict showed that the US could dispose of space-based capabilities for data gathering (EO satellites) and transmission (communication satellites) that were lacking in Europe. Space technology has emerged as a key enabling infrastructure for defence. This is the reason why after this conflict, several EU members decided to increase (France) or create (Italy, Germany, Spain) space capabilities for security and defence. From the 1990s up to the first decade of the 21st century, this "space services for defence and security" paradigm was developed in order to answer growing needs. Military operations like the Balkan conflicts, Afghanistan or more recently the French intervention in Sahel (Serval, Epervier and Barkhane operations) have indeed confirmed space capabilities as key resources for any country or group of countries to project forces abroad.

On the EO side, France initially developed civilian (SPOT) and military (Helios) systems. The military took over SPOT's technological achievements and developed Helios for their own needs in a different programmatic environment. Italy has selected to invest in a dual-use system (Cosmo-Skymed), a logic later adopted by France for its Pleiades optical satellites. This trend clearly indicates an ever increasingly blurred distinction between civilian and non-civilian activities in this field. This dual-use trend was also inspired by the development of the Ikonos satellite in the United States, initially launched in 1999 by the company Space Imaging Inc. which would become Digital Globe after some years. This company has enlarged to become one of the main commercial providers of EO imagery for the US military.

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

Space technologies have become key to providing continuous support to the command, control and information chain, but also to meet growing needs in terms of data bandwidth, due to the expanding use of digital data collection systems such as drones. EO answers the increasing need for geo-referenced information for military and security forces in the context of worldwide "out-of-area" military operations. First, space systems are in many instances the only available tools to collect information in strictly controlled areas over large distances. In addition, other requirements have been stemming from the need to feed intelligence systems as well as from the growing appetite generated by the rapid evolution of data-fusion techniques, which combines sources like EO satellites, drones, and in situ technical systems. In this context, satellite generated data would ultimately be used not only by military users but more largely by security and safety-oriented applications.

Expanding needs for EO applied to security are moving away from classic security organisations and operations. For long, environmental observation has been divided into two different paths: science and research uses on the one hand and crisis monitoring uses (resulting for example from natural disasters) on the other hand.

The progress of applied science and the ability to retrieve and process data means that environment observation now plays a key role in a whole set of political decisions. It has become part and parcel space-based applications used for security as it may help political decision-making and have strategic consequences without necessarily involving classic security users such as military forces, coast guards, or customs offices.

1.2 The "democratisation" of the use of EO satellite-based data

Open source EO data is for example now widely available on the internet and can provide valuable intelligence if properly exploited. Newly created analytics companies are now able to extract military-level information from commercial and civil EO programmes such as Copernicus.

One of these analytics companies stressed its capacity to exploit Sentinel 1 radar data to closely monitor the battle of Mosul as it was happening.[1]

The potential of "pattern analysis" based on Copernicus data for security, but also defence, applications has been also illustrated by a Company such as E-Geos when monitoring harbours and vessel activity.

[1] Deimos Imaging, *DEIMOS-1 & DEIMOS-2 Coverage of the Battle of Mosul, Iraq, October/November 2016*, http://geo4i.com/wp-content/uploads/2017/05/Deimos1-Deimos2-Coverage-of-Mosul-Battle-Oct-Nov-2016.pdf.

© 2020 IAI ISSN 2280-6164 DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

Sentinel 2 imagery can be used to detect illegal refineries. Modern image analysts used scientific tools and methods to assess the probability of destruction of infrastructure.

What used to be considered as highly sensitive information is now widely available for anyone with sufficient know-how and analytical skills. For instance, regulations can limit the extent of imagery collection. SI Imagery does not provide images of North Korea and Digitalglobe does not provide images of Israel; however, it is now possible to obtain imagery from anywhere in the world by mixing data from different providers.

In the future, analytical skills could even prove superfluous given the rapid development of automatic analysis by Artificial Intelligence algorithms, although most professionals believe image analysts will remain important for a long time.

These technological and market trends confirm the importance of Copernicus data, a highly appreciated source of satellite imagery worldwide, for its availability and quality. But these global approaches also underline current new trend which consists in considering satellite data as a commodity and emphasising analytics as a real source of added-value. As a source of data, Copernicus can indeed be used for defence-related applications it was never designed for.

This *security provided from space also had applications within the EU* with an increasing use of space-based infrastructures for security applications. We can observe growth of the defence and dual-use space systems in keys MS such as France, Germany, Italy or Spain. Space applications (communication and EO) have grown as enabling technologies for security missions, but also as a feature largely used by specialised defence and security bodies. The MoD's have often played a key role from the 1990s onwards, as they require space-based services when projecting forces and operations abroad.

These "*space applications for security and defence*" also have a resonance at EU level where the two flagship programmes, Copernicus and Galileo, have developed a set of "security services" for defence and security users.

The development of *Galileo's Public Regulated Service (PRS) and of Copernicus' "security services" translate this logic of "space applications for security" at EU level*.

Those "institutional space programmes" have been serving two sets of players, MOD's security administrations and the EU's Galileo and Copernicus agencies with a security mandate. These programmes have been based on requirements for defence and security operations, but they also offer security guarantees in terms of ownership, availability and data policy. What could be summarised as "*secure institutional space systems for security applications*" entail pros and cons that can be summarised as follow:

- pros: control of ownership, control of the technology, data policy (i.e. allowing data integrity);

© 2020 IAI

ISSN 2280-6164

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

• cons: costs/performances, clearly inferior to the latest commercial evolutions.

In this context, Copernicus presents an interesting case as it can be described as a *public EO asset* as its legacy has stemmed in the first place from the promotion of a science and environment policy perspective, with a logical focus on an "open" philosophy in terms of production and data sharing practices. This logic of "open access data" has made Copernicus a key provider of scientific data for different communities of users, whether scientific or even for private companies all around the world, using the data a raw material for selling elaborated information products. In this respect, it can be recognised that Copernicus has been fulfilling its original mission of consolidating the data production and uses environment.

Furthermore, Copernicus has emerged has a contributor to EU institutional security services. Through the EU SatCen, European Maritime Safety Agency (EMSA) and Frontex agencies, Copernicus is delivering security services for EU institutions and MS, which adds a twist to the original logic of "open data for science and the environment." We can observe a more classic "space based security applications" logic for "security users", in many ways parallel to the EU MS one that has already been described.

