

Statement of Work

Danish ARTES Kick-start call 2023

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ARTES Kick-start call 2023

This document describes the themes expected to be addressed by the proposals for space sector services in relation to the Danish Kick-Start call 2023.

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Acronyms and Abbreviations

AI:	Artificial Intelligence
ARTES:	Advanced Research in Telecommunications Systems
BASS:	Business Application – Space Solutions
CAGR:	Compound Annual Growth Rate
EO:	Earth Observation
IoT:	Internet of Things
PNT:	Positioning, Navigation, Timing
SATCOM:	Satellite Communication
SATNAV:	Satellite Navigation
SatEO:	Satellite Earth Observation
SoW:	Statement of Work
UAV:	Unmanned Aerial Vehicle

1. Context

The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and to ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. The proposals submitted in reply to the Kick-start call for Danish industry 2023 shall be implemented in the context of ESA BASS GPL (Generic Programme Line) of ARTES.

The Generic Programme Line Business Applications - Space Solutions (BASS) is an element of the ESA Advanced Research in Telecommunications Systems (ARTES 4.0). BASS is managed by the ESA Commercial, Industry & Competitiveness Directorate (CIC).

The overall goal of ARTES 4.0 BASS can be summarised as "the study and development of pre-operational services enabled by space technologies and/or data for a wide range of users through the combination of different systems". Essentially, to support industry in bringing innovative, space-enabled, commercially sustainable services to market. BASS activities aim at:

- collecting user feedback for better tuning of the applications and the operation of all elements involved;
- developing commercial sustainable space-based applications by linking user needs to corresponding solutions incorporating space assets with technology adaptations;
- demonstrating to users and stakeholders that the proposed solutions work in their operational environment and are compatible with their operational practices;
- utilising at least one space asset (such as Satellite Communications, Satellite Earth Observation, Satellite Navigation, Human Spaceflight technologies), leading to a better exploitation of existing space capacity and know-how together with a better understanding of how space technology could or should evolve to respond to user needs.

Business Applications activities are organised around two main pillars:

1. Feasibility Studies that aim at assessing the technical feasibility and economic viability of new services;
2. Demonstration Projects that aim at implementing and validating pre-operational services in partnership with the users during a pilot demonstration.

The activity "Kick-start Call for Danish Industry" falls within the category of feasibility study (of which kick-start activities are a specific type).

3. Objective(s) of the activity

The purpose of this activity is to analyse the technical and business viability of applications that utilise data from existing space assets, such as Satellite Communication, Earth Observation, Satellite Navigation and Human Spaceflight technologies, in combination with terrestrial technologies, to deliver sustainable services for the benefit of user communities, within the areas of topics indicated below. The proposed utilization must be user driven, i.e. there must already be a potential customer base for the development proposed, and the utilization of the space assets must be a key element in reaching a business solution wanted by the end-users, almost the game-changer.

The services proposed by the Contractor in the context of the present activity can leverage on the integration of space assets together with other datasets, such as aerial imagery, in-situ data and data from other sources (e.g. statistic, maps). Solutions may also find value in integrating further terrestrial technologies such as artificial intelligence, Internet of Things (IoT), machine learning, distributed ledger technologies, cloud computing and beyond.

The following requirements shall be taken in account when carrying out the activity:

- The kick-start study shall target the definition of innovative services, the development of business models for their provision, and the roadmap for further realisation, but not pure research and technology development activities.
- The envisaged services shall benefit from one or more space assets (including SatNav, Satcom, SatEO, Human Spaceflight). The space assets shall represent a clear added value for the considered services, product and operation, and do not need to be limited to ESA's or European space assets.
- Due to the customer/user-driven nature of the study and with the aim to consolidating the case for a potential follow-on demonstration project, the Contractor shall engage with the relevant customer/users from the outset of the study and, whenever relevant for the successful achievement of the activity's objectives, other relevant stakeholders. Such involvement shall be reinforced by the Contractor during the whole study, to:
 - Understand the current solutions adopted by the users;
 - Define the user needs, constraints and expectations;
 - Validate the user requirements;
 - Identify potentially paying customers/users;
 - Validate the adequacy of the proposed system and associated services;
 - Coordinate and agree on the implementation roadmap of the services and possible participation in a demonstration project

3. Kick-start activities for Danish industry

3.1 Background

The global situation of the societal, economic and geopolitics environment as well as the environmental sustainability has sped up demand for better solutions and new applications to support automation and improved handling within a number of areas. One of the major changes in technologies within the past 10 years are today's availability of numerous advanced global Earth operating satellite services for connectivity, PNT and Earth observations, that can play a key role to accommodate new societal and market requirements and support the transition to a new more advanced digitised society and economy.

