



**Special  
Report**

# **COVID-19 and the European space sector**

**Report:**

Title: "ESPI Special Report - COVID-19 and the European space sector"

Published: July 2020

ISSN: 2218-0931 (print) • 2076-6688 (online)

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## FOREWORD



Dear members and readers,

The outbreak and worldwide spread of the COVID-19 crisis have already left a significant mark on 2020. Started as a public health crisis, a global economic and financial turmoil has followed with unprecedented consequences and unparalleled magnitude. The crisis has indeed profoundly affected the GDP and employment rate at global and regional levels, impacting many economic and industrial sectors. Europe is slowly rebooting most of its activities and resuming business-as-usual. However, there is a long road ahead: the crisis has imposed new practices concerning social distancing in the workplace; the health alert and contagion trends are still high in other regions of the world, continuing to profoundly influence global trade; furthermore, the sword of

Damocles of a second wave still poses a serious threat to the recovery phase.

With regards to space, two aspects are particularly salient and worth taking into consideration: the use of space to monitor and respond to the crisis, and its impacts on the sector.

Space offers unique capabilities when it comes to the management of natural disasters as well as humanitarian crises; what is more, space-based services proved to be fully available and reliable during the public health crisis and are legitimately expected to provide relevant solutions to boost the economic recovery.

At the same time, as other sectors, the European space industry has been deeply affected by the crisis, because of the direct impacts of the lockdown measures but also by disruptions in the global supply chains. As a matter of fact, the space industry and business will likely continue to endure the consequences of the COVID-19 crisis for some time.

The European institutions have been responsive to the outbreak of the crisis, taking measures to shelter and safeguard the continuity of business. Beyond these immediate measures, the crisis may also influence the space policy debate, bringing up and amplifying long-lasting discussions on critical issues, such as European autonomy, technological non-dependence, supply chain security and the overall European approach to space industrial policy.

The objective of this special report is neither to produce a comprehensive assessment of the usefulness of space nor to quantify the impacts on the sector, but rather to put together the socio-economic indicators available in the current context and to make an objective status of the situation of the European space sector in the immediate aftermath of the health crisis.

Sincerely yours,

A handwritten signature in black ink, consisting of several overlapping loops and strokes, representing the name Jean-Jacques Tortora.

Jean-Jacques Tortora

Director of the European Space Policy Institute

## SPACE SOLUTIONS IN RESPONSE TO THE CRISIS

The COVID-19 outbreak and the global crisis that followed highlighted the importance of quickly getting access to reliable information for various purposes, in response to often unforeseen circumstances. Data proved to be essential to assess the context of the crisis, to monitor its evolution and to support effective responses to mitigate its socio-economic impact.

Space systems repeatedly demonstrated that they provide unique solutions, essential to better understand, monitor and respond to a variety of crises. For example, the Copernicus programme already proved to be an important asset for crisis management in various occasions, such as in the events of: the Hurricanes Irma (2017), Michael (2018) and Dorian (2019) over the coasts of the U.S. and Bahamas, as well as during wildfires in Australia (2020), tropical cyclone in India (2019), earthquakes in Haiti (2018), Iran (2019) and Turkey (2020), volcanic activities in the Philippines (2020) and major floods in Italy (2019), Finland (2020) and Norway (2020). Overall, the Copernicus [Emergency Management Service and Rapid Mapping capability has been activated 444 times since 2012](#). Other space services such as satellite communication or navigation are also extensively used for crisis management.

Although the use of space solutions has been, until now, usually envisaged in the event of natural or human-made disasters to support risk management and emergency response, the COVID-19 crisis showed that space systems can also be quickly put to good use in the case of other unexpected critical situations.

It is not the first time that space systems are used in the frame of an epidemic outbreak actually: in 2014, Copernicus data already proved beneficial to support the management of the [Ebola crisis](#) in Western Africa. However, the extraordinary circumstances of the COVID-19 crisis, a pandemic of unprecedented magnitude hitting at the heart of Europe, raised exceptional challenges and required an entirely different response.

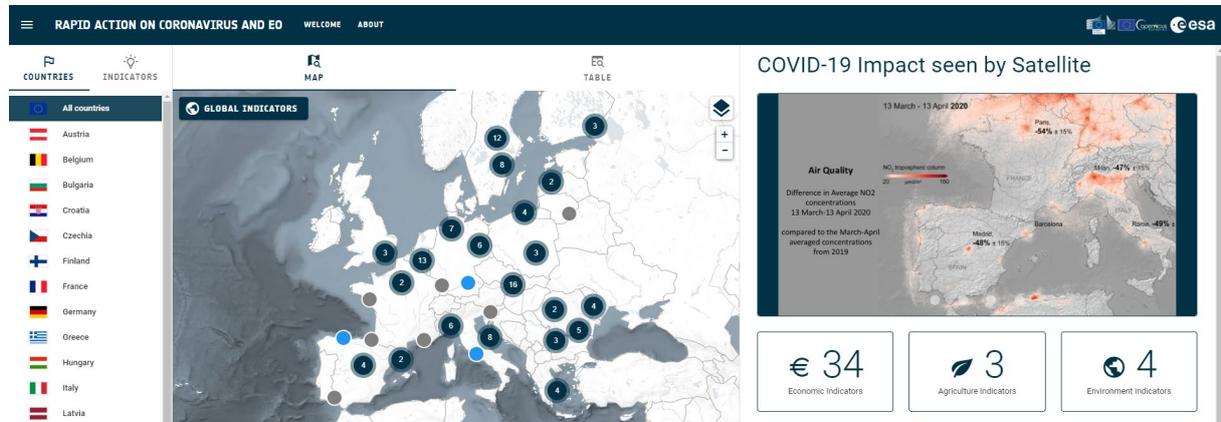
Ultimately, space solutions proved to be valuable at all stages of the management of the crisis, from monitoring and assessment of the situation to enabling responses and accelerating recovery, but also to supporting epidemiologic research efforts and intelligence about the situation outside Europe:

- **Satellite imagery** enabled direct observation of multiple effects of the crisis across large areas, actively supporting an informed monitoring and assessment of its impact. Satellite imagery also helped to plan operations on the ground and to gather valuable information for a multitude of applications.
- **Satellite navigation** has also been used to actively detect and track a variety of situations such as traffic jams at borders, allowing for a better management of these issues through information dispatch and coordination of countermeasures.
- **Satellite communications**, which are essential to ensure ubiquitous connectivity for all in Europe and which provide backhaul solutions for broadband and cellular networks, played an even more important role whilst European telecommunication infrastructures were facing a quick and massive increase of bandwidth demand.

Overall, the “big picture” delivered from space allowed to visualize the lockdown of cities, monitor the effects on the environment and on economic activities, enabled decision-making and gave transparency to the implementation of containment measures. European institutions, in particular ESA, the European Commission and national space agencies, actively sought to maximise the benefits of space for the management of the COVID-19 crisis and quickly launched various initiatives to stimulate the development of new space applications. A few selected examples of how space solutions supported the management of the COVID-19 crisis so far are provided hereafter.