Copernicus thus appears to be a mixed EU institutional model, based on an open and free data distribution model while also supporting security services.
• On the one hand, Copernicus' "full free and open data policy" aims to be a game changer for environment EO on a worldwide level. Indeed, Copernicus data distribution policy has fostered the growth of an ecosystem through the Copernicus "Data and Information Access Services" system (DIAS).
• On the other hand, Copernicus has also supported EU security services and appears to be an emerging backbone for an EU institutional space model, following the "Galileo" model, which has already defined several categories of users, including security ones.

Copernicus' "open access" policy raises a series of issues. Copernicus' data has widely contributed to private and public EO-based applications developed by non-EU actors. It has also provided a competitive advantage to a whole set of non-EU industries (such as the Big Tech) which can be considered as competing with EU info tech industries on a daily basis. This has raised the issue of worldwide competition and public investment in a world in which the data paradigm has changed: data is now considered key for the economy but also a strategic issue in terms of citizens' rights and democracy. *The question of Copernicus data policy within the worldwide data market has become more pressing as the EC has increased its capacity for data regulation* (see General Data Protection Regulation – GDPR). Data policy and data management has become a political priority in line with the development of the EU as a Global actor eager to promote its values worldwide.

On the commercial side, we can observe that the EO "supply-side" has been quickly evolving. An international commercial EO sector has emerged with the goal of providing information-based services at ever lower costs. This has led to a more complete integration of space-originated data in the information value chain.

Commercial space activities have seen a set of players developing new capabilities over the years: one can mention actors like MDA geospatial services having built upon existing state-funded space systems (Radarsat) to enhance and develop a new data provider business model. On the European scene, the evolution of France's Spot Image (now Airbus DS Geo) also illustrates the emergence of a then new paradigm based on public investment in EO satellites managed by a national space agency but privately operated, and being further privatised in order to keep up with the pace with an evolving market (cf Airbus Pleaiades neo and CO3D). National agency EO spin-offs such as Italy's e-Geos or French CLS have paved the way for a commercial approach taking advantage of public assets. Today those player tend to invest in satellites fleets to develop their potential service market, which is a remarkable change compared to the 20th century "satellite driven" approach.

The current commercial actors in the field of EO have mostly adopted a quality-driven approach. For example, Kompsat Korean satellites have improved their quality according to some users, whereas Jilin Chinese satellites are usable but lack a precise location capability. The most important factor however is the cost, which has dropped dramatically from thousands or even tens of thousands of euro for an image to a few hundred euro today. Important dimension remains necessary for quality but we observe a trade-off between costs and quality. Radar imagery is however still expensive, which is why Sentinel 1 data is so precious to image analysts.

Costs for EO technologies are going down, with systems increasingly smaller and lighter allowing their orbiting at lower prices coupled with lowered launch costs. On the other hand, new players have been investing in the EO sector and relying on a mix of venture capitalism and technological breakthroughs (example Blacksky constellation). However, for the moment these companies are not generating profit, the United States using them as a proof-of-concept to make space an integral part of a modern information system. The San Francisco-based company Planet has been kept afloat by the National Geospatial Agency, one of the US's main intelligence agency. A major question mark remains about whether this is the correct approach: the United States institutional users have taken moderate risks in supporting companies whose return on investments remains uncertain in an ever more uncertain environment faced by space industry worldwide.

It must however be acknowledged that EO data are more and more involved in many sectors. This is also the case for the EU where nearly all EU policies can draw information from EO.

For example, environmental EO capabilities, specifically for Copernicus, contribute to key EU policies such as maritime affairs (DG MARE), agriculture (DG AGRI), Energy (DG ENER), Justice (DG JUST), mobility (DG MOVE), regional policy (DG REGIO), Network and Technology (DG CONNECT), humanitarian aid (DG ECHO), Climate action (DG CLIMA), Environment (DG ENV) and internal market (DG Grow),

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

while the security EO capabilities are exploited by EMSA, Frontex and EU SatCen (DG RELEX).

However, this "open and free" access policy also has its downsides, namely the fact that external actors can benefit from EO data which can, as we have seen, be used for security, military or even nefarious terrorist purposes. Although there is currently no evidence such actions have already taken place, it is clear from trends in this sector that image analysis is made easier and cheaper by cloud and automatic analysis technologies.

Theses evolutions of trends in the EO security field can also be closely associated with the dynamics of the different EO Copernicus sectors of activity. In this respect, the Copernicus "security services", i.e. the services that have been dedicated to security end-users from the start of the programme have touched upon a much larger perimeter than security only. EO data have been increasingly involved in an impressive array of public policies with key strategic implications, and often contribute to enhancing EU's global role. This is a "strategic" value and demonstrates for these uses a different nature than only "security"-focused ones, with all the constraints and limitations attached to it in terms of uses. These natural developments plead for a genuine global strategic vision for EO public data in Europe, very much needed to ensure the continuity, the growth and the quality of data to feed the policies of today and tomorrow.

Several inquiries about EO gap analysis for EU policies[2] have insisted on the expression of growing needs in terms of precision and revisiting time. This expressed need which does not take into consideration any pricing, can build upon a free and open access model. We have already recalled the fact that for example in the US EO commercial activities often benefit of public furniture contracts.

2. Evolution trends of the EO Copernicus sectors as EU external projections enablers

2.1 Copernicus Marine Environment Monitoring Service

The maritime domain is by definition a global policy dimension: this vast and rapidly changing environment has increasing monitoring needs, from the support brought to human activities to wildlife and environmental management while it is difficult to maintain local observations networks. In this context, EO technologies can offer an impressive set of services well-adapted to the maritime domain.

The main Copernicus service within this area is the *Marine Environment Monitoring Service*. Satellite imagery has been used to monitor water quality and

[2] European Commission, *Expression of User Needs for the Copernicus Programme* (SWD/2019/394), 25 October 2019, https://data.consilium.europa.eu/doc/document/ST-13958-2019-INIT/en/pdf.

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

water pollution caused by oil, toxic algae and garbage patches. It is also helpful in monitoring changes in sea-level. Space-based EO data has been used to support sustainable fishing and aquaculture practices, and satellite imagery has been an important tool for helping navigation of ice-covered seas, thanks to its ability to estimate ice thickness and assess the presence of icebergs. The service performs these activities in support of marine safety.

All these aspects have appeared to be critical today and will be even more in a future, with the fastening impact of global warming. This is the reason why maritime monitoring EO technologies shall be enhanced. In this context, it will also play an important role as a political tool.

With the foundations of EMSA, the EU has created an operational agency able to put actual policies in place. Since the Sulphur directive, EMSA has been involved in defining and monitoring new environmental norms for maritime transportation. For example, EMSA has been given the task of monitoring the ship's smoke emission levels and shall benefit from the development of EO-based interferometry applications to implement it. This prospective example is just one among many illustrating the matching between global strategy needs and the further development of and European public EO policy such as Copernicus. As other services, this one uses several space-based assets, including non-European ones, in partnership with other agencies. (National Aeronautics and Space Administration – NASA and Japan Aerospace eXploration Agency – JAXA).

This segment of the Copernicus Service is also particularly critical for the support of the EU Policy for the Arctic.[3] It can combine with other services, as the arctic policy is also an element for the Climate Change, Land and Atmospheric Services.

2.2 Copernicus Land Monitoring Service

Agriculture is another important sector which encompasses a range of cross-cutting domains and activities involving international interests and global policy issues. It includes cooperation and development, but also can be linked with population and government stability. This is the reason why even if farmers cannot be described as "security users", the sector triggers numerous security implications involving a range of applications which are taken into consideration by Copernicus. The service is articulated in three components, a "Global" one providing information on bio-geophysical products on the entire globe, a "Pan-European" one producing satellite image mosaics for land cover change in Europe and a "Local" one providing information over EU city areas, Riparian zones along rivers to monitor biodiversity, and Natura 2000 sites.

[3] European Commission, *An Integrated European Union Policy for the Arctic* (JOIN/2016/21), 27 April 2016, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016JC0021.

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

Agriculture should be one of the most promising markets to benefit from Copernicus data.[4] Precision farming in particular requires up-to-date detailed imagery to determine the best sowing and harvest time. Small and medium enterprises (SMEs) and large companies alike use Copernicus data, as well as scientists trying to perfect their understanding of crop management. This market is the most mature at using Copernicus data as well, the *Copernicus Land Monitoring Service* addressing the need of several European policies, in particular the Common Agricultural Policy.

Opportunities are expected to raise in developing countries when food security issues are getting critical preoccupations. Examples can also include other subjects of interest such as forestry monitoring in tropical regions.

2.3 Copernicus Atmosphere Monitoring Service

Monitoring and providing information on air quality on a European scale and analysing the chemical composition of the atmosphere on a global scale are the stated missions of the *Copernicus Atmospheric Monitoring Service* (CAMS). Building upon the results of the Monitoring Atmospheric Composition and Climate Horizon 2020 project, it provides data records for recent years on atmospheric composition, accurate data to monitor today's situation and allows the forecasting of future situations. Most of their analysis can be found in their online catalogue.[5] This service's main objective consists in providing the European and international community with the appropriate means to assess the effectiveness of the Paris Agreement and COP21 decisions regarding man-made CO_2 emissions and CO_2 budgets. This could counteract the current low reliability of current CO_2 emissions inventories, based on self-reported statistical data by the emitters themselves.

Renewable energy is another sub-sector that goes beyond its publicised scope. The production of renewable energy represents an important goal within the energy policy. But the monitoring of areas or infrastructures linked to renewable energy can provide extremely valuable information with direct policy aspects, such as the related resources possibly offered by assessed areas. Beyond only competitive aspects, per se a relevant aspect, this also has key effects on policy decision-making.

Space-based EO can help identify the best areas for renewable energy production. This is one of the roles of the CAMS which provides Solar and Ultraviolet (UV) radiation products to support the planning, monitoring and efficiency improvement of solar energy. Renewable energy providers exploit EO data to evaluate the potential of certain areas, including biomass and solar energy (Forest monitoring and sun exposure). This is a relatively new market niche in which

[4] European Commission, *Agreement Between the European Union, Represented by the European Commission, and the European Environment Agency on the Implementation of the Copernicus Land Monitoring Service and the In Situ Component. Annex I: Description of Tasks*, 1 December 2014, https://www.copernicus.eu/sites/default/files/2019-10/SIGNED_EU_EEA_ANNEX-I_Description_of_tasks_Ares_2014_4012930.pdf.

[5] CAMS website: *Data Catalogue*, https://atmosphere.copernicus.eu/catalogue.

EO data can help fulfil 2030 energy and climate goals. Space-based EO can help identify infrastructures requiring an overhaul of their energy efficiency, especially in building and industry-related activities which together use 65 per cent of the total amount of energy consumed in the EU. Increased competition in the market drives production companies toward cost reduction and production optimisation. Regulation also plays a role, as biomass producers are increasingly required to monitor their production management. Given the utmost priority of this policy for Europe, it is probable that the expertise tools for decision-making will be reinforced by the Copernicus services in the future.

2.4 Copernicus Climate Change Service (C3S)

Climate action is another high-level policy issue for the EU. Copernicus has been developed also as an information tool able to provide a better assessment of climate change. Today EO data can further help to ensure the climate goals reveals itself as a fundamental asset for scientific research and international assessment. But climate action is not only a science problem, it is also a policy one, which has direct implications on the importance of EO measuring data.

Space-based EO data has a multifaceted impact on measuring, assessing and controlling the respect of EU international agreements on carbon emissions. Satellite data is used to track global phenomena such as El Nino, and track the extent of climate change on Earth. It can also be used to measure CO_2 emissions globally, and assess the best sources of carbon traps such as forests. This work is accomplished by the CAMS and the Copernicus Climate Change Service (C3S). It is an indispensable tool to check if the objectives stated in the climate and energy framework and the 2015 Paris Agreement are respected by the EU. This objective consists in achieving a carbon-neutral Europe by 2050.

Environment policy is based on monitoring tools. This is the reason why EO observation is essential to perform diagnosis for environment policy. Here again the EO Copernicus capabilities are called into contributing to the EU awareness for environment.

Several key environmental variables can be monitored from space, including air quality, aerosol pollution, the extent of forest coverage, snowpack and icepack melting and several gas emissions. Satellites can also be used to assess the quality of ocean nutrients and multiple other environmental data to form a complete picture of the planet. Global initiatives, such as the UN's Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD), require highly accurate and precise data on forestry which could represent an opportunity for companies in Europe to showcase their know-how.

2.5 Copernicus Emergency Management Service (CEMS)

After a disaster, EO data is used to collect information on the location prior to the arrival of external help. EO data can help assess damage extent, determine the best

ISSN 2280-6164

way to reach distressed populations and navigate to provide help. It is also used to determine the best location to set-up a camp. Satellites are helpful in assessing the presence of large-scale threats to vulnerable populations, such as land subsidence, earthquakes or even mosquitoes.

The service is divided into two main components: a mapping service and an Early Warning service. The first one is used to provide maps in a timely manner during and after a crisis, the Early Warning component delivers alerts and risk assessments, today for flood and forest fires.

Copernicus data can be used to provide information on humanitarian and man-made disasters, and their consequences. The *Copernicus Emergency Management Service* (CEMS) uses geospatial data to address all phases of a disaster: Prevention, Preparedness, Response and Recovery. Due to immediate needs, the Emergency Monitoring Service has mostly used data from multiple contributing missions (satellites from other nations) because of the need of timely data.

Humanitarian aid is a consolidated policy at a EU and MS level: DG ECHO has developed a series of actions which are part of the global outreach of the EU. Even if taken under an "humanitarian" umbrella, the decisions, supported by data, have a high-level policy implication, also because they often deal with troubled political situation like civil wars or failed states. This is the reason why the data involved in humanitarian aid management can be highly sensitive.

2.6 Copernicus Security Service

Security applications are one of the earliest uses of satellite imagery. The Copernicus programme is civilian by nature; however, space imagery is inherently dual-use. Satellite imagery is used to support external actions and peacekeeping operations, border surveillance and migration monitoring by Frontex. Civilian imagery can also be used to assess foreign capabilities in security-related areas such as weapon production, troop movement etc.

The *Security Service* of Copernicus provides information in support of the civil security challenges in Europe. Its aim is to improve crisis prevention, to help prepare response capacities. Recent events at the border of the EU have shown the need to improve global security for the EU. Regional conflicts, illegal migrations and wrongful actions at sea highlight the need for good situational awareness, to which Copernicus contributes.

Copernicus provides actionable data in three areas related to European security: maritime surveillance with the EMSA, border surveillance with Frontex and support to EU EEAS with the EU SatCen.

Maritime surveillance is guaranteed by EMSA, which operates on a delegation agreement signed with the EC on 3 December 2015. EMSA uses space data, in particular from the Sentinel-1 satellite, to carry out its missions. Satellite data,

ISSN 2280-6164

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

combined with other sources available within the Copernicus services for security applications, is used to combat piracy, smuggling and illegal dumping of waste, contribute to ship safety, monitor pollution and improve fisheries control.

Border control is managed by Frontex, which has since 10 November 2015, benefitted from Copernicus data to carry out its missions. In cooperation with EU SatCen and EMSA, Frontex uses satellite data to monitor European coasts and international waters, detect and track vessels and anomalies. In 2015 Copernicus data was used to detect four boats leaving the coast of Libya, seize a vessel used for smuggling and locate a drifting migrant boat.

As we already analysed, Security represents a dedicated set of Copernicus services, managed through specific institutional channels. It is indeed a significant reality, as it has a common mechanism of data processing and distribution within a EU security environment. This is the reason why these Copernicus security services are to be carefully developed. The EU SatCen can represent an interesting point, as it is tasked to support the EU external action needs.

2.7 The evolution of the EU SatCen as an institutional focus point for EO security in the EU

The contribution to EU external action has come from EU SatCen since the signature of a delegation agreement with the EC. The service became operational in 2017. EU SatCen uses Copernicus data to monitor crisis areas and assists the EU in its operations outside EU territory. EU SatCen, which possesses capabilities in mapping and contingency planning, provides decision makers with geo-information, for instance reports on refugee camps and reference maps to help EU missions and delegations in planning evacuation operations. It can monitor the extent of crimes, assess the health of critical infrastructures, assess military capabilities of foreign powers and follow the proliferation of weapons of mass destruction.

EU SatCen is the main European instrument for EU policy implementation to use space data in a security context. It is increasingly using Sentinel data because of its open access policy. The data is used in a security context, to monitor European external operations, regional conflicts, piracy, non-proliferation policy. It covers migration in support of Frontex, but also supports humanitarian aid activities. EU SatCen also works on archaeological sites to preserve cultural heritage and evaluate the damage to artwork linked with increasing traffic of artefacts.

Copernicus' security programme has 200 million euro of financing, of which 26 million euro are dedicated to EU SatCen over a period of 5 years, 6 million euro are dedicated to external operations support, and 3 to 4 million euro for Frontex. EU SatCen's total budget is 30 million euro per year, 15 of which are financed by the EC and 15 by member-states. Those figures illustrate the relatively low level of EU SatCen's budget, a clear indication of the relatively weak priority given to an EU EO data institution for security.

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

Seventy per cent of EU SatCen activities are externalised to the industry in the Copernicus programme. High-resolution imagery and radar images are used to generate analysis which is then incorporated in reports, and EU SatCen is currently working on artificial intelligence algorithms.

There are margins for further progress at EU SatCen. For example, EU SatCen could expand its activities to include justice-related information, particularly regarding crimes against humanity. The International Court of Justice seems interested in benefitting from Copernicus data. The World Customs Organisation also appears interested in this cooperation.

A limitation of EU SatCen activity lies in its ability to create classified intelligence: this is currently impossible and may appear to be a strong red line for some possible future developments. The distinction between "security" and "defence" applications, while non-existent in practice, remains a strong political barrier within the EU. Today, Italy is by far the main user of EU SatCen, meaning that there is also room for a growing use by other EU members.

EU SatCen budget figure indicates that this policy has remained a relatively modest effort for the EO union. But even with limited means EU SatCen shall appear as a potentially key institution for the development of an enhanced EU security dimension: beyond the sole the management of Copernicus security services, already an important issue, the EU SatCen is well positioned to take into account the strategic aspects of the whole chain of data provided by EO for EU policies, especially regarding the sensitive issues in terms of control of technology and data policy.

When thinking about the future of EO policy and security in Europe, one shall bear in mind the multiple levels of strategic applications for EO, a key enabler for public policies, which cannot fit into today's limited official security boundaries. On another hand one could also insist on the growth of security defined policies, and then capitalising on the EU SatCen experience and know how. But a general re-shuffle of EO public policies in Europe could also be necessary, also to take into consideration the security aspects of data managed by civilian and research bodies. We can foresee a double approach, with a growth of the EU SatCen in the security and, possibly, the defence field while the whole EU space public institutions shall start to deal with the strategic implication of the EO, not only in terms of data policy but also as a policy vision taking into consideration larger aspects related sovereignty of the data and of the technology.