There are some well-recognized opportunities brought by the advent of satellite provided services. Amongst them:

1. Boost the societal impact of space-based applications, addressing new use cases and user communities through the integration of SATNAV, SATCOM and SatEO data services as well as other space technologies and data.
2. Combine the satellite-based services with one another as well as with other terrestrial technologies, networks and services, as well as the latest innovations with other technology advances, such as artificial intelligence, machine/deep learning and big data analytics, improvements in many areas of sensing and imaging (including Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR)), high-accuracy location determination and Internet of Things (IoT).
3. Integrate satellite provided data services with any other terrestrial data sources to provide improved and consistent global data coverage also for areas where terrestrial data are not available.
4. Using satellite services to be able to remotely carryout autonomous unmanned activities, at any location on the Earth, thanks to satellite's global coverage.

This kick-start initiative seeks to promote new business opportunities for innovative services relying on space technology to address the most promising verticals¹ within the topics of relevance, by introducing new services to industries (B2B), consumers (B2C), governmental entities (B2G) or improving existing ones, where space (satellite communications, Earth observation and/or satellite positioning) has a clear added value.

¹ Vertical markets, or "**verticals**" are areas at different levels within a specific sector where vendors offer goods and services specific to an industry, trade, profession, or other group of customers with specialized needs within that specific sector, opposed to a horizontal market in which a product or service meets a need of a wide range of buyers across different sectors of an economy.

3.2 Kick-start activity

"Kick-Start" is ESA's funding scheme enabling companies to undertake short Feasibility Studies that explore new service and application concepts making use of space capabilities. They require limited initial investment by companies and are particularly attractive for SMEs and start-ups granting them an easy entry into ESA BASS support schemes.

The objective is speeding-up an early revenue generation for the companies, by facilitating a faster time to market of products and/or services, thus helping to recoup the development costs and fuel further innovation by use of space assets. Kick-start activities are driven by the objective to develop business solutions to existing customer-needs in areas where there is the opportunity for scale-up and also internationalization. The call opens up for Danish companies to develop innovative solutions by use of space assets and satellite data services to address the topics listed below. The users can be both industry and public entities. Proposed Kick-start activities shall have the potential of developing solutions to sell to multiple customers, and not only a few.

ESA has developed a competitive and quick tendering process for Kick-start activities with an easy to access procedure, including template outlines to be used for the preparation of activity proposals to ESA. The procedure also includes a rapid evaluation process to allow for a speedy development of a product and/or a service to quickly reach the market. When successful, and dependent upon national ESA funding allocations, Kick-start activities may be followed by further development support via ESA BASS Demonstration Projects.

Kick-start activities have a duration of 6 months with 75% ESA co-funding, maximum Euro 60.000.

The goal of Kick-start activity is to address the following 3 key elements:

1. **Customer/User Engagement**

The company must engage with potential end-users and customers to understand their needs well and translate these into requirements for the product and/or services to be developed. ESA is looking for companies that is already in dialog with potential customers and during the 6 months the functionality planned to be developed must be aligned with the future end-users. This can e.g. involve the development of some mock-up functionality to be illustrated and validated with the end-user as well outline illustrations of foreseen user interface operations.

2. **Technical Feasibility**

The company must evaluate all the technical aspects of the proposed system and/or service, and complete a first definition level of the system architecture. It is important to address all critical technical aspects,

be sure that e.g. all the needed satellite data services actually are available when needed in order develop the proposed solution. In order to access the technical feasibility, it can often be an advantage to do a mock-up test set-up, an early prototype or a laboratory test arrangement.

3. **Economic Viability**

The company must evaluate the economic viability of the proposed services and/or system with the development of a business plan, that must include market analysis for the envisioned service, competitive analysis, business proposition, service value chain planning with partnership model, identification of economical, technical and other risks areas, a roadmap for service implementation, funding identification and potential follow-on activity.

A successful 6 months Kick-start activity shall make the company able to initiate the development of a first Minimum Viable Product (MVP), for initial market entry. A good Kick-start activity is one which potentially could result in a market entry within a timeframe of a few years.

3.3 Topics of relevance

This kick-start call is organized in three main sub-thematic calls, each addressing areas benefiting from the integration of satellite provided data services:

1. **Robotics and Drones** - Addresses automation applications in industries, services and society carrying out e.g. inspection and maintenance. This includes:
 - **Movable Robots**, which offer fully- or semiautonomous operations both in society and within industrial activities
 - **Drones**, which provides fully- or semiautonomous in the air, at sea and/or underwater.
 - **Combined robotic-drone solutions**, that provide an innovation way of carrying out fully- or semiautonomous robotic-based interventions on a movable drone-platform providing the means of transportation to the target location for the intervention.
 - **Auxiliary Functionality**, that includes mechanisms and systems providing value-added plug-in functionality to movable robots and drones, to improve their operations and performance.
2. **Civil Security and Crisis Management** – Supports the development of innovative downstream applications enabled by space technologies addressing the needs in our society and economy to improve civil security

and crisis management, both today and tomorrow. New solutions, also for dual-use, enabled by the utilization and integration of satellite data services shall address one or more of the following three areas of vital importance for Denmark:

- **The Arctic and North Atlantic Region**, including Greenland and the Faroe Islands.
- **The maritime sector**, worldwide.
- **Critical Infrastructures**, both at land and at sea.

3. **Climate and Environment** – Which has a special focus on supporting the development of innovative solutions thanks to the use of satellite services, SATCOM, SATNAV and Satellite EO, in particular for the following areas:

- **Renewable Energy**, which include both wind and solar power but not only. The call opens up for smart solutions to make sustainable energy systems more efficient, more secure and more environmentally-friendly, as well as for innovative systems and methods for energy storage. Solutions proposed can also include arrangement for the integration of different types of energy generation and/or storage in order to improve and guarantee better societal energy productions, supply and service.
- **Biodiversity** and conservation of the nature require data to meeting UN Sustainable Development Goals. Innovative systems and services using space assets will play a crucial role to support an evidence-based approach to conservation practices and policy, where high-quality monitoring data for decision-making and intervention validation is needed.
- **Clean Tech** is an essential tool to achieve sustainable development, both in developed and developing countries. Innovative solutions combining new technologies and space assets can provide significant advantages to reduce air and water pollution, improve energy efficiency, conserve natural resources, and overall reduce greenhouse gas emissions.

More details on each theme are provided below.

3.3.1 Robotics and Drones

Robotics and drones can help automate in many areas and sectors of society, and with the use of global satellite data services they can carry out operational tasks, also autonomously, almost in any place on the Earth, and in close communication even with control centers far away.

Robots are used in multiple areas, especially where they can carry out repetitive jobs, handle toxic substances, alleviate strenuous tasks or complete missions that are difficult or dangerous for a human to undertake. Recent advances in robotics and AI are revolutionising business, society and our personal lives in many ways.

Drones are used in many different areas and sectors to perform autonomous tasks, also where humans have difficulty to arrive, do it quicker and often more precisely. They are already used for aerial surveillance and photography, express shipping and delivery, gathering information or supplying essentials for disaster handling and management, search and rescue operations, geographic mapping of terrains and locations, inspection of building and constructions, safety surveillance of important sites, and more.

This kickstart call aims to stimulate the development of robotics and drone applications underpinned by space technologies into a wide variety of sectors and develop innovative solutions in extreme environments, infrastructure, transportations, social care and others. Solutions can include either or both drone and robotics technology.

Robotics, drones and AI augment and amplify human potential, increase productivity and are moving from simple reasoning towards human-like cognitive abilities. Space assets and satellite technology can offer added value to the robotics and drone sector and increase its capabilities in a number of ways.

Topics of relevance include:

- **Robotics and drones for extreme environments.** These technologies can provide solutions to intervene during natural and manmade disasters, rapidly identify how to prevent disasters and get quick help to victims where immediate relief can save lives. They can execute tasks in extreme environments, such as for nuclear energy site inspection and decommissioning, offshore energy installations and maintenance, remote exploration and surveillance, carry out tasks in extreme cold difficult to reach Arctic polar region, just to mention a few.
- **Robotics and drones for infrastructure monitoring.** Over the last several decades, substantial amounts of sensors and sensing systems have been developed to monitor and assess the condition of structures. Structural health monitoring is an essential component in civil engineering for safety and integrity of civil structures such as buildings, bridges, power plants, off-shore structures and tunnels. State-of-the-art sensing, automation and robotic/drone technologies can greatly facilitate construction, monitoring and maintenance automation of infrastructure systems.
- **Robotics and drones in the transport sector** are expanding the shipping and logistics industry, and for automation and autonomously operation

often flanked by radio transmitters, 5G communication, vision cameras, magnetometers, LiDAR, lasers, digital maps, navigation systems and sensors to identify obstacles. Automating transport could boost safety, reliability, service level and efficiency.

- **Robotics and drones for social care.** There are numerous successful tech innovations happening at the frontline of social care, but the current under utilisation of both medicinal and digital technology means that there is real opportunity to unleash a new wave of innovation that could have a revolutionary impact on how care is delivered, and how patients interact with professionals to manage their own health and care. Robots, drones and autonomous systems, together with AI, connected data and digital infrastructure can have the potential to revolutionise the way in which social and medical care is delivered, for the elderly and disabled people, also at remote locations. Introducing robot/drone solutions could also free up health care workers to improved human patient relations and service.
- **Auxiliary Functionality and Automation.** With the more and more developments of un-manned autonomous production and service solutions based on the use of robotics and drone technologies, in any part of society, a need for intelligent and secure plug-in units opens up for innovative business solutions. This could be units guaranteeing a drone or robot not operating outside a well-defined area with use of GNSS, providing 5G communication to terrestrial- and satellite-based networks, AI-powered visual guidance systems, EDGE processing systems, battery and solar-energy power systems and other plug and play functions.

The call is not limited to the above indicated and proposals for other solutions and services using robotics and drone technologies in combination with automation is encouraged. However, proposals within the topics mentioned above may be prioritized. Due to a running ESA thematic kick-start call, activities focusing on robots/drones and agriculture will not be considered.

3.3.2 Civil Security and Crisis Management

Digital satellite services are growing explosively these years and provide new opportunities for more efficient operation and automation of activities and interventions within the areas of civil security and crisis management in the Arctics/North Atlantic area, the maritime sector and in relation to critical infrastructures.

In these years satellite communication opens up for unprecedented solutions with global 5G services, without relying on terrestrial infrastructures that in many areas only offer reduced or non-existing services. At the same

time, satellite GNSS positioning and services are continuously getting better with EU Galileo's special services like its High Accuracy Service (HAS) now offering accuracy down to just 30-40cm. In addition, the EU's Copernicus satellites deliver each year better and more precise Earth observation data, with global land and ocean coverage. Combining these new satellite services with the latest IT initiatives - IOT, data-in-the-cloud, machine-learning, AI, VR/AR/MR etc. - opens new opportunities for innovation within society and business solutions.

This kickstart call aims to stimulate the development of innovative systems, services and applications providing better support to authorities as well as business operations within the Arctic/North Atlantic area, the maritime sector and in relation to critical infrastructures, with the focus on how space assets, especially satellite data services, can improve aspects of civil security as well as improve crisis management activities.

Topics of relevance include:

- **The Arctic and North Atlantic Region security.** The Arctic region is a unique area among Earth's ecosystems. At the pole, we find ice coverage the size of which changes from year to year dependent upon climatic variations. The region acts as a regulator of the Earth's climate, and in recent decades the Arctic has been warming at almost twice the global average rate. At the same time, the North Atlantic region is one of the richest oceans in the world and also one of the regions with the most maritime traffic. Due to the reduced ice coverage the different humane activities are furthermore expanding more and more into the Arctic polar region. Together, the Arctic and Northern Atlantic region (ANA) is thus characterized by presence of economically important marine activities and infrastructure, sparse to high-density population areas, challenging marine conditions, inhospitable environments, diverse and often extreme climates, and ocean areas bordered by cliffs, fjords and mountains which are difficult to access. Although the sea occupies the majority part of the ANA region, also the sparse landmasses with the bigger islands Greenland, Svalbart and Baffin as well as numerous smaller islands present similar problems with challenging environments and limited availability of services common to more populated areas like Europe.

The ANA region has traditionally been important in terms of fisheries and fisheries-related activities, but increasingly is experiencing more attention, resulting in greater traffic, and increased human activity. Different types of vessels in the region include: fishery ships, tourism cruise *ships*, ocean liners, cargo ships such as liquefied natural gas (LNG) and oil tankers, bulk carriers and container ships, offshore service and exploration vessels, research vessels and naval fleet vessels including

submarines. The increase in cruise vessel traffic, up 36% in the last 2 years, is of key concerns with the growing numbers of vessels and passengers. New method is needed to ensure that pressing maritime safety and security innovation is undertaken amongst governments, industry and security organizations across many jurisdictions.

Therefore, better and more accurate surveillance systems are required to strengthen the security for people and ships, both on land but even more important for the vast sea areas. Innovative solutions are needed to provide better overall situation views, improve traffic coordination, and be prepared in case of needs for providing more accurate and targeted assistance in case of needs as well as support in execution of search and rescue (SAR) operations. Key challenges for all these activities and operations include developing smart solutions considering the vast distances, the severe weather conditions, the ice situation, currently poor communication network services and lack of infrastructures in these regions.

- **The maritime sector.** Civil security and crisis management within the maritime sector include the protection of both people and vessels, and both internally and externally, as well as general preventative measures to reduce risks but also aspects of handling crisis situations for people and vessels. The areas from which ships and maritime operations need protecting include but not limited to terrorism, piracy, rough environment, weather, illegal trafficking of goods and people, illegal fishing confrontations, collisions and accidents. Satellite services can play an important role in developing innovative and smarter systems to support the handling of these situations with efficient tools both to prevent but also mitigate when occurring. Satellite communications services can provide life-saving live-communication with authorities and support entities on land and combined with SATNAT exact positioning, help quickly to establish the best support scheme for a given crisis situation. Earth observation satellites can provide near real time information on weather, both current situations a vessel may meet on route as well as provide a basis for good weather forecasts. Communication via satellites can provide 24/7 voice and video links with the ship owner company headquarter, and with the upcoming 5G SATCOM the price is expected to be reduced significantly opening up for many more use cases. This can enable the assistance from anywhere in the world to ships in distress, so crews onboard are not alone in handling problems encountered. They can be remotely assisted by medical doctors in case of accidents or critical health situations, get support from experts in case of terrorism and piracy, and technicians on land can support the ship engineer to resolve mechanical problems online and in real time. Satellite navigation systems, combined with SATCOM, can support in tracking ships that are

in distress for faster and more exact interventions. SATNAV can provide the exact locations of man overboard information for quicker search and rescue. Satellite Earth observation data can be used to track and identify vessels that have switched of their AIS. This is useful to be able to create a complete situation overview of ships in a given area, thus also providing the basis for coordinating interventions.

- **Critical infrastructures.** The critical infrastructures whose assets, systems and networks, whether physical or virtual, are so vital for our society that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety or any combination thereof, include: communication systems, energy and utilities, financial sector, food and agriculture, healthcare, police and emergency services, information technology, transportation and logistics, water and waste water systems, waste handling, governmental administrations and facilities and critical manufacturing and production. Satellite data services can be used in developing new and to create better surveillance and handling of risk and disruption in critical infrastructures. Satellite communication can secure connections with remote places or disaster locations and provide back-up of terrestrial communications systems. Satellite Earth observation can provide imagery enabling mapping, ground assets monitoring, situational awareness, etc. of critical infrastructures and areas affected by disasters. Satellite navigation provides accurate positioning, navigation and timing even when critical ground systems are not operational, and allow to track and trace vehicles, people and assets, and also navigation of autonomous vehicles and robots to intervene in disaster areas.

The call is not limited to the above indicated and ESA encourages proposals for other solutions and services addressing civil security and crisis management problematics within the topics listed.

3.3.3 Climate and Environment

The climate affects nearly every aspect of our lives, from our food sources to our transport infrastructure, from what clothes we wear, to where we go on holiday. It has a huge effect on our livelihoods, our health, and our future. Many of the changes in the climate is due to humans and the way our society operates. This call intent to push services and developments in three environment-related areas which can affect the climate change in a positive direction: use of renewable energy sources instead of fossil fuels, interventions to improve the biodiversity and support the development of clean tech solutions.