## Space solutions for crisis monitoring

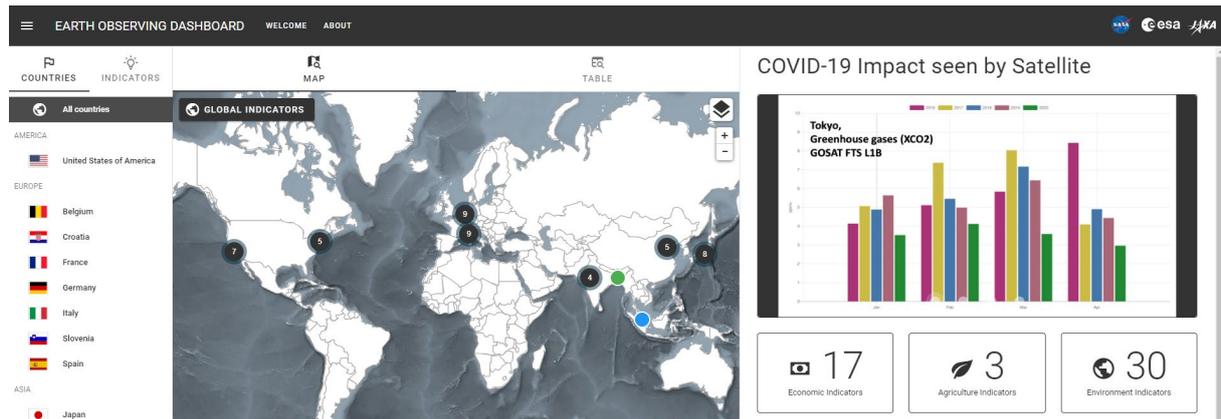
### RACE Dashboard: monitoring COVID-19 impact from space



RACE dashboard, map visualisation

Together with several industrial partners, ESA and the European Commission launched the [Rapid Action on COVID-19 and EO \(RACE\)](#), a dashboard to provide key information on the impact of the crisis at environmental, economic and social levels based on satellite data combined with artificial intelligence. RACE presents 64 economic indicators, 3 agriculture indicators and 4 environmental indicators to monitor the disruptions caused by the lockdown across 22 European countries but also to detect signs of recovery. At economic level, RACE displays the status of oil refinery sites, metallic/non-metallic ores production sites, the status of intermediate and finished goods production, the level of activity at commercial centres. During the presentation of the project, ESA Director for Earth Observation Josef Aschbacher recalled how the “unique data from space are pivotal in supporting crisis management during the coronavirus pandemic”. EC DEFIS Deputy DG Pierre Delsaux added that “RACE shows the role that the EU Space Programme can play for Europe’s sustainable, long-term recovery”.

### Earth Observing Dashboard: tri-agency (ESA, NASA, JAXA) effort to monitor global COVID-19 impact



Earth Observing Dashboard, map visualisation

Initially announced in April, ESA negotiated a joint initiative with NASA and JAXA to create the Earth Observing Dashboard; the Dashboard is a partnership that brings together resources, technical knowledge and expertise from the three agencies and aims to generate comprehensive measurements and robust datasets to understand the impact of the crisis. As of now, the Dashboard provides data covering 7 European countries, the U.S., Japan, China, India, Singapore and Bangladesh. The EO Dashboard presents 17 economic indicators, 3 agriculture indicators and 30 environmental indicators. In particular, the

economic indicators also include airports and ports throughputs and nightlights, while the environmental indicators also combine data on greenhouse gases, with measurements across Earth. Data are provided by NASA’s Aura and OCO-2 satellites, JAXA’s GOSAT and ALOS-2 and European Sentinels.

**Examples of economic indicators for Europe from the dashboard**

The satellites data presented by the RACE dashboard provide specific insights into the COVID-19 impact on commodities, especially on the status of metallic ores and steel production across the most important European sites. The monitoring of the impacts on critical commodities market could be extremely relevant for the overall European steel industry and single economic sectors, such as automotive and construction industries. The RACE dashboard collects data in different European countries (Germany, Spain, France, Italy and Poland) related to ships

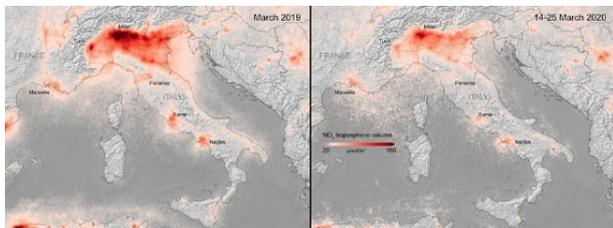
**Hamburg, Import/production sites: status of metallic ores**  
Changes in Ships traffic at dedicated piers



*Changes in ships traffic in Hamburg (February-June 2020)*

traffic at top five locations for metallic ores import and production sites: the changes in ship traffic depicts the impact of the crisis on business activities. For what concerns steel production, RACE provides data on the inventory levels in 26 different locations in four countries (Finland, Poland, Romania and Sweden): the dashboard collects quite different results, depending on the single production sites and warehouses, with initial widespread drops and more gradual recovery with different trends across Europe.

**Reduction of pollution seen from space**



*NO2 concentrations over Italy, Sentinel-5P*

EO data distributed by ESA offered impactful examples of the lockdown, such as in [Venice](#), and of the [efforts to set-up medical facilities](#). Satellite imagery data have drawn attention to the environmental and economic impacts, such as the massive reduction in air pollution in various areas of the world. The reduction in concentration of NO2 and particulate matter, a noteworthy

outcome of the crisis, further underlined the extent of [pollution related to Human activity](#). Unsurprisingly, the restart of economic activities is immediately followed by a return of pollution, monitored as well by Copernicus data, elaborated by [OilX](#) and [Descartes Lab](#).

**Economic intelligence and preparation of crisis recovery**

EO data contribute to understand the impact on commercial activities for the purpose of economic intelligence; it has been the case of the unsettled oil sector, where satellite imagery provided exclusive insights on the recent [oil glut](#), on the [oil supply chain](#) and on other business areas, such as [food supply chains](#) or deserted theme parks and anchored cruise ships observed by the [Iceye SAR constellation](#). From this point of view, EO and remote sensing data could prove essential to monitor and appraise the restart of economic and social activities, for instance by [monitoring night-time light emissions](#) – a technique utilised also by the [IMF](#) – as well as by combining geospatial data with official statistics, as done by the Berlin-based [UP42](#) and [Descartes Lab](#), by [HawkEye 360](#) in terms of maritime activity near Italy, and finally by [GHGSat](#) and the [SRON Netherlands Institute for Space Research](#) to investigate methane emissions and impacts on the natural gas industry across the globe using Sentinel-5P data.

## Space solutions for crisis response

### Galileo Green Lane: managing traffic and easing congestion at European borders



*Green Lane app, map visualisation*

The European Commission and the GSA launched the Galileo Green Lane app, supported by the DG DEFIS, DG MOVE and the EU Joint Research Centre (JRC). Developed in partnership with FoxCom, SpaceTec Partners and the Austrian company Sixfold, the Galileo Green Lane app aims to [support road traffic management](#) to facilitate mobility and the transit of goods, “[easing the situation at borders](#)” as recalled by the DEFIS DG Timo Pesonen. The app provides detailed reports and supports two different interfaces, for border authorities as well as drivers.