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

3. Copernicus, evolutionary trends and way forward

3.1 The value of Copernicus

The Copernicus programme in its current form has been able to produce value. Through the added value created in the upstream space industry, the sales of Copernicus-based applications and the exploitation of Copernicus-enabled products, the cumulated economic benefits from 2008 to 2020 have been calculated to be worth 13.5 billion euro against an investment of 7.4 billion euro over the same period.[6]

The investment in a space-based EO data infrastructure appears to be a rational choice able to achieve the stated objectives of EU strategy. Making sure the Copernicus programme is oriented to benefit the EU's industrial base is essential. The Copernicus programme was expected to create up to 48,000 jobs over the 2015-2030 period.[7]

There is a rising number of companies in Europe, most of which are SMEs, focusing on delivering value-added services based on Copernicus data. For every euro spent by public funds in Copernicus upstream activities, it has been estimated that the value added to the whole economy is 1.4 euro.[8]

Copernicus could also potentially provide more dual-use synergies than it currently does. Although extracting information from Copernicus data for defence operators is possible, it was not the first intention in developing these infrastructures. While there are multiple political obstacles, integrating defence objectives into this inherently dual-use observation system could be regarded as a potential development of the follow-up programme to Copernicus, an opening which could correspond to the trend already observed when the EC moved from its "only civilian" approach in creating the European Defence Fund.

Copernicus data in security-related fields is mainly used for maritime applications by official institutions. However, Copernicus data has also proven useful on more defence-focused applications such as intelligence gathering on land bases. In the future, civilian applications such as high-precision agriculture will require Copernicus data with an ever-increasing resolution. Whether the resolution is spatial (more detailed pictures), temporal (more frequent revisits) or spectral (different available wavelengths), the reliability and performance of civilian missions will likely depend on it.

[6] PwC for the European Commission, *Study to Examine the Socio-economic Impact of Copernicus in the EU. Report on the Copernicus Downstream Sector and User Benefits*, Luxembourg, Publications Office of the European Union, October 2016, p. iii, https://doi.org/10.2873/01661.

[7] Ibid., p. 31.

[8] PwC for the European Commission, *Copernicus Market Report*, No. 2, February 2019, p. 31, https://doi.org/10.2873/011961.

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

Improving the resolution of Copernicus data on any segments also means improving space data quality for its potential use on dual-use applications.

The dual-use nature of space data is apparent. European defence forces or North Atlantic Treaty Organisation (NATO) forces may not be authorised to make use of Copernicus data if it does not correspond to a specified NATO Standardisation Agreement, but the free and open access means paradoxically that foreign armies, intelligence agencies or even terrorist organisations are not prohibited from using the data. Going forward in the definition of technical capabilities for Copernicus' new generation, this is something to keep in mind. Although Copernicus is a civilian programme under civilian authority, there is no guarantee that its users are and will be civil, and it would therefore be reasonable to bear in mind that EU and non-EU dual-use users can benefit of the system.

There is an increased interest from space institutions around the possibility of using Copernicus data for security purposes. The Meteor project, a joint ESA-European Defence Agency (EDA) programme aims at assessing the potential to establish an EU military Space Based EO Capability. These types of studies appear to highlight an increasing demand for European institutional dual-use capability in space, in particular to support the Common Security and Defence Policy (CSDP) and, from 2016, the Global Strategy for the EU's Foreign and Security Policy.

3.2 Lessons learned from Galileo

When talking about the space programme in the EU, Galileo appears to be a key reference. This flagship programme has reached a level of achievement and illustrates a policy generally praised by all actors. The launching of Galileo, an EU space infrastructure for navigation (Barbaroux 2016), is quite significant as a strategic infrastructure for Europe. One of the main reasons for this programme was to provide positioning services for citizens, with the aim of fostering the development of an important application market. The programme was strongly advocated as a civilian one, also to comply with EU rules which at the time carefully avoided the defence realm leaving it to MS. Galileo has, however, created a Public Regulated Service, PRS, which can be operated by public security users, including defence. Galileo has experienced a fierce dialectic with the US which initially opposed Galileo perceiving it as a competitor to their Global Positioning System (GPS). The Galileo case represents a significant shift for space security in Europe: the debate started around a programme decided and built up as a "service to citizens," but it quickly triggered side effects about the inherent security applications and the foreign policy debate when dealing with USA-UE relations. To a certain extent, the Galileo case illustrates one of the strongest cases demonstrating a consolidated process for a genuine *EU foreign policy action. Slowly, space policy is taking shape out from its "science and service to citizens" box and emerges as a possible strategic multisector policy*.

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

The high value information and space-based services provided by EO data is effective for a whole set of EU policies: EO applications are considered strategic, not only in the defence/security realm, treated essentially by MS, but for a more global vision where the control of the information technology chain, from data acquisition to transmission and process, appears to be a key issue. *Digital data and data policies* are increasingly relevant for the EU. This is expressed in the "*IT and digital economy paradigm*" where data production, processing and transmission is a key enabler for economic and political development. The *European Commission Digital Strategy* published in late 2018 describes a future vision where

> By 2022, the Commission will be a digitally transformed, user-focused and data-driven administration — a truly digital Commission. It will be endowed with a new generation of trusted and personalised digital solutions supporting its digitalised policies, activities and administrative processes. These solutions will increase the Commission's efficiency, effectiveness, transparency and security and will deliver EU-wide, borderless, digital public services that are indispensable for the functioning of the EU.[9]

We should be aware that it is not only a digital transformation of the administrative tool, but a more holistic concept of digital and data-based action of the EU in the world. The foreseen creation of an EC "data ecosystem" is extremely relevant:

> As outlined above, the provision of a corporate data ecosystem overseen by the Information Management Steering Board is a critical element in the transformation of the Commission to a data-driven administration. The corporate data ecosystem will underpin the move towards multidisciplinary, data-driven, evidence-based policy-making and supports initiatives such as Data4Policy.[10]

This text establishes a clear link between policy and data. This connection reinforces the concept that we already illustrated about EO data: because of its specificities but also because of the growing importance of data and data policy, EO data, and more specifically EO Copernicus data, is conceived as a key piece of the data chain to be developed and organised in coherence with the EC Digital Strategy. This short-term policy goal (by 2022) illustrates the rapid pace of changes and the opportunity to further connect EO data production centre such as Copernicus with EC DG DIGIT that will pave the way towards a "data-driven Commission". Still at an early stage, the connexion between Copernicus DIAS and the EC DG DIGIT data ecosystem hasn't been established yet, but it could represent a promising way forward.

[9] European Commission, *European Commission Digital Strategy. A Digitally Transformed, User-Focused and Data-Driven Commission* (C/2018/7118), 21 November 2018, p. 3, https://ec.europa.eu/transparency/regdoc/rep/3/2018/EN/C-2018-7118-F1-EN-MAIN-PART-1.PDF.

[10] Ibid., p. 13.

In the digital and data realm, Europe must compete with global IT platforms which are not only strong competitors, but also raise problems in terms of information control, autonomy, democracy and rules/regulation (cf. GDPR, relations with China, etc.). For example, the commercial capability of Galileo is currently not available in the USA because a waiver has not been granted on Galileo's Mode 6, which includes PRS and the commercial signal. This gives an idea of the potentially fierce international competition for the technological market, and contributes to reinforcing European policy aimed at investments in the space sector.

3.3 A technological way forward

Key technologies will be required to achieve the objectives of a satellite-based EO infrastructure into the 2020s.

Europe benefits from a strong upstream industrial base: most industrial actors involved in the production of launchers, satellites and ground segments as well as satellite operators are among the best in the world. However, the downstream segment is not as developed as in the United States, where tech giants share the digital market among themselves. Although a strong upstream sector is necessary to leverage the benefits brought by digital data to their full potential, it is not sufficient to build a downstream sector directed to services.

Europe has also proven its competence in building large satellite constellations, especially with the Galileo programme. Implementing such an ambitious project was a difficult endeavour, but the current version of the system already provides services to hundreds of millions of users. The European industry is technically very well positioned to address the development, manufacturing and launch of a satellite constellation, should the next generation of Copernicus satellites require such a configuration.

Some technologies could prove crucial in creating a strong market benefiting from satellite data as well as other sources. Cloud platform holders, providing storage and easy access as well as cloud processing power and tools for basic image processing, are expected to play a major role in the EO data market in the coming decade, as already witnessed for instance with the Amazon Web Services ground segment and cloud offer. The cloud is indeed the only platform capable of providing sufficient computing power to store and interpret the massive amount of data generated by satellite imagery. The Copernicus programme itself generates up to 8 petabytes of data per year. Planet, the leading US EO CubeSats company, has already developed a network of about 150 small imagery satellites generating 7 petabytes per year and 7 terabytes of data per day. Naturally, all imagery not being completely useful, a cloud-based computing power is necessary to analyse such data automatically.

Artificial intelligence appears to be a promising tool to use in the interpretation of satellite data, potentially mixed with other digital sources. Deep-learning algorithms have developed at an impressive rate in the past few years, and they

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

are now capable of interpreting massive amounts of data in a short amount of time while extracting meaningful information. Generated by tech giants such as Google, Facebook and Amazon, their applications are now spreading into the space domain.

Still, the absence of a EU global regulation on digital data creates uncertainties related to the legal conformity of certain activities from a business perspective: indeed, collecting data from satellites can be interpreted as "processing data" in the framework of GDPR for instance. Furthermore, collecting data for national security purposes is not covered by GDPR. Synergies between military and civil uses of commercial imagery could be emphasised, or reduced depending on the interpretation of European regulations on dual-use systems such as observation satellites and AI technology.

AI and satellite imagery make for a powerful combination. It is even possible in the future to foresee real-time interpretation of satellite imagery by deep learning algorithms, or even intelligent satellites able to observe and analyse imagery on the fly. This disruptive technology is a developing trend, with computer vision and deep-learning being the fastest growing segments of artificial intelligence today.

Many companies are exploiting the capacities offered by the combination of AI and satellite imagery: Planet, Orbital insight, Descartes Labs, Rezatech, Geo4i, CrowdAI, Figure Eight, MapBox, Ursa Space Systems, Utilis, Bluesky, Satellogic, Satintelligence, Bird.i are the most well-known representatives of this trend.

However, deep learning algorithms can hardly appear as transparent techniques due to the associated automated computer processes.[11] This makes AI applications hard to use in a security and defence context since their process cannot be fully explained and guaranteed. That said, this technological trend shows no sign of slowing and is fuelled by tech giants such as Google and Facebook which are leading the way in research in this domain.[12] Generated by an open-source community, AI algorithms are becoming increasingly accessible for various applications, including military ones.

This new reality creates great opportunities: as the amount of data increases, so will the understanding of our planet and the ability to fulfil the EU's strategic goals in all strategic domains. It seems reasonable to anticipate that Copernicus data alone will not be sufficient to accomplish all of the EU's strategic objectives, and that more data sources will have to be added to the mix to provide a more complete global database. Complementing Copernicus data with commercial satellite data appears to be the logical path for these companies.

[11] Matt Turek, *Explainable Artificial Intelligence (XAI)*, DARPA Research, April 2018, https://www.darpa.mil/program/explainable-artificial-intelligence.

[12] Facebook Artificial Intelligence website: https://ai.facebook.com.

© 2020 IAI ISSN 2280-6164 DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

However, enhanced access to satellite imagery can also create threats. Copernicus data can also be used for nefarious purposes, such as terrorism or monitoring the movement of armies in the field. Correlation of radar maps can be especially useful in tracking troop movements, especially in desert areas. Sensitive areas can become easily observable, which can result in added effectiveness of malevolent actions. Open and free data access is a good way to gather useful data when their interpretation is correct. However, correctly interpreting satellite imagery is a complex endeavour requiring special training. Misinterpretation, misidentification, misdating or intentional modification of satellite data poses a problem of information accuracy which can distort the truth and even legitimise wrongful actions. Open access satellite imagery can therefore potentially be used to support outright lies against the EU's interests.

While the EU's industrial base benefits from important public programmes such as Copernicus, the free data policy does not appear as beneficial given the size and strength of foreign competitors (Big Tech), which are able to leverage this data much faster and much more efficiently than the European industrial base.

This consideration further illustrates important aspects of space data production: positioning data has already paved the way for a strong European public controlled capability, EO also represents a key interest considering the multi sectorial strategic value of EO data. The question of the technological frontiers for Europe comes next. *Technological and data-centric development in Europe fosters the need to analyse and review European data policy at large, including data production systems (such as satellites) to ensure that new goals in terms of digital and data policy are taken into consideration by legacy mechanisms*. This is the case for the two successful EU flagship programmes in space, Galileo and Copernicus, where the production of digital data will be included and reviewed through the new EU digital policy. Indeed, it is a challenge but also an opportunity to show how space not only contributes to existing EU "security policies" in an extended concept, but also can be a tool for the data-based digital transformation process launched by the EU.

3.4 The stakes of a European cloud infrastructure

There is no European cloud infrastructure in place today. The DIAS of Copernicus cannot be compared to the capability currently in place in the USA. This is potentially an immense challenge for Europe, since data policy heavily depends on data storage and utilisation facilities. In essence, current EU data policy is just reflecting United States capabilities and policy. Any development in this field would require very important investments, which are difficult to put in place in Europe because of the lack of agreement on European interests. The definition of "autonomy" varies from one country to the other. In the meantime, the United States and China are positioning themselves on this issue, which may cause problems in the future.