Satellite data services can in particular be an important enabler for novel solutions and systems in these areas. The European Copernicus programme for monitoring Earth's environment using satellite and in-situ observations can provide an objective and near real-time view on the status. Combined with GNSS and in situ IoT based data measurements collected via SAT-COM, the latest development in these three types of satellite-based data services can open up for innovative and effective solutions and systems in these three environment-related areas.

Also the two value-added products the Copernicus Atmosphere Monitoring Service (CAMS) and the Copernicus Climate Change Service (C3S), tailored to more specific public or commercial needs, and currently under implementation by EU offer data services for innovative developments of systems and services.

Topics of relevance include:

- **Renewable energy** is energy derived from natural sources that are replenished at a higher rate than they are consumed. Sunlight and wind, for example, are such sources that are constantly being replenished. Renewable energy sources are plentiful and all around us. This call opens up for development of solutions and systems to support the further strengthen of this area. This could include but not limited to solutions related to solar energy, the most abundant of all energy resources that can even be harnessed in cloudy weather, wind energy, that harnesses the kinetic energy of moving air by using large wind turbines located on land (onshore) or in sea- or freshwater (offshore), geothermal energy, that utilizes the accessible thermal energy from the Earth's interior, hydropower, that harnesses the energy of water moving from higher to lower elevations, ocean energy, that is derived from technologies using the kinetic and thermal energy of seawater waves and currents to produce electricity or heat, and bioenergy, that is produced from a variety of organic materials.
- **Biodiversity** is essential for the processes that support all life on Earth, including humans. Without a wide range of animals, plants and microorganisms, we cannot have the healthy ecosystems that we rely on to provide us with the air we breathe and the food we eat. The biodiversity is currently under stress, but nature responds quickly when land is managed in a way that is more favourable to biodiversity. Everyone who manages land, whether being a small garden, a large farm or public spaces, can greatly improve the biodiversity by making small changes. Examples include cease or limit the use of pesticides, create wetlands, leave grassland unfertilised, plant native trees and shrubs,

don't cut raised bogs, let dandelions grow and maintain winter stubble. Also, remote observation from satellites and maybe combined with in-situ measurements, data measurements from aircrafts and drones with appropriate sensors can improve the understanding of both current situation as well as the progress of interventions to improve the biodiversity.

- **Clean tech**, short for Clean technology, is any process, product, or service that reduces negative environmental impacts through significant energy efficiency improvements, the sustainable use of resources or environmental protection activities. Clean tech includes a broad range of technology related to recycling, renewable energy, information technology, green transportation, electric motors, green chemistry, lighting, grey water, and more. Environmental finance is a method by which new clean technology projects can obtain financing through the generation of carbon credits. Clean tech solutions are often developed with concern for climate change mitigation projects, also known as a carbon project. The usage of innovative clean technology can eventually become an essential part of designing a sustainable future in various areas such as land, cities, industries, climate, etc. and is critical to reach several of the UN's 17 Sustainable Development Goals (SDGs). Clean tech systems and solutions for water and air are used to fulfill these objectives, such as filters for trapping pollution, technology for desalination, filtered water fountains for communities, decarbonizing road transportation, mitigate climate change by reducing harmful CO₂ emissions, dealing with greenhouse gas emissions.

The call is not limited to the above indicated and ESA encourages proposals for other solutions and services addressing climate and environmental aspects, and sustainability within the topics listed.

4. Value of Space

Exploitation of space-based assets data is crucial for the proposed Kick-start theme, applicants should include at least one space asset in their service proposition, as per the below:

Satellite Communications provide a means to communicate with users located in remote locations where there is no, or limited, terrestrial network. Satellites can also serve to enhance terrestrial networks robustness and resilience. E.g. seamless 5G networks, relying on combined terrestrial and sat-

ellite components, will have a key role in the establishment of novel 5G services in the above domains, delivering the (high) amount of data required by the applications with the required latencies and coverage.

Satellite Navigation, Positioning and Timing are instrumental in the development of applications requiring geo-referencing, positioning and timing information. Such technologies can also be augmented by terrestrial PNT (Positioning, Navigation and Timing) technologies to cater to services with more stringent requirements. The use and advantage of high accuracy satellite positioning services and other value-added services could also open up for developing new innovative solutions and services.

Satellite Earth Observation can provide contextual data spanning air quality, surface displacements, meteorological data, mapping information, digital terrain models, high-resolution optical imagery of site all of which can support various applications across the key verticals mentioned herein.