The app is based on the “Green Lane” initiative to facilitate crossing time and keep it to less than fifteen minutes. Galileo Green Lane offers a visualisation of the Trans-European transport NeTwork (TEN-T) borders crossings, covering approx. 187 crossings; hence, it is able to report about the real-time waiting time and traffic flows at each border, predict patterns and anticipate peak traffic, in order to consistently avoid kilometres of queues and delays in deliveries of critical goods.

### GNSS4Crisis Database: repository of applications for COVID-19 response

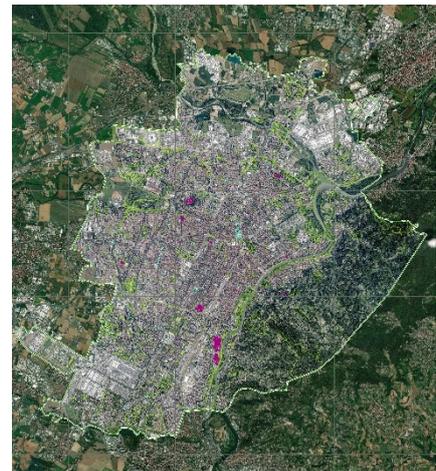
The GSA compiled a [repository of apps](#) that use GNSS location to map the spread of the virus. The database includes 8 categories covering various purposes, such as monitoring of the circulation of the virus, prevention of spreading as well as coordination of crisis responses. Some examples include:

- the Governments of Iceland, Norway, Spain and Cyprus developed GNSS location-based applications to track new infection cases; respectively called Rakning C-19, Smittestopp, Asistencia COVID-19, and Covtracer, the apps help authorities and emergency responders to limit the contagion and provide clear information to citizens;
- [Crowdless](#) is utilised for queue management with real time data provided to users allowing informed decisions, it is developed by the UK company Lanterne and has received support by ESA;

- [CovTrack](#) has the purpose to track potential infections as well and has been developed by the [Romanian company RISE](#) and is supported by ESA through the Navigation Innovation and Support Programme (NAVISP);
- [Mapy.cz](#) (in Czech Republic) or [Hamagen](#) (in Israel) are mapping applications that alert citizens in case of potential exposure to the virus, through locations sharing and cross-referencing with positive tests data.

**Copernicus Services activated to support emergency management, food security and geospatial intelligence**

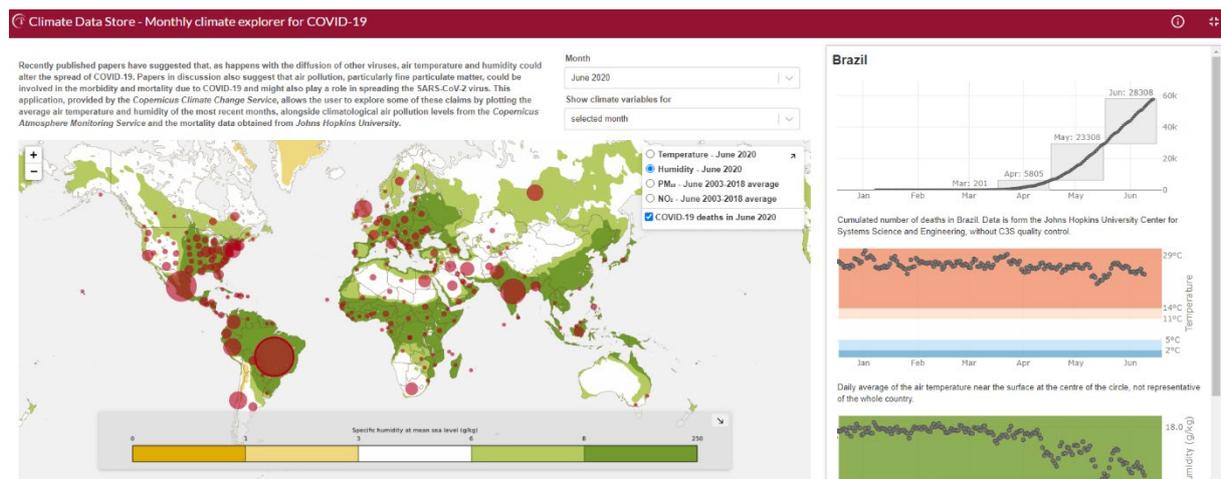
Made necessary by the urgency of the context, Italy activated the [Copernicus Emergency Management Service \(EMS\)](#) and [Rapid Mapping \(RM\)](#) on April 5<sup>th</sup>, a service distributed by a consortium led by the Italian e-Geos. The EMS provided the Civil Protection Department with a complete, near real-time, overview of facilities on the ground, essential for the management of efficient countermeasures. For instance, the EMS service provided the authorities with timely information regarding hospitals and healthcare facilities, including mobile or temporary triage and field hospitals. At the same time, the maps help to identify open-air markets or sports and recreation facilities that can be used in case of emergency to set up crisis services. The information provided by the EMS were also merged with data on population to deliver an even more complete and detailed understanding of the situation on the ground.



*Copernicus EMS, City of Turin*

Copernicus Sentinels enable the [European Farm Sustainability Tool \(FaST\)](#) and the [Data and Information Access Services \(DIAS\)](#), used to monitor and mitigate the disruptions caused by the COVID-19 outbreak in the [agricultural sector](#) to ensure food security. In this case, the support of space applications contributes at the same time to help farmers improving their response to the crisis but also to comply with the parameters of the [Common Agricultural Policy \(CAP\)](#) and streamline the access to subsidies.

**Insights from space to support COVID-19 research**



*Climate Data Store. Data from June 2020 on specific humidity at mean sea level and COVID-19 deaths*

The comprehensive data from the [Copernicus Atmosphere Monitoring Service \(CAMS\)](#) and the [Copernicus Climate Change Service \(C3S\)](#) satellites supported the scientific community and provide insights to understand the virus' behaviour and produce epidemiological models assisting the research on the COVID-19 disease. In details, the satellite data gathered in the [Climate Data Store application](#) help

to investigate a potential correlation between air temperature, humidity and pollution to the COVID-19 mortality, in order to study the diffusion of the virus, its lethality but also its alteration due to external characteristics. According to the Director of the C3S Service Carlo Buontempo, this information “could be useful for learning more about coronavirus and may play a small part in helping authorities to implement effective measures”.

### **Space solutions in place of heavily impacted weather observations and forecasts**

According to the World Meteorological Organization (WMO), [the COVID-19 had an impact on both the quality and quantity of weather observations and forecasts](#), due to an unprecedented reduction of aircraft as well as surface-based measurements; during the pandemic, the observations and forecasts dropped by an average of 75-80% compared to normal operations, up to 90% in the southern hemisphere. This in turn could bring additional vulnerabilities related to loss of early warning alerts in the event of weather-related disasters, such as hurricanes and floods, “exacerbating multi-hazard risks”. In this sense, valuable contribution came from [ESA’s Aeolus](#) that provided weather measurements and forecasts, supplying data in place of the usual measurements and mitigating the temporary loss of scientific information.

### **Satellite connectivity and telemedicine for Health services**

The Government of Luxembourg has granted free access to healthcare operators to the tele-health SATMED platform. Initially in operation during the Ebola crisis in Western Africa and based on the SES satellite fleet, the eHealth service is installed on remote medical centres and hospital ships to ensure communications and enable specific responses.

[ESOA \(the EMEA Satellite Operators Association\)](#) reported examples of how European satcom operators also supported the crisis response, in particular to:

- Provide Direct Connectivity keeping millions online while isolated or at home
- Support Mobile Network Operators with additional backhaul capacity to connect citizens
- Broadcast information and live education channels and enabling connectivity for remote learning
- Connect first responders & Supporting humanitarian missions
- Enable telehealth solutions & Ensuring connectivity to essential services
- Monitor changes on earth thanks to Earth observation data & remote sensing

Satcom are an integral component of the European telecommunication infrastructure through the broadband services they provide, in particular to remote European areas. They also provide backhaul solutions for terrestrial networks to handle the quick and massive increase of bandwidth demand. ESOA reports that “satellite operators have seen increases in capacity from 10% in islands to 50% in rural areas.”

## Initiatives to stimulate the development of COVID-19 space applications

### ESA and ASI cooperate for healthcare and education projects

ESA in cooperation with ASI and the Italian Minister for Technological Innovation and Digitization (MID) launched an Announcement of Opportunity to encourage the development of space-based solutions addressing healthcare and education to fight the COVID-19 emergency. Initially funded with €2.5 million, the Italian Space Agency has [increased the overall funding](#) by €7.5 million – totalling €10 million: [€8.2 million for healthcare and €1.8 million for education projects](#). Among the 130 proposals, some projects focused on Galileo's positioning service for contactless delivery of goods, others are focused on data from the Italian hyperspectral satellite PRISMA for a deeper understanding of the virus' spread, others on satellite communication to tackle digital divide and e-learning opportunities from the ISS laboratories.

### ESA and UKSA in support of the healthcare system

ESA and the UK Space Agency launched a Call for proposals for projects in response to the health crisis that use space technologies, [in support of the UK National Health System](#). The £2.6 million initiative aims to bring space-based innovations in support of the healthcare efforts to fight the virus, in terms of logistics and emergency management, challenging “the space business community to show just how much it can offer, to help us through this a once in a century event”.

### ESA deploys an integrated field laboratory in Italy for crisis management, telemedicine services in Spain



*Biological Light Fieldable laboratory for Emergencies (B-LiFE) in Piedmont*

A particular initiative put in place by ESA, with the support of project partners including SES, concerns the development of the [Biological Light Fieldable Laboratory for Emergencies \(B-LiFE\)](#), a facility that integrates all space assets: satellite communications, positioning and tracking services as well as EO data in an easily deployable laboratory. Developed by ESA and the University of Louvain, the [B-LiFE](#) was already utilised during the Ebola crisis but has been enhanced to effectively respond to the COVID-19 crisis with specific diagnostic capabilities. The field laboratory has [operated in Northern Italy](#) during the outbreak of the current crisis.



*Tempus Pro telemedicine devices in use by emergency teams in Spain*

In addition, ESA supplied two [telemedicine devices](#) called [Tempus Pro](#) to Catalonia's [Sistema d'Emergències Mèdiques \(SEM\)](#) to allow fast operations and secure transmission of data at triage, “intermediate ambulances” and emergency facilities; originally designed to assess astronauts' health parameters at the European Astronaut Centre (EAC) in Cologne, the devices have been loaned to Spain for the duration of the pandemic in order to improve the national response to the crisis.

## European initiatives for innovative EO technologies

In coordination with the European Commission, ESA launched the “[COVID-19 Custom Script Contest](#)” to find innovative projects based on EO technologies to mitigate the impact of the crisis on economic, human and agricultural activities that will contribute to the RACE dashboard. Among the weekly and monthly winners of the contest, some projects are based on monitoring the consequences for transportation and mobility, or for river water quality, lettuce production and food security, but also for tracking construction activities, car parks, airports and trucks.

Another contest based on the responses to the pandemic is the “Galileo Masters” and its specific “[Space for Being Safe & Healthy Challenge](#)” organised by the GSA in coordination with the European Commission, centred around the innovative use of downstream space data from Copernicus and Galileo.

In this framework, ESA, NASA and JAXA together with CNES and CSA launched the “[Space Apps COVID-19 Challenge](#)” on May 30<sup>th</sup>, that saw 15.000 participants competing on different challenges focused on understanding the impacts and opportunities of the crisis based on EO data.

ESA has also included EO-based solutions to the COVID-19 crisis in an existent [Open Call](#) and issued two new Announcement of Opportunity (the second to be issued by the end of June) for space applications in the phases of the crisis outbreak and recovery. ESA also sponsored a [COVID-19 hackathon](#) in Estonia, won by a German start-up that developed a solar-powered sanitizer.

## Space industry capabilities and technologies put to use

Besides initiatives to develop innovative space-based applications the crisis, several space actors have actively contributed to the response to the pandemic. National space agencies and several space industrial actors have participated in the effort to manufacture respirators, masks, protective equipment and utilise the logistics, research and technology capabilities to cope with the COVID-19.

Examples are provided below (non-exhaustive list).

[ESA's European Astronaut Centre \(EAC\)](#) has utilised the astronaut training technology to produce 3D printed face shields for the safety of workers. [CNES](#) has developed prototypes to optimise the functioning of ventilators, manufacturing devices then delivered to hospitals to connect more people to the same ventilator in case of emergency. Moreover, [CNES has partnered with the Centre Hospitalier Universitaire \(CHU\)](#) of Toulouse providing expertise on artificial intelligence in order to support the research on the disease and improve the diagnostic capabilities for COVID-19 patients. [Arianespace](#) has delivered protective equipment in France as well as in the French Guiana, also to assure the safety of workers returning to the launch operations activities. [DLR has converted its 3D printers](#) to manufacture masks as well as valves for ventilators but is also testing models to [study the potential propagation of the virus](#) onboard airplanes and trains, with the aim of protecting passengers and advance safety parameters for mass mobility. Thales has broadly supported the medical efforts across Europe, with diagnostic solutions and telemedicine services, but also private companies and organisations against cybercrimes. [Airbus](#) invested its facilities across Europe as well to produce and distribute face shields and masks for healthcare operators and launched a hackathon for its employees to produce [innovative devices](#) for the medical staff and services. [Leonardo](#) has supported the manufacturing of masks and valves for ventilators to sustain the healthcare efforts, especially in Northern Italy at the beginning of the outbreak, and supporting companies transitioning to smart-working with cyber-security services. [Sener Aerospace](#) in Spain and Poland put its industrial capabilities towards the production of protective equipment in support of the healthcare staff. The Scottish launcher start-up [Skyrora](#) has also joined the efforts to produce protective equipment, such as hand sanitizers and face shields for the healthcare system.

## IMPACT OF THE CRISIS ON THE EUROPEAN SPACE SECTOR

Like most economic sectors in Europe, the space sector has also been profoundly impacted by the COVID-19 crisis and lockdown measures adopted by governments to slow down and mitigate the spread of the pandemic. All actors of the space value chain, including space agencies, manufacturers, launch service providers, satellite operators as well as downstream companies were confronted with multiple restrictions that disrupted their activities to varying extent.