The US CLOUD Act of 2018 provides the United States with the legal tool to extract data stored on American servers anywhere in the world. The use of data transiting

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

through the US becomes American, and the consent of the US is necessary if one wants to avoid repercussions. It is therefore a formidable tool of dominance.

A sovereign Cloud capacity could become a necessary condition for political sovereignty. As Galileo is a critical infrastructure, its cloud capacity would certainly become critical infrastructure.

Everybody understands that Amazon's Cloud is under US control, however, not everyone grasps that the US's ability to regulate the use of this data is a key capability, which could have severe consequences, up to incapacitating governments. Cloud Act decisions mainly target companies outside the US, thus posing a threat to economic autonomy. In a nutshell, the United States is able to use its Cloud infrastructure to hold hostage most of the world's companies.

This is the reason why the question of a European Cloud is key, particularly when envisioning the future of Copernicus. This is a problem which goes beyond a simple "Copernicus" decision. The EC has already decided to implement a "European Open Science Cloud". This is indeed an interesting initiative, but our EO assessment indicates important needs for a European cloud covering public policy but also industry data, with strategic and security implications, which might not be covered by an "open scientific architecture". There is a need to dig into the technology, architecture and legal framework in order to define what options could exist for a European Cloud launched by the EC.

3.5 From a technology development vision to support services and mission to a technological policy vision within the EU?

As "digital policy" clearly indicates, technology has become a key aspect of EU policy agendas, like the Strategic Energy Technology Plan. Until recently, technological development was considered a key tool in fostering economic development and in fulfilling specific missions. Today, the digital transformation has been increasing the value of data in large proportions. In this situation, data security has been emerging as a key issue. This does not only imply policies for taking care of all aspects of citizens' data (privacy, rule of law, protection) but it also requires that policy goals are aligned with technology policy and capabilities. Data retrieving and transmission systems such as space-based EO architecture can be part of a technological vision to be developed in conjunction with "digital policy". If digital policy states the importance of data, it also insists on European investments in order to develop digital technology. There is also a strong sense of competition coming from the US and China, where we can observe the consequences of massive investments in Information Technology. The impact is so huge that it can be viewed by some analysts as a threat to the very sense of democracy and to the rule of law in Europe. This is the reason why already existing data systems (such as space based EO systems) should be carefully maintained. This is also questioning the different levels of dependence and trust that we want to have with non-EU partners and/or competitors. Considering setting up an enlarged "technological and data policy" must be reflected in the light the growing role of the EC both as a

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

digital and a space actor. It must reflect the need for robust policy efforts endorsed both by EU institutions, ESA and member-states. Currently, the creation of European space programmes is more dictated by the needs of individual countries which use the European level to obtain a national capability, rather than trying to create an effective coherent European space infrastructure.

The process of space-based data within the IT chain: the "new space" paradigm offers examples of how space data has gotten integrated within the "digital data chain", following the logic developed by large data integration platforms (Big Tech). Data regulation and security is a domain worth exploring for the EU, since it must deal with threats arising from the ubiquitous use of data. As digitalisation permeates every aspect of life, including public administration and management, data security will become a key component of ambitious new policies. Indeed, if new data usage develops in the private sector but then quickly involves public institutions, importing the practices from the private sector also means importing its vulnerabilities.

Space data collection are generated by satellites, but their storage, processing and interpretation are all crucial steps to obtain actionable data which can be leveraged for efficient decision-making. For this reason, when considering data management, a growing need to address data value chain management has also emerged. This means controlling and assessing end-to-end data integrity is fostering a more comprehensive information control.

At each of these steps data is at risk of being corrupted, tampered with or misinterpreted. This raises the issue of data security and integrity all along the chain. Indeed, it is not clear today whose responsibility it would be, if a critical decision was made on unreliable satellite information. Tampering is theoretically possible all along the data value chain.

Enhancing control mechanisms and assessing potential threats to data disruption could represent a key development of EU data policy. Guaranteeing Copernicus data integrity all along the value chain could help the development of its use in security applications, where reliability is paramount.

3.6 The opportunity for a European data architecture, with institutional (national, ESA Copernicus) and commercial data

Data is becoming a global strategic issue. EO data can fill up the data chain but the integrity, the reliability and the availability are key features, both for private (commercial) and public (non-defence administration) users. EO commercial data raises a series of concerns when used within institutional processes. This precise point requires some re-thinking of the data policy associated with EO systems, and could lead the EU flagship programme to push for convergences between its "data policy" and the new "digital policy", raising concerns about data security. *In this respect, Copernicus must be reassessed as a key element of a much-needed renewed European digital security posture*. Commercial satellite imagery is also becoming

© 2020 IAI
ISSN 2280-6164
DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

more and more accessible via a simple internet purchase. Various companies are now offering satellite tasking and download capabilities at various spatial, temporal and spectral resolutions. Sensitive areas are often blurred or rendered inaccessible in certain search engines, for instance Google Earth. However, a great number of imagery companies offer to sell imagery not considered sensitive in their own nation, which allows anyone to have access to potentially sensitive information by cross-referencing. For instance, it is now possible to find imagery online from Korean or Chinese remote-sensing satellites. This trend is worldwide and it is likely that rules made in the EU will not apply to these companies. Controlling data imagery, sources and scope will soon become irrelevant as the world becomes more and more open.

Conclusion: Further steps for a strong Copernicus programme, in order to ensure continuity and growth of EU space based EO capabilities and the ESA role and know-how

All this builds up the case for a strong Copernicus follow up, in order to ensure institutional programme continuity (important ESA know-how) in EU industrial space policy (public demand for satellites and systems), and to maintain and develop European capabilities with public control and certification on data in order to fulfil "digital policy" goals. It is a matter that goes far beyond the classic "security" concept and leads to an "enlarged data policy" vision where an EU funded programme, such as Copernicus, benefits from its "service to citizen" approach in contributing to the new "digital policy" EU transformation process. The creation of an extended portfolio including" digital market, industrial policy, defence and space" within the 2019 EC is a clear sign of this political vision which provides a refurbished industrial and digital policy framework where space can be reassessed to play a new enabling role in a larger EU strategic and security-driven interconnected infrastructure.

The setting up of the DG "Industry, Defence and Space" (DEFIS) has confirmed this priority given to space. Within the EC, Space is at the same level as Defence: this clearly means that those two sectors shall be considered not only as pillars for industrial policy, but also as important political manifestos. While Ursula von der Leyen is claiming a "geopolitical Commission", the priority given to defence and space is a strong statement pushing for those two sectors. Defence investment will be pursued and there is room for cooperation in terms of innovation between defence industry and space, two distinct axes. This confirms the priority given to space in itself and witnesses its strategic importance. As far as the space is concern, we can observe that three fields will be undertaken: space policy, navigation and EO. The importance given to space appears through the global reference to space policy, a clear difference with a defence limited to its industrial and market aspects. As we have illustrated, the multi-layer strategic aspect of space emerges strongly within the new EC. This shall not be interpreted as a return to a "scientific and commercial" space only, separated from the defence activities, as bridges are set up between the two. Furthermore, there is a need to explore and develop the different security aspects of EO space activities. Clearly the growing concern about space strategic implications also translates the mobilisation around technological sovereignty as often expressed by the EU's Internal Market Commissioner Thierry Breton.

EO, together with navigation, is confirmed as a dedicated policy from the EC. The priority given to Copernicus cannot be static: indeed, the programme will evolve within a more dynamic space policy framework, where space contributes to a more digital and strategic European policy. For this reason, we have to bear in mind that the "classic" contribution to security from space will be pursued, but will probably have to face further accelerations and spin-offs in terms of security and strategy implication of the whole EO chain, in order to contribute to a more assertive geopolitical and sovereign European policy. On another hand during the 2019 ESA ministerial conference Copernicus programme received a 29 per cent oversubscription of the budget. It is a remarkable aspect which confirm the robustness of ESA EO programme and the will to pursue technological development and deployment. This excellent result also reinforces the ESA. Between the growth of the DG DEFIS in the EC and the success of EO within ESA ministerial conference, we can observe a mutual growth for European space institutions, a clear sign of an expanding sector with increasing governance and funding needs.

At the end of this analysis, it is strongly recommended to consider developing a comprehensive analytical framework allowing capitalising on Copernicus achievements and projected programmes in the new geopolitical and security context.

This framework will have to promote a comprehensive vision of security for Europe by taking into account the evolving nature of new security missions as well as the dynamics in the Information technology downstream sectors that will play an ever-increasing role in the security of the European citizens. We see an important opportunity to liaise the classic "user need" for security gap analysis with a strong reconnaissance in terms of security policy evolution, also in its technological dimension, a contribution to allow EO policies to participate to the transformative vision of security and strategy in Europe, already into action.

Updated 4 February 2020

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

List of acronyms

C3S	Copernicus Climate Change Service
CAMS	Copernicus Atmospheric Monitoring Service
CEMS	Copernicus Emergency Management Service
CSDP	Common Security and Defence Policy
DIAS	Data and Information Access Services
DG	Directorate General
DG AGRI	Agriculture and Rural Development
DG CLIMA	Climate Action
DG CONNECT	Communications Networks, Content and Technology
DG DEFIS	Industry, Defence and Space
DG DIGIT	Informatics
DG ECHO	European Civil Protection and Humanitarian Aid Operations
DG ENV	Environment
DG GROW	Internal Market, Industry, Entrepreneurship and SMEs
DG JUST	Justice and Consumers
DG MARE	Maritime Affairs and Fisheries
DG MOVE	Mobility and Trasport
DG REGIO	Regional and Urban Policy
EC	European Commission
EDA	European Defence Agency
EEAS	European External Action Service
EMSA	European Maritime Safety Agency
EO	Earth Observation
ERS	European Remote Sensing
ESA	European Space Agency
EU	European Union
EU SatCen	European Union Satellite Centre
EUGS	European Union's Global Strategy
GDPR	General Data Protection Regulation
GPS	Global Positioning System
JAXA	Japan Aerospace eXploration Agency
MOD	Ministry of Defence
MS	Member States
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organisation
PRS	Public Regulated Service
REDD	Reducing Emissions from Deforestation and Forest Degradation
SME	Small and Medium Enterprise
SPOT	Système Probatoire d'Observation
US	United States
UV	Ultraviolet

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020 ISSN 2280-6164

© 2020 IAI

ISSN 2280-6164

DOCUMENTI IAI 20 | 02 - FEBRUARY 2020

Istituto Affari Internazionali (IAI)

The Istituto Affari Internazionali (IAI) is a private, independent non-profit think tank, founded in 1965 on the initiative of Altiero Spinelli. IAI seeks to promote awareness of international politics and to contribute to the advancement of European integration and multilateral cooperation. Its focus embraces topics of strategic relevance such as European integration, security and defence, international economics and global governance, energy, climate and Italian foreign policy; as well as the dynamics of cooperation and conflict in key geographical regions such as the Mediterranean and Middle East, Asia, Eurasia, Africa and the Americas. IAI publishes an English-language quarterly (*The International Spectator*), an online webzine (*Affarinternazionali*), three book series (*Global Politics and Security*, *Quaderni IAI* and *IAI Research Studies*) and some papers' series related to IAI research projects (*Documenti IAI*, *IAI Papers*, etc.).

Via Angelo Brunetti, 9 - I-00186 Rome, Italy
T +39 06 3224360
F + 39 06 3224363
iai@iai.it
www.iai.it

Latest DOCUMENTI IAI

Director: Alessandro Marrone (a.marrone@iai.it)

20 | 02	Jean-Pierre Darnis, Xavier Pasco and Paul Wohrer, *Space and the Future of Europe as a Global Actor: EO as a Key Security Aspect*
20 | 01	Francesco Pettinari, *L'Europa della difesa accelera, e l'Italia?*
19 | 21	Eleonora Poli e Lara Laviola, *Tavola rotonda italo-olandese Van Wittel/Vanvitelli*
19 | 20	Eleonora Poli, Lara Laviola and Laura Sacher, *Central European Initiative Dialogue Forum*
19 | 19	Matteo Bonomi, *Walking the Strategic Talk. A Progressive EU Foreign Policy Agenda. Conference Report*
19 | 18	Margherita Bianchi, *From Findings to Market: Perspectives and Challenges for the Development of Gas Resources in the East Med*
19 | 17	Michele Nones, Paola Sartori e Andrea Aversano Stabile, *La difesa missilistica e l'Italia: vecchie minacce e nuove sfide per la sicurezza nazionale*
19 | 16	Filippo Cutrera, *Priorità italiane dopo 70 anni di Nato*
19 | 15	Andrea Lezzi, *Comunicazione social dei partiti e narrazione euroscettica nelle europee 2019*
19 | 14	Nicola Casarini and Lorenzo Mariani (eds), *Between "America First" and the "Chinese Dream": What the EU and Japan Can Do Together*