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IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a
REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

establishing the Union Secure Connectivity Programme for the period 2022-2027

{COM(2022) 57 final} - {SEC(2022) 77 final} - {SWD(2022) 31 final}

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Glossary

Term or acronym	*Meaning or definition*
CAPEX	Capital expenditures
COMSATCOM	Commercial Satellite Communication
EDA	European Defence Agency
EEAS	European External Action Service
ENISA	European Union Agency for Cybersecurity
ESA	European Space Agency
EUSPA	European Space Programme Agency
GDP	Gross Domestic Product
GEO	Geostationary Earth Orbit
GOVSATCOM	Governmental Satellite Communication
IoT	Internet of things
ITU	International Telecommunication Union
Latency	Amount of delay, measured in milliseconds (ms), that occurs in a round-trip data transmission to a satellite.
LEO	Low Earth Orbit
MEO	Medium Earth Orbit
MILSATCOM	Military Satellite Communication
M2M	Machine to Machine
OPEX	Operational expenditures
RR	Radio Regulations (ITU)
QKD	Quantum Key Distribution

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

The culmination of a long political process

Satellite communications provide ubiquitous coverage, which is **complementary to terrestrial networks** (ground-based in a form of cable links such as fibre broadband or wireless). Satellite communication can provide the means for seamless digital communication in areas where terrestrial networks are absent (e.g. oceans, during flights), have been destroyed (e.g. during flooding events, or forest fires) or where local networks cannot be trusted (in crisis situations, or for diplomatic services in third countries).

Governmental satellite communication is conceived to bring a tangible contribution to the objectives for a strong, secure and resilient European Union. It is now an integral part of the Space Strategy for Europe[1], the European Defence Action Plan[2]and the European Union Global Strategy. Moreover, the notion of governmental satellite communication with an EU dimension was first raised and welcomed in successive Councils since 2013[3].

The adoption of the Space Regulation on 28 April 2021 constituted a first step towards this resilience objective, through the establishment of a dedicated EU GOVSATCOM component[4].

Yet, the international system evolves rapidly with geopolitcal shifts affecting the EU more systemically. New ambitious actors, demonstrations of force by various means, regional conflicts, terrorism, cyber threats, growing migration pressures and destabilisation strategies featuring cyber warfare and disinformation **create a multifaceted nexus of systemic challenges for the EU's overall security status.**

Acknowledging the changing nature of the above challenges, the Strategic Compass process[5] has initiated a 'review of the Union's civilian and military capability needs in light of the evolving security situation and provide a coherent vision on the future military forces and civilian capacities'[6]. Governmental operations, and in particular **security-related missions cannot be conducted without guaranteed access to satellite communication services[7].** A space-based secure communication shield across the EU that would protect our economy and society from various threats becomes thus increasingly critical.

This includes the need to **develop future-proof cryptographic systems** that offer unprecedented levels of secure communications by resisting to future quantum computing attacks**.** The European Quantum Communication Infrastructure (EuroQCI)[8] initiative aims at developing such a capability in the Union.

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[1] Space Strategy for Europe COM(2016) 705 final
[2] European Defence Action Plan COM(2016) 950 final
[3] Dec. 2013 EUCO, Dec. 2014 COMPET Space, May 2015 FAC Defence
[4] EU GOVSATCOM in Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU
[5] Towards a Strategic Compass - European External Action Service (europa.eu)
[6] Memo_-_strategic_compass_-_final.pdf (europa.eu)
[7] EU Institute for Security studies (2021) – Securing Heavens - How can space support the EU's Strategic Compass
[8] European Quantum Communication Infrastructure (EuroQCI) | Shaping Europe's digital future (europa.eu)

Moreover, the Commission Strategic Foresight report[9] identifies **digital hyper-connectivity and technological transformation as one of the prevalent megatrends of the next half century**, underpinned by an unprecedented demand for services, for ex. in data economy and finance. Increased connectivity of objects, places and people will result in new products, services, business models, and life and work patterns. The number of connected devices globally might increase from 30.4 billion in 2020 to 200 billion in 2030. At the same time, hyper- connectivity results in an increased risk of cyber-attacks and network outages, in both digital and physical world, e.g. essential infrastructures like pipelines and energy grids. This will results in a much higher need for secure connectivity than expected even a few years ago[10], especially for security actors.

These technological advances **lead global satcom connectivity to be increasingly handled as strategic asset.** To that end, several major government-backed projects with a variety of connectivity strategic objectives are underway.[11] These strategic infrastructures initiated by all major space powers highlight the growing need for governmental services to ensure a resilient connectivity to support not only their security operations, but also to connect critical infrastructures, manage crises as well as to support border and maritime surveillance. Additionally, the social **footprint of connectivity services for citizens** increases with technological advances: for instance, e-health and e-education in remote areas and smart mobility in urban centres are regular examples of use cases beyond strict governmental contexts.

The global multifaceted changes and challenges prompted the political acknowledgement of the need for space-borne secure connectivity in a series of high-level policy documents urging for action. In particular:

- In March 2017 the Council Political and Security Committee endorsed the High Level Civil Military User Needs for Governmental Satellite Communications[12], recognising that satellite communication plays an indispensable role in security and defence related governmental communication. In particular, satellite communication is used when other, ground-based, means of communication are not possible, reliable, or available. Satellite communication is an essential tool for a range of governmental missions and operations, especially in crisis situations or cases related to security and defence.
- In March 2019 the European Council stressed that the EU needs to go further in developing a competitive, secure, inclusive and ethical digital economy with world-class connectivity[13].
- Due to the lack of terrestrial communication systems in the Arctic, the European Council conclusions of 21 November 2019 on 'Space solutions for a sustainable Arctic' space infrastructure is stressed for its 'important role in guaranteeing reliable communication and high speed network connectivity'[14].
- The European Council conclusions of 1-2 October 2020 call for strategic autonomy while preserving an open economy and new industrial alliances, including on secure telecommunication networks[15].

[9] Strategic_Foresight_Report_2021_en.pdf (europa.eu)
[10] Commission Staff Working Document Executive Summary Of The Impact Assessment GOVSATCOM, SWD/2018/328 final - 2018/0236 (COD)
[11] Such as the US Space Development Agency's 'Transport Layer', a constellation of 300 to more than 500 satellites in LEO) ranging from 750km to 1200km in altitude, or the Russian Roscosmos 'Sfera', a constellation of 640 satellites at an orbit of 870km.
[12] EEAS(2017) 359
[13] Conclusions of the European Council meeting (21 and 22 March 2019), EUCO 1/19
[14] Council Conclusions on Space solutions for a sustainable Arctic, 21 November 2019, 13996/19
[15] Conclusions of the special meeting of the European Council (1 and 2 October 2020), EUCO 13/20,

- The secure connectivity initiative is mentioned as a mean ‘towards an innovative, resilient and competitive Union space sector to realise the opportunities of New Space’[16] in the Competitiveness Council Conclusions on New Space for people in May 2021[17].
- In the same vein, the European Council conclusions of 21-22 October 2021 stressed ‘the importance of digital connectivity, including through assessing the feasibility of further developing secured space based connectivity’[18].
- The EU Space Programme is recognised as sharing the common goal of sustainable connectivity as the EU connectivity agenda in the European Council conclusions of 12 July 2021 on ‘A Globally Connected Europe’[19].
- Space-borne resilient communication capacity contributes to the European cyber shield, as proposed in the Commission cyber security strategy[20].
- The European Commission’s ‘Action Plan on synergies between civil, defence and space industries’ of 22 February 2021, states that it aims to ‘enable access to high-speed connectivity for everyone in Europe, and provide a resilient connectivity system allowing Europe to remain connected whatever happens’[21].
- The 2021 Strategic Foresight Report[22] identifies Digital hyperconnectivity as ‘driving the transformation. It results in an increased convergence of industries, products, technologies and services.’ It therefore sets the need for the EU to ‘acknowledge the EU space infrastructure as strategic and maximise the benefits of new technologies, such as (…) or secure communications and Earth observation for secure connectivity.’
- The Joint Communication on ‘The Global Gateway’[23] announces that ‘The EU will work with partner countries to deploy digital networks and infrastructures such as submarine and terrestrial fibre-optic cables, space-based secure communication systems as well as cloud and data infrastructures [...]’

In conclusion, improving safety, security and resilience for its citizens, protecting European values and interests and ensuring technological non-dependence and industrial competitiveness becomes an urgent and complex task for the EU. The Union has to charter its position within the increasingly competitive strategic environment by ensuring Europe is prepared not only for the unprecedented challenges facing it right now but also to support its ambition to be a stronger and more autonomous power on the global scene.

To that end, President von der Leyen, considering the strategic importance of the in-built global sovereignty space systems offer, included the EU space-based secure communication system in the State of the Union 2021 Letter of Intent under the section *A Europe fit for the digital age*[24] - as a key initiative to be carried out in 2022.

16 New Space comprises start ups, mid caps and SMEs in the Space industrial ecosystem.

17 New Space for People – Council Conclusions, 28 May 2021, 9163/21,

18 Conclusions of the European Council meeting (21 and 22 October 2021), EUCO 17/21

19 A Globally Connected Europe - Council Conclusions July 2021

20 JOIN(2020) 18 final

21 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on synergies between civil, defence and space industries: https://ec.europa.eu/info/sites/default/files/action_plan_on_synergies_en_1.pdf

22 Strategic_Foresight_Report_2021_en.pdf (europa.eu)

23 JOIN(2021) 30 final

24 State of the Union 2021 letter of intent (europa.eu)

Governmental satellite communications: state of play

Satcom present various degrees of security. There are globally operating private companies (**Comsatcom**[25]) and nationally-owned and –operated military satcom systems (**Milsatcom**[26]). Each type of system is designed for its primary users, ranging from TV broadcasting for millions of global users (commercial satcom), to supporting specific military operations (military satcom). Whereas the latter addresses exclusive, highly niche use cases requiring a very high level of availability, security, and robustness, commercial satcom address a wider global market with less security features.

The use of satcom by public authorities (**Govsatcom**) is a case in-between, requiring higher security standards than commercial satcom but less than military ones. Satcom is a strategic asset, closely linked to national security. Hence, public users tend to favour either government-owned or public-private solutions[27] or make use of specific accredited private providers. The close public-private link in the satcom sector is also apparent from the fact that most current privately-owned satcom operators were originally public entities (often intergovernmental, such as Inmarsat, Eutelsat, Intelsat) which were privatised in the 1990s. Commercial providers' role in Govsatcom type services is most often limited to public-private partnerships (PPP), and there is therefore no functioning, competitive market that could serve all governmental users.

Governmental satcom can provide crucial new capabilities – guaranteed access to secure satellite communications for all security actors[28] in the EU and in Member States[29] and will enhance the effectiveness of civil protection and humanitarian interventions in the EU and globally. **It relies on space-based communication systems because they are the only viable option in situations where ground-based systems are non-existent, disrupted or unreliable.** They are also indispensable **in remote regions and in the high seas and the airspace hence offering resilience and redundancy.**

Governmental use cases have been developed in close cooperation between the Member States, the Commission, the EEAS, the European Defence Agency (EDA), and the European Space Agency (ESA) by consulting Member States and EU Satcom end-user communities and formalised in the High **Level Civil Military User Needs for Governmental Satellite Communications document[30] (HLUN)** and was endorsed by the Council's Political and Security Committee in March 2017. They are grouped in the following three pillars: **(i) surveillance, (ii) crisis management** (including civil protection and humanitarian operations in natural or man-made disasters); **(iii) connection and protection of key infrastructures.**

i. **Surveillance.** This includes land and maritime surveillance, border surveillance, the fight against illegal activities, and the monitoring for potential environment disasters (oil spills, forest fires). Surveillance

[25] COMercial SATellite COMmunications

[26] MILitary SATellite COMmunications

[27] Such as Germany's Satcom BW or Luxemburg's GovSat

[28] The term 'security actor' is also used in A Global Strategy for the European Union's Foreign and Security Policy (2016) and defined as both private and public actors which act in the interest of public safety and security, in both civil and military domains.

[29] National police-, defence- and border protection forces and the maritime communities; the civil and military Common Security and Defence Policy (CSDP) missions; EEAS and Commission, FRONTEX, EMSA, the Emergency Response Coordination Centre (ERCC)

[30] EEAS(2017) 359, High Level Civil Military User Needs for Governmental Satellite Communications (HLUN)

operations typically need various manned or un-manned connected platforms (ships, airplanes, satellites, drones) for 'intelligence, surveillance, reconnaissance' missions (ISR). Civil and military actors may be involved at national and EU level. Secure satcom will play a major role in the provision of maritime surveillance services, as a central part of the EU coast-guard functions characterised by cooperation among three EU agencies (European Maritime Safety Agency, FRONTEX and European Fisheries Control Agency). Secure satcom will in particular enable enhancements to current services such as monitoring for potential environment disasters, or communication with the Remotely Piloted Airborne Systems (RPAS) beyond radio line of sight.

ii. **Crisis management, including civil protection and humanitarian operations in natural or man-made disasters**

Multiple actors collaborate at the local, regional, national, or international level and across civil-military boundaries. The EU's military and civilian CSDP missions and operations alone currently occur in around 15 theatres, involving some 6 000 deployed EU staff. The response to disasters is coordinated at EU level in the EU Civil Protection Mechanism, which currently includes the Emergency Response Coordination Centre (ERCC) of the European Commission. Here, too, secure satcom is a critical enabler for successful operations.

iii. **Key infrastructures.**

This includes a wide range of national infrastructures, such as nuclear power plants and energy systems (e.g. command and control of smart grids), dykes and dams, and essential transport systems (e.g. airports, major tunnels or bridges), as well as EU infrastructures such as Galileo and Copernicus. While all major infrastructures require communications, only a subset need secure communications and cannot use ground infrastructure. For example, remote operational sites of Galileo currently use commercial satellite communications. Transport infrastructures are usually managed and controlled by public and/or private actors, and some safety-related aspects are managed by governmental entities. Almost all security- or safety-critical applications could benefit from EU Govsatcom capacities, either as primary or backup solutions.

At EU level, apart from national Govsatcom systems, **the EU GOVSATCOM component** under the EU Space programme has been established. Its aim is to optimise the use of existing satcom capacity for governmental users on the basis of pooling and sharing of available national and private EU satcom resources. Due to the limited lifespan of a satellite (approximately 15 years for GEO satellites) several of the governmentally owned infrastructures that will constitute part of the pooling and sharing of GOVSATCOM will need to be replenished in the coming decade[31].

For this reason EU GOVSATCOM foresaw:

- **Phase 1**, from today until approximately 2024, during which the demand will be aggregated across EU and Member States, and across civil and military boundaries. The EU GOVSATCOM capacity will be procured (via service level agreements) from Member States with national systems and spare capacity, and from accredited commercial European satcom and Service providers.

[31] PwC (2016) 'Satellite Communication to support EU Security Policies and Infrastructures'

- From 2024 onwards, when many of the existing national assets will reach their end of operational life and where the need for additional bespoke capacities could be envisaged, the legislator has urged the Commission to continuously assess the evolution of satcom needs with regard to supply and requires ‘taking into account new risks and threats, as well as new developments in technology’. Should this evaluation ‘reveals that this approach is insufficient to cover the evolving demand, it should be possible to take a decision to move to **a second phase** and develop additional bespoke space infrastructure or capacities through one or several public-private partnerships, e.g. with Union satellite operators.’ [32]

► **Satcom have become a critical component on which several governmental operations and critical infrastructures heavily rely. A guaranteed access to secure satcom resources has therefore been initiated at EU level to reinforce the resilience of these operations.**

2. PROBLEM DEFINITION

2.1. The core problem

Both governmental user needs and the satcom solutions are changing rapidly. Under the increasing threat levels and increasing importance of real time needs, in particular for Machine to Machine (M2M) and Internet of Things (IoT), user needs are moving towards **higher security solutions, low latency**[33] **and global coverage. However, the current EU Satcom assets cannot meet these new needs.**

The core problem for this initiative is therefore:

‘There is a growing mismatch between governmental needs for secure, reliable and diverse satcom services, and available EU and Member State satcom solutions.’

The core problem can be described by the below problem tree, based on an analysis of the risks and problems identified in stakeholder inputs[34] and an analysis of the evolution of the threat and geopolitical environment.

[32] Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU, recital 104

[33] Latency: amount of delay, measured in milliseconds (ms), that occurs in a round-trip data transmission to a satellite.

[34] From HLUN, consortium and ENTRUSTED study. A classified note summarises these needs.

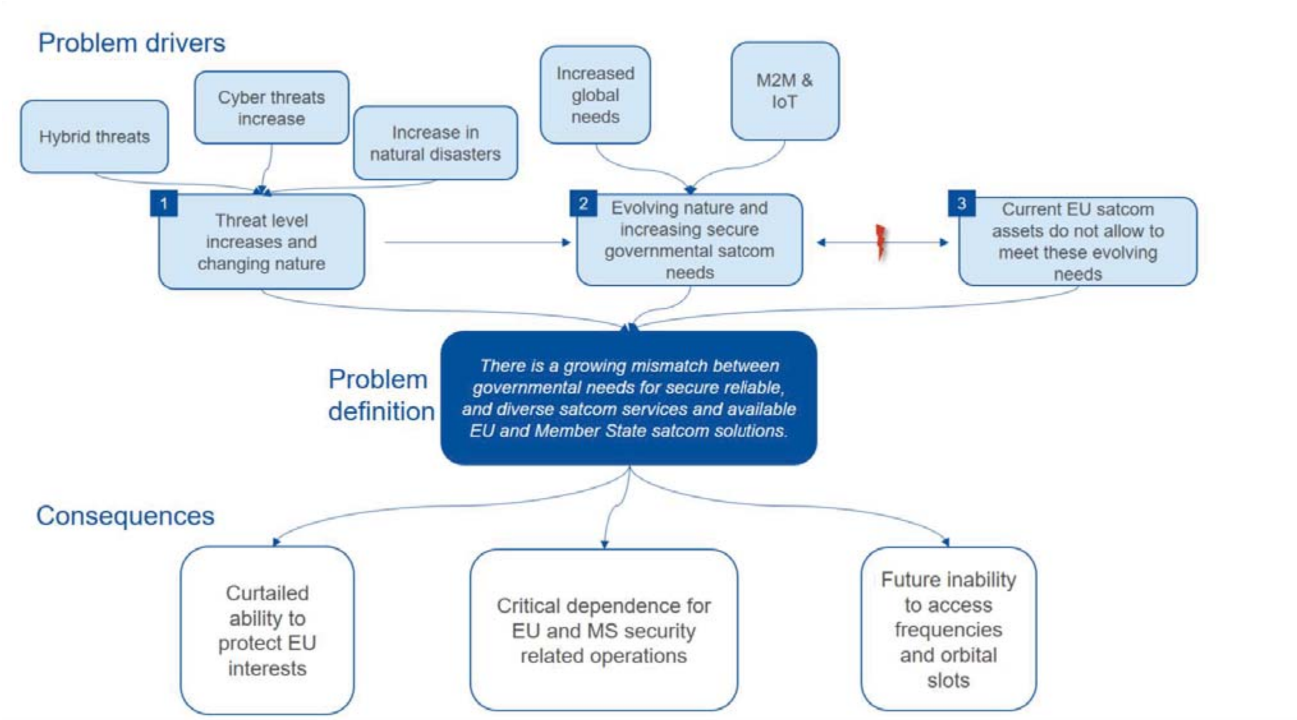

Figure 1: Problem tree

2.2. Problem drivers

2.2.1. Threat level increases and it is changing in nature

As clearly documented in a range of EU policy documents (see section 4.3), the threat level against EU Member States and institutions is increasing, and changing in nature, leading to increased risks to citizens, governments, EU institutions and their interests.

Hybrid threats: The 2016 joint Communication on a 'Joint Framework on countering hybrid threats'[35] has described how threats have become more 'hybrid', and are taking increasingly non-conventional forms as state- and non-state actors perform a range of hostile and subversive activities below the threshold of traditional warfare. The 2020 joint staff working document reporting on the implementation of this framework[36] has highlighted that hybrid threats are growing in frequency and impact and increasingly blur the strict distinction between civilian and security actions and responses. These new forms of attacks set new requirements for the level of preparedness of Member States and the EU in order to be resilient. The staff working document identifies, among other capabilities, Satcom as 'the area where space solutions deliver cross-cutting capability in countering hybrid threats' with

[35] JOIN/2016/018 final
[36] COM_SWD(2020)0153

secured Satcom as an enabler of 'support (to) security critical missions, with the ability to exchange sensitive information worldwide in a hybrid threats environment'[37].

Cyber threats: The joint Communication on 'EU's Cybersecurity Strategy for the Digital Decade'[38] has reminded to which extent Cybersecurity had become an 'essential part of Europeans' security. Whether it is connected devices, electricity grids, or banks, aircraft, public administrations or hospitals they use or frequent, people deserve to do so within the assurance that they will be shielded from cyber threats.' The EU's economy, democracy and society depend more than ever on secure and reliable digital tools and connectivity. Cybersecurity is therefore essential for building a resilient, green and digital Europe. With expanding digitalisation comes also increased security risk. More advanced cybersecurity responses have therefore become a matter of urgency.

During the pandemic the amount of cyberattacks has increased, with 'some affecting critical infrastructure essential to managing the crisis'[39]. In 2019 European critical infrastructures were hit by almost 450 cybersecurity incidents. The annual cost of cybercrime to the global economy in 2020 is estimated to be €5.5 trillion[40].

Technologies by ill-intentioned actors are evolving fast. As the threat landscape is changing, so is the technology behind the attacks. Satcom security-related features are therefore an important area of technology evolution: anti-jamming and other security-related features, secure hosted payloads, optical communications, Quantum technologies including Quantum Key Distribution, Highly Elliptic, Low Earth Orbit small satellites (mega-) constellations allowing better infrastructure resilience -frequency user equipment, and integration with ground-based communication systems (5G).Without **resilient and innovative technology** the EU risks becoming increasingly vulnerable to ill-intentioned actors.

The rise of quantum computers adds an additional threat to the list. With their fundamentally improved capabilities, it is expected that quantum computers will be able to decrypt content that is currently encrypted. The threat is therefore already present due to the 'harvest now, decrypt later' principle. This means that data which are sent today, can be stored and decrypted when a sufficiently powerful quantum computer becomes available, which may be the case 15-20 years from now[41]. Therefore, sensitive data which need to be protected for more than 15 years are already at risk today when sent with currently accepted encryption techniques. Without any countermeasures, the problem will become larger and larger. In an increasingly interconnected world, vulnerabilities are not only related to critical infrastructure directly, but also for non-critical digital infrastructures that can pose a structural risk when exploited systematically[42].

Increase of natural disasters: Climate change is driving an increase in natural hazards and disasters, such as storms, floods, and wildfires[43]. Over the last 50 years, the number of recorded disasters has

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[37] Idem
[38] JOIN(2020) 18 Final
[39] Declaration by the HRVP, on behalf of the EU, on malicious cyber activities exploiting the coronavirus pandemic
[40] JRC (2020) , Cybersecurity – Our Digital Anchor quoted in JOIN(2020) 18 Final
[41] McKinsey (2020) A game plan for quantum computing
[42] Rethinking strategic autonomy in the digital age - Publications Office of the EU (europa.eu)
[43] https://www.eea.europa.eu/publications/europes-changing-climate-hazards-1/climate-hazards-indices

increased from an average of occurring every 30 days in the 1970s to every seven days the last three decades[44]. Many such natural disasters lead to the breakdown of terrestrial communication networks, with severe, and sometimes deadly consequences for those affected by the disaster in the first place. Prime examples are the recent floods in Belgium and Germany, where terrestrial communication networks were down, and fires in Greece and Spain in summer 2021.

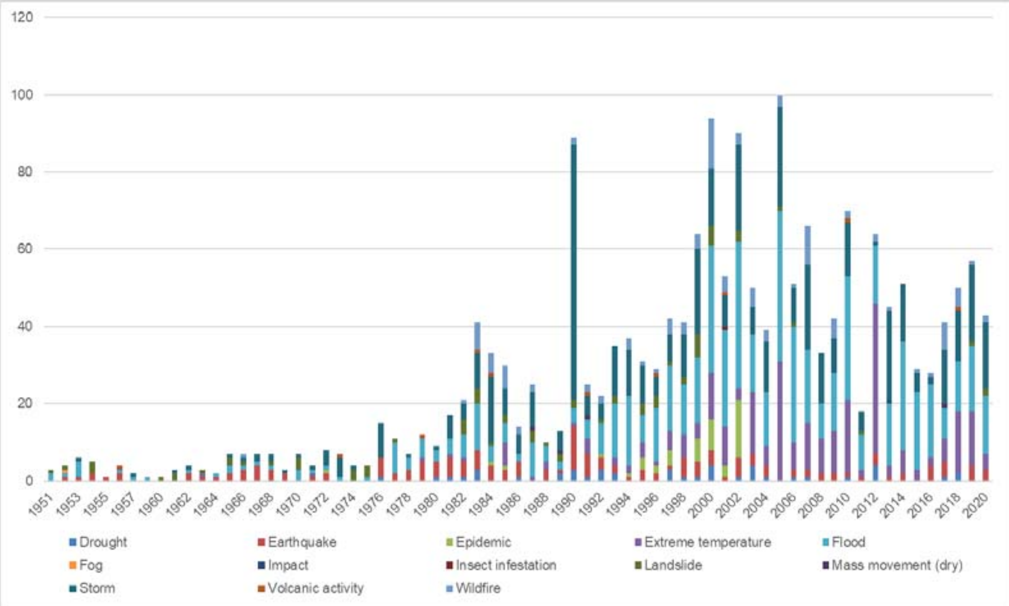


Figure 2: Number of reported natural disasters in Europe, 1950-2020 [45]

► **The increasing hybrid and cyber threat levels and propensity of natural disasters drive the changing needs of governmental actors towards higher security, reliability and availability of commensurate satcom solutions.**

2.2.2. Evolving nature of secure governmental satcom needs

Traditionally, satcom has been used for voice communication and data transfer in remote areas (e.g. at sea), but the nature of use cases is rapidly evolving, driven by both technological developments and geopolitical shifts.