Concretely, lockdown measures translated into an extensive use of teleworking, industrial and launch site shutdowns, supply chain disruptions as well as work interruption, payment delays and orders cancellation in some cases. Beyond the immediate effect on productivity and business that will lead to programme delays and economic loss, the resulting shock will likely have ripple effects on the space sector for some years. Space actors, domains and markets are not impacted to the same extent or in the same way.



### Direct impact on labour and operations:

- Recourse to teleworking
- Sites and operations shutdowns
- Supply chain disruptions



### Direct and indirect impact on business:

- Payment delays
- Order cancellations
- Increased costs



### Wider macroeconomic impact:

- Changes in demand and market verticals
- Changes in public policies and budgets
- Changes in investment capacity

In light of these unprecedented circumstances and with a high risk for the space sector to be greatly impacted by the crisis, public actors, in particular space agencies in this case, quickly adopted a set of measures to mitigate the effect of the crisis in the European space sector and to ensure some continuity of activities and safeguard business plans.

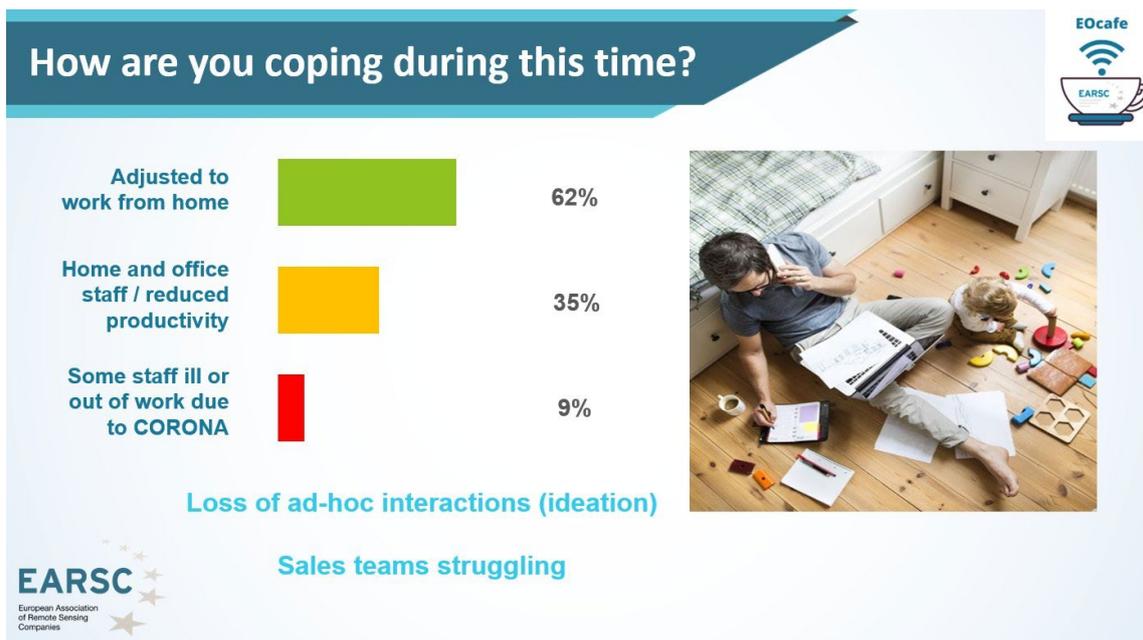
European governments started to lift lockdown measures only recently and although companies and agencies are progressively resuming normal activities, the COVID-19 crisis is far from being over in Europe and in the World. A comprehensive and robust assessment of the impact of the crisis on the European space sector will not be possible before some time has passed but several organisations, in particular trade associations, already started to investigate the situation in their respective areas and to provide initial estimations of the potential economic shock related to the crisis. This chapter aims to provide an overview of available indicators giving a sense of how the European space sector is affected by lockdown measures and by the crisis at large.

## Direct impact on labour and operations

European countries adopted different policies and approaches to the COVID-19 crisis which gave way to a heterogeneous set of national measures and agendas concerning population confinement, activities shutdown and borders closure. As a result, the implications and direct impact of the crisis on the space sector differed from state to state; and space agencies and companies handled the crisis in very different ways, including within organisations operating multiple sites across Europe. In Italy for example, some activities in the space sector obtained specific authorisations to allow day-to-day operations.

A first consequence of lockdown measures for most sectors in Europe, including the space sector, has been an extensive recourse to teleworking in order to partially mitigate the consequences of population confinement on regular business activities. In its bi-weekly brief on COVID-19 impact on the space manufacturing industry, Eurospace estimated that the share of teleworking oscillated between 40% and 50% through April, May and June 2020 in the manufacturing sector. The share of employees working from home was probably even higher in space agencies, satellite operators and service providers. In an effort to reduce personnel working on-site, [the vast majority of ESA's workforce has been teleworking](#) and only key personnel performing critical tasks such as spacecraft operations are still present on site at ESA's establishments throughout Europe. In France, CNES has [transitioned 90% of its employees to teleworking](#). Satellite operator SES explained in a press release that [almost all its employees are working from home](#).

This extensive recourse to teleworking raises the difficult question of productivity loss. Although most companies did not wait for the COVID-19 crisis to integrate home office in their normal work practices, they were not necessarily prepared to face such share of remote work, both from an organisational and IT infrastructure standpoint. Eutelsat, for example, explains that despite an active and capable remote working culture, the company had to [quickly ramp up its IT infrastructure](#) to support both employees and operations. [OHB Italia](#), which reported that 60% of its employees were teleworking, also stated that the company had to introduce more dedicated VPN lines to enable every employee to work efficiently from home. EARSC, the European Association of Remote Sensing Companies, reported that 62% of its members considered they had fully adjusted to teleworking while 44% were facing a partial or complete loss of productivity. Ultimately the implications of teleworking greatly differ between organisations according to the nature of their job and to their managerial and technical preparedness.



EARSC, from the webinar "The European Earth Observation Industry in the time of COVID-19"

Beyond the extensive recourse to teleworking, many organisations in the space sector also had to shut down some sites and activities and to temporarily lay off employees, supported in most countries by governmental partial unemployment plans. In the upstream space sector, Eurospace recorded up to 26% of personnel not working at the peak of the crisis early April but the share quickly dropped to 7% at the beginning of June. In parallel, personnel working on-site for critical industrial activities represented only 30% of the workforce early April. With the easing of confinement measures throughout Europe in May, the share of on-site personnel increased to above 50% (measured at the end of May), with discrepancies between European countries.

**Information and reports suggest that, despite multiple activity shutdowns in the space sector, European agencies, manufacturers and operators successfully managed to maintain critical deliveries and operations despite some delays that could be partially recovered after the crisis.**

Selected examples of reported impacts on space activities and operations are provided below:

- **Activity shutdowns:** overall, the decision taken by the French government were also applied to Guiana Space Centre in Kourou; the CSG remained closed for approx. two months, with delays in launch operations and in the development of the Ariane 6 ELA4 launch complex. Consequently, the [maiden flight of Ariane 6](#) initially expected between October and December 2020 will be postponed to 2021, according to the ESA Director of Space Transportation Daniel Neuenschwander. The four sites of [Thales Alenia Space Italia](#) reduced most operations and restarted normal activities only in June, managing however to successfully deliver [Sentinel-3D](#) to TAS facilities in Cannes. Airbus announced the shutdown of most of its operations for some weeks at its facilities in Spain and France to comply with the emergency measures issued by governments.
- **Critical deliveries or operations:** [Avio](#) reported almost-normal operations during the pandemic. [Airbus and ArianeGroup facilities in Germany](#) managed to continue most of operations, as for instance those related to the initial integration of the JUICE probe and the sound test for the upcoming [Sentinel-6](#). Despite the crisis the launcher manufacturer start-up [Isar Aerospace](#) announced the development of a production facility outside of Munich. Eutelsat has implemented a well-rehearsed Business Continuity Plan for key workers in mission-critical posts, enabling teleports and control centres to operate nominally and support customers who are reliant on their services.”
- **Programme delays:** in March, ESA decided to [stop instrument operation and data gathering on four science missions](#) (Cluster, ExoMars 2016, Mars Express and Solar Orbiter), [resuming all operations after a few weeks](#). However, ESA and Roscosmos had to announce the official postponement of [ExoMars 2020](#) to the next suitable launch window – in the late summer of 2022 – mentioning difficulties in completing necessary tests exacerbated by the COVID-19 crisis.

Supply chains have also been largely affected by the COVID-19 crisis, either as the result of difficulties faced by suppliers or because of disruptions in logistics, for example for shipping due to border closures and issues faced in the transportation sector. Some suppliers reportedly use contractual clauses of Force majeure to delay deliveries. Here also supply chain issues greatly differed from one country and company to another. Overall, Eurospace estimates that disruptions in the space sector, including in supply chains, led to an average delay for space programmes between 1 and 2 months, underlining that such delays could be partially recovered after the crisis. Most programmes, including launcher, satellite and ground systems are affected to varying degrees. Production is more impacted than R&D.

## Direct and indirect impact on business

The COVID-19 crisis has directly affected the activities of the European space sector which, in turn, affected revenues, productivity and costs in the space business. In addition to direct impacts on business, space companies were also affected by a loss of commercial activity in other sectors including in the aeronautical industry to which the space sector is closely tied.

Although the crisis is far from being over and that some more time will be needed to provide an actual assessment of the implications of the pandemic for space business in Europe, some companies carefully started to communicate about business and financial consequences. The main impact of the crisis on the European space sector concerns delayed and cancelled orders. The space sector is probably structurally more resilient than other sectors due to long project lead time of several years giving way to long-term developments and to considerable backlogs. The central role played by public demand, at least in the upstream segment, and the strategic relevance of space systems for economy and society also provide some important guarantees for the sector at large. This being said, the financial consequences of the crisis for space businesses should not be underestimated, in particular in commercial and export markets in the short-, medium- and long-term.

Public customers (ESA, EU and agencies, national agencies) quickly reacted to the situation and adopted a series of mitigation measures to ensure business continuity by maintaining payment despite programme delays. For example, ESA put forward a [detailed plan](#) to streamline and facilitate the procurement approval and the tendering processes, make partial advanced payments applicable from prime contractors up to sub-contractors and industrial partners. These measures have been extended to the end of June 2020 and, furthermore, applied also to EU space programmes (Copernicus, Galileo, EGNOS). With the same objective, the GSA reportedly [agreed to adjust contractual arrangements](#) with its contractors throughout the entire supply chain, from Large Scale Integrators to SMEs. The Space Economy Observatory established by CNES to monitor the development of the crisis and assess its impact reported in a [communiqué](#) that the agency received around 40 requests from suppliers concerning the adaptation of payment plan suspensions and other contractual adjustments to take into account difficulties faced by companies. CNES already processed at least 30 of these requests concerning 6 large groups, 7 intermediate-size enterprises and 14 SMEs. Mitigation measures adopted by most institutional customers will likely prevent major financial consequences for public programmes, at least in the short-term. Industrial delays that cannot be recovered will put pressure on contractors on the longer-term and economic consequences (e.g. fixed costs during activity shutdown) will have to be absorbed at some point either by suppliers or customers.

Comparable arrangements are not expected on commercial markets where customers are themselves confronted with financial issues and market uncertainties. On these markets, which represent a third of the European space industry revenues, Eurospace estimates that the sector could suffer a reduction of sales of up to 1.2 billion € at the end of the year, corresponding to a 14% turnover decrease in 2020. Cancelled and delayed orders would also reduce the backlog of the industry by around 1.5 billion € with long-term implications for the sector. These estimations assume that activities will progressively return to normal during the summer and remain as such until the end of the year. According to the [Space Economy Observatory](#), major actors report even higher potential revenue losses between 25 and 30%.

The immediate consequences for satellite operators may be less impactful since revenues are associated to the delivery of services that has been significantly less affected than industrial development and production activities. So far, Eutelsat reported only [limited impacts on revenues](#) – in the order of a €20 million loss – related to specific vertical markets and to delays suffered by its Quantum satellite and ground network services programmes. SES did not fully disclose the financial results of the first quarter of 2020 yet but the company mentioned that [impacts of the COVID-19 crisis should also be limited](#).

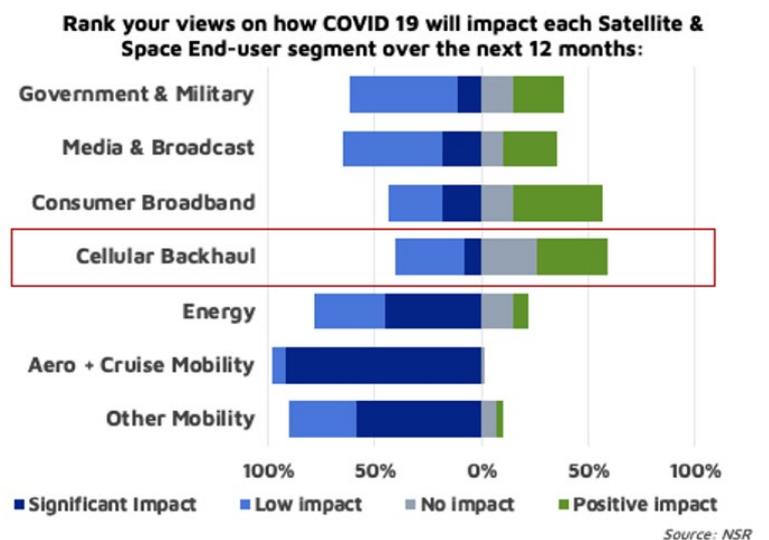
Nevertheless, SES adopted preventive measures to limit discretionary costs and remove 180 million € from the capital expenditures programme over the next four years in order to mitigate potential losses of revenues.

In addition to the economic loss related to activity shutdowns, the sector also had to deal with increased costs to implement protection measures on sites. Space agencies and companies had to implement complex and burdensome procedures to safeguard the health of personnel working on-site and ensure social distancing and protection. Additional costs include the purchase and dispatch of protective equipment such as masks, antiseptic gel and gloves, the regular cleaning of work environments but also major productivity loss related to reduced teams and work shifts and to adapted HSE protocols involving ground marking for distancing and personnel circulation. Eurospace estimates that the financial impact of the implementation of health protection measures in the manufacturing industry could be as high as 400€ to 1000€ per month and per employee. Costs are probably the highest for employees working in production lines. Other additional expenses related to the COVID-19 crisis include initial investment and running costs in adapted IT infrastructure to sustain the massive recourse to teleworking.

### Wider macroeconomic impact

Beyond the immediate economic shock related to activity shutdowns and supply chain disruptions affecting productivity, sales and costs in particular in the upstream segment of the space value chain, the European space sector will also be impacted, probably for several years, by the wider consequences of the COVID-19 crisis for the overall EU economy. The European space sector is particularly reliant on commercial programmes, including for satellite, launcher and ground systems, and is therefore more prominently exposed to the evolution of commercial markets.

From this standpoint, and although private satellite operators reported limited financial losses so far they also warned about potential issues on several market verticals that are severely affected by the crisis. In a [survey on the COVID-19 impact on satellite & space markets](#), Northern Sky Research (NSR), estimates that the demand for space services will likely be most negatively affected in energy, aviation and cruise sectors. Potential losses on these markets may however be offset by a possible demand growth for cellular backhaul and consumer broadband as a direct result of the higher need for bandwidth to ensure connectivity. Market uncertainties are very high.



COVID-19 crisis impact on markets (Source: NSR)

These changes in demand and market structures in the downstream segment of the space value chain may, in turn, have consequences for industrial activities at a later stage. This will largely depend on how the changes observed during the crisis actually persist as well as on their magnitude, which is difficult to assess and anticipate at the moment. It will also depend on the business and financial strategies that private operators and service providers will adopt. Business impacts related to the COVID-19 crisis should also be put in perspective with other structural trends in the space sector (both industry and market

forces) which play a prominent role in the shaping of future commercial space activities across the different domains.

In addition to the evolution of the commercial activity, the future of the European space sector will also depend on possible changes in public policies and budgets as a result of revised priorities. The COVID-19 crisis is shaking up political lines in Europe and topics such as economic resilience, strategic autonomy, sustainable growth or public safety are rising up in governmental agendas. More concretely, the unprecedented economic shock suffered by the continent will necessarily translate in a revision of public budgets and instruments to adapt to the consequences of the crisis.

Several bodies have advocated for a resolute and reactive response to guarantee a solid recovery for the space sector. In a letter to the DEFIS Commissioner Thierry Breton, seven members of the European Parliament [warned about the impact of the crisis in the space sector](#) and called for a recovery plan for the space industry. The Sky and Space Intergroup of European Parliament also addressed the issues faced by the aerospace industry in a [letter to the EC President Ursula Von der Leyen](#), calling for economic measures comparable to the ones adopted by European competitors and investment plans grounded also on key space programmes (Copernicus, Galileo, GovSatCom and SST). EU Space Programme stakeholders also signed [a joint letter to the European Institutions](#) to emphasise the essential role of space for the economic recovery and for the European policy agenda, advocating for a strong European budget. Along these lines, several trade associations and other organisations published position papers outlining recommendations for support measures in the space sector.

Influenced by the pandemic the European Commission revised its proposal for the Multiannual Financial Framework 2021-2027 and published a new [EU budget powering the recovery plan for Europe](#) on May 27<sup>th</sup>. In this new budget, the EU Space Programme would receive €14.87 Billion (€13.3 Billion in 2018 prices): a noticeable cut compared to the initial proposal of €16 Billion in 2018. The detailed impact on the different programme components (Galileo/EGNOS, Copernicus, Govsatcom, SST) are not yet known.

Budget for space	2.034	2.074	2.118	2.163	2.207	2.252	2.298	15.145
European Space Programme	1.997	2.037	2.080	2.125	2.167	2.211	2.255	14.873
Decentralised agencies	36	37	37	38	40	41	43	272

#### *MFF 2021-2027 budget proposal for space in current prices (€ Million)*

However, the budget was not yet approved. Uncertainty remains with regards to the use of other instruments to support space activities and sector recovery including through the new temporary recovery instrument Next Generation EU (€750 billion) aimed to support Member States, boost private investment and reinforce key EU programmes. Political support for space remains high: on June 4<sup>th</sup>, the Council of the EU adopted the conclusions on [Space for a sustainable Europe](#), recognising the immediate and long-term effects of the crisis on the sector and emphasising the role of integrated space programmes for a sustainable economic recovery. It is however still unclear how this political support will translate into public programmes and support instruments in the future.

Consequences of the COVID-19 crisis on national and ESA budgets, which received a considerable boost at the end of 2019/early 2020 are unknown.

Finally, another important consequence of the crisis will concern investment capacities, both external and internal. Although the impact on the finance ecosystem is hard to predict with uncertain consequences for the space sector, the CNES Space Economy Observatory noted that [some space companies already announced that they will no longer have self-financing capacities](#) to support R&D and new activities in 2021 and possibly 2022. This situation could have dramatic long-term consequences for competitiveness and innovation in the sector.

## QUESTIONS RAISED BY THE CRISIS FOR THE EUROPEAN SPACE POLICY

### Showcase for the role of space for crisis management and for the progress achieved by Europe

Space systems already demonstrated, at various occasions and in different circumstances that they provide unique solutions, essential to better understand, monitor and respond to a variety of crises. The COVID-19 crisis showed that space systems can also be quickly purposed and put to good use even in the case of unforeseen critical situations. It is of course impossible to quantify the contribution of space systems to the mitigation of the crisis impact in Europe, but from a qualitative standpoint it is clear that the situation illustrated the various roles space systems play in improving situational awareness, strengthening economic resilience and supporting an adapted response.

As a matter of fact, the crisis highlighted the great relevance of European programmes such as Galileo and Copernicus, which actively contributed to the response to the crisis and the key role played by national and European institutions that were able, in close cooperation, to quickly support the development of adapted tools such as dashboards and dedicated applications, making full use of new European capabilities. Solutions also came from the private sector, stimulated by dedicated public initiatives totalling at least €20 Million across Europe. Here, institutions were able to make good use of their increasingly wide-ranging and far-reaching involvement with the downstream sector resulting from their growing efforts to boost market uptake and maximise socio-economic benefits of space-based solutions.

### Taking stock of the impact of the crisis on the sector: between resilience and vulnerability

Like most economic sectors in Europe, the space sector has also been profoundly impacted by the COVID-19 crisis and directly suffered the consequences of lockdown measures adopted by European governments. Throughout the space value chain, the activity of space agencies, system manufacturers, launch service providers, satellite operators as well as downstream companies was disrupted in multiple ways:

- extensive use of teleworking,
- industrial and launch site shutdowns,
- supply chain disruptions as well as work interruption,
- payment delays and orders cancellation.

As compared to other industrial sectors, space is probably structurally more resilient thanks to long-term contracts and backlogs which partially mitigate the impact of temporary disruptions. The central role played by public programmes, at least in the upstream segment, also provides some important guarantees through a stable, predictable and sizeable demand. This resilience was further enhanced by the set of measures quickly taken by national and European institutions to ensure business continuity, uphold payment plans and process contractual adjustments. This will likely prevent major financial consequences for public programmes, at least in the short-term. The situation is different in commercial markets, on which the European space sector also depends greatly.

While the manufacturing sector suffered the more immediate consequences of the crisis, the crunch of commercial activity on some market verticals, still difficult to predict, may also impact operators and downstream companies in the medium-term. This might, in turn, continue to affect the manufacturing industry through reduced demand.

Available indicators show that the resilience of the sector has limits and the COVID-19 crisis will lead to a net deficit for the space sector related to productivity loss, reduced turnover and increased costs that should not be underestimated. The sector may also continue to suffer in the longer-term from other impacts such as deteriorated markets or reduced financing capacities among others. Ultimately, the

magnitude of business impacts and their ripple effects will depend on multiple factors related to the crisis, to the governmental response and to the wider socio-economic shock. Although the outcome of the crisis is difficult to anticipate, it is essential to already take stock of the impact suffered by the European space sector so far and to take into consideration that it will come out of the crisis weakened.

### **The role of public actors and the place of space in post-COVID Europe**

In addition to adapted business strategies from the private sector to cope with the consequences of the crisis, public actors will also play a critical role to facilitate the recovery of the sector. This will require a tailored and concerted action between public and private stakeholders to elaborate an effective action plan and complement short-term measures taken to ensure business continuity with an adapted long-term strategy. Based on industrial inputs, this strategy should not only address the survivability of the highly regarded space industrial base but also give it the means to tackle the structural difficulties that were arising on commercial markets before the crisis. What is at stake is Europe's capacity to ensure the evolution of its space programmes that are unanimously praised for their relevance and invaluable contributions in the current context.

This raises also the question of the place of space in the post-COVID European policy agenda.

The COVID-19 crisis is shaking up political lines in Europe and topics such as economic resilience, strategic autonomy, sustainable growth or public safety are rising up in governmental agendas. Space programmes already demonstrated their specific value and capacity to support all these agenda items on multiple occasions. As a matter of fact, the political support for space is high but this support does not always translate into concrete means to achieve the ambitions displayed by European institutions and their Member States. From this perspective the level of budget that will be allocated to the EU space programme for the next multi-annual financial framework will be decisive to accompany industry efforts towards recovery. Therefore, a reduction of objectives and budgets anticipated initially to achieve them would seriously jeopardise Europe's capacity to successfully tackle the challenges that the sector will face, not only as a result of the COVID-19 crisis but also from the overarching tense situation on commercial markets.

The crisis is breathing new life into policy debates in Europe, providing a fertile ground for fresh reflections on long-standing European space policy issues.

Beyond the need to address immediate concerns of the sector, the crisis could therefore offer an opportunity to revisit strategic priorities and public action in the domain to position space as an integral component of the post-COVID agenda, for example by:

- giving shape to a technological and industrial policy with a stronger focus on strategic autonomy;
- rethinking accordingly the supply chains and the associated procurement processes as well as the investment, innovation and export policies;
- exploring a more ambitious public procurement of space services to support relevant public action of the EU and its Member States, in particular to boost a sustainable economic recovery;
- emphasising the role of space diplomacy to better promote European capabilities and know-how.

Raising important questions about European priorities and ambitions in the space sector and putting topics such as industrial policy and space diplomacy under the spotlight, the ultimate outcome of the COVID-19 crisis could very well be an acceleration of long-standing European space policy debates.

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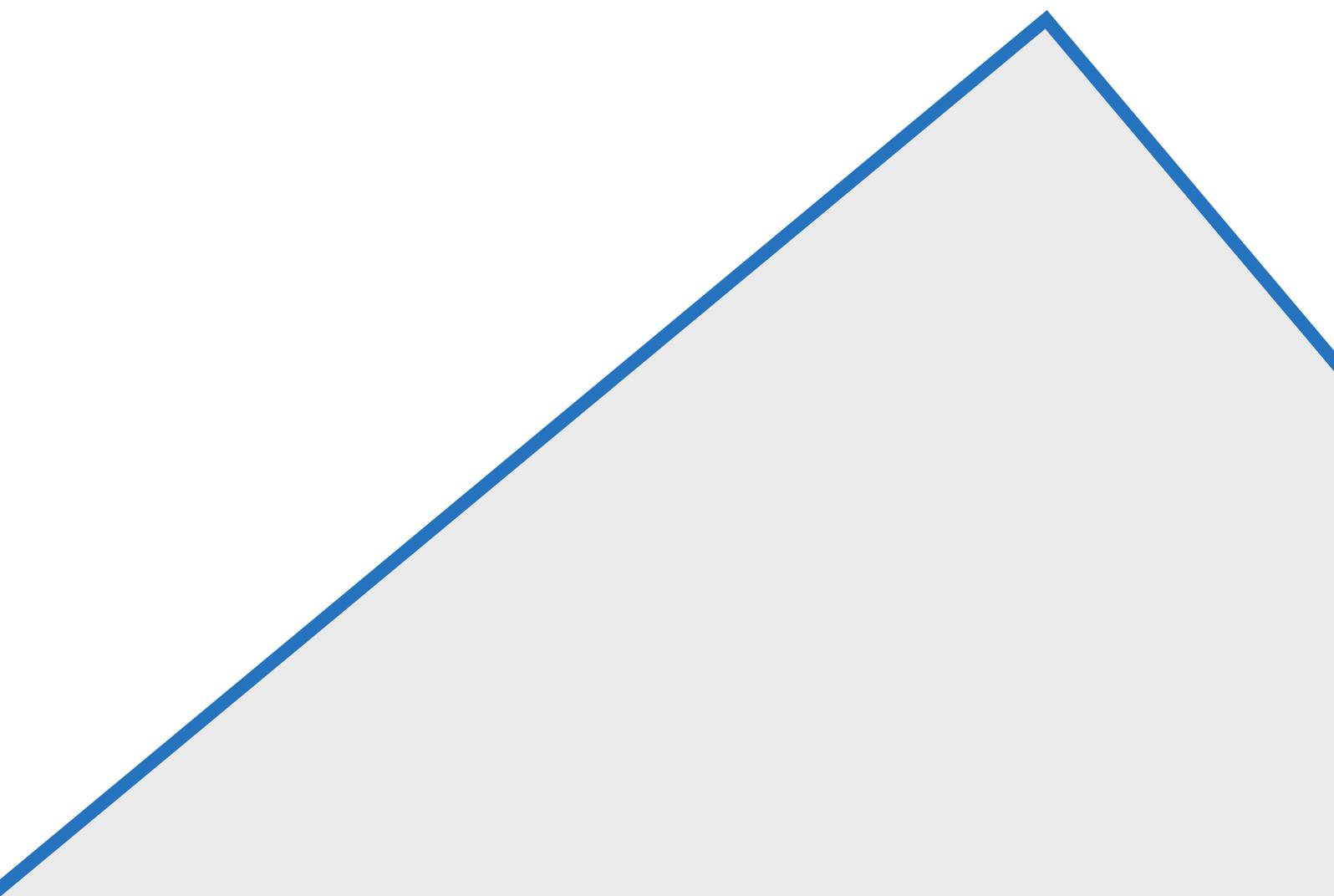
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