The use cases below are taken from the ENTRUSTED study[46], where they were identified by Member States' experts as the most prominent examples of the evolving Govsatcom demand.

Machine to Machine (M2M) and Internet of Things (IoT): there is a rapidly growing need for capabilities that can support the connectivity that underlies M2M and IoT applications, which is

[44] WMO atlas of mortality and economic losses from weather, climate and water extremes (1970–2019), page 40

[45] EMDAT (2020): OFDA/CRED International Disaster Database, Université catholique de Louvain – Belgium ((emdat.be)

[46] A network of Users for governmental Satellite Communications (including Member States and EU agencies) under the 'European Networking for satellite Telecommunication Roadmap for the governmental Users requiring Secure, inTeroperable, innovativE and standardiseD services' (ENTRUSTED) study. Detailed outputs are classified.

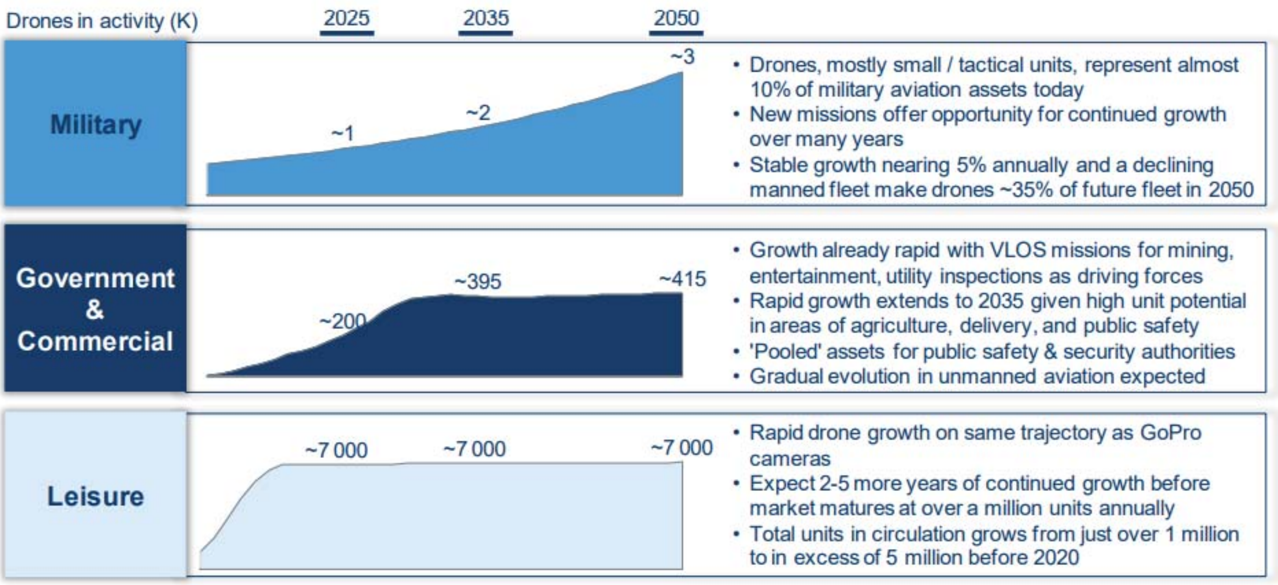
expected to use both space and terrestrial infrastructure. M2M and IoT provides connection between one or more applications that communicate with each other in order to monitor and control themselves independently and autonomously. Governmental use-cases of IoT frequently require autonomous and secure satellite communications solutions. For example IoT systems related to major water dam protection, or systems related to critical infrastructures. The global trends show an increased usage of secure M2M for event detection and alerting via deployed sensors in relation to for example border protection[47].

Typically M2M and IoT communications require **low data rates and especially low latency**, whereas existing communication infrastructures are usually designed to transmit high bandwidth, but with high latency. **This new mix of needs has been confirmed by governmental stakeholders.[48]**

Move towards autonomous transportation: in addition, stakeholders of the HLUN identified the use of **Remote Piloted Aircraft Systems (RPAS)** as a technology that is expected to play a significant role.

The user community for RPAS is very diverse, covering needs in border surveillance, maritime community, law enforcement missions, civil protection, humanitarian aid, EU external action, Transportation and space Infrastructure[49]. The replacement of piloted aircraft with RPAS will create cost-saving and efficiency gains for the operations. **However, in order to succeed, they require a robust, continuous communication link to command the RPAS and retrieve the data from sensors. For long-range RPAS this can only be provided by secure satcom**.

A study by the **Single European Sky ATM Research** (SESAR) Joint Undertaking underline that the governmental assets are expected to dramatically increase (See figure 3 below)[50].



[47] ESSCS, D110, page 27
[48] Further details on use-needs are recapped in a classified note.
[49] PwC (2017) Study in support of the Impact Assessment of an EU GOVSATCOM initiative page 213
[50] A study by the Single European Sky ATM Research (SESAR) Joint Undertaking, projected in their 2016 Drones O

Figure 3: Total fleet size (Current through 2050) (Source SESAR)

Automation will also enable other means of transportation to become driverless: **Remote piloted vessels** are expected to emerge between 2025 and 2030, and will generate a growing demand for moderate throughput, highly resilient and highly secure satellite connectivity services[51]. **Secure satcom is the only option to provide these remotely piloted vessels with communication and connectivity systems due to its potential for global coverage.** The land-based transportation models, such as **autonomous vehicles and trains** will also be relying on terrestrial communication, but secure satcom will play an important role as back-up systems in order to create resilience.

The cumulative combination of technological developments with the identified use-cases testify to a significant evolution of EU secure satcom needs.

		Polar Regions	**RPAS**	**M2M communication and IoT**
Surveillance	Border surveillance and control		✓	✓
	Maritime surveillance and control	✓	✓	✓
Crisis Management	Maritime emergencies	✓	✓	✓
	Humanitarian aid		✓	
	Civil protection		✓	✓
	Law enforcement interventions		✓	✓
	EU external action			✓
	Forces deployment	✓	✓	✓
Key infrastructures	Transport infrastructures	✓	✓	✓
	Space infrastructure	✓		
	Institutional communications	✓		
	Other key infrastructures	✓	✓	✓

Table 1: Fields of application and specific use cases of evolving Govsatcom services (source: ENTRUSTED)

Increased global coverage needs: With proliferating global tensions and fiercer strategic competition, the frequency and level at which the EU and its Member States are called upon to act in a global setting are increasing. This may be in multilateral, EU, regional, or national frameworks and may be in the civil or defence, and increasing in mixed civil and defence settings. All these missions and operations rely on satellite communications services, either from private entities, from national systems, or from partner systems such as the US Wideband Global Satcom (WGS). **Crisis management mission and operations are likely to take place anywhere in the world, but with a priority for neighbouring areas of Europe**[52] (Africa, Mediterranean, Middle East Asia, Arctic, Atlantic). **This is all the more**

[51] ESSCS, D110, page 41
[52] EEAS(2017) 359

important because our strategic partners are reconsidering their priorities, and require a suitable level of preparedness and capabilities from their EU partner.

> ► **In all, the governmental satcom needs evolve towards low latency and more global coverage.**

2.2.3. Current EU satcom assets do not allow to meet these evolving needs

Initially, satcom has been relying on geosynchronous (GEO) spacecraft. Technical progress[53] has allowed the emergence of non-geosynchronous-orbit (NGSO) communications constellations, comprising low-Earth-orbit (LEO) and medium-Earth-orbit (MEO) satellites to emerge and gradually offer connectivity services comparable in performance to terrestrial infrastructures in terms of latency[54] and bandwidth.

Figure 4: Comparison of GEO, MEO and LEO performances

There is not today any EU LEO and MEO operational or project capabilities that could meet the evolving governmental user needs. Figure below illustrates this gap. The current and committed Satcom capacities providing governmental services at the disposal of the Member States, are all based on a reduced number of GEO assets, covering mainly Europe. The majority of the capacity is dedicated to military missions, with a strong governance control (from owned infrastructure to stringent public private partnership). Moreover, due to certain military requirements these Milsatcom capabilities are unsuitable for Govsatcom applications.

Additional LEO and MEO assets would fill several capacity gaps for governmental users since:

1. The lower altitude of these new LEO/MEO satellites compared to GEO reduces the latency making it suitable for demanding applications such as: beyond line-of-sight communication and collaborative operations (for instance Frontex activities that involve multiple entities on several air, land and naval platforms), drones, telesurgery, etc.

[53] Through the use of non-geosynchronous-orbit (NGSO) communications constellations, including low-Earth-orbit (LEO) and medium-Earth-orbit (MEO) satellites

[54] Latency: amount of delay, measured in milliseconds (ms), that occurs in a round-trip data transmission to a satellite.

2. Its orbits would allow to cover high latitudes (Arctic and Antarctic regions) as well as the Indo-Pacific region where no governmental service is currently available.
3. The resilience of the service is higher thanks to the large number of small interconnected LEO satellites, compared to a limited number of GEO satellites where each failure would disrupt service provision.

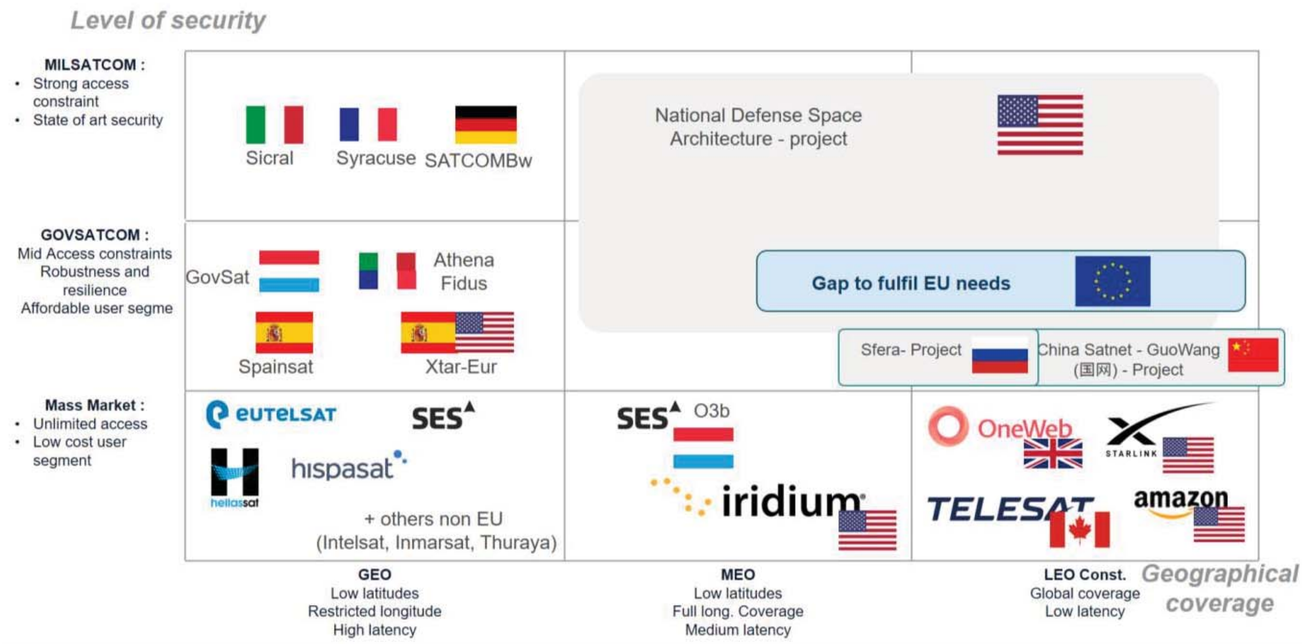


Figure 5: Civilian and defence users of the different tiers of satellite communications (Commercial, Governmental and Military) at GEO, MEO, and LEO.

Figure above exemplifies the absence of EU solutions in this MEO/LEO higher security-critical area compounded where third-countries flag a considerable investment effort.

► **The absence of EU solutions in higher security-critical areas is compounded by an absence in the technology-edge Low Earth orbit- where third-countries flag have a considerable presence. Therefore the available satcom resources of EU GOVSATCOM need to be complemented with new capabilities meeting these increased and evolving needs.**

2.3. Who is affected, in what ways and to what extent?

Those primarily affected by the identified problem are the EU and EU Member States' governmental actors. By extension, the mismatch will also affect, directly or indirectly, the security and safety of all EU citizens.

The aggregation of factors such as cyber and hybrid threats, ill-intentioned use of technologies, and the evolving nature of secure satcom needs requiring a global outreach and low latency affects EU Member States which are **confronted with a decreased level of resilience of their secured**

communication infrastructure, leading to limitations in their missions and operations, or in some cases may need **to refrain from activities** that they would undertake if sufficient and adequate secure satcom services would be available to them. Such limitations impair directly the capacity of the EU and its Member States to act autonomously to protect their interests. Such impairment does, in turn, **curtail sovereignty, increases technological dependence and weakens competitiveness.** On a wider scale, this problem could affect the **credibility of the EU as a security actor** on the global stage.

EU citizens have become acutely aware of the importance of secure and reliable communication during crisis situations, and the effect of the absence of such systems for security actors who protect them. Although they may not always be aware of the lack of suitable satcom solutions, the effects will be felt as a general lack of communication in crisis situations (due to outage of ground based systems), and the inability of civil and security actors to deal rapidly and effectively with the situation (e.g. without means of communication it can be very difficult to quickly assess the damage in a disaster area and the deployment, operation and coordination of first intervention teams, critical for saving lives). The withdrawal of EU Member State actors in Kabul revealed challenges to the EUs ability to rescue and evacuate its citizens beyond its borders; the catastrophic floods in Germany and Belgium in July 2021, and the forest fires in Greece in summer 2021 demonstrated the acute need for reliable and robust communication means. The general conclusion is that **when governmental actors do not have access to the right tools to carry out their complex mission, citizens suffer from the consequences**.

2.4. How will the problem evolve?

The problem will **evolve both on the demand side and on the supply side**. As shown above, the demand is expected to increase and is expected to become more differentiated.

On the supply side the provision of satcom services is a complex interplay between national decisions for governmental systems, and decisions of private companies regarding new investments in satcom commercial systems. Since the Govsatcom market segment is relatively small (compared to the needs of the private sector), and none of the EU Member States has sufficient market power to leverage fully private solutions, it is unlikely that future EU and Member States Govsatcom needs will be spontaneously met by EU private actors: Cost modelling analyses performed by ASD Eurospace[55] highlight that the magnitude of the investment would require a commitment of the public sector to alleviate the risk. Industrial stakeholders have also confirmed this assessment of the market.[56]

Although some EU Member States have national satcom systems, none of the EU Member States is planning to develop a global low latency system in the coming decade. As a consequence, as shown in the figure below, the EU will see a market decline in the number of communication satellites per region compared to the rest of the world.

[55] Trade association of the European Space Industry (ASD document available here). Annex 3 – Stakeholders consultation further expands the rationale

[56] It is worth highlighting that the lack of a 'technology push' offer from Industry does not constitute a market failure, but rather a logical outcome for such a product that (i) requires several hundred-millions upfront non-recurring cost and (ii) that would not be marketable for B2C commercial applications.

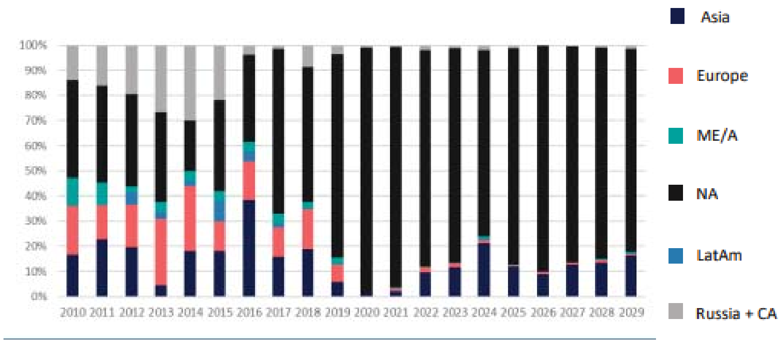


Figure 6: Communication Satellites to be Built and Launched, 2020-2029, Euroconsult study

This decline, both in number of satellites and relative bandwidth share is driven by the launch of currently planned US Low Earth Orbit mega constellations able to provide low latency services. Individual systems may be renewed, and may partly be used in the EU GOVSATCOM pooling and sharing scheme, but this is unlikely to cover the additional, evolving satcom needs. Technological advances mean that a low latency global satcom constellation is now within the technical possibilities, whereas this was not yet the case a few years ago. This will further strain an already scarce access to frequencies.

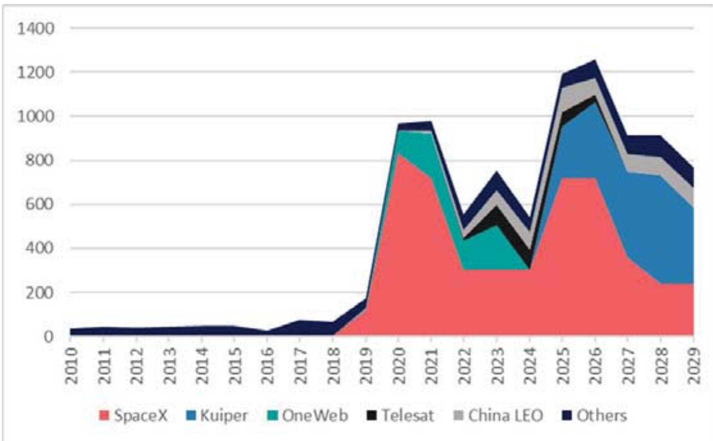


Figure 7: Forecast of Satcom mega-constellations, 2010-2029[57]

Risks of reduced access to frequencies and orbital slots

The portfolio of EU-available frequency filings that would allow to establish a LEO infrastructure is facing strong attrition over time. Wireless data communication most commonly uses radio frequency (RF) transmission of electromagnetic waves through space and the atmosphere. However, the laws of physics makes only a certain portion of this 'radio spectrum' feasible for use by satellites, due to atmospheric and propagation signal losses. This usable range is in turn further restricted by competing

[57] Source: Satellites to be Built and Launched, 2020-2029, Euroconsult (2020)

demand from other radio uses, such as terrestrial mobile phone systems, and is ultimately limited by the international Radio Regulations, an international treaty based regulation that allocates what frequencies can be used for what purpose.

A well as defining frequency allocation, the Radio Regulations, written by nation parties to the International Telecommunication Union (ITU), define a set of rules and procedures that must be followed before any satellite system can use frequencies in space. This is based on a first-come, first served principle, which determines a regulatory priority when new systems apply to use the same frequencies. Late comers are required to observe this priority, especially during the international coordination process. The priority system means that the holders of later 'junior' filings need to negotiate access to the spectrum with everyone in front of them, without assurance of access. Filings must be brought to use in a limited timeframe: the maximum time span between the initiation of the filing process and the actual operation of the satellite amount to seven years

In recent years, due to a general increase in the use of space and the huge growth in mobile phone use and online videos, the demand for radio spectrum has increased almost exponentially, driven both by the requirements of new technologies and market players as well as demand from the mass market. As a result, radio spectrum auctions have realised billions of dollars for governments around the globe.

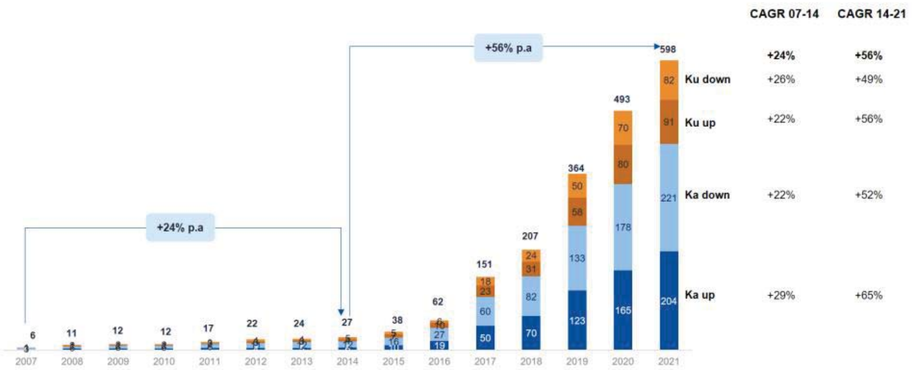


Figure 8: non GSO filings as of 15 Dec 2021 (source: ITU)

While there are today senior filings that can be used to serve EU governmental needs, a failure to bring them into use in the coming years would deprive the Union of a unique window of opportunity[58].

► **Without timely bringing-into-use of available EU filing for relevant radio frequencies, the EU risks its ability to secure future satcom capabilities that can meet governmental needs.**

[58] Details on current filings under consideration are recapped in a classified note.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

The initiative will be based on Article 189 TFEU, which provides the legal basis for the EU to act in space policy matters, and provides the legal basis to establish EU space programmes:

1. *To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space.*

2. *To contribute to attaining the objectives referred to in paragraph 1, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the Member States.*

The initiative aims to establish a civil system under civil control. The use cases will be civil and some will have security implications [59].

3.2. Subsidiarity

According to Article 4 TFEU, Article 189 is a shared competence. EU actions falling outside exclusive competence have to be assessed in the light of the subsidiarity principle set out in Article 5(3) TEU. Hence, it must be analysed whether the objectives of the proposal could not be achieved by the Member States in the framework of their national legal systems or whether, by reason of its scale and effects, they are better achieved at EU level.

3.2.1. The objectives of the proposed initiative cannot be sufficiently achieved by the Member States

As described under Chapter 2.2., the dimension of the evolving needs has a global element and will therefore have to be addressed at EU level. Due to the European and even global scale of the problems, there is no possibility to address the issue at the regional or local level.

A new initiative would build upon EU GOVSATCOM existing pooling and sharing arrangement, but no EU Member State alone has the capacity to fulfil the totality of evolving user needs globally and the related costs. Moreover, the provision of governmental communication is sensitive and requires a level of resilience and trust among the stakeholders which is difficult to achieve by any EU Member State acting alone.

An EU solution provides added value because action and coordination at EU level would avoid duplication of efforts across the Union and Member States, and would increase synergies between

[59] The initiative does not aim at acquiring Milsatcom capabilities. Furthermore, the space enabled services expenditure for military operations will not be part of this initiative, hence Article 41(2) TEU is not applicable.

civil, space and defence. It would lead to a better exploitation of existing assets, to greater security and resilience, notably through quantum cryptography, to better coverage, and to provision of a greater array of services. Other EU and Member State thematic policies would benefit, too.

3.2.2. The objectives of the proposed action, by reason of its scale and effects, can be better achieved at EU level

On the basis of the findings in previous sections, there are clear benefits from EU-level action in terms of economies of scale, whereby a coordinated action would remove duplication of efforts across the Member States. The individual user needs across Member States are generally heterogeneous and often unpredictable in terms of scope, capacity, timing and location. Common for all use cases is the need for flexibility due to the often unpredictable need for satcom capacity. Acquiring such flexibility of access to capacity requires large investments, both for the provision of national capacity and for the provision of commercial solutions, where tailor made contractual solutions ensuring assured access to capacity currently serves the largest global customers only.

The establishment of an EU-level governance that can leverage secure and edge satcom services for all national and EU security actors would contribute to a more effective and autonomous EU response to risks and threats, ranging from cyber-attacks and hybrid threats, and natural disasters to evolving secure governmental satcom use cases and increasing global needs. Therefore, by reason of effectiveness and efficiency, the establishment of such system can only be achieved at the EU level.

The EU satcom industry would benefit from the long-term commitment and EU-level security accreditation. With the EU as a long-term anchor customer for governmental services the satcom industry business case is strengthened and de-risked for them to have better access to finance and ultimately be more competitive.

Last, but certainly not least, European citizens would benefit directly and indirectly from the enhanced operational effectiveness of the various security actors.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

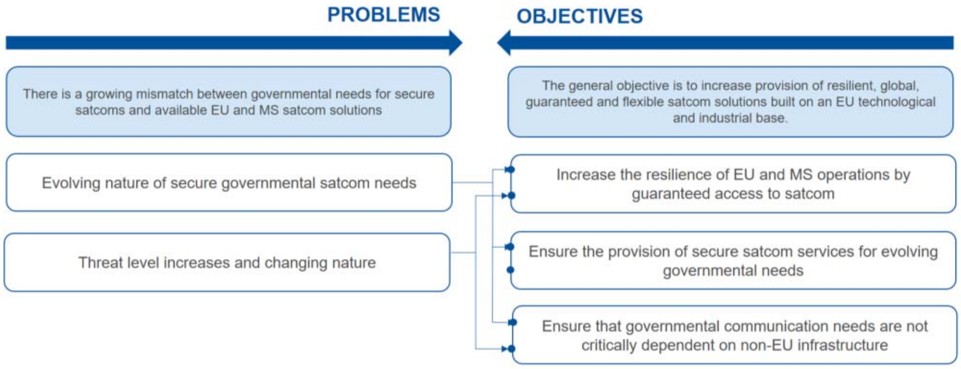


Figure 9: Overview of problems and objectives articulation

4.1. General objective

The general objective is to increase provision of resilient, global, guaranteed and flexible satcom solutions built on an EU technological and industrial base.

4.2. Specific objectives

To meet the above general objective, the following specific objectives should be achieved:

- Ensure the provision of secure satcom for evolving public needs;
- Increase the resilience of Member States and EU operations by guaranteed access to satcom;
- Ensure that governmental communication needs are not critically dependent on non-EU infrastructure

4.3. Consistency with other policies and objectives

This initiative contributes in a cross-cutting manner to a range of headline political ambitions of the Union. By providing secure digital connectivity to public actors in situations where land–based connections are absent (remote areas, seas), partially or fully destroyed (disaster areas), or cannot be trusted (conflict areas), this initiative is closely linked to:

- The **EU space policy** and in particular the EU Space Programme, in which the EU GOVSATCOM component can be regarded as precursor for this initiative. At space infrastructure level, this initiative may also create operational synergies with existing Space Programme components such as Galileo or Copernicus.

- **Digital policies**, such as the *2030 Digital Compass: the European way for the Digital Decade*[60], which highlights the need for a mix of technologies to provide connectivity, including space connectivity, and *The EU's Cybersecurity Strategy for the Digital Decade*[61], highlighting the increased security risks associated with connected networks, and the need to mitigate such risks at EU level by technological sovereignty in critical technologies and systems.
- The **EU Security Union Strategy**[62], highlighting the need for an integrated EU response, helping EU security actors with the tools and information they need. Secure satellite communication is a recognised essential tool for the wide array of security actors, including border management, law enforcement, crisis management (e.g. terrorist attacks), civil protection, fire fighters, fisheries control, and maritime security.
- EU policies relating to **global leadership**. Those have seen a strong evolution in the last years, in sync with the rapidly changing geopolitical landscape, US leadership and global strategic positioning, and rapidly evolving threats to complex hybrid patterns, in which even migration can be weaponized. The **Global Strategy for the European Union's Foreign and Security Policy** started the process in 2016, with and important policy on **countering hybrid threats in 2018**[63], referring to satellite communications as key assets for a range of security aspects. The current reflections with Member States revolve around the **Strategic Compass for security and defence**, which is based on a common risk and threat analysis. The text under discussion highlights that the threats we face are intensifying and that the capacity of individual Member States to cope with such threats is insufficient and declining. At the same time wider geopolitical trends (e.g. US priorities in Asia Pacific) call for the EU to undertake a greater share of responsibility for its own security and that of the world.
- **Research, development and innovation policies**, including Horizon Europe, and InvestEU, are all crucial to ensure that the EU has the technological and industrial base necessary to avoid strategic dependencies which limit the EU and Member State' freedom of action, as highlighted in the 2021 update of the **New Industrial Strategy[64]**. They would support the initiative by contributing to the development of innovative solutions to the service demand.
- Transport policies**,** such as the **Sustainable and Smart Mobility Strategy**[65] where satellite services are identified as an enabler for Cooperative, Connected and Automated Mobility.
- EU policies relating to **connecting strategic areas**, such as the Joint Communication on **A peaceful, sustainable and prosperous Arctic**[66]**,** where the space-based secure connectivity initiative is mentioned as a way to provide essential connectivity services in a region with limited terrestrial connectivity infrastructure and in **Towards a comprehensive Strategy with**

[60] COM(2021) 118 final
[61] JOIN(2020) 18 final
[62] COM(2020) 605 final
[63] JOIN(2016) 18 final
[64] COM(2021) 350 final
[65] COM (2020) 789 Final
[66] JOIN(2021) 27 final

Africa[67], where the EU declared its intention to establish a partnership to boost the continent's digital transformation.

- **Global gateway**[68]**,** the EU plan for major investments in infrastructure development around the world. Space based communication systems are global infrastructures by definition, and thereby, as indicated in the joint communication, offer opportunities for cooperation with partner countries and regions, such as Africa.

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. Definition of options

The satcom market differs significantly from other space segments where the EU has already established components of its Space Programme, such as Earth Observation under Copernicus and Navigation Services under Galileo. Each of these specificities impacts the way options have to be considered to address the growing mismatch between public needs for secure satcom and available EU and Member State satcom solutions.

European satcom was the first space commercial market to emerge in the 1970's. It constitutes a functioning market generating EUR 102 billion revenues in 2019. Services are mature and follow defined commercial, governmental and military standards. There is effective competition among established and new players, including several European companies.

The intervention logic should therefore follow a service-based approach. The options to consider to close the gap in the provision of required services do not necessarily have to go through the establishment of a brand-new EU-owned infrastructure, as it was the case for Galileo, and, to a lesser extent, for Copernicus. This is in particular reflected in the way the EU GOVSATCOM under its current Phase 1 has sought the optimisation of existing European capacity.

The first question when considering the options is therefore:

i. to assess whether **the public or private sector can provide these secure accredited services**, with the EU and Member States purchasing such services:
   a. from the marketplace in the EU (Baseline) or
   b. from foreign market providers (Option 3).

ii. or to provide the required services, the EU will need to act to ensure the provision of these services by either
   a. **fully funding and procuring its own system** (Option 1 – Fully Public) or
   b. **establishing a public- private partnership (in the form of a concession)** (Option 2: Public-private-partnership: EU Concession).

[67] Join (2020) 4 Final

[68] JOIN(2021) 30 final

5.2. Option 0: Baseline

Under the baseline scenario, no EU action would take place beyond what is currently being implemented through EU GOVSATCOM.

EU GOVSATCOM is already a component of the EU Space Programme[69]. The objective of this component is to pool the existing national satellite communication capacities and private capacities across the EU and to share them on the specific use-case basis amongst the EU Member States and specific EU entities, such as the EU Agencies, EEAS, or ESA.

The baseline is taken to mean the continuation of the EU GOVSATCOM Phase 1, i.e. limited to current pooling and sharing of Member State and private satcom systems. In such a scenario individual Member States, or EU companies[70] may decide to develop new satcom satellites, the partial capacity of which is sold to the EU GOVSATCOM pool. Transition to EU GOVSATCOM phase 2 in the initially planned timeframe would still require a legislative act, additional budget and available frequency filings in the 2026-2030 timeframe (see chapter 2.4).

Services: The services are only governmental and provided through service contracts with EU and Member States. A continuation of EU GOVSATCOM pooling and sharing alone, would provide only existing services portfolio, without offering the low latency services and global secure satcom[71].

Ownership: Assets providing capacity in this option are owned by Member States and private operators, whereas the EU owns the GOVSATCOM hub which is the coordination platform that connects users and providers of satcom capacities and services.

Governance: The Commission is the Programme manager of EU GOVSATCOM and has entrusted European Space Programme Agency (EUSPA) for the procurement and the operation of the GOVSATCOM hub.

Security: EU GOVSATCOM is subject to the security provisions of the Space Regulation including the Council Decision (CFSP) 2021/698. Quantum-based and enhanced space systems and services are currently not a component of the EU Space Programme. In the baseline scenario, activities regarding a European Quantum communications infrastructure would continue under the EuroQCI initiative, independently from the EU GOVSATCOM component.

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69 Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU, OJ L 170, 12.5.2021, p. 69, Articles 62-69.

70 Under the EU Space Programme Regulation only companies that have been security accredited by the Security Accreditation Board (SAB) set up under the Regulation can provide GOVSATCOM services. Accreditation of entities established in a third country would require a security of information agreement based on Article 218 TFEU with the third country where these companies are established (cf. Article 55 of Commission Decision (EU/EURATOM) 2015/44). Even if this requirement was fulfilled, it is highly unlikely that a security accreditation could be provided in the light of Article 24 of the Space Programme Regulation. NB: so far the SAB has never issued a security accreditation to an entity established in a third country.

71 See Chapter 2.2.3.

5.3. Option 1: Fully Public

This scenario foresees the development of a **dedicated infrastructure allowing to provide low latency services and global coverage**, complementing the existing GEO capacity. In addition, assets owned and operated by Member States or EU private entities would be integrated through pooling and sharing arrangements building upon the ongoing arrangements in the frame of EU GOVSATCOM. In this respect, the dimensioning of the low latency capacity needs should be carefully assessed in a joint process with governmental user communities to ensure that there is no overcapacity.

Services: The services are exclusively governmental. Their provision to EU and Member State users and the operations would be under the overall responsibility of the Commission. However, depending on the security requirements, operations, maintenance and service provision could be contracted to an industrial operator, similar to Galileo Services Operations.

Ownership: This infrastructure would be procured by the Union that would become the owner of all tangible and intangible assets created or developed under the initiative. The public sector would ensure appropriate action towards risks arising from the development, deployment, operation and use of the system and services, or in the event of a threat to such system and services. The Union would assume the risks in connection with the implementation, including costs, deployment, delay, and operational risks.

Governance: similar to the one set out in the Space Regulation for Galileo with Commission as a Programme Manager, ESA entrusted with development and deployment tasks and EUSPA entrusted with exploitation tasks.

Security: similar to the security governance foreseen by the Space Regulation including the Council Decision (CFSP) 2021/698. The Quantum Key Distribution (QKD) capability developed under EuroQCI would be fully integrated to the system.

5.4. Option 2: Public-private-partnership: EU Concession

Similar to Option 1, this scenario foresees the development of a dedicated infrastructure allowing to provide low latency secured services and global coverage, complementing the existing GEO capacity. The EU GOVSATCOM pooling and sharing of existing capability would be fully integrated into the system. In this respect, the dimensioning of the low latency capacity needs should be carefully assessed in a joint process with governmental user communities to ensure that there is no overcapacity.

Under this scenario, the Union would partner with the private sector. In accordance with the provisions of Article 2(14) of the Financial Regulation[72], a public private partnership is defined as a concession contract between one or more economic operators and one or more contracting authorities (i.e. the EU institutions, bodies and agencies). A concession contract entrusts the execution of works

[72] Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, OJ L 193, 30.7.2018, p. 1.

or the provision and management of services to an economic operator (the concessionaire) and involves a transfer to the concessionaire of the operating risk related to these works or service.

Services: The services would be governmental. However, the concessionaire would have the right to develop and own additional infrastructure elements allowing it to provide commercial services. In this case, an adequate open access mechanism should be foreseen to allow other EU telecom operators to use a share of the commercial capacity.

With regard to the cost and risk sharing mechanisms:

i. The concessionaire would be tasked with the operations, maintenance and necessary upgrades of the system (except for security assets directly operated by the EU). In turn, the EU could commit to appropriate long-term service payments to cover provision of services to EU institutions and Member States.
ii. The concessionaire would bear all costs related to the provision of commercial services as well as any additional infrastructure cost.

Ownership: The ownership of the infrastructure will be based on the capital expenditure sharing model between public and private sector agreed under the concession contract. In all cases, to ensure the security and availability of the governmental services, the Union should own the part of the system infrastructure related to security (such as the quantum encryption part of the system, or the Security Monitoring Centre) and ensure an non-exclusive and unrestricted access and use of the other parts of infrastructure which are necessary for the provision of the Governmental Services. The private sector would exclusively own the additional elements of the infrastructure related to the provision of the commercial services.

Governance: The Commission will be the Programme Manager for the establishment and the supervision of the concession. EUSPA will be entrusted with the provision of the governmental services. ESA will be entrusted with the supervision of the development and validation activities.

Security: similar to the security governance foreseen by the Space Regulation including the Council Decision (CFSP) 2021/698. The Quantum Key Distribution (QKD) capability developed under EuroQCI would be fully integrated to the system.

5.5. Option 3: Service procurement from a non-EU private constellation

Several non-EU based commercial constellations are currently being deployed, but none in the EU. Under this scenario, the Union would need to conclude an agreement where it would take an equity stake in one of the entities controlling these infrastructures, in order to ensure guarantee of access to services on a par with other system users. This stake could materialise, through a shareholder agreement, in detaining a specific class of shares allowing to ensure a certain level of control over the internal decision-making process of the company in specific areas, (such as the service portfolio to be offered to EU governmental users). The instrument to be used by the Union to buy and detain corporate shares remains to be defined, as this would be the first time the EU would acquire a significant amount of shares of a company established in a third country.

Services: The governmental services would be provided on the basis of a service contract. The system would still primarily provide commercial services to other users.

Ownership: The infrastructure would remain owned by the private non-EU entity. The system implementation, its operations, maintenance, **governance** and the provision of services would remain entirely in the hands of the third-country commercial entity. The entity would continue to operate under the laws and the supervision of its country of establishment, outside of the Union. The Union would just be one shareholder among others.

Security: The entity would be subject to the security regime in force in its country of establishment. To ensure the security and availability of the governmental services, the Union would have to request that some adjustments are brought to the system architecture (such as geographical footprint of the Ground System, software development and validation approach, cybersecurity approach). These adjustments would need to be sufficient to allow a security accreditation in line with the provisions of the Space Regulation[73]. EuroQCI or any EU native encryption features would not be integrated into the system.

5.6. Other Options discarded

Further options have been carefully analysed, however these were discarded at an early stage:

Research partnerships: Concerning the implementation under one of the research partnership instruments foreseen in the TFEU (EU participation in research programmes jointly undertaken by several EU countries under Article 185 or joint undertakings under Article 187 TFEU) and the Horizon Europe Regulation (co-programmed partnerships, co-funded partnerships)[74], these partnerships are foreseen and tailored for long-term research and innovation activities and are not suitable for the implementation of operational space services systems[75]. Furthermore, such partnerships do not allow a competitive tendering element with a view to obtain the best value for money.

[73] Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU

[74] Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013, OJ L 170, 12.5.2021, p. 1–68

[75] Art. 2 (3) Horizon Europe Regulation: "European Partnership' means an initiative, prepared with the early involvement of Member States and associated countries, where the Union together with private and/or public partners (such as industry, universities, research organisations, bodies with a public service mission at local, regional, national or international level or civil society organisations including foundations and NGOs) commit to jointly supporting the development and implementation of a programme of R&I activities, including those related to market, regulatory or policy uptake."

5.7. Summary

The following table provides an overview of the policy options discussed in this chapter:

	Ownership	**Operations**	**Governance**	**Services**		**Security**
				Public Sector	**Commercial Market**	
Option 0: Baseline	EU	EU	Commission, with tasks entrusted to EUSPA	Service contract with EU and Member States	N/A	Subject to Space Regulation No integration of QKD into the system.
Option 1: Fully public	EU	If the security level allows, some assets can be contracted to industrial operator	Commission, with tasks entrusted to EUSPA and ESA	Services to public stakeholders managed by EU. Industrial Operators could be tasked with the operation of the system, through a service contract	None	Similar to the security governance foreseen by the Space Regulation including the Council Decision (CFSP) 2021/698. The Quantum Key Distribution (QKD) capability developed under EuroQCI would be fully integrated to the system.
Option 2: Public-private-partnership: EU Concession	Public-owned security assets Private owning operational and commercial assets	Private (except security assets, directly operated by EU)	Commission, with tasks entrusted to EUSPA and ESA	Commitment to long-term service payments to cover the demand of Member States and EU institutions regarding public secure satellite services	Concessionaire free to market commercial services, provided he entirely finances and deploys the additional infrastructure required to deliver such services.	
Option 3: Service procurement from a non-EU constellation	Private (with minority EU stake)	Private non-EU	Private non-EU	Service contract with EU and Member States	Private	Subject to security regime of 3rd country No integration of QKD into the system.

Table 2: Summary of Options

6. WHAT IS THE IMPACT OF THE POLICY OPTIONS?

6.1. Economic impact

The economic impact has been analysed on three main dimensions. One of the major impact of the initiative is the cost of the satcom services, and in some cases the cost of the infrastructure investments (CAPEX) and operational costs (OPEX) needed to enable these services. A second group of economic impact relates to the broader effects of public investments, such as changes in employment or Gross Value Added (GVA, a measure of economic output). Those have been analysed by econometric input-output modelling. The third group of economic impact concerns the enabling of commercial downstream activities in the options where a private operator would build upon the governmental infrastructure to develop a commercial offer.

6.1.1. Cost

The estimated cost of the additional satcom capacity, designed to serve governmental demand is as follows:

- The cost associated to the deployment of the infrastructure needed to provide governmental services is estimated at around EUR 6 billion.
- The cost to operate and maintain the constellation
- The investment share and risk exposure of the public sector would depend on the policy option selected for its implementation.

Figures are built upon cost modelling exercises performed in the context of the secure connectivity study. The cost of the initiative will differ based on which option is chosen.

	CAPEX for the Union in EUR	**Annual OPEX for the Union in EUR**	**Annual Service costs paid by the Union in EUR**	**Comments**
Option 0: Baseline	180 million	Not applicable	40 million from 2025 to 2027	Services would be procured depending on budgetary availability (currently 40m in current MFF)
Option 1: Fully public	6 billion	250 million	Not applicable	
Option 2: PPP / Concession	4 billion	170 million	Not applicable	Current assumption based on power/bandwidth allocation: two-third of costs for public sector (EU+MS)
Option 3: Stake in non-EU constellation	tbd[76]	Not applicable	400 million	Provided that a private operator manages to deploy the infrastructure allowing to provide the new services, bandwidth would be sold on a market price basis.

Table 3: Cost impact per option

6.1.2. Job creation and gross value added (GVA)

Job creation and gross value added (GVA) is directly affected by the level of investment into the EU space economy. From an infrastructure deployment perspective (upstream sector), multipliers defined

[76] Subject to negotiation. As a benchmark, the UK government purchased a GBP 400m stake in Oneweb equity of 19.3% with additional special rights ('Golden share')

in the frame of previous Space Regulation impact assessment studies can be transposed seamlessly to this infrastructure. However, when it comes to the downstream sector, it should be better to use telecommunication/ broadband multipliers. In that case, the econometric used is the one developed by ITU[77].

Upstream sector: Investment into the space upstream sector creates transactional effects as the investment in the space economy increases the value added of suppliers in this sector, and the wider economy due to expanding business and salaries which raise consumption. Multipliers of transactional effects in European space programmes are estimated to be 1.4-2.0 (i.e. EUR 1 invested in the space sector leads to a GDP increase of EUR 1.4-2.0)[78]. Currently, the European space industry employs over 231 000 professionals[79], most of them highly skilled. The fostered growth would cause an additional demand for jobs in this industry.

The economic impact on the baseline scenario (option 0) is equivalent to the current EU GOVSATCOM programme, which is expected to increase the cumulative Gross Value Added(GVA) until 2040 by EUR 2.7-5.0 billion (mainly in Europe) while requiring spending for the infrastructure and services in a magnitude of EUR 2.2-4.1 billion[80]. As Options 1 and 2 would require the **deployment of a new infrastructure**, its impact on GVA would reach EUR 17-24 billion. Impact of Option 1 would be lower than in Option 2, as the infrastructure that the public sector could deploy would be strictly limited to the provision of governmental services, while in Option 2, commercial investments made by the private sector, including in and with the European New Space ecosystem, could enable further GVA increase. Option 3 would not primarily lead to increased investment directly in the EU space sector, except for adjustments on the ground segment footprint that could be requested by the EU[81].

Downstream sector. Investments in Space upstream infrastructure is estimated to generate a six-fold impact in downstream sectors[82].The spill over effects are created by downstream sectors using the services, technologies and data provided by the space sector to enhance their business. These are estimated to have an impact at 1.8-3.2 (i.e. EUR 1 invested in the space sector leads to a GDP increase of EUR 1.8-3.2). As Options 1 and 2 would require the deployment of a new infrastructure, its impact on GVA would reach EUR 10-19 billion.

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77 ITU (2020): *The economic contribution of broadband, digitization and ICT regulation: Econometric modelling for the ITU Europe region* It is worth noting that the model differentiates between low, medium and high income countries and therefore has a relatively conservative estimate of benefits for the Europe region.

78 PwC (2019): Main trends and challenges in the space sector and Eurostat (2019): EU inter-country supply, use and input-output tables — Full international and global accounts for research in input-output analysis (FIGARO)

79 Council of the EU: EU in space.

80 EC (2018): Study in support of the Impact Assessment of an EU GOVSATCOM initiative, Annex 8

81 It is however worth noticing that EU space industry is significantly contributing to the deployment of several major non-EU constellations: Telesat Lightspeed, Oneweb, etc.

82 Council of the EU: EU in space.

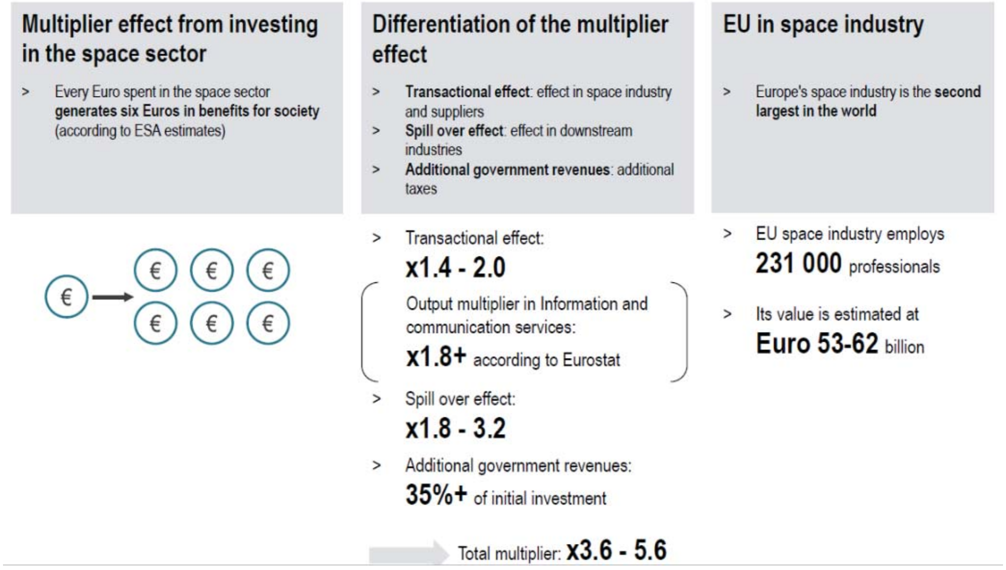

Figure 10: Output multiplier calculation. Source: Roland Berger

The growth of the downstream sectors, triggered by secure satcom, would create **new job opportunities:** employment multipliers of European space programmes are estimated to be 1.2-2.4 (i.e. for each new job in the space sector 0.2-1.4 additional jobs are created in the wider economy outside the space sector[83]). For Option 0, the job creation would be limited to those created in relation to EU GOVSATCOM, whereas Option 1 and 2 would have a higher impact on jobs due to growth in space and downstream sectors.

The possibility offered in Option 2 and 3 for the private sector to make additional investment to develop commercial services **can create additional economic benefits for the downstream sector, as it can address significant commercial market opportunities**. In addition to fixed and mobile offerings, satcom can contribute to enabling 'smart' systems and applications, particularly smart energy systems (smart electricity grids, smart home devices for heating, air conditioning, and lighting), but also smart applications in agriculture (e.g. to connect sensors for humidity and temperature to manage irrigation), manufacturing, logistics and other sectors[84].

Satcom communication could foster digital technologies in the downstream sectors which could reduce the number of jobs due to process automation or outsourcing of jobs to non-EU countries. However, it can be expected that these effects would be compensated by the effect on innovations in applications and services which would create new jobs[85]. These new services, technologies and data would also

[83] PwC (2019): Main trends and challenges in the space sector

[84] Apart from the overall economy the areas profiting most from space investments are environmental management, transport and urban planning, R&D and science, climate monitoring and meteorology, telecommunications, defence and security, energy, agriculture, high-tech industries, and manufacturing, mining and construction. OECD (2019): The Space Economy in figures. https://read.oecd-ilibrary.org/science-and-technology/the-space-economy-in-figures_c5996201-en#page45

[85] A study by ITU considering the different effects of additional access to fixed and mobile broadband networks came to this result. ITU (2020): The economic contribution of broadband, digitization and ICT regulation. Econometric modelling for the ITU Europe region. https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.BDT_EUR-2020-PDF-E.pdf

create spill over effects for the downstream sector to enhance their business opportunities. Option 2 and 3 may therefore provide additional positive impact on the job creation.

The new commercial services may support bridging the digital divide by providing ubiquitous broadband coverage to the EU. This can push ICT adoption in rural areas, which would trigger investments and lead to additional growth lowering the economic gap to non-rural areas[86]. A study undertaken by the ITU has shown that a 10% increase in mobile and fixed broadband penetration in Europe would yield an increase of 2.1% and 0.46%, respectively, in GDP per capita[87].

Further, additional government revenues that stem from taxes on transactions, salaries and consumption, the share of the investment to be recovered from the original investment is estimated to be more than 35%[88]. It is not however, taken into account as such, in the summary below.

Summary of the impacts compared to the different options:

	Upstream	Downstream
Option 0	• Economic growth limited to the economic impact of EU GOVSATCOM • Risk of lagging behind the competition from non-EU companies	• No EU triggering of economic growth stemming from SatCom commercial market services
Option 1	• Additional investment required to build the new infrastructure would provide transactional effects of 1.4-2.0.	• Spill-over effect in the downstream market estimated to have an impact at 1.8-3.2 • Investment in the space upstream infrastructure is estimated to generate a six-fold impact in the downstream sectors • Job growth in estimated to be 1.2-2.4 • Additional government revenues are estimated to be more than 35% of the original investment • No EU triggering of economic growth stemming from SatCom commercial market services
Option 2	• Additional investment required to build the new infrastructure would provide transactional effects of 1.4-2.0. • Competition during concession-award process and in operations would lead to well-suited market solutions	• Investment in the space upstream infrastructure is estimated to generate a six-fold impact in the downstream sectors • Spill-over effect in the downstream market estimated to have an impact at 1.8-3.2 • Job growth in estimated to be 1.2-2.4 • Additional government revenues are estimated to be more than 35% of the original investment • The private concessionaire would be allowed to commercially exploit the system which would lead to economic growth and additional jobs in space and downstream sectors (including New Space). This includes the economic benefits of bridging the digital divide.
Option 3	• The equity investment will have marginal impact on the EU space economy	• Commercial satcom solutions would lead to economic growth and additional jobs in the downstream sector. This

86 The GDP per capita in rural regions is only at 75% of the EU average and in remote rural regions it is even lower, at 70%. EC (2021): A long-term Vision for the EU's Rural Areas - Towards stronger, connected, resilient and prosperous rural areas by 2040. https://ec.europa.eu/info/sites/default/files/strategy/strategy_documents/documents/ltvra-c2021-345_en.pdf

87 ITU (2020): *The economic contribution of broadband, digitization and ICT regulation: Econometric modelling for the ITU Europe region*

88 PwC (2019): Main trends and challenges in the space sector

	• Risk of lagging behind the competition from non-EU companies	includes the economic benefits of bridging the digital divide

Table 4: overview of economic impacts

6.2. Social impact

6.2.1. Civil protection

The initiative enhances the **resilience of EU infrastructure and public services hence the social imprint of their operational performance.** A very high reliability and availability ratios of more than 99.9% are further advantages of satcom when it comes to civil protection[89]. The initiative would provide a ubiquitous and resilient communication system to ensure smooth functioning of critical infrastructure (dams, power stations, local 5G cells etc.) and uninterrupted coordination of citizens and public authorities in case of emergencies and disasters. It provides a backup infrastructure for terrestrial networks as well as a reliable infrastructure for areas that are currently disconnected but may require communication in case of emergencies and disasters like earthquakes, floods, fires, and attacks by terrorists or criminals.

The added value for citizens as well as for people responsible for critical infrastructure sites to have the chance to communicate in such a situation is extremely high. A delay in delivering the communication service or a limitation of such service may result in a greater number of people injured and lives lost as well as in more damages in the critical infrastructure with all its subsequent consequences. A resilient communication network would mitigate these risks and enable rescue and evacuation teams to react quickly. The use of Quantum Key Distribution (QKD) would improve Information Assurance by strongly reinforcing encryption robustness. The implementation of such a system would increase trust and resilience of telecommunications within Europe. In addition, satellite communication would enhance early-warning systems to further save lives by monitoring the environment and sending the most recent data to public authorities to immediately respond to environmental threats like floods, earthquakes, tsunamis, or radioactive releases[90].

Reliability and guaranteed access of the service is needed in order to ensure the capacity during an emergency. For the baseline scenario (Option 0) this is ensured to a certain extent, limited by use-case gaps and the life-time of the current pooling and sharing satellite fleet. Option 1 and 2 would provide full capacity to Member States and EU institutions, but the access to ensure a high security, availability and reliability would be easier under Option 1 than 2. However, it would be the most difficult to ensure this level of assured access under Option 3, as other foreign governments may compete over the same access in Option 3.

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[89] For a comparison of terrestrial and satellite networks see Orange (2015): satellite vs. terrestrial – which network is right for you. https://www.orange-business.com/sites/default/files/media/library/0215_satellite_vs_terrestrial_wpr-sat-0094.pdf

[90] ESOA (2021): Satellite Communications for Early Warning, Environmental Monitoring & Climate Change. https://esoa.net/wp-content/uploads/2021-01-Satellite-Communications-for-Early-Warning-Environmental-Monitoring-Climate-Change.pdf

6.2.2. *Benefits of potential commercial use cases*

The involvement of the industry in **Option 2 and 3 may produce spin-off effects for the social and territorial cohesion of the EU, if they chose to exploit the system for commercial use cases**[91], such as providing satcom broadband to remote areas. This would increase the quality of life in remote regions by providing broadband access to the internet and thus enabling internet-based services like online education, eHealth and eGovernment. In 2019, 86% of all EU households had access to a broadband connection of at least 30 Mbps (Next Generation Access, NGA) while in rural areas only 59% of households had this type of connection.[92] For local companies in remote areas the initiative would open business opportunities to connect with suppliers and customers as well as to develop digital business models.

6.3. Environmental impact

6.3.1. *Environmental impacts of building infrastructure*

Launching a satellite communication system would inevitably have an impact on the environment, particularly due to the environmental footprint related to the manufacturing and launching of the system infrastructure. **In this regard, Options 1 and 2 are expected to have the similar environmental impact**. Compared to other industry sectors, the manufacturing of spacecraft does not emit significant greenhouse gases emissions[93]. The initiative has similar positive contribution towards environmental objectives as the Galileo and Copernicus components of the Space Regulation[94]. A dedicated study on the environmental benefits stemming from the use of the components is approximately 2 orders of magnitude higher than the environmental footprint generated by the construction, deployment (including the launches and the production of launchers) and use over the complete life time (22 years) of these systems. See figure 11 of the benefits to impact comparison.

[91] Example of commercial broadband use-cases include: mobile and fixed broadband satellite access, satellite trunking for B2B services, Satellite access for transportation, reinforced networks by satellite and satellite broadband and cloud-based services. Source: Study DEFIS/2020/ OP/0008: *GOVSATCOM and EuroQCI: Building Blocks Towards a Secure Space Connectivity System*

[93] Eurostat Manual of Supply, Use and Input-Output Tables (2008)

[94] Note that even though of the number of satellites are bigger in this activity than in Galileo or Copernicus, the small size and mass of the satellites coupled with the possibility to launch them in groups of large numbers (e.g. from 12 to 36 satellites in one launch) results in relatively comparable footprint evaluation.

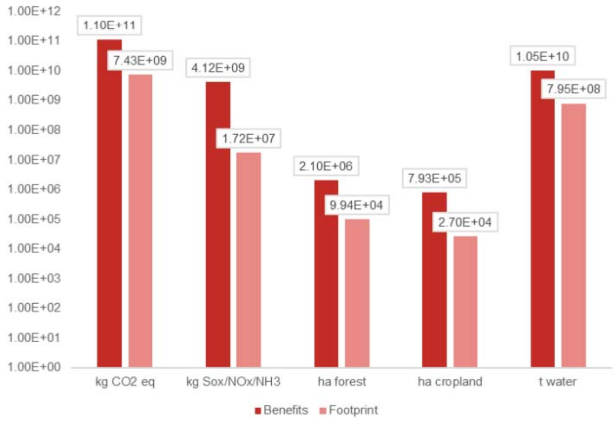


Figure 11: PWC (2020) Analysis of the Environmental Impact of the EU Space Programme

Option 0 would not have a further environmental impact, as it relies only on existing satcom capacities. **Option 3 would have a lower impact than Options 1 and 2**, for those third country owned LEO constellations that have already launched an initial set of satellites allowing them to provide initial services. However, Option 3 would have a higher impact than Option 0, as these third country owned LEO constellations have not yet achieved full operational capability and require further launch of satellites.

Satellites in orbit create a risk for long-term environmental harm, due to its potential of creating additional space debris, either at their end-of-life or due to a technical failure. To mitigate the impact on the space environment, **Options 1 and 2 would comply with the international standards on the protection of space environment** (e.g. the Committee on the Peaceful Uses of Outer Space (COPUOS) and Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation Guidelines), as well as the existing national legislation (e.g. the French *LOI n° 2008-518 relative aux opérations spatiales*[95]). Further, **an EU built system would also comply with existing EU environmental regulations,** such as REACH regulation[96] and the EU Directive on Hazardous Waste[97]. Reducing the debris risk with voluntary adherence to international debris mitigating standards is challenging in the case of owning a stake in foreign constellation (Option 3).

6.3.2. Environmental benefits

At the same time, **the initiative is also expected to result in a number of positive environmental impacts**. The infrastructure will provide communication through space, hereby avoiding the deployment of ground networks, submarine cables, high power cables or fibres (buried in the ground or above the ground). No significant harm will therefore be done to the sustainable use and protection of water and marine resources. Satcom services for maritime surveillance supports pollution detection

[95] LOI n° 2008-518 du 3 juin 2008 relative aux opérations spatiales
[96] Regulation (EC) No 1907/2006 Of The European Parliament And Of The Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC
[97] Council Directive 91/689/EEC of 12 December 1991 on hazardous waste

and response as well as environmental monitoring. In addition, minimising environmental risks to a large extent relies on **data monitoring**. Monitoring data like water levels, land cover change, ice sheet elevation, and ice sea thickness will become even more important and require larger quantities of data being transmitted. The initiative could help to relay data from Earth Observation satellites (such as Copernicus) to ensure high-speed delivery of time-critical data to be better prepared, inform citizens, and take action. The services provided by a space-based secure connectivity infrastructure are also expected to provide the communication channels for autonomous vehicles, thus resulting in more energy efficient road transport.

Where the private industry choose to exploit the system for commercial services (potentially Option 2 and 3), low-latency broadband can be beneficial for the environment. For example, smart systems creates energy efficiency by enabling households to have better understand and control their energy management, precision farming can increase input use efficiency and reduce emissions, and IoT applications can be used to track wildlife extension.

An overview of the analysis of the initiative's compliance with the "do no harm principle" can be found in annex 5.

7. HOW DO THE OPTIONS COMPARE?

7.1. Effectiveness

The **effectiveness** of the options is examined against the policy objectives identified in Section 4. The criteria presented below are used to help assess the effectiveness.

Specific objectives	Assessment criteria
Specific Objective I Ensure the provision of secure satcom for evolving public needs	- Ability to scale the capacity to meet future needs in a flexible manner
Specific Objective II Increase resilience of Member States and EU missions and operations by guaranteed access to satcom	- Extent of information assurance & guarantee of access through the GOVSATCOM hub and security accreditation board - QKD payload
Specific Objective III Ensure that governmental communication needs are not critically dependent on non-EU operations	- Appropriate level of non-dependence on third countries, e.g.: o Location of system management and operations in the EU o Software produced and validated in the EU o Testing of technology in the EU - Long-term competitiveness of the EU satcom industry

	Baseline	Option 1	Option 2	Option 3
Specific Objective I				
Ensure the provision of secure satcom for evolving governmental needs	**(=)** • EU current pooling and sharing capacity under GOVSATCOM dependent upon further commitment from MS and national governments • Future gaps not ensured in current pooling and sharing system, and would become increasingly difficult to cover in time due to the frequency scarcity	**(+++)** • EU ownership allows the ability to scale up according to each MS' identified needs		**(-)** • The service provided would be commercial-off-the shelf, and would not meet several governmental requirements (e.g. signal robustness, use of governmental frequencies)
Specific Objective II				
Increase resilience of Member States and EU missions and operations by guaranteed access to satcom	**(=)** • EU GOVSATCOM hub and security accreditation applies • However, no possibility to implement low latency services, global coverage and QKD payloads	**(+++)** • Increased number of satellites compared to existing assets, leading to greater resilience of the system and to a reduction of service disruption risk • EU GOVSATCOM hub integrated and security accreditation applies • Ability to implement low latency services and to include QKD payloads		**(-)** • Services would be supervised by non-EU authority, in non-EU jurisdiction, thus decreasing overall resilience and EU operational autonomy • Security accreditation for non-EU solution would be very challenging, and the services may not offer the same level of security requirements as an infrastructure primarily designed for governmental use (Design robustness and encryption remain commercial…)
Specific Objective III				
Ensure that governmental communication needs are not critically dependent	**(=)** • Limited to the current pooling and sharing under EU GOVSATCOM component low latency user needs cannot be satisfied • Risk of EU satcom industry losing industrial competitiveness in the field of low latency	**(+++)** • The EU can define and control all aspects of the initiative: • Full operational autonomy		**(--)** • Entirety of operation, and thus the very service provision, would be performed outside of EU. The decision or not to disrupt services would be entirely in non-EU decision making processes (at both service provider level and third state supervision authority).

on non-EU operations		• Appropriate/affordable level of industrial dependence (to be discussed with industry during the procurement phase) • R&D investment will contribute to the EU industrial competitiveness	• This option would even be worse than baseline, because over time users would increase their dependence by building systems, tools, processes that rely on these non-EU services. A subsequent disruption would create even disturbance. • Risk of EU satcom industry losing industrial competitiveness in the field of low latency

Table 5: Effectiveness assessment

7.2. Efficiency

The combined measures under the retained Options have economic, social and environmental impacts. The major costs of Options 1 and 2 relate to building the infrastructure.

Baseline costs as well as economic, social and environmental benefits are not recapped in this table, as services are not fully comparable. However, impacts are measured against baseline

	Option 1 – Full Public	**Option 2 – PPP/Concession**	**Option 3 – Stake in non-EU constellation**
Costs			
Infrastructure	6 billion	4 billion	Depending on the Equity stake to be taken
Service costs	Not applicable	Not applicable	400 million, bandwidth valued on market price basis.
OPEX for the Union	250 million	170 million	Not applicable
Benefits			
Economy (GVA)	**(++)**	**(+++)**	**(+)**

	• Additional investment required to build the new infrastructure would provide transactional effects of 1.4-2.0. • Spill-over effect in the downstream market estimated to have an impact at 1.8-3.2 • Investment in the space upstream infrastructure is estimated to generate a six-fold impact in the downstream sectors • Job growth in estimated to be 1.2-2.4 • Additional government revenues are estimated to be more than 35% of the original investment • No EU triggering of economic growth stemming from SatCom commercial market services	• Additional investment required to build the new infrastructure would provide transactional effects of 1.4-2.0. • Competition during concession-award process and in operations would lead to well-suited market solutions • Investment in the space upstream infrastructure is estimated to generate a six-fold impact in the downstream sectors • Spill-over effect in the downstream market estimated to have an impact at 1.8-3.2 • Job growth in estimated to be 1.2-2.4 • Additional government revenues are estimated to be more than 35% of the original investment • The private concessionaire would be allowed to commercially exploit the system which would lead to economic growth and additional jobs in space and downstream sectors (including New Space). This includes the economic benefits of bridging the digital divide.	• The equity investment would have marginal impact on EU economy • Risk of lagging behind the competition from non-EU companies • Commercial satcom solutions would lead to economic growth and additional jobs in the downstream sector. This includes the economic benefits of bridging the digital divide
Social impacts (civil security and potential spill-over effects)	**(++)** • Full coverage of governmental satellite communication needs • Availability and reliability of satellite communication services for citizens in case of emergencies and disasters	**(+++)** • The EU has the opportunity to set requirements in the concession to secure a high service level regarding availability and capacity of the network in case of emergencies and disasters • Commercial services can provide positive benefits for EU citizens and business (e.g. digital divide) • Full coverage of governmental satellite communication needs	**(+)** • Provides capacity for governmental user needs, but lower assured access to capacity than the other options because of co-ownership (potentially with other non EU governments). • Commercial services can provide positive benefits for EU citizens and business (e.g. digital divide).
Environmental benefits	**(-)** • Negative environmental impact of developing and launching additional satellites • Build upon existing infrastructure from GOVSATCOM • Ownership requires the EU to approve the design, hereby enabling a strict adherence to environmental standards and regulation • Governmental services supporting environmental monitoring	**(-)** • Negative environmental impact of developing and launching additional satellites • Build upon existing infrastructure from GOVSATCOM • Through the concession agreement the EU can set requirements of adherence to environmental standards and regulations • Governmental services supporting environmental monitoring • The private concessionaire can exploit the commercial services enabling environmental friendly applications	**(=)** • Low environmental impact from using existing capacity, however the non-EU constellations have not yet achieved full operational capability and require the launch of further satellites. • Reducing risk with voluntary adherence to international environmental standards challenging in a foreign constellation • Services could be used for environmental monitoring

	Negative environmental impact of developing and launching additional satellites		

Table 6: Efficiency

7.3. Coherence

As regards **coherence with key EU policy objectives,** the main objective of the initiative is to provide Member States and EU Institutions with a tool to respond to their public satcom needs.

Option 1 and 2 would integrate the EU GOVSATCOM component of the Space Regulation in their infrastructure, and hereby create coherence with **EU space policy**. In addition, as Option 1 and 2 would be EU operated and provide the highest level of security, they would strengthen the ability to provide an integrated EU response to security threats as called for in the **EU Security Union Strategy** and in the global strategy for the **European Union's Foreign and Security Policy**.

The development of new infrastructure could benefit from **EU research, development and innovation policies**, hereby contributing to the avoidance of strategic dependence in line with the **New Industrial Strategy**.

The services enabled by a new infrastructure, would support **transport policies** for autonomous mobility, and would connect **strategic areas** such as Arctic and Africa, in line with policy targets in these regions and the **global gateway**. As Option 2 may further enable commercial services to these regions, it ranks higher than Option 1.

Option 2 and 3 may contribute to **EU's digital policies**, should the private sector exploit the commercial opportunities.

<table>
<tr><th>Policies (see section 4.3)</th><th>Option 0 – Baseline</th><th>Option 1 – Full Public</th><th>Option 2 – PPP/Concession</th><th>Option 3 – Stake in non-EU constellation</th></tr>
<tr><td>EU space policy</td><td>=</td><td>+</td><td>+</td><td>-</td></tr>
<tr><td>Digital policies</td><td>=</td><td>=</td><td>++</td><td>+</td></tr>
<tr><td>EU Security Union Strategy</td><td>=</td><td>++</td><td>++</td><td>--</td></tr>
<tr><td>Research, development and innovation policies</td><td>=</td><td>++</td><td>++</td><td>-</td></tr>
<tr><td>Transport policies</td><td>=</td><td>+</td><td>+</td><td>=</td></tr>
<tr><td>Union policies relating to global leadership</td><td>=</td><td>+</td><td>++</td><td>-</td></tr>
<tr><td>EU policies relating to connecting strategic areas</td><td rowspan="2">=</td><td rowspan="2">+</td><td rowspan="2">++</td><td rowspan="2">-</td></tr>
<tr><td>Global gateway</td></tr>
</table>

7.4. Feasibility

Option 0 (Baseline). As the baseline option is already being implemented, it has the highest feasibility ranking. During bilateral meetings, Member States have expressed support for the current GOVSATCOM pooling and sharing. However several Member States acknowledged the urgency of action now, in order to obtain frequency and orbital slots for future evolving needs, and are therefore positive towards the early next initiation of further capacity. Industry stakeholders have stated that there are no plans for EU private companies of creating a satcom constellation that will meet the evolving governmental low-latency and global needs[98].

Option 1 (Fully public) is assessed to have a medium feasibility ranking. The EU has large experience of implementing such initiative from its flagship programme EGNSS and Copernicus and can take full recourse to respective lessons learned and established practices. Namely, Commission, EUSPA, and ESA have considerable experience with large scale procurements of space assets and ground system elements. Similar experience also exists where a private operator should be charged with the system operations, maintenance, and service provision tasks.

Option 2 (PPP Concession) is assessed to have a medium feasibility ranking. There is a legal certainty and clarity regarding the concession process (Article 2 (14) and Article 164 of the EU Financial Regulation). However, a concession requires a very sound preparation and the procurement procedure would likely be relatively lengthy and would require dedicated resources. The need to negotiate a sound and reliable allocation and delimitation of risks and benefits adds further complexity. The Space Regulation[99] acknowledges the PPP approach for the acquisition of satcom infrastructure. Consultations with stakeholders reveals that the majority of industrial stakeholders favours the PPP approach.

Option 3 (Stake in non-EU constellation) is assessed to have the lowest feasibility ranking. This low score is given, because it would be difficult politically to garner the support for a stake. Legally speaking it is also difficult, because it would require the EU to acquire a significant amount of shares of a company established in a third country, which has not yet been done. The instrument for such acquisition could thus have to be defined. Non-EU LEO constellation operators have expressed support for this option, because of the benefits related to cost-efficiency and quick access to services.

7.5. Comparison summary

The table below summarises the assessment of impacts:

	Baseline	Option 1	Option 2	Option 3
Effectiveness	(=)	(+++)	(+++)	(-)
I – Ensure provision of secure satcom	(=)	(+++)	(+++)	(-)
II – Increase MS resilience	(=)	(+++)	(+++)	(-)
III – No critical dependency	(=)	(+++)	(+++)	(--)
Efficiency	(=)	(+)	(++)	(+)
Cost	(=)	(--)	(-)	(=)
Economic benefits (GVA)	(=)	(++)	(+++)	(+)
Social impact	(=)	(++)	(+++)	(+)
Environmental benefits	(=)	(-)	(-)	(=)
Coherence	(=)	(+)	(++)	(-)
Feasibility	(=)	(+)	(+)	(-)

[98] Detailed views of the different stakeholder groups can be found in Annex 2.
[99] Recital 104 of the Space Regulation

Table 7: summary of impacts

8. PREFERRED OPTION

8.1. Concession as the Preferred Option

Option 2, the concession, is assessed to be the preferred option. Together with Option 1 it ranks the highest with regard to effectiveness.

Regarding efficiency, it ranks higher than Option 1 as it allows the EU to split the risks and costs with industry hereby limiting the economic burden of the EU. Industry involvement in turn provides spin-off opportunities, enabling it to commercially exploit the satcom system for other services, such as broadband. These spin-off effects may have additional economic and social impacts, and provides the potential for the initiative to meet broader EU policies related to the digital agenda. Option 2 is also strongly favoured by Member State and industry stakeholders. The drawback of Option 2 is the complexity related to the preparations and negotiation of the concession agreement.

However, several examples of successful PPPs already exist at national level, for example HISDESAT in Spain, or LuxGovSat in Luxemburg. ESA is using a similar approach to leverage innovation in projects, for example in the approach taken on the European Data Relay System. In satellite communications this is tried and tested concept that has been used variably for limited investments, such as hosted payload on a satellite, and to larger investments of full satellites.

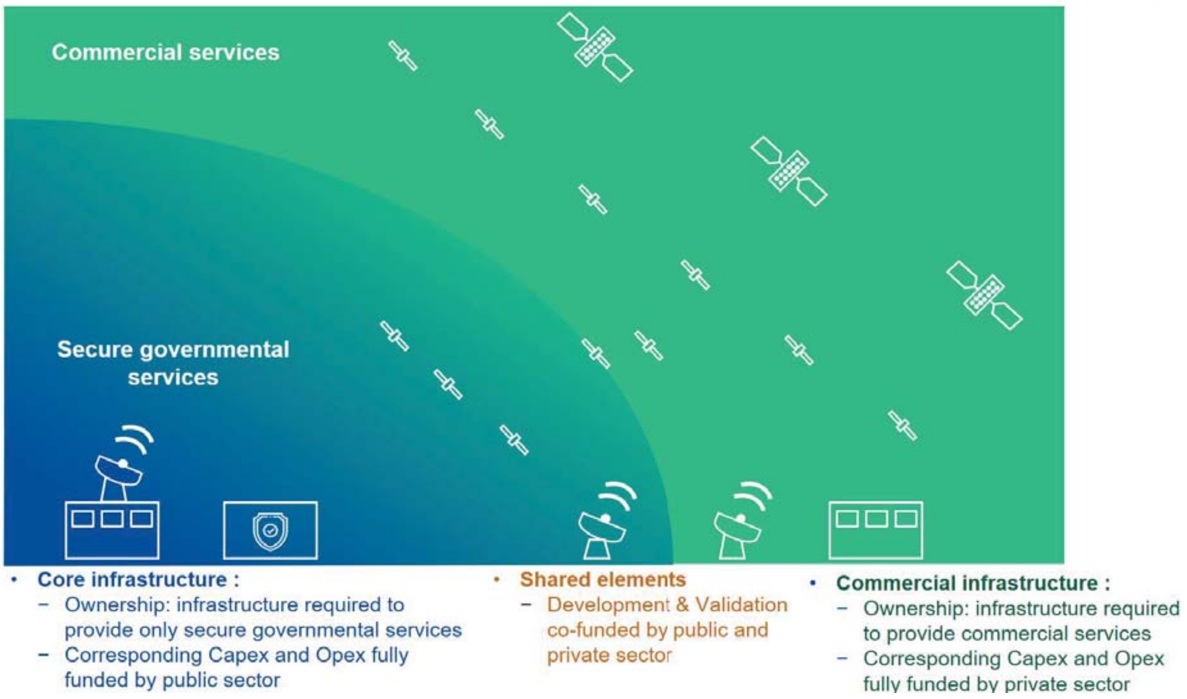


Figure 12: PPP approach[100]

<table><tr><td>Option 2 has the advantages that it:
Improves the provision of governmental services (low latency, resilience, security, guaranteed access, autonomous use)
Enables the provision of additional commercial services (economic growth, social benefits)
Optimises costs:
- development and deployment with economies of scale
- operations with mutualisation of capacity
Stimulates R&D and leverages innovative technologies, in particular with the New Space involvement (sharing the technology risk between public and private)</td></tr></table>

8.2. Implementation of the Concession

The initiative would be **implemented under direct management** in accordance with the Financial Regulation or under indirect management with bodies referred to in point (c) of the first subparagraph of Article 62(1) of the Financial Regulation.

The **funding** would be covered by a financial contribution by the Union, the Member States (possibly through ESA) as well as private sector investment.

The EU would retain **ownership** of all tangible and intangible assets forming part of the Governmental Infrastructure. To that effect, the Commission would ensure that contracts, agreements and other arrangements concerning activities which may result in the creation or development of such assets contain provisions ensuring the Union's ownership of those assets. The private would own operational and commercial aspects of the initiative, and could exploit the system for commercial services through additional infrastructure that it would bear the cost for.

In line with requests from Member States that New Space involvement is ensured in the initiative, the **procurement** could elaborate criteria for the award of the **concession ensuring the participation of start-ups and SMEs** along the whole value chain of the concession, hereby incentivising the development of innovative and disruptive technologies. The procurement should also ensure effective and transparent competition, reinforce the **autonomy of the EU in technological terms**, and ensure compliance with requirements related to security, service continuity and reliability.

[100] A classified note provides more information regarding the proposed set-up

The governance would be based on the following principles:

- clear distribution of tasks and responsibilities between the entities involved in its implementation;
- strong control of cost, schedule and performance;
- service continuity, including protection of the infrastructure from relevant threats;
- systematic and structured consideration of the users needs and their evolution;
- risk mitigation, in particular through appropriate risk sharing mechanism between public and private partners.

The Commission would have overall responsibility for the implementation of the Programme, including in the field of security, without prejudice to Member States' prerogatives in the area of national security.

ESA and EUSPA would be entrusted by the Commission to contribute to the sound implementation in terms of 0development and validation activities, and exploitation activities respectively. **In addition, EUSPA would carry out the security accreditation**[101] of the Governmental Infrastructure and Governmental Services in accordance with Chapter II of Title V of the Space Regulation.

To minimise **design and service provision risks**, the principle of unity of command should be applied. In particular, the concessionaire should be the only architect and operator of the system.

Finally, to ensure the **control by the Union over the infrastructure shared with the private partner**, a number of **contractual provisions** should be considered in the concession agreement such as: buy-back option in case of default; veto right in case of acquisition by a third country company; vetting of key personnel; etc.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The initiative will be successful if:

1. Member States governments and EU institutions can access initial set of governmental services in 2025, with full capacity in 2027.
2. The system performance in term of coverage (Over 99.5% availability), service availability (Over 99.9%), bandwidth, and resilience to threats/potential attacks (identified in a classified threat analysis) is meeting the services requirements set by the Commission.
3. The system obtains in 2027 a security accreditation allowing the services to transmit EU Classified Information (EUCI) up to a certain level (classified) and the equivalent

[101] Through its Security Accreditation Board

level of national classification in all EU Member States, following the principles set in Council Decision (2013/488/EU) on the security rules for protecting EUCI.

The monitoring of the initiative should cover the following aspects:

- Implementation: Infrastructure deployment according to the concession contractual arrangements.
- Application: Performance of the services provided under the initiative and evolution of needs of the users of the initiative. Concretely measured through the indicators below in Table 8.

Specific Objective	Indicators	Source	Frequency of measurement
Ensure the provision of secure satcom for evolving governmental needs	• Global coverage (30° over horizon) • Service availability • Average latency • throughput • number of users	• Concessionaire (with EUSPA validation)	• Daily
	• User's satisfaction	• Member States • End-user EU Institutions and Agencies	• Quarterly
Increase the resilience of Member States and EU missions and operations by guaranteed access to satcom	• Number of users • Volume of data used (i.e. system is used and capacity is sized properly) • Resilience to adverse events and threats • Availability of various ranges of end-user terminals	• Concessionnaire • EUSPA	• Quarterly
	• Report on use-cases in non-classified areas – level of 'cross-fertilisation' between users	• Member States • End-user EU Institutions and Agencies	• Yearly
Ensure that governmental communication needs are not critically dependent on non-EU infrastructure	• Assessment on critical components and maturity of EU supply chain	• Commission with support of ESA and EUSPA	• Every second year

Table 8: Monitoring framework

Current targets for all these indicators have been defined during the secure connectivity study and are at this stage considered sensitive non classified.

The initiative would follow the evaluation approach set out for the space programme components as set in Regulation. The timeline for evaluation is therefore **every fourth year**. The evaluation would for example use surveys to measure capacity gaps and user satisfaction, and reports of service availability in order to measure the effectiveness, efficiency and EU added value in line with the Better Regulation.

In addition, **regular meetings with Member States would take place four times a year** under the Govsatcom configuration of the Space Programme Committee. During these meetings, the Commission would report on the progress of the initiative, enabling Member States to react and come with feedback. Furthermore, an end-user forum, similar to the one of Copernicus, would be established.

ANNEX 1: PROCEDURAL INFORMATION AND FOLLOW-UP OF COMMENTS FROM THE REGULATORY SCRUTINY BOARD

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

DG DEFIS is the lead Directorate General, in close coordination with DG CNECT, for this initiative on EU space-based secure connectivity.

The initiative was validated in Decide Planning under reference PLAN/2021/10522.

The Inception Impact Assessment was published on Commission website on 31 August 2021[102].

2. ORGANISATION AND TIMING

The work on the Impact Assessment on the EU space-based secure connectivity initiative was coordinated with other services through an Inter-Service Steering Group (ISSG). The ISSG was established on 30 April 2021. Representatives of the Secretariat General (SG), Legal Service (LS), Directorate-General for Mobility and Transport (MOVE), Directorate-General for Competition (COMP), Directorate-General for Communications Networks, Content and Technology (CNECT), Directorate-General for Maritime Affairs and Fisheries (MARE), Directorate-General for Neighbourhood and Enlargement Negotiations (NEAR), Directorate-General for International Partnerships (INTPA), Directorate-General for Migration and Home Affairs (HOME), Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (GROW), Directorate-General for Health and Food Safety (SANTE), Directorate-General for Research and Innovation (RTD), Directorate-General for Agriculture and Rural Development (AGRI), Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO), Directorate-General for Regional and Urban Policy (REGIO), Joint Research Centre (JRC), Directorate-General for Budget (BUDG), European Defence Agency (EDA), European Border and Coast Guard Agency (FRONTEX), European Union Agency for Space Programme (EUSPA), and the European External Action Service (EEAS)) were appointed to the ISSG.

The ISSG met four times, first on 27 May 2021, and the final meeting before the first submission of the draft Impact Assessment to the RSB took place on 7 October 2021. Another ISSG meeting was held on 10 December 2021 before the second submission to the Regulatory Scrutiny Board.

3. CONSULTATION OF THE REGULATORY SCRUTINY BOARD

The Draft Impact assessment Report was submitted to the Regulatory Scrutiny Board on 11 October 2021. It received a negative opinion on 12 November 2021, and was resubmitted on

[102] Better Regulation: EU space-based secure connectivity initiative – public consultation

20 December 2021. While noting the improvements responding to its initial comments, the Board nevertheless maintained its negative opinion on 12 January 2022, referring to shortcomings in the following areas:

(1) analytical coherence between the problem definition, objectives, options, criteria for the comparison of options and the definition of future monitoring indicators;
(2) on the lack of explanations on the choice of policy options as assuming a predetermined technical solution and consequently artificially limits the scope, design and content of the options to the implementation of this predetermined outcome;
(3) absence of a timescale and identification of funding sources
(4) clarity on methodological assumptions and validity of secondary data cited
(5) lack of explanations on the compatibility of the initiative with the objectives of the Climate Law.

4. Regulatory Scrutiny Board findings and follow-up

The follow-up to the above listed five main shortcomings that the Regulatory Scrutiny Board has identified is outlined below for each of them.

1) There is still no analytical coherence between the problem definition, objectives, options, criteria for the comparison of options and the definition of future monitoring indicators.

a) Problem definition

i) The core problem

Both governmental user needs and the satcom solutions are changing rapidly. Under the increasing threat levels and increasing importance of real time needs, in particular for Machine to Machine (M2M) and Internet of Things (IoT), user needs are moving towards **higher security solutions, low latency**[103] **and global coverage.**

However, the current EU satcom assets cannot meet these new needs. The problem is not about a **quantitative gap** between supply and demand (which could be covered by existing GEO capacity) but rather a **qualitative one**, as there is not today any EU low latency solution (LEO and MEO) that could meet the evolving user needs.

As explained in section 2.4, EU public and private stakeholders have indicated their intention not to pursue the development of their own LEO capabilities. The non-geostationary nature of the system leads to launch a significant amount of satellites to provide permanent coverage,

[103] Latency: amount of delay, measured in milliseconds (ms), that occurs in a round-trip data transmission to a satellite.

which requires an amount of CAPEX that could not reasonably be covered by a single Member State[104].

In addition, **this problem cannot be adequately addressed through a non-EU solution** since Member States and EU Institutions require, *for governmental needs*, **a guaranteed access in an unrestricted manner** to secure connectivity services **without soliciting the assent of a third party.**

The use of non-EU, commercial off-the-shelf satcom capabilities for low-criticality governmental applications should remain open to third-country operators, as it is the case today.

ii) Problem drivers

As regards the problem drivers, the following clarifications need to be taken into account:

- *as regards the threat level increase and its changing nature*

As clearly documented in a range of EU policy documents (see section 4.3 of the Impact Assessment), the threat level against EU Member States and institutions is increasing, and changing in nature, leading to increased risks to citizens, governments, EU institutions and their interests.

This relates to hybrid threats, cyber threats, increase of natural disaster, as well as quantum computers.

With regard to **quantum key distribution**, the initiative will include quantum technology with a view to avoiding a situation where quantum computers would be able to decrypt the information transmitted through its infrastructure. Quantum Key Distribution (QKD) is one way to develop post-quantum cryptography. The current technologies for terrestrial QKD have a distance limit due to signal light attenuation (Current record, set early 2022 by a team from the University of Science and Technology of China, reaches only 833 km[105]), but its range of communication can be extended by employing satellites equipped with high-quality optical links. In 2017, a quantum key distribution was performed between Beijing and Vienna (4 600 km) using Chinese QKD satellite Micius. Further activities need to be conducted between 2022 and 2027 to ensure that such a system can be accredited to convey EU classified information (EUCI).It is important to remind that the Secure Connectivity initiative does not create the EuroQCI infrastructure or its space based segment (adopted in June 2019), but that the two initiatives are integrated to maximise the synergies.

[104] The cost to deploy such a system exceeds EUR 5bn, where the highest spenders in the EU (France, Germany, Italy) spend on average EUR 0.5bn per year on Satcom systems.
[105] Wang, S., Yin, ZQ., He, DY. *et al.* Twin-field quantum key distribution over 830-km fibre. *Nat. Photon.* **16,** 154–161 (2022).

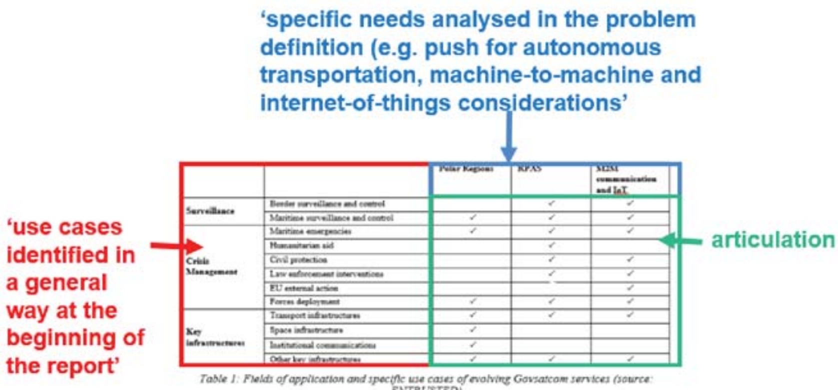
The use of private satellites is not considered compatible with the high security requirements of QKD, because the satellite itself should be trusted as it generates (or has access to) the cryptographic keys.

- *as regards the evolving nature of secure governmental satcom needs*

Traditionally, satcom has been used for voice communication and data transfer in remote areas (e.g. at sea), but the nature of use cases is rapidly evolving, driven by both technological developments and geopolitical shifts:

- Machine to Machine (M2M) and Internet of Things (IoT)
- Move towards autonomous transportation and Remote Piloted Aircraft Systems (RPAS)
- Increased global coverage needs.

The cumulative combination of technological developments with the identified use-cases testify to a significant evolution of EU secure satcom needs. Table 1 page 13 provides a visual synthesis of the above linkages. It demonstrates that all identified use-cases are affected for instance by Machine-to-Machine communication (e.g. border surveillance increasingly relies on sensors spread on land and maritime borders that require connectivity), or RPAS (Remote Piloted Aircraft Systems, e.g. Civil protection operations increasingly rely on such unmanned aircraft).



		Polar Regions	RPAS	M2M communication and IoT
Surveillance	Border surveillance and control		✓	✓
	Maritime surveillance and control	✓	✓	✓
Crisis Management	Maritime emergencies	✓	✓	✓
	Humanitarian aid		✓	
	Civil protection		✓	✓
	Law enforcement interventions		✓	✓
	EU external action			✓
	Forces deployment	✓	✓	✓
Key infrastructures	Transport infrastructures	✓	✓	✓
	Space infrastructure	✓		
	Institutional communications	✓		
	Other key infrastructures	✓	✓	✓

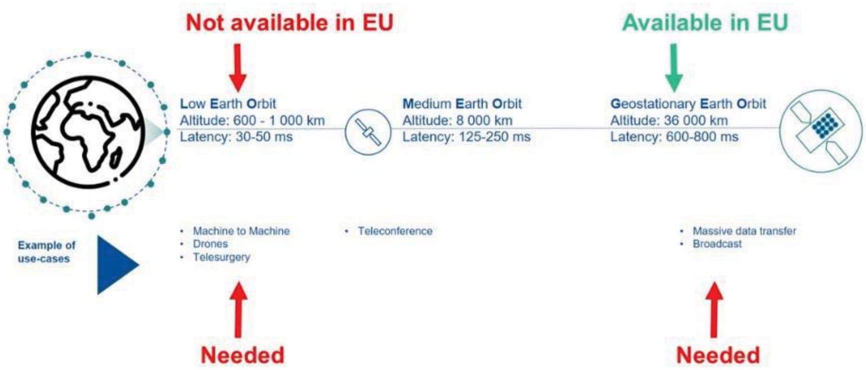
Table 1: Fields of application and specific use cases of evolving Govsatcom services (source: ENTRUSTED)

- *as regards the fact that the current EU satcom assets do not allow to meet these evolving needs*

The problem is not about a **quantitative gap** between supply and demand (GEO capacity) but rather a **qualitative one** between new low latency needs (LEO/MEO capacity) and the existing EU fleet.

Initially, satcom has been relying on geosynchronous (GEO) spacecraft. Technical progress has allowed the emergence of non-geosynchronous-orbit (NGSO) communications constellations, comprising low-Earth-orbit (LEO) and medium-Earth-orbit (MEO) satellites to emerge. **There is not today any EU LEO and MEO operational or project capabilities that could meet the evolving governmental user needs.**

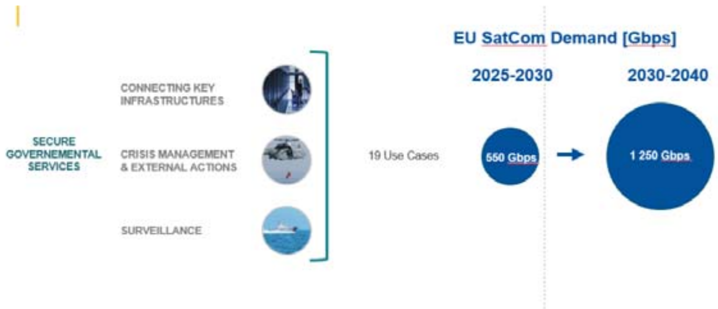
Figure 4 page 14 explains these various concepts:



b) Evolution of the problem

- *in terms of demand and supply*

On the **demand side** the figure herewith provides an overview of the evolution of EU governmental satcom volume demand:



This figure shows a **stark increase** in demand between the period 2025-2030 and 2030-2040 of more than 100%. It is to be noted that the technical and security requirements differ for each use cases.

Furthermore, a **detailed table** on demand per use case has been added as Annex 4 in this document.

On the **supply side**:

- the provision of satcom services is a complex interplay between national decisions for governmental systems, and decisions of private companies regarding new investments in satcom commercial systems;
- since the Govsatcom market segment is relatively small (compared to the needs of the private sector), and none of the EU Member States has sufficient market power to leverage fully private solutions, it is unlikely that future EU and Member States Govsatcom needs will be spontaneously met by EU private actors;
- cost modelling analyses performed by ASD Eurospace[106] highlight that the magnitude of the investment would require a commitment of the public sector to alleviate the risk. Industrial stakeholders have also confirmed this assessment of the market[107]; and finally although some EU Member States have national satcom systems, none of the EU Member States is planning to develop a global low latency system in the coming decade.

As a conclusion on this mismatch between supply and demand, the only way for EU Member States and Institutions to meet these emerging needs, should no action be taken at EU level, would be to rely on non-EU infrastructure, such as the future US Transport layer, the British Oneweb 2, or the Russian Sphera.

-in terms of urgency of the initiative

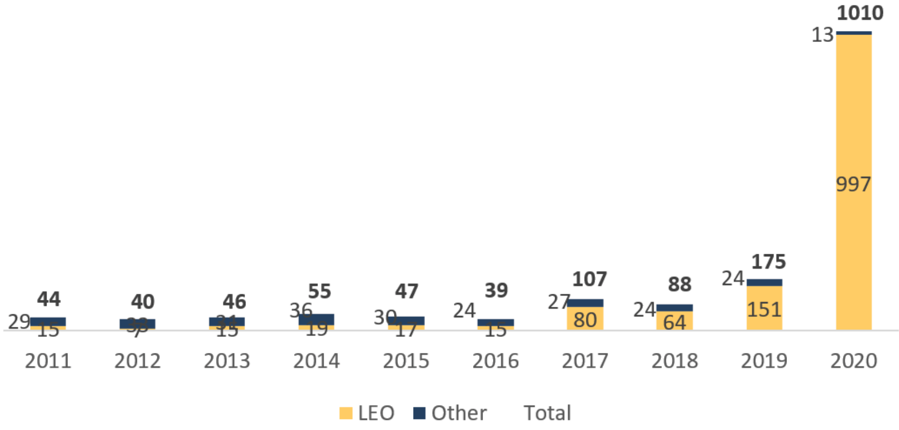
The urgency of the initiative is linked to the following interrelated developments:

- **technological progress** (as evidenced in section 2.2. of the Impact Assessment) that has led to the **emergence of low latency solutions** as from 2018/19;

- the emergence of various public-supported or **subsidised non-EU mega-constellations** in the US, China and Russia spurred by this technological progress.

[106] Trade association of the European Space Industry. Annex 3 – Stakeholders consultation further expands the rationale. ASD document available here.

[107] It is worth highlighting that the lack of a 'technology push' offer from Industry does not constitute a market failure, but rather a logical outcome for such a product that (i) requires several hundred-millions upfront non-recurring cost and (ii) that would not be marketable for B2C commercial applications.



Number of launched communication satellites, 2010-2019 (Source: Space Foundation)

- **risk of shortage of available filing and orbital slots** due to exponential increase of these mega-constellations. As each orbit can hardly support more than one or two constellations, the first-comers are better served in terms of positions, bandwidth and priority on frequency use; the others might be prevented reasonable and sustainable service operation. Without timely action, the currently available EU filings will become obsolete. There is therefore a need to proceed urgently, in order to profit from these existing filings. Figure 8 page 18 illustrates the analysis conducted on the ITU filing database;

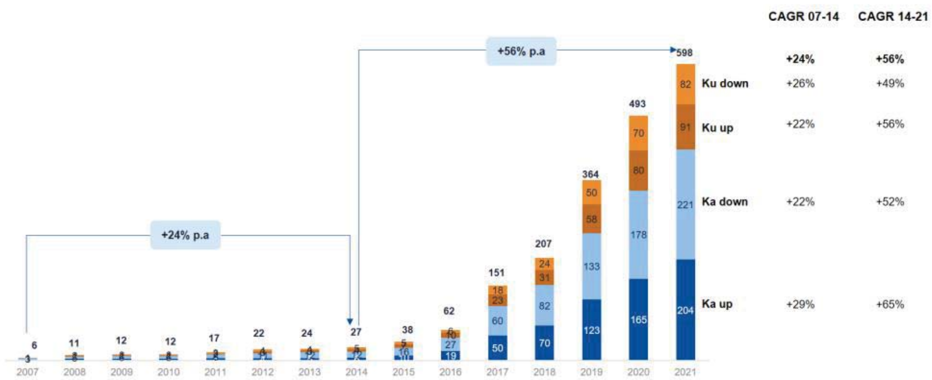


Figure 8: non GSO filings as of 15 Dec 2021 (source: ITU)

- in addition the EU available frequency filings that would allow to establish a LEO infrastructure is facing strong attrition over time. On top, EU Member States have a **very limited number of filings compared to other players** as illustrated in the figure below108; and

[108] It is to be noted that while taken individually, the number of European filings is limited, it is a significant asset would this portfolio of filings be managed at an integrated EU level ,

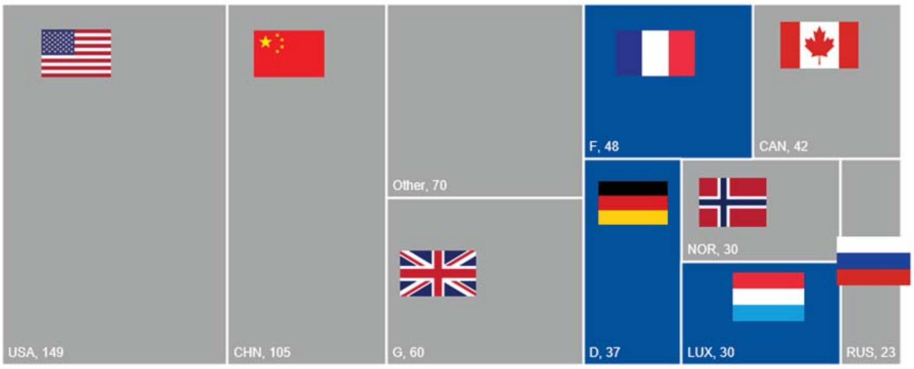


Figure: LEO/MEO filings 2007-2021(source: ITU)

- **the lead time** for the design, development and deployment of a space-based system takes several years and needs to be anticipated well in advance. Not all space-based services necessary to satisfy our needs can be developed at a moment's notice.

c) Objectives

The additions and clarifications made above to the problem definition and problem drivers, improve the analytical coherence with regard to the objectives as set out in section 4.1 and 4.2 of the Impact Assessment.

The improvement is related to:

- the evolving public needs notably in terms of quality (low latency);
- the need for guaranteed access to satcom whilst avoiding any critical dependence on non-EU infrastructure that could be detrimental to the integrity, resilience and sustainability of the Union's operations.

d) Options

Further details as regards the choice of the options are provided hereunder point (2).

e) Criteria for the comparison of options and monitoring indicators

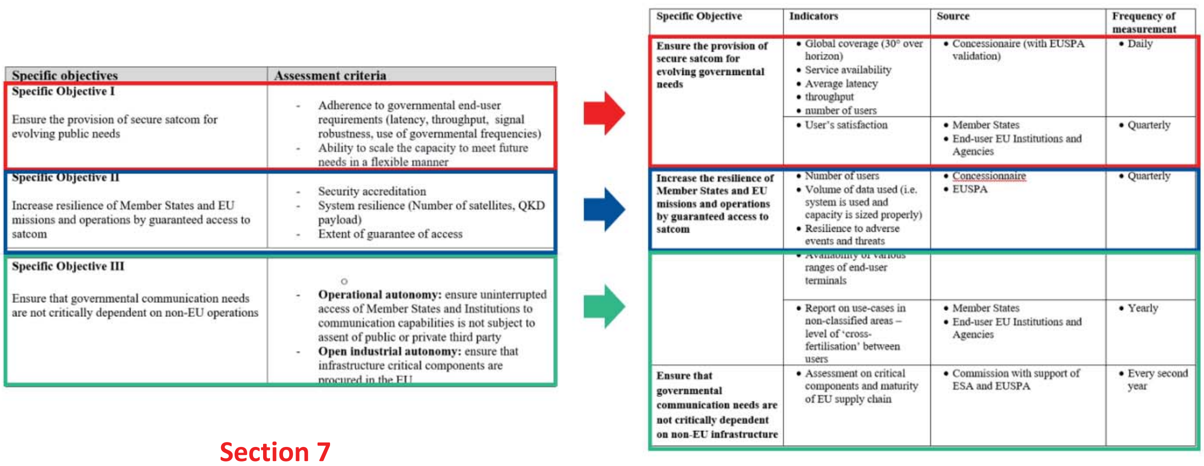
Options are compared vis-à-vis:

- For effectiveness: against policy objectives set out in section 3 of the Impact Assessment.
- For efficiency against the preceding analyses carried out in section 6 of the Impact Assessment in terms of economic, social and environmental impacts.

Table in section 7.1 page 36 below has been reviewed clarifying the various assessment criteria:

Specific objectives	Assessment criteria
Specific Objective I Ensure the provision of secure satcom for evolving public needs	- Adherence to governmental end-user requirements (latency, throughput, signal robustness, use of governmental frequencies) - Ability to scale the capacity to meet future needs in a flexible manner
Specific Objective II Increase resilience of Member States and EU missions and operations by guaranteed access to satcom	- Security accreditation - System resilience (Number of satellites, QKD payload) - Extent of guarantee of access
Specific Objective III Ensure that governmental communication needs are not critically dependent on non-EU operations	o - **Operational autonomy:** ensure uninterrupted access of Member States and Institutions to communication capabilities is not subject to assent of public or private third party - **Open industrial autonomy:** ensure that infrastructure critical components are procured in the EU

In order to ensure a **perfect correlation between the criteria used for comparison (cf. section 7.1 of the Impact Assessment) and the monitoring indicators (cf. section 9 of the Impact Assessment)** comparison criteria have been systematically flown down into monitoring indicators. The following table illustrates this point:



Specific objectives	Assessment criteria
Specific Objective I Ensure the provision of secure satcom for evolving public needs	- Adherence to governmental end-user requirements (latency, throughput, signal robustness, use of governmental frequencies) - Ability to scale the capacity to meet future needs in a flexible manner
Specific Objective II Increase resilience of Member States and EU missions and operations by guaranteed access to satcom	- Security accreditation - System resilience (Number of satellites, QKD payload) - Extent of guarantee of access
Specific Objective III Ensure that governmental communication needs are not critically dependent on non-EU operations	o - **Operational autonomy:** ensure uninterrupted access of Member States and Institutions to communication capabilities is not subject to assent of public or private third party - **Open industrial autonomy:** ensure that infrastructure critical components are procured in the EU

Section 7

Specific Objective	Indicators	Source	Frequency of measurement
Ensure the provision of secure satcom for evolving governmental needs	• Global coverage (30° over horizon) • Service availability • Average latency • throughput • number of users	• Concessionaire (with EUSPA validation)	• Daily
	• User's satisfaction	• Member States • End-user EU Institutions and Agencies	• Quarterly
Increase the resilience of Member States and EU missions and operations by guaranteed access to satcom	• Number of users • Volume of data used (i.e. system is used and capacity is sized properly) • Resilience to adverse events and threats	• Concessionnaire • EUSPA	• Quarterly
	• Availability of various ranges of end-user terminals		
	• Report on use-cases in non-classified areas – level of 'cross-fertilisation' between users	• Member States • End-user EU Institutions and Agencies	• Yearly
Ensure that governmental communication needs are not critically dependent on non-EU infrastructure	• Assessment on critical components and maturity of EU supply chain	• Commission with support of ESA and EUSPA	• Every second year

Section 9

(2) The report continues to assume a predetermined technical solution – without specifying it – and consequently artificially limits the scope, design and content of the options to the implementation of this predetermined outcome.

The intervention logic has been significantly clarified between the first and second submissions of the impact assessment to better explain the choice of options.

The policy options, as considered in the current analysis, address the objective of supplying *satcom* services. The initiative leverages the work done by Member States, the Commission, the EEAS, the European Defence Agency (EDA), and the European Space Agency (ESA) in the elaboration of the High Level Civil Military User Needs for Governmental Satellite Communications document[109] (HLUN). **In this respect, satcom is not a predetermined technical solution, but the starting point of the problem definition.** The impact assessment does not in particular challenge the conclusions of the HLUN by trying to find alternative technical ways to meet the fundamental requirements expressed by these end-user communities. Its ambition, as it was the case for the Govsatcom impact assessment, is narrower and focuses on meeting these needs.

The approach does not assume a technical solution, and does not specify it: while the use-case needs expressed by governmental end-user communities are converging into a stable set of requirements, technical solutions meeting each use-case needs are still very open.

Defining options through a limited set of technical scenarios would, paradoxically:

i. Prejudge that all options necessarily go through the acquisition by the public sector of an infrastructure, where maybe buying a series of services from the private sector could suffice;
ii. Dismiss ex-ante the existence of potential technical innovations that could be brought by the private sector, and in particular the startups ecosystem that has emerged in the field of low-latency services.
iii. Dismiss ex-ante the potential for synergies between governmental services and commercial satcom.

This service-based approach is all the more warranted as **satellite communications is an established market**. Therefore, it is important to identify realistic options where the public investment could be optimized by profiting from such a well-established market.

The **situation is different from other EU space initiatives** like Galileo, where in 2012 there was no functioning market for navigation and positioning services, no existing operators for such services and no expertise either in the public or the private sector within the EU. This is

[109] EEAS(2017) 359, High Level Civil Military User Needs for Governmental Satellite Communications (HLUN)

the reason why the EU by deciding to fully fund the programme analysed the different architectural options.

For the present initiative, such technical implementation questions would in any case have **no impact on the scope and content of the options** as detailed in the Impact Assessment since with regard to the services the question of number of satellites is not relevant, as long as the solution is capable of providing the required services.

a) Scope and design

As explained above, the satcom market differs significantly from other space segments where the EU has already established components of its Space Programme, such as Earth Observation under Copernicus and Navigation Services under Galileo.

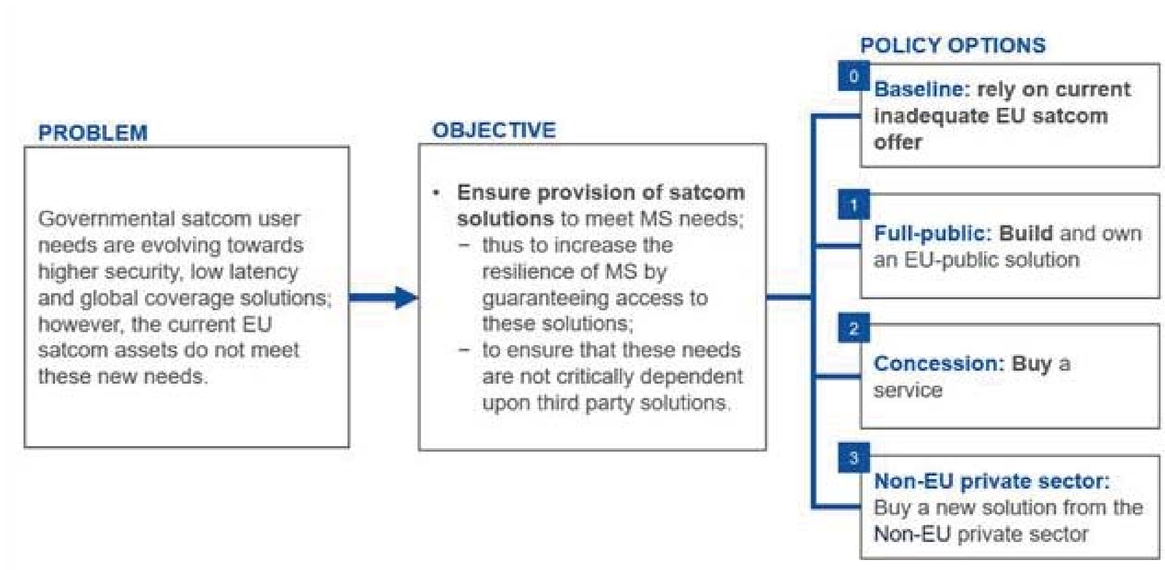
To acquire a low latency service, the possible options for the EU are:

- either to buy off-the-shelf-services;

- build a EU-owned system; or

- define, together with Member States and agencies requirements tailored for each use case and ask the private sector to offer technical solutions.

This is further illustrated in the following figure:



In the options where the Commission would **buy a service** (and thus where the private sector has to reflect upon the best architectural approach to meet public sector demand), **the assessment of any architectural trade-off is irrelevant.**

The policy options should not be considered as mere 'implementation modes' of a same 'predetermined technical solution'. On the contrary, the technical outcome of each policy option would, by construction, be very different, for example, between:

- Option 1: A fully public-owned constellation, emitting only in governmental frequency band, dimensioned to meet, on a standalone basis, peak governmental demand, and thus requiring a high number of satellites, mostly unused outside of peak times
- Option 3: A privately-owned constellation, comprising a limited number of governmental payloads, emitting in various bands, able to divert non-critical governmental demand (e.g. humanitarian aid, some civil protection applications that do not require high security requirements) through commercial payloads during peak times,

During the procurement process of the concession, the Commission will express a requirement for a service, defined in terms of coverage, latency, throughput, etc. The applicants will propose services and will present technical/architectural designs to demonstrate that they are in position to deliver such service. The Commission will evaluate these various **architectural proposals** only against their ability to meet its **service requirements**. The architectural proposal will also allow **to identify those assets that are essential, notably from a security point of view, to ensure proper provision of the governmental services and that should, therefore, be owned by the Union.**

The added value of a concession is that it **offers also the opportunity to create a considerable amount of benefits through commercial services,** and at the same time, to mutualise capabilities with a governmental system that, alone, would be significantly more expensive and would not create any direct socio-economic benefits.

This concession scheme could permit **to build upon** the existing EU satellite communication technological and infrastructural base and to provide robust and innovative governmental services, while allowing the private partner to complement the governmental infrastructure with additional capabilities to offer commercial services including through its own investments.

Such a scheme would furthermore **optimise the costs** by sharing development and deployment costs on components common to both governmental and commercial infrastructures, as well as operational costs by allowing a high level of capacity mutualisation.

Finally, it would **stimulate innovation** in particular for New Space by enabling the sharing of research and development risks between public and private partners.

b) Content

As regards the content of the options, it is noteworthy to clarify the following points:

- *as to the relationship between capacity and costs*

What is the same in options 1 (full public) and 2 (concession scheme) is not the total capacity of the system but the Union's demand for governmental services. To that end it should be clarified that although the **Union demand is the same for option 1 and 2, the cost for the Union is different for each option** as set out in Table 3 page 29 herewith. This is due to the fact that in option 1 the Union finances the entire infrastructure; whereas in option 2 there is **optimisation of the costs** by sharing development and deployment costs on components common to both governmental and commercial infrastructures, as well as operational costs by allowing a high level of capacity mutualisation.

	CAPEX for the Union in EUR	Annual OPEX for the Union in EUR	Annual Service costs paid by the Union in EUR	Comments
Option 0: Baseline	180 million	Not applicable	40 million from 2025 to 2027	Services would be procured depending on budgetary availability (currently 40m in current MFF)
Option 1: Fully public	6 billion	250 million	Not applicable	
Option 2: PPP / Concession	4 billion	170 million	Not applicable	Current assumption based on power/bandwidth allocation: two-third of costs for public sector (EU+MS)
Option 3: Stake in non-EU constellation	tbd[78]	Not applicable	400 million	Provided that a private operator manages to deploy the infrastructure allowing to provide the new services, bandwidth would be sold on a market price basis.

Table 3: Cost impact per option

It is to be noted that CAPEX cost for a stake in a non-EU constellation is not quantified because of the various parameters to take into account:

i. Identify a constellation potentially for sale and determine a target price for Equity (as well as special rights that would allow the Union to preserve its essential security interest[110]), notwithstanding the ability of the Union to acquire shares of a private company that, moreover, would be established in a third-country.[111]
ii. Quantify the required CAPEX to
   a. Transfer selected ground control and security assets within the EU
   b. Buy robust satellites allowing the provision of governmental services

- *as regards the management of the uncertainty of government's demand*

It should be noted that the uncertainty of governmental demand for capacity needs is to be managed at two levels:

- firstly at the level of governmental request for capacity;

[110] Such as a so-called 'golden share' mechanism that would allow the public sector to veto Board decisions that could be detrimental to the Union's interests.
[111] In a similar situation regarding the potential establishment of an EU-owned private company to manage the Galileo system during its exploitation phase, an analysis (see SEC(2011) 1446 final p. 48) concluded that 'the creation of an EU public enterprise will likely require putting in place a specific branch of EU law, a task that would need many years to be accomplished';

- secondly at the technical level, i.e. the sizing of the system.

As regards the first point, an **Implementing Act** will be foreseen under the proposed legislative proposal which will deal with the question of capacity sharing and prioritisation. In other words, basic rules will be established under which circumstances Member States can require additional capacity beyond their estimated average capacity needs. Should Member States during a certain period require less capacity than their average capacity needs, this could then be given to Member States who require during the same period of time higher capacities than their average needs. Should there be overall a higher request for capacity than available, then a prioritisation mechanism based on objective criteria (e.g. date of the request, volume request, etc.) would ensure a fair allocation of capacity between Member States.

Regarding the commercial services there is no need for an Implementing Act, as these will be defined by the private sector under the concession scheme. The Commission should retain the right to assess such services to ensure that the Union's essential interests in terms of security and market competition are preserved.

As regards the second point, at the technical level, the following **differentiation** can be made between the different options:

Option 0:

As this option does not allow for the provision of low latency services. The question of uncertainty of governmental demand is thus not relevant.

Option 1:

A fully public infrastructure would need to be sized at the peak capacity needs of Member States. It would require a strict sharing and prioritisation mechanism.

Option 2:

A concession scheme would allow for flexibility through capacity mutualisation and ease the question of sharing and prioritisation.

Option 3:

Depending on the shareholder agreement reached, flexibility through capacity mutualisation could be envisaged.

- *as regards third party access which is specific to Option 2:*

An adequate mechanism should be foreseen in the concession contract to allow other EU telecom operators to use a share of the commercial capacity; and

Adequate safeguards should be foreseen to avoid any overcompensation of the contractor, distortions of competition, any conflict of interest, undue discrimination and any other hidden indirect advantages.

- *as regards allocation of liability which is specific to Option 2:*

Under the concession contract will be foreseen the allocation of liability for loss and damages to assets (and related insurance approach) as well as for service provision, with relevant possible limitation of liability as necessary to ensure the financial viability of the contract. It is intended thus to implement a similar approach as the one chosen for the Galileo and EGNOS operations' contract.

- *as regards the procurement process for the concession award which is specific to Option 2:*

The **procurement process** would be carried out in accordance with Title VII of the Financial Regulation, ensuring fair and open competition. In developing the procurement documents, several key principles should be addressed in order for the concession contract to:

• define a clear distribution of tasks and responsibilities between the partners;

• ensure an appropriate prioritisation of governmental user needs;

• the approach to access/exploitation of the infrastructure components, in particular security-related components
• allow the provision of commercial services to be defined by the private sector; the Commission should retain the right to assess and approve such services to ensure that the Union's essential interests and Programme's objectives are preserved and adequate safeguards are put in place to prevent distortions of competition and avoiding any overcompensation of the private partner;
• define the financing scheme proposed in terms of split between the required public sector investment (either in kind or through availability payments), the offered private sector investment (either in cash or in kind);
• define the ownership regime of the assets, implementing a clear distinction between assets to be owned by the Union and assets to be owned by the contractor.

In order to ensure the **New Space involvement** in the initiative, the procurement should elaborate criteria for the award of the concession ensuring the participation of start-ups and SMEs along the whole value chain of the concession, hereby incentivising the development of innovative and disruptive technologies. New Space stakeholders have demonstrated their innovative ideas for the initiative, and the following two studies on 'New Space solutions for long-term availability of reliable, secure, cost effective space based connectivity building on GOVSATCOM' enabled the Commission to leverage these early ideas. The outcome of these studies inputs should be duly considered when drafting the procurement documents.

The procurement should reinforce the **non-critical dependence** of the EU in technological terms, and ensure compliance with requirements related to security, service continuity and reliability by inserting them as minimum requirements or award criteria in the tender documentation.

The Commission should ensure effective and transparent competition by continuing spreading awareness of the procurement within the limits of the Financial Regulation.

- *as regards security governance*

The process set out in the **Space Regulation** will be followed. In terms of steps, this requires that first, a threat and risk analysis is being undertaken, on which basis subsequently general and specific security requirements will be developed and finally flown down to the concession contract.

This governance scheme applies to all options, except option 3 where the Union would have to request that some adjustments are brought to the system architecture (such as geographical footprint of the Ground System, software development and validation approach, cybersecurity approach). These adjustments would need to be sufficient to allow a security accreditation in line with the provisions of the Space Regulation.

(***3) The report does not contain any timescale for the initiative nor does it identify where the necessary funding would come from.***

a) Timescale

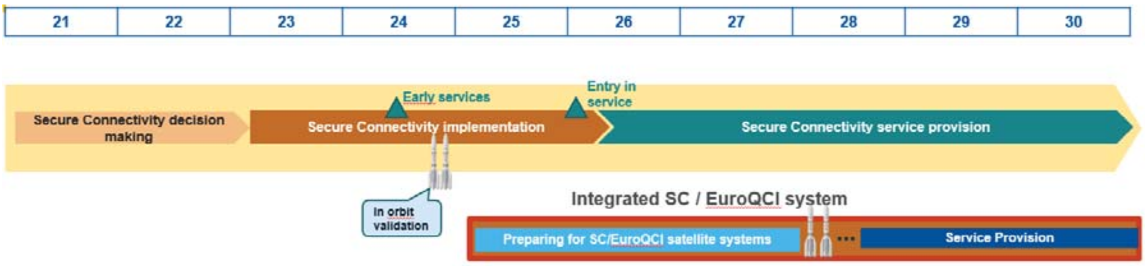
The secure connectivity initiative would be implemented according to the following main milestones under the assumption that the legislative act will be adopted by end of 2022/ early 2023 by the co-legislator:

- 2023: Award of the concession contract
- 2023-2027: Development and deployment of the infrastructure
- 2024-2025: Provision of first low latency services
- 2027: Provision of full portfolio of services

In the course of 2022, the inter-institutional legislative process will be carried out, which should lead to the adoption of the Regulation by the end of the year/ beginning 2023, based on a Commission’s proposal adopted by February 2022.

In the meanwhile, preparatory steps that will lead to the award of the concession contract would start already in the first half of 2022. This phase is expected to be completed by 2023.

The technical work for the system implementation will commence at the signature of the concession contract. This will entail the development and validation phases for both the space and the ground segments, to be carried out in the period 2023-27. The initial services based on the new infrastructure (with low-latency services) can be provided by end of 2024/ early 2025, and the full portfolio of services (with the integration of the quantum capability) can be available in 2027 (see picture below).



b) Funding

Regarding the **funding sources**, these are as follows:

- Baseline: 100% EU funding
- Full public: 100% EU funding
- PPP: The cost sharing that will be defined in the context of the negotiation of the concession contract. It is envisaged to have recourse to a blending of various budgetary sources stemming from:
    - the public sector (2/3) to cover the investment for the governmental service component via EU budget and national funding (either through ESA or national budgets, or in kind contributions);
    - the private sector (1/3) investment to leverage the commercial service component.

- Stake in Non-EU constellation. The Union would fully finance the acquisition of shares.

In this **baseline option (Option 0)**, the funding of the initiative be would be entirely covered by a financial contribution by the Union (100% EU funding). In this case, the funding has been already allocated to the GOVSATCOM component of the EU Space Programme in the current Multi-annual Financial Framework (2021-27).

In **Option 1 (Fully Public)**, the funding will also be provided entirely by the Union. In this case, however, the allocation of funds in the current MFF would not allow sufficient financial resources to support entirely the envisaged cost of the infrastructure for the secure connectivity system; Member States' contribution is also unlikely to reach the amount needed to finance the system.

In the **Option 2 (Public-private-partnership: EU Concession)**, the funding would be covered by a financial contribution by the Union, the Member States (possibly through ESA) as well as private sector investment. The precise financial scheme and the cost sharing between the public and the private parties will be defined in the context of the negotiation of the concession contract. The **EU budget and national funding would finance the governmental service provision and contribute to the development and validation activities, while the private sector would be called to finance the commercial service provision.** Therefore, a blending of various budgetary contributions can be envisaged, in accordance with the following principle:

- Public sector would cover the investment for the governmental service component, for around two thirds of the total cost of the system. Part of the funds would be provided via the EU budget, and part would be provided by Member States national funding, either through ESA or national budgets. In-kind contributions from Member States would also be possible.

- The private sector would invest to leverage the commercial service component, contributing to one-third of the total cost of the system.

In **Option 3 (Stake in Non-EU constellation)**, the Union would fully finance the acquisition of shares. In this case, the Union would need to conclude an agreement where it would take an equity stake in one of the entities controlling the non-EU constellation. The instrument to be used by the Union to buy and detain corporate shares remains to be defined, and the funding sources for this operation are not defined.

(4) The impact analysis is incomplete as it continues to lack clarity on methodological assumptions and validity of secondary data cited and broadly employed for the economic estimates, benchmarks and multipliers in relation to the present initiative.

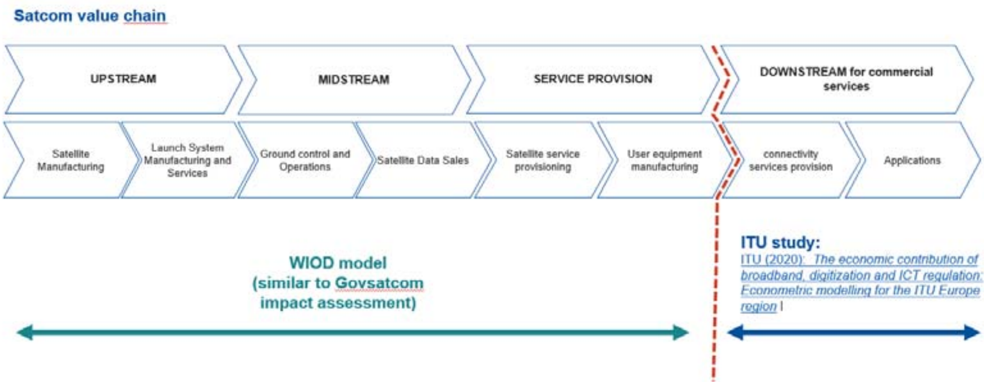
The methodological approach followed in essence the one used in the Govsatcom component's impact assessment: The economic impacts were based on the costs associated to the options, the impact on Gross Value Added (GVA) and jobs created. The expenditures were injected in an input – output model (World Input Output Database – WIOD 2016 release[112] adjusted with Eurostat 2018 Input Output), leading to an estimation of direct, indirect and induced impacts. The expenditure considered include the total CAPEX, the OPEX and service costs. The use of the findings accumulated on Govsatcom is relevant : the same value chain is addressed.

In option 3, the GVA of **additional commercial services** is calculated separately using a distinct model developed for the purpose of assessing the impact of broadband using the

[112] Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production" , Review of International Economics ., 23: 575–605 (link to 2016 release)

multiplier relying on an econometric model developed by the International Telecommunication Union.

Our methodological choice is to measure benefits only within the EU. In this context, several evidences tend to demonstrate that space downstream activities emerge preferably close to the upstream ecosystem. An example stemming from the satellite navigation field illustrates this: while GPS has been accessible to civilian use since 1983, location-based services have thrived in the EU only after the start of the deployment of Galileo. The EU satellite navigation market has grown from EUR 27bn in 2009 to EUR 675bn in 2019, reaching a market share comparable to the US[113].



As it can be expected, the overall costs and the impact on GVA and jobs creation are directly proportional. The lower the overall expenses for procurement of SatCom services are, the lower the economic benefits of the option are.

It is to be noted that the overall GVA impact of option 3 would be an increase between 25 and 33 billion euro. Compared to the total EU economy of about 13 400 billion euro[114]) this is an extremely small effect (+0.2%). The case for public intervention remains primarily to provide the Union and Member States with tools to increase the resilience of governmental operations. The positive economic impact is a welcome side effect, but not the main driver of the initiative.

As regards the **environmental data** used, further more detailed explanations as to the relevance of the study used, as well as additional calculations can be found below (cf. point 5).

(5) The report does not specify how the increased greenhouse gas emissions generated by the initiative would be compatible with the objectives of the Climate Law.

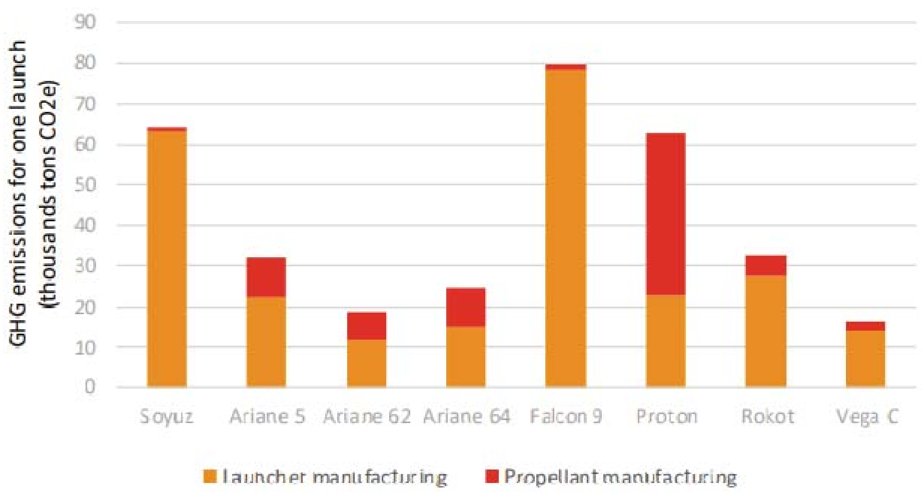
[113] GSA Market Report 2010 and Market Report 2019.
[114] Eurostat 2021

The environmental impacts of the initiative can be measured on the emissions relating to the development and deployment of the infrastructure (point a)) and the positive environmental impacts stemming from the use of the services (point b)).

a) Environmental impacts of building and launching infrastructure

Launching a satellite communication system would inevitably have an impact on the environment, particularly due to the environmental footprint related to the manufacturing and launching of the system infrastructure. **In this regard, Options 1 and 2 are expected to have the similar environmental impact**. There is for the time being no technologies that would allow the space industry to be carbon neutral. However, compared to other industry sectors, the manufacturing of spacecraft does not emit significant greenhouse gases emissions[115]. Using the metrics developed in a 2020 PWC report 'Analysis of the Environmental Impact of the EU Space Programme', it is estimated that deploying and maintaining a constellation **over 20 years could generate 5 Mt CO2, i.e 0,25 MT per year**, which would represent **0.0008% of 2020 emissions**. However, the precise estimation would be determined by the size and weight of the constellation.

The number of satellites may be bigger in this initiative (around 200 satellites) than in Galileo (30 satellites) or Copernicus (8 satellites), however satcom satellites have a comparably smaller size and mass, which means that they can be launched in large groups, hereby reducing launch emissions. The envisaged deployment strategy considers 9 launches for full operational capability, compared to 12 launches for Galileo and 8 for Copernicus.



PWC (2020) Analysis of the Environmental Impact of the EU Space Programme

[115] Eurostat Manual of Supply, Use and Input-Output Tables (2008)

Option 0 would not have a further environmental impact, as it relies only on existing satcom capacities. **Option 3 would have a lower impact than Options 1 and 2**, for those third country owned LEO constellations that have already launched an initial set of satellites allowing them to provide initial services. However, Option 3 would have a higher impact than Option 0, as these third country owned LEO constellations have not yet achieved full operational capability and require further launch of satellites.

Satellites in orbit create a risk for long-term environmental harm, due to its potential of creating additional space debris, either at their end-of-life or due to a technical failure. To mitigate the impact on the space environment, **Options 1 and 2 would comply with the international standards on the protection of space environment** (e.g. the Committee on the Peaceful Uses of Outer Space (COPUOS) and Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation Guidelines), as well as the existing national legislation (e.g. the French *LOI n° 2008-518 relative aux opérations spatiales*[116]). Further, **an EU built system would also comply with existing EU environmental regulations,** such as REACH regulation[117] and the EU Directive on Hazardous Waste[118]. Reducing the debris risk with voluntary adherence to international debris mitigating standards is challenging in the case of owning a stake in foreign constellation (Option 3).

Finally, it should be noted that the **size** of the envisaged the Secure Connectivity constellation is not comparable to US and UK constellations (over 10 000 for Starlink in final configuration, 650 for Oneweb, vs a maximum of 200 satellites in the heaviest architecture scenario currently contemplated by industry).

b) Environmental benefits of the services

The initiative has similar positive contribution towards environmental objectives as the Galileo and Copernicus components of the Space Regulation[119]. The PWC study showed that the environmental **benefits stemming from the use of the components is approximately 2 orders of magnitude higher than the environmental footprint generated by the construction**, **deployment (including the launches and the production of launchers) and use over the complete life time** (22 years) of these systems. Out of the 20 positive impacts identified by in the study, secure connectivity could contribute to 16 of them: for example, in-situ sensors monitoring marine environment rely today on radio to transmit data, requiring

[116] LOI n° 2008-518 du 3 juin 2008 relative aux opérations spatiales

[117] Regulation (EC) No 1907/2006 Of The European Parliament And Of The Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

[118] Council Directive 91/689/EEC of 12 December 1991 on hazardous waste

[119] Note that even though of the number of satellites are bigger in this activity than in Galileo or Copernicus, the small size and mass of the satellites coupled with the possibility to launch them in groups of large numbers (e.g. from 12 to 36 satellites in one launch) results in relatively comparable footprint evaluation.

significant energy and thus heavy (and toxic) batteries. A low-data rate (“IoT”) solution would enable smaller, energy efficient in-situ sensors. See figure 11 of the benefits to impact comparison.

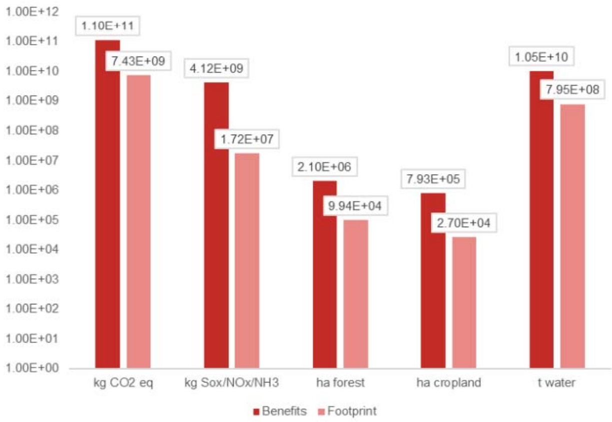


Figure: PWC (2020) Analysis of the Environmental Impact of the EU Space Programme

In addition, the infrastructure will provide communication through space, hereby avoiding the deployment of ground networks, submarine cables, high power cables or fibres (buried in the ground or above the ground). No significant harm will therefore be done to the sustainable use and protection of water and marine resources. Satcom services for maritime surveillance supports pollution detection and response environmental monitoring. In addition, **minimising** environmental risks to a large extent relies on data monitoring. Monitoring data like water levels, land cover change, ice sheet elevation, and ice sea thickness will become even more important and require larger quantities of data being transmitted. The initiative could help to relay data from Earth Observation satellites (such Copernicus) to ensure high-speed delivery of time-critical data to be better prepared, inform citizens, and take action. The services provided by a space-based secure connectivity infrastructure are also expected to provide the communication channels for autonomous vehicles, thus resulting in more energy efficient road transport.

Where the private industry choose to exploit the system for commercial services (potentially Option 2 and 3), low-latency broadband can be beneficial for the environment. For example, smart systems creates energy efficiency by enabling households to have better understand and control their energy management, precision farming can increase input use efficiency and reduce emissions, and IoT applications can be used to track wildlife extension.

Stakeholders' views, including dissenting views, – particularly those of Member States (who will provide the funding) and SMEs and potential disruptive innovators (who will provide the technological input) are still not reflected.

Stakeholders views are extensively reflected in the problem definition, as well as regarding their views on the possible options. Some additional insights and potential orientations are furthermore given by governmental stakeholders regarding the implementation of the preferred option.

a) Problem definition and objectives

As far as **demand** is concerned, the governmental satcom use cases have been defined in a joint work with Member States, the EEAS, the European Defence Agency, with the support of the European Space Agency by consulting Member States and EU Satcom end-user communities. The evolving needs for improved latency, data rate, and other features of the services to be provided are being updated within a classified study that consults EU Member £Stes governmental user capacities on the technical features of their demand.[120]. There is overall a consensus of Member States and end-user communities on the fact that these new evolving needs should be met, and confirm the increasing governmental needs for guaranteed access to secure satcom.

On the ways **to meet these demands**, while there is not yet an aligned view on a single solution, several attention points have been highlighted:

- Several Member States have stressed that the principles established for EU GOVSATCOM should remain: for uses that can cope with less stringent latency needs, the future Secure Connectivity solution should also **rely on existing Member States' and commercial satcom assets and capacities**. New development activities should focus on **complementing gaps and missing links.** In particular, several Member States have stressed the need to cover gaps that are already known, such as the coverage of the Arctic.
- A similar view is expressed by the French Air and Space Academy that considers that 'For all services considered as essential for a sovereign and secure European communication system, the GEO infrastructure meets and will continue to meet needs where there is no stringent requirement as to latency or Polar Regions / global coverage.'[121]

[120] Excerpts of ENTRUSTED study first outcomes are shared in a classified note.
[121] Académie de l'Air et de l'Espace (2021) – AAE Opinion n°12 on European Secure Connectivity

- Consequently, several Member States stress the fact that **the capacity of the future system needs to be adequately sized**. This sizing should be carried out in a joint technical work with Member States. Other Member States have asked that the technical **synergies with new National initiatives** are assessed.
- Several Member States suggested that the system should be **scalable and flexible** enough to **adapt to evolving demand.**
- One Member State highlighted the need for the system to be able to work together with governmental **terrestrial infrastructures** and another asked about the potential interoperability with foreign constellations. This need is also highlighted by the French Air and Space Academy for which 'The envisaged EU infrastructure should be doubly inclusive: a) working alongside and blending with the terrestrial infrastructure; b) integrating European private actors, companies and operators. It is important not to squeeze out the private market but rather to encourage new agile players, such as startups and SMEs, to participate.'
- **Industry players** have highlighted the need for a **significant commitment of the public sector** to build such a solution: Some governmental needs cannot be met by commercial off-the-shelf solutions and will require bespoke technical developments. To venture into these capital-intensive activities, the private sector needs an assurance on the long-term commitment of the Union to buy the services.
- Most Member States have highlighted the necessity to ensure a strong involvement of **NewSpace enterprises** in the setup for service provision.
- Several public and private stakeholders have highlighted the **urgency**, having in mind the progress and advance of non-EU public a nd private projects

b) Available policy options

- Several Member States supported the **concession option**, reminding that the Space Regulation already foresaw that scheme to be adequate to compelement Govasatcom. The fact that several Member States have used a public-private partnership scheme to launch their national govasatcom infrastructure has been recalled.
- In particular, this **scheme allows for a flexible technical solution** and for incremental developments, leveraging existing assest and technical synergies, which also allows for technical evolutions to meet new service needs.
- However, these Member States have also highlighted the fact that a successful implementation of a **public-private partnership scheme entail pre-requisites** that the Commission should consider in terms of roles and responsibilities, in particular on security and technical trade offs.
- One Member State has highlighted that **priority setting rules between governmental and commercial objectives** should be clear.
- One Member State suggested that the use cases for governmental and commercial services **should be split**, with the former being fully public and the latter fully private.

This Member Stated stressed the importance of including lessons learned from Galileo and its first attempt at a concessionaire

- A Member State stressed the need for a **civilian solution under civilian control,** although military users might use the system for their non-Milsatcom needs.
- Most Industry stakeholders have **favoured the Concession option** (See Annex 2 for details). Very few see the possibility of a pure private solution. The Trade association of the European Space Industry shared an economic analysis further explaining why the profitability of such a constellation could not be sustained only by commercial use cases.
- Non EU satcom operators have also highlighted the attractiveness of a solution relying on **non-EU constellations**. A partnership with non-EU constellations (in the form of interoperability) is partially supported by some EU operators as long as this partnership is limited to commercial use-cases.

Most of these stakeholders' views have been incorporated in the text of this second version, in particular in sections:

- 2.2.2 Evolving nature of secure governmental satcom needs – on the evolution of needs (global coverage, latency)
- 2.4 How will the problem evolve?
- 7. How do the options compare
- 8.1 Concession as the preferred option

Overview of how the five main and eight specific comments (C1-C8) of the Regulatory Scrutiny Board (RSB) in its 2nd opinion have been addressed

RSB comments		Report revisions
1) There is still no analytical coherence between the problem definition, objectives, options, criteria for the comparison of options and the definition of future monitoring indicators.		
C1	*Building on the clearer scope of the initiative, the report should create a more consistent intervention logic.* ***First,*** *it should link the governmental needs and use cases identified in a general way at the beginning of the report with the subsequent analysis. The report should demonstrate how the specific needs analysed in the problem definition (e.g. push for autonomous transportation, machine-to-machine and internet-of-things considerations, and access to frequencies) reflect the general use cases.*	Traditionally, satcom has been used for voice communication and data transfer in remote areas (e.g. at sea), but the nature of use cases is rapidly evolving, driven by both technological developments and geopolitical shifts. • Machine to Machine (M2M) and Internet of Things (IoT) • Move towards autonomous transportation and Remote Piloted Aircraft Systems (RPAS) • Increased global coverage needs: Table 1 page 13 **provides a visual synthesis of the above linkages**. All identified use-cases are affected for instance by Machine-to-Machine (e.g. border surveillance increasingly relies on sensors spread on land and maritime borders that require connectivity), or RPAS (e.g. Civil protection operations increasingly rely on unmanned aircraft) It is important to note that **the issue of frequency is not driving a change in user needs** but it is an essential condition to be able to secure future satcom capabilities. The attrition of EU MS frequency portfolio is a factor driving the urgency to act now.
	Second*, the problem definition should clearly demonstrate the issues associated with using non-EU satellite infrastructure, thus justifying the inclusion of a specific objective on autonomous solutions.*	**Connectivity gap cannot be adequately addressed through a non-EU solution** since Member States and EU Institutions require, for governmental needs, a **guaranteed access** in an unrestricted manner to secure connectivity services **without soliciting the assent of a third party.** It should thus be avoided that EU governmental operations could be **disrupted by a unilateral decision of a third public or private party.** Therefore, any critical dependence on non-EU satcom infrastructure would be **detrimental to the integrity, resilience and sustainability of the Union's operations.**
	Third, *the options should address the identified problem and problem drivers and be coherent with them. In particular, there is an apparent contradiction between the assumption in the options that there is supply of the necessary satellite services, and the argument in the*	The problem is not about a **quantitative gap** between supply and demand (GEO capacity) but rather a **qualitative one** between new low latency needs (LEO/MEO capacity) and the existing EU fleet. Initially, satcom has been relying on geosynchronous (GEO) spacecraft. Technical progress has allowed the emergence of non-geosynchronous-orbit (NGSO) communications constellations, comprising low-Earth-orbit (LEO) and medium-Earth-orbit (MEO) satellites to emerge. **There is not today any EU LEO and MEO operational or project**

	problem description that there is insufficient supply.	**capabilities that could meet the evolving governmental user needs.** Figure 4 page 14 below explains these various concepts
	Finally*, the analysis should be more consistent between the criteria used for the comparison of options and the monitoring indicators.*	We ensured an **identical correlation between the criteria used for comparison (section 7.1) and the monitoring indicators (table 8)** by flowing down systematically comparison criteria into monitoring indicators. The following table illustrates this point. **Assessment criteria** have been further clarified in this annex.
C2	*When discussing how the current EU satellite assets are insufficient to meet the evolving government needs, the problem description should contain a more specific analysis of expected future supply and demand trends and explain and analyse the drivers behind the lack of supply.*	A figure on the evolution of EU governmental satcom volume demand has been added in this annex. Furthermore, a detailed table on demand per use case has been added as Annex 4 in this document. It should be underlined that **the problem is not about a quantitative gap between supply and demand but rather a qualitative one** between new low latency needs and the existing EU fleet. - On the demand side, the classified note accompanying the impact assessment provides further information on how MS qualitative requirements are evolving over time. - On the supply side : o the provision of satcom services is a complex interplay between national decisions for governmental systems, and decisions of private companies regarding new investments in satcom commercial systems; o since the Govsatcom market segment is relatively small (compared to the needs of the private sector), and none of the EU Member States has sufficient market power to leverage fully private solutions, it is unlikely that future EU and Member States Govsatcom needs will be spontaneously met by EU private actors; o cost modelling analyses performed by ASD Eurospace[122] highlight that the magnitude of the investment would require a commitment of the public sector to alleviate the risk. Industrial stakeholders have also confirmed this assessment of the market[123]; and finally o although some EU Member States have national satcom systems, none of the EU Member States is planning to develop a global low latency system in the coming decade.

[122] Trade association of the European Space Industry. Annex 3 – Stakeholders consultation further expands the rationale

[123] It is worth highlighting that the lack of a ‘technology push’ offer from Industry does not constitute a market failure, but rather a logical outcome for such a product that (i) requires several hundred-millions upfront non-recurring cost and (ii) that would not be marketable for B2C commercial applications.

	It should further explain the evidence-based rationale and urgency for the initiative, which seems accelerated compared with the timing of the two phases of the governmental satellite communication (GOVSATCOM) deployment.	Urgency for the initiative is mainly due to: - **technological progress** (as evidenced in section 2.2.) that has led to the **emergence of low latency solutions** as from 2018/19; - the emergence of various public-supported or **subsidised non-EU mega-constellations** in the US, China and Russia spurred by this technological progress; - **risk of shortage of available filing and orbital slots** due to exponential increase of these mega-constellations. As each orbit can hardly support more than one or two constellations, the first-comers are better served in terms of positions, bandwidth and priority on frequency use; the others might be prevented reasonable and sustainable service operation. Without timely action, the currently available EU filings will become obsolete. There is therefore a need to proceed urgently, in order to profit from these existing filings. Figure 8 page 18 in section 2.4 illustrates the analysis we conducted on the ITU filing database; - in addition the **EU available frequency filings** that would allow to establish a LEO infrastructure is facing **strong attrition** over time. On top, the EU has a very limited number of filings compared to other players as illustrated in the figure below; - **the lead time** for the design, development and deployment of a space-based system takes several years and needs to be anticipated well in advance. Not all space-based services necessary to satisfy our needs can be developed at a moment's notice.
C3	*The problem description should explain the link between the European Quantum computing infrastructure initiative and the need for EU government satellite infrastructure. It should clarify, in particular, why quantum key distribution cannot happen through secure land communication or through private satellites, and whether key distribution through satellites would not depend on*	The Quantum communication infrastructure EuroQCI is based complementary on a terrestrial **and a space component.** The terrestrial infrastructure will allow covering distances in the range of few hundreds of kilometers. It will be based on Quantum Key Distribution (QKD) nodes linked via optical fibres. Although very secure from a cybersecurity point of view, such infrastructure could still be subject to physical attacks on the terrestrial links themselves (i.e. damaging optical fibres) that would make the service unavailable. The space component allows covering very large distances that are not possible to attain today in absence of quantum repeaters. Once these devices will become available, still, some very large distances would be too costly to cover through ground links, so the space links will remain preferred. Also, the space infrastructure will allow reaching remote/isolated sites all around the globe and specific EU sites that could be located in non-trusted territories such as embassies, etc.

	land communication for at least part of the connection.	Even if both terrestrial and satellite quantum key distribution infrastructures will be interlinked, they will be designed so that they function independently: the availability of the space-based QKD service would not be impacted by unavailability of the terrestrial QKD. **The use of private satellites is not considered compatible with the high security requirements, because the satellite itself should be trusted as it generates (or has access to) the cryptographic keys.**
C7	*The comparison of effectiveness of options should stem logically from the preceding analysis. Moreover, the measures used under each of the comparison criteria (e.g. security accreditation, quantum key distribution payloads, etc.) should be explained, allowing for clear comparability and more straightforward identification of the preferred policy option.*	• Options are compared vis-à-vis: o For effectiveness: against policy objectives set in section 3. o For efficiency against the preceding analyses carried out in section 6 in terms of economic, social and environmental impacts. • The various assessment criteria have been clarified in this annex

(2) The report continues to assume a predetermined technical solution – without specifying it – and consequently artificially limits the scope, design and content of the options to the implementation of this predetermined outcome.		
C4	*The report should provide a wider set of policy options or explain why policy choices are limited to the modes of implementation of the initiative, leaving aside options pertaining to system architecture or scope.*	The logic for our policy options follows a **service-based approach** and not an infrastructure-based one. To acquire a low latency service, our options are: - either to buy off-the-shelf-services; - build our own system; or - co-invest. The policy options to consider do not go through **building an ex-nihilo infrastructure** (with potential architectural trade-offs, as it was the case for Galileo), but consider how the satcom ecosystem could address the gap in the provision of low latency secured services. Therefore we assess:

		i. whether the public or private sector can provide these secure accredited services based on their current capacity (Option 0 – Baseline, or Option 3 – from foreign market providers); or ii. whether the EU needs to ensure the provision of these services by either a. procuring its own system (Option 1 – Fully Public); or b. establishing a public-private partnership (Option 2: Public-private-partnership: EU Concession). In the options where we would **buy a service** (and thus where the private sector has to reflect upon the best architectural approach to meet public sector demand), **the assessment of any architectural trade-off is irrelevant.** **During the procurement process** of the concession, the applicants will propose technical/architectural designs. The Commission will evaluate these proposals against their ability to meet <u>service</u> needs. However, when assessing the options, it becomes clear that **the concession scheme offers also the opportunity to create a considerable amount of benefits through commercial services,** and at the same time, to mutualise capabilities with a governmental system that, alone, would be significantly more expensive and would not create any direct socio-economic benefits. This concession scheme could permit **to build upon** the existing EU satellite communication technological and infrastructural base and to provide robust and innovative governmental services, while allowing the private partner to complement the governmental infrastructure with additional capabilities to offer commercial services including through its own investments. Such a scheme would furthermore **optimise the costs** by sharing development and deployment costs on components common to both governmental and commercial infrastructures, as well as operational costs by allowing a high level of capacity mutualisation. Finally, it would **stimulate innovation** in particular for New Space by enabling the sharing of research and development risks between public and private partners.
	In particular, it should explain why the capacity (and cost) of the system would be the same under the fully public option and the public private-partnership option.	What is the same in options 1 (full public) and 2 (concession scheme) is not the total capacity of the system but the Union's demand for governmental services. **To that end, the cost for the Union is different for each option as set out in** Table 3 page 29 **in section 6.1.1.** In other words, the costs are based on the same Union's demand for governmental services, no matter whether it concerns option 1 or option 2.

	As to the content of the policy options, the report should be more explicit with regard to funding (from EU, Member State and private sources), third party access regime for commercial services, liability as regards joint assets (e.g. satellites), governance and security aspects, explicitly explaining which decisions need to be taken now, which in the future, what they will depend on and what actions they will require.	Regarding the **funding sources**, these are as follows:
		
		- Baseline: 100% EU funding
		- Full public: 100% EU funding
		- PPP: The cost sharing that will be defined in the context of the negotiation of the concession contract. We envisage a blending of various budgetary sources stemming from:
		    o the public sector (2/3) to cover the investment for the governmental service component via EU budget and national funding (either through ESA or national budgets, or in kind contributions);
		    o the private sector (1/3) investment to leverage the commercial service component.
		
		- Stake in Non-EU constellation. The Union would fully finance the acquisition of shares.
		
		Regarding **third party access**:
		- an adequate mechanism should be foreseen in the concession contract to allow other EU telecom operators to use a share of the commercial capacity; and
		- adequate safeguards should be foreseen to avoid any overcompensation of the contractor, distortions of competition, any conflict of interest, undue discrimination and any other hidden indirect advantages.
		
		As regards the **allocation of liability** for loss and damages to assets (and related insurance approach) as well as for service provision, with relevant possible limitation of liability as necessary to ensure the financial viability of the contract, will be foreseen under the concession contract.
		
		Regarding **security governance,** the process set out in the **Space Regulation will be followed.** In terms of steps, this requires that first, a threat and risk analysis is being undertaken, on which basis subsequently general and specific security requirements will be developed and finally flown down to the concession contract.

	It should clarify to what extent the level of private funding will be subject to the outcome of a (competitive) concession award procedure. It should explain how an efficient and timely public procurement process as well as the effective participation of SMEs and innovative start-ups would be ensured. It should also clarify how uncertainty on	Regarding the **procurement process,** it would be carried out in accordance with Title VII of the Financial Regulation, ensuring fair and open competition. In developing the procurement documents, several key principles should be addressed in order for the concession contract to: • define a clear distribution of tasks and responsibilities between the partners; • ensure an appropriate prioritisation of governmental user needs; • the approach to access/exploitation of the infrastructure components, in particular security-related components • allow the provision of commercial services to be defined by the private sector; the Commission should retain the right to assess and approve such services to ensure that the Union's essential interests and Programme's objectives

	the governments' demand for satellite capacity would be managed under the different options. The report should set out a clear timescale for the deployment of the initiative consistent with the immediate needs it identifies	are preserved and adequate safeguards are put in place to prevent distortions of competition and avoiding any overcompensation of the private partner; • define the financing scheme proposed in terms of split between the required public sector investment (either in kind or through availability payments), the offered private sector investment (either in cash or in kind); • define the ownership regime of the assets, implementing a clear distinction between assets to be owned by the Union and assets to be owned by the contractor. - In order to ensure the **New Space involvement** in the initiative, the procurement should elaborate criteria for the award of the concession ensuring the participation of start-ups and SMEs along the whole value chain of the concession, hereby incentivising the development of innovative and disruptive technologies. New Space stakeholders have demonstrated their innovative ideas for the initiative, and the following two studies on 'New Space solutions for long-term availability of reliable, secure, cost effective space based connectivity building on GOVSATCOM' enabled the Commission to leverage these early ideas. The outcome of these studies inputs should be duly considered when drafting the procurement documents. - The procurement should reinforce the **non-critical dependence** of the EU in technological terms, and ensure compliance with requirements related to security, service continuity and reliability by inserting them as minimum requirements or award criteria in the tender documentation. - The Commission should ensure effective and transparent competition by continuing spreading awareness of the procurement within the limits of the Financial Regulation. Regarding the **uncertainty on the governments' demand**, a full public infrastructure would need to be sized at peak demand whereas a PPP option would allow for more flexibility.

(3) The report does not contain any timescale for the initiative nor does it identify where the necessary funding would come from.		
		An **indicative timeline** supporting this objective could be as follows: • End 2022: Adoption of Regulation by European Parliament and Council • 2023: Award of the Concession • 2023-2027: Development and deployment of the infrastructure • 2025: Provision of first low latency services • 2027: Provision of full portfolio of services Regarding the **funding sources**, these are as follows:

		- Baseline: 100% EU funding - Full public: 100% EU funding - PPP: The cost sharing that will be defined in the context of the negotiation of the concession contract. We envisage a blending of various budgetary sources stemming from: o the public sector (2/3) to cover the investment for the governmental service component via EU budget and national funding (either through ESA or national budgets, or in kind contributions); o the private sector (1/3) investment to leverage the commercial service component. - Stake in Non-EU constellation. The Union would fully finance the acquisition of shares.

(4) The impact analysis is incomplete as it continues to lack clarity on methodological assumptions and validity of secondary data cited and broadly employed for the economic estimates, benchmarks and multipliers in relation to the present initiative.		
C 5	*The report should further discuss the methodological validity and assumptions behind the broad economic impact estimates, benchmarks and multipliers just extracted from secondary sources and done for projects of different scope and characteristics. It should also align the used economic multipliers between different parts of the report and the annexes. It should better argue why the public-private-partnership option would generate additional commercial services, as it seems that these services could largely be provided through commercial (most likely non-EU) satellite providers under the baseline.*	**Methodological assumptions** and data stem from authoritative sources: - For the upstream (i.e. space infrastructure deployment), the metrics used stem from Eurostat Input/Output tables and have already been applied in the most recent IA of the Space Regulation, in particular the GOVSATCOM component; - For the downstream, the metrics needed to be adapted to the Telecommunication sector. The authoritative table used is therefore relying on an econometric model developed by the International Telecommunication Union. On **additional commercial services**, our methodological choice is to measure benefits only within the EU. In this context, several evidences tend to demonstrate that space downstream activities emerge preferably close to the upstream ecosystem. An example stemming from the satellite navigation field illustrates this: while GPS has been accessible to civilian use since 1983, location-based services have thrived in the EU only after the start of the deployment of Galileo. The EU satellite navigation market has grown from EUR 27bn in 2009 to EUR 675bn in 2019, reaching a market share comparable to the US.

(5) The report does not specify how the increased greenhouse gas emissions generated by the initiative would be compatible with the objectives of the Climate Law.		
C6	*Also for the environmental impacts, the report should better justify why impacts from this initiative would be similar to those from other EU space programmes. It is, for example, not clear why the environmental benefits would be similar to those of Copernicus, which has a much clearer focus on earth observation for environmental purposes. The report should also specify how it would ensure that the increased greenhouse gas emissions from large-scale satellite production and launches would not have negative effects on the trajectory to climate neutrality of the Climate Law.*	• **Greenhouse gas emissions**. We acknowledge that deployment generates greenhouse gas emissions. Using the metrics developed by PwC, we estimate that deploying and maintaining the constellation (in the heaviest architecture contemplated by the private sector[124]) over 20 years would generate 5 Mt CO_2, i.e 0,25 MT per year, which would represent 0.0008% of 2020 emissions. • It should be noted that technologies allowing space industry to be carbon neutral do not exist for the time being. Therefore, a **carbon offsetting scheme** is being proposed. • As regards the **environmental footprint**, there is no difference between manufacturing and launching a satellite, whether it is aiming at serving Copernicus or secure connectivity. The conclusions of the PwC study assessing the impacts of the Space Programme is valid for Secure connectivity. The number of satellites may be bigger in this initiative than in Galileo or Copernicus, however satcom satellites have a comparably smaller size and mass, which means that they can be launched in large groups, hereby reducing launch emissions. • As regards **environmental benefits**, out of the 20 positive impacts identified by PwC, secure connectivity could contribute to 16 of them: for example, in-situ sensors monitoring marine environment rely today on radio to transmit data, requiring significant energy and thus heavy (and toxic) batteries. A low-data rate ("IoT") solution would enable smaller, energy efficient in-situ sensors. • Finally, it should be noted that the **size** of the envisaged the Secure Connectivity constellation is not comparable to US and UK constellations (over 10 000 for Starlink in final configuration, 650 for Oneweb, vs a maximum of 200 satellites in the heaviest architecture scenario contemplated by industry).

[124] Described in classified annex

5. EVIDENCE, SOURCES AND QUALITY

The Commission contracted an independent consultant Roland Berger to support the analysis of the indirect benefits of the initiative through providing the econometric support and analysis.

Quantitative and quantitative data supporting this impact assessment has been collected from Member States, and relevant industry stakeholders. This report also draws on the work of the Commission on the GOVSATCOM component of the EU Space Programme, and EuroQCI, as well as on the research activities conducted within the framework of the ENTRUSTED project. The impact assessment has also leveraged the consultation of end-user communities held within the framework of the study on 'Building Blocks Towards a Secure Space Connectivity System'.

ANNEX 2: STAKEHOLDER CONSULTATION

Introduction

The Commission actively engaged the stakeholders in the process of the initiative and consulted them on GOVSATCOM services and European secure quantum communication infrastructure (EuroQCI), as well as in the context of the Action Plan on Synergies between Civil, Defence and Space Industries.

Interaction with stakeholders will also regularly take place via the Expert Group on the Aerospace & Defence Ecosystem. Public consultation regarding civil user needs has been conducted in relation to the Digital Single Market Strategy and is ongoing through studies on the SatCom market. The relevant consultation activities are listed below.

In addition, a public consultation was conducted within the period between 26 August and 23 September 2021 on the inception impact assessment of the space-based secure connectivity initiative[125]. The key findings of this consultation are summarised below.

The facts and date collected via the stakeholder involvement were important for the impact assessment, enabling the Commission to substantiate, validate, develop or modify the problems and their drivers, and the corresponding objectives identified in the inception impact assessment and to elaborate a list of specific possible policy measures and policy options which could address each of the problem drivers identified.

1.1. Overview of the Relevant Stakeholder Consultations

The following relevant consultations of stakeholders have taken place or are planned, including workshops and ongoing studies:

Date	**Name**	**Activity**	**Description**	**Reference**
2016	Satellite Communications to support EU Security Policies and infrastructures	PwC study for GOVSATCOM impact assessment	This study analysed the risks and problems associated with each mission of security actors as potential **EU GOVSATCOM users.**	Ref. Ares (2016) 1563278, see here

125 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13189-EU-space-policy-space-based-secure-connectivity-initiative_en

15.03.2017 (or we could say ongoing as we still get input)	High Level Civil Military User Needs for Governmental Satellite Communications (GOVSATCOM)	Distribution to Member States (the Political and Security Committee)	The **user needs for governmental users** have been largely collected in the phase that led to the definition of the GOVSATCOM component of the EU Space Regulation, on which the secure connectivity initiative is based. The data have been collected in the document.	ref. EEAS(2017) 359 published here
15.06.2017	**Workshop on security users for GOVSATCOM**	Workshop industrial actors (manufactures, operators)	Brought together some 80 representatives of the various sectors concerned. In both events, the hybrid policy-options for GOVSATCOM were presented which had been adapted to incorporate stakeholders' initial comments. Both meetings delivered the necessary feedback for the Impact Assessment for GOVSATCOM.	
06.06.2017	High-level meeting with member states and observers on GOVSATCOM	High-level meeting with member states and observers	**Workshop with EU Member States satellite communications security users, EU agencies involved, institutional actors (space agencies, procurement agencies, etc.) and Industry Associations for GOVSATCOM.**	
2019	Preliminary market consultation on GOVSATCOM	Preliminary market consultation	As part of the **preparation of the GOVSATCOM programme, an extensive public preliminary market consultation** was carried out through a call for Call for Expression of Interest.	Link
30.06.2020	Market consultation in preparation of the innovation partnership procurement of GOVSATCOM Hub(s)	EUSPA Market consultation	The objective of the market consultation was to confirm whether **technical solutions for the GOVSATCOM Hub(s)** infrastructure, as described in paragraph 1, already exist in the market or as near to market development activity.	Link

12-13.11.2020	Impact of the Covid-19 pandemic on EU Aerospace and Defence ecosystem	Workshop	**The workshop in particular consulted on space-based secure connectivity.**	Link
23.11.2020	Roadmap for the Action Plan on Synergies between Civil, Defence and Space Industries	Public Consultation	The **roadmap included a point regarding secure connectivity.**	Link
16.12.2020	The EU's Cybersecurity Strategy for the Digital Decade	EU's cybersecurity strategy	**EuroQCI** is part of the EU's cybersecurity strategy.	JOIN(2020) 18 final
19.03.2021	Digital Day 2021	Event with Member States	The event brought together **Member States to discuss current and future challenges of digital technologies** and commit to addressing them, including **secure connectivity.**	Link
Ongoing	GOVSATCOM and EuroQCI: Building Blocks Towards a Secure Space Connectivity System	Study on GOVSATCOM and EuroQCI	The study is collecting data from more than 60 relevant input documents on the subject, and will deliver an **aggregated elaboration of user needs for GOVSATCOM and EuroQCI** in the first half of 2021.	Contract ref. DEFIS/2020/OP/0008
Ongoing	ENTRUSTED	Study	A network of Users for governmental Satellite Communications (including Member States and EU agencies) has been set up which will support the **establishment of high level civil and military user needs for EU GOVSATCOM**. They are currently being represented in the coordinated and support action managed by the GSA called	Link

			ENTRUSTED, which is open to participation of EU Member States institutions.	
Ongoing	Study on the System Architecture of a Quantum Communication Infrastructure	2 Studies on EuroQCI	Launched in 2020, the studies did contribute to the analysis of use cases and the **description of the corresponding user requirements that the QCI** would have to satisfy. This work was carried out through a wide consultation of governmental and private users, with the support of participating Members States of the EuroQCI initiative. The user needs for the EuroQCI use cases are now defined to a great extent. A new system study has started in Q1 2021, which will allow to further accurately describe the user requirements and use cases in order to determine the possible options of the architecture design.	SMART 2019/0086 - LC-01381549 and LC-01381564
Ongoing	EU space economics and the global context	Study by SpaceTEC and EuroConsult	Includes satellite communications sectorial analysis providing amongst other results a forecast on key sectoral trends and SWOT analysis, hereby **identifying satcom user needs for consumer broadband, aerospace, enterprise, maritime amongst others.**	DG DEFIS FWC 712/PP/2018/FC
31.05.2021	Member States workshop on Secure Connectivity	Workshop with Member States	The workshop shared the technical findings of the consortium study, and of the legislative process by COM representatives, who interacted with Member States during the Q&A.	
15.06.2021	Secure Connectivity Initiative: Opportunities for	Workshop with SMEs and start-ups	The workshop was designed to be attended by both industry and COM representatives, who interacted within guided discussion sessions and via short scheduled matchmaking sessions. The event	

	the European New Space Ecosystem.		included technology focus sessions at which preselected presenters showcased their solutions and engaged in guided panel discussions relevant for the topics of the **Secure Connectivity Initiative.**	
26.08.2021 to 23.09.2021	Inception impact assessment	Public Consultation on the Inception Impact Assessment		Link
30.11.2021	Member States workshop on Secure Connectivity	Workshop with Member States	The workshop shared the technical findings of the consortium study, and of the legislative process by COM representatives, who interacted with Member States during the Q&A.	

1.2. Focus on Public Consultation on the Inception Impact Assessment

On 26 August 2021 the Commission published for public feedback the draft inception impact assessment highlighting the core objectives of the secure connectivity initiative.

In total 13 stakeholders submitted their feedback, representing the views of a group of EU poorly densed territories (1), private companies (8), business associations (2), a non-governmental organisation (1), and a private citizen (1).

Options in the public consultation was:

0. baseline
1. EU owned space infrastructure
2. Fully private infrastructure
3. Public Private Partnership – Concession
4. Purchase of a minority stake in one of the non-EU constellations being built

It has to be noted that since the public consultation exercise, option 2 - full private infrastructure has been discarded but for the sake of transparency and completeness, it is still presented.

Private companies:

	0	1	2	3	4
SES				+	
Intelsat					
Hispasat				+	
Airbus DS	---	-	+	+	For Commercial
Telesat			+	+	+
Eutelsat	---	---		+	++[126]
Oneweb				+	++
ArianeEspace	---			+	---

SES - Satellite and terrestrial telecommunications network provider

Preference for PPP with a concession and/or availability model. Best balance of outcomes for the EU and member states. Positive towards general objectives and overall framework.

Some general remarks on ESSCS:

- Focus shall be on principal geographies and markets indicated as of strategic interest by the European Commission.
- These shall be served by a hybrid of various orbits, taking advantage of existing and committed assets and creating a more sustainable and less costly architecture.
- Propose integrated multi-orbit constellation and gradually deploy and scale up – leveraging existing/committed MEO/GEO assets to be complemented by LEO assets, and take full advantage of the relative merits of each obit, based on relevant use cases.

Intelsat (US HQ) - Communications satellite provider

[126] Eutelsat has recently acquired a 24% stake in Oneweb

Positive towards the ESSCS initiative. No explicit statement on which model is preferred but stresses the need for:

- Durable partnerships with industry
- Open and fair procurement processes grounded on security, competitiveness, and technological-efficiency considerations crucial in ensuring that the EU remains a competitive market.
- Autonomous, reliable and cost-effective access to space can only be achieved by making full use of available competitive and diversified solutions
- Strong advocate for mixing of technologies: not only innovation offered by LEO satellites, but also state-of-the-art existing GEO capabilities, as well as combining of terrestrial and space-based platforms.

Hispasat - Spanish satellite communication operator

Company endorses ESSCS. Preference for PPP model with EC as anchor customer.

General comments:

- the use of current and planned assets from EU operators is deemed essential for ESSCS.
- Seen the maturity of the EU satcom market, the initiative should no distort the existing commercial markets.
- ESSCS should cover multiple orbits.
- Company is working actively on GEOQKD mission with ESA.

Airbus DS France

Strongly supporting ESSCS. No clear preference for a policy option, but notes that they do not favour the baseline option and states that Option 1 should not preclude the private sector from running the services. Under option 3 Airbus notes that EU long-term commitment is necessary. For the 4th Option they note that it should only be considered for commercial services due to the security requirements linked to governmental services.

- ESSCS shall rely on seamless integration of terrestrial and space components.
- Modular architecture to provide first services quickly, that can later be expanded.
- In order to be more independent from non-EU states, intersatellite optical links are a way to go.
- GovSatCom hub start early as possible.
- Chosen policy option shall not compete or distort satcom commercial market.

TELESAT - Canadian Satellite Operator

Company endorses ESSCS. Telesat believes that it could work with any of options 2 -4. It has similar PPPs with Governments of Canada, Quebec and Ontario

General Comments

EUTELSAT - French-Based satellite operator

- Eutelsat welcomes the initiative and the issuance of the Inception Impact Assessments
- strongly believes that the future EU autonomous and secure infrastructure for connectivity will be an accelerator of the EU digital transformation and a booster for competitiveness.
- Supports option 3b and 4, somewhat positive to Option 3a, and negative towards Option 1 and 0.
- More generally, relying on non-EU satcom assets in which EU companies have industrial/capital interests and play a substantial role would help the EU to control the level of external dependency, and manage the associated risk. Option 4 would also help fast-track the EU's access to the future of satcoms, and enjoy the distincitive advantages that some of those constellations can offer.

General comments

- High risk that the EU lose the constellation race
- Given this sense of urgency, the EU should meet short-term objectives, to keep up with the rapid growth and evolution of user needs
- The EU can count on the full support of its satcom private industry
- Providing a reasonable level of predictability of the initiative for the establishment of the System (calendar and budgets), as the industry would need to engage in this initiative large, valuable human and financial resources, and this for a long time
- not only focus on the long-term perspective, meant to lower dependencies and address technology gaps

OneWeb – UK-Based LEO Constellation Satellite Operator

- Company endorses ESSCS, and Option 3 and 4, and suggests a combination of the two options: Start with acquiring capacity through an existing constellation operator, then gradually build up the PPP. Regarding Option 4 it notes that it is the most cost-efficient solution and allow for the fastest implementation timeline.

Arianespace

- Company endorses ESSCS, and notes that Options 0 and 4 would **not bring** answers to the Key Problems listed by the Commission, starting with the growing demand and lack of infrastructures and well as the risk of strategic dependency & loss of digital and space sovereignty. All other options could allow to achieve the strategic objectives set by the Commission, although a **PPP seems a good way** to best address both the EU GovSatCom and commercial market needs

Both professional organisations strongly support the initiative but both insist on urgency to implement because of growing scarcity of orbits and frequencies.

ASD-Eurospace – Association representing the European space manufacturing industry

- **Associations strongly supports the initiative** - It will help the Union to remain a leading international player with freedom of action in the space domain, and will support the competitiveness and innovation capacity of space sector industries within the Union
- **Options**: all **possible indicative policy options** considered by the Commission would meet sovereignty and autonomy requirements allowing to promote and favour a support towards a dynamic, innovative and publicly supported EU-based industry
- **General comments:** The Association highlights the benefits from a partnership between the EU and ESA in particular for the underlying key technologies and product roadmaps supporting the programme to ensure the best use of ESA's heritage in that domain. The Association insists on the urgency to implement this new Flagship.

ESOA – Association representing 22 global and regional satellite operators.

- The Association welcomes the initiative
- The Association notes that Non-European players have benefited from targeted industrial policy & funding frameworks, which led directly to significant progress and innovation in satellite communications outside the EU, notably in the United States.
- **The initiative is therefore late.** There is a need for the Commission to ensure best chances of success, provide a demonstrable return on taxpayers' money, and ensure minimum risk exposure through an initiative that would **leverage the scale, knowledge, and customer base of European satellite operators.**

1.3. Focus on previous consultations on governmental satcom services (GOVSATCOM and high level meetings in the frame of the definition of the GOVSATCOM component of the EU Space Regulation

Who was consulted?

Governmental organisations are the main EU GOVSATCOM users and therefore main stakeholders. The regular meetings of the Experts Group thus covered an essential part of the consultation. Between April 2016 and April 2021, the Group has met 8 times to elaborate the high-level civil-military user needs and to cover other relevant topics including the requirements for the potential use cases

Additional consultations were launched to target specific stakeholder groups. These consultations were carried out as part of the impact assessment, during bilateral contacts with MS' authorities and industrial actors.

The main focus of this targeted consultation was on Member States and Industry:

- Member States were consulted in their double function as potential providers of governmental satcom capacities and as future users of EU GOVSATCOM. In bilateral discussions the

Commission discussed with the interested national administrations (including line-Ministries, Military forces and potential civilian users) their experiences and capacities, their current and future national needs, and their expectations with regard to an EU initiative.

- On the side of industry, all relevant domains were covered from satellite operators and service providers to satellite manufactures and SMEs

The exchange of views took place

a) within expert group and bilateral meetings
b) Workshops with Member States and Industry

Main results of the GOVSATCOM Expert Group and bilateral meetings

- Most Member States expressed explicit support for the principle of an EU initiative to provide a step-by-step solution based on existing satcom assets. Interventions also generally supported the overarching objectives. One Member State underlined the need to guarantee the EU's strategic autonomy, based on European technologies and capacities. Other salient points were the need to tackle the security aspects in a timely manner, and to define the overall systems architecture and Services' requirements. **Several Member States confirmed the increasing governmental needs for guaranteed access to secure satcom.** Some suggested using existing national surplus capacity as a starting point, while others proposed the integration of adequate commercial or PPP capacity from the outset.

- Regarding the issue on whether and how to aggregate the existing demand across the civil and military spectrum, and across the EU and national boundaries, one Member State stressed the need for a **civilian solution under civilian control,** without recourse to national military satcom assets. One other Member State underlined that the initiative should federate civilian and military demands. It should also rely on Member States' and commercial satcom assets and capacities, build on ESA and EDA work, focus on gaps and missing links, and put in place hybrid solutions on a permanent basis.

- One Member State recalled the **need to tackle possible frequency and spectrum issues in the International Telecommunication Union (ITU)** context.

- Several Member States stressed that national capacities alone might possibly satisfy short-term needs, but will not be sufficient in the long run. **Some of the gaps (e.g. Arctic)** are already known.

- Regarding the long-term financing of capacities, incl. the renewal of existing space assets, the filling of gaps, or the provision of global coverage, most interventions agreed that the EU Budget should pay for the EU GOVSATCOM usage by EU institutions and Agencies. Some also argued that EU GOVSATCOM should become a full-fledged, budget-financed EU

Program. Others suggested leveraging the market to the extent possible in the short-term, to explore co-financing by Member States and commercial actors, to look into what ESA could do on innovation and R&D, or to address the long-term issues later.

- The Commission has held bilateral meetings with ASD Eurospace experts. The outcome is that there are no plans for EU private companies of creating a satcom constellation that will meet the evolving governmental low-latency and global needs. ASD Eurospace provided a possible explanation behind the lack of an EU initiative: The purely commercial business case is not convincing due to the large price related to the infrastructure (requiring hundreds of LEO satellites to be launched for assuring a dense global coverage), the limited lifetime of satellites and the limitations on the market. Mega-constellations provide a global coverage, however, the need for global coverage is not constant, and means that the satellites often will be covering places on earth where there is no commercially sellable market (e.g. coverage on high seas, deserts or areas where competitors have the market). With an expensive system that only provides sellable services a limited amount of time, the demand will need to be extremely high to cover the investments. Because of these factors, Oneweb declared chapter 11 bankruptcy in March 2020, but was revived thanks to a $1 billion strategic investment by the British government and Bharti Global, an Indian telecoms conglomerate. This illustrates the lack of a purely commercial business case, combined with major governmental strategic advantages for those that manage to gain access to such satcom mega-constellations. No LEO satcom constellation have yet proven to be profitable.

Main results from workshops

- During the **Secure Connectivity State of Play workshop with Member States on 31 May 2021**, the Commission presented the outcome of the technical studies (including use-cases and different orbital solutions) and possible exploitation models.
  - Member States supported the integration of GOVSATCOM, EuroQCI into the Secure Connectivity. In addition, Member States stressed the need for the involvement of New Space, and welcomed the upcoming New Space study.
  - With regards to exploitation models, one Member State suggested that the use cases for governmental and commercial services should be split, with the former being fully public and the latter fully private. One Member Stated stressed the importance of including lessons learned from Galileo and its first attempt at a concessionaire. Another suggested the Commission look at is creating a company with public actors as shareholders (option 3).
- During the **Secure Connectivity State of Play workshop with Member States on 30 November 2021**, the Commission presented updates from the current technical study and information about the New Space studies. The Commission also presented the objectives and the target exploitation model.

- Member States reaffirmed the need to integrate their existing capacity, and the GOVSATCOM hub. Several Member States stressed the importance of involving New Space and EuroQCI in the initiative, and one asked how the Commission would handle risks relating to the use of disruptive technology. One Member State highlighted the need for the system to be able to work together with the terrestrial infrastructure and another asked about the potential interoperability with a foreign constellation (option 3).
- Several Member States asked about how the Commission would separate the governmental and commercial services to ensure the necessary level of security, in an option 2 configuration.

- During the **Secure Connectivity Workshop for the European New Space Ecosystem** on 14 June 2021, 458 participants (including 196 SME and start-ups) discussed innovative ideas for the Secure Connectivity initiative. The workshop was divided into four different sessions where SME and start-ups presented and discussed innovative satcom solutions. The workshop showed that the **New Space ecosystem is technological advanced and eager to contribute to the initiative**. It also demonstrated ways in which a new initiative could benefit from their solutions and what challenges they have of bringing it to market, for example:
  - SMEs and startups involved in the fields of operations and service provisions, discussed how technological innovation can occur if the appropriate enablers are put in place. **In this respect, SMEs and startups could become essential in engaging commercial users, because their innovation capabilities is the best instrument to drive the creation of new services, new solutions favouring the uptake of the system in all market niches**
  - The flexibility to use standard modularised components to build satellites has enabled New Space to find its place in the space ecosystem; European New Space will increasingly not only offer one-off missions, but solutions based on constellations of nano and small satellites in innovative orbits. **New Space companies are aiming at making more advanced capabilities available to potential customers using technologies that are not used yet** (such as W-band), and that traditional players may not be looking at yet.
  - Participants brought new technologies to the table ranging from electric propulsion, to digitalized and reprogrammable satellites. **They underlined the double challenge of having credible commercial demand for their satellite platforms and resilience in front of increased competition.**

ANNEX 3: WHO IS AFFECTED AND HOW?

1. Impacts on Affected Stakeholder Groups

The impacts of the preferred option are expected to fall on different stakeholder groups (Member States, EU institutions and agencies, satellite communication service providers, and EU citizens) to different degrees. The estimates of the expected financial impacts are uncertain, as they are strongly influenced by a large number of assumptions, limited by the available evidence used to quantify them and by the simplification inherent in modelling. The indirect benefits are, however, somewhat more certain and the direction of the impacts (i.e. whether a stakeholder group in aggregate benefits or incurs costs) are presented with a reasonable level of certainty, although it should not be used to infer the expected impact on individual stakeholders.

1.1 Member States

Member States' national and regional governments would benefit from an access to a system that would provide security, civil protection, or law enforcement organisations with a connectivity system under EU control, rather than procuring services in several fragmented procurements with various service providers, some under third-countries control. The use of a common system should also ensure a better interoperability between these services, be it at national or EU level. The Member States would incur some direct costs in procuring the necessary ground infrastructure – i.e. user segment. However, the system interoperability should also favour economies of scales in the receiver segments by reducing the number of standards used.

1.2 EU Institutions and Agencies

The impact on the EU institutions and agencies would be similar to the impact on the Member States. The EU institutions and agencies would also benefit from an access to a connectivity system, without procuring different services from different service providers.

1.3 Satellite Communication Service Providers

The European satcom service providers would incur part of the initial CAPEX in order to deploy the infrastructure envisaged in this initiative. However, once deployed, the satcom providers, next to providing services to the government users, would also have the opportunity to scale the system in order to also provide commercial services to the mass market.

1.4 EU Businesses

Various EU businesses would benefit from the secure connectivity initiative. The telecommunications operators would benefit from the increased capacity and reliable service offered by the proposed infrastructure, and therefore would be offer a higher quality of service to their customers. If the commercial services are exploited, the retail services would be able to reach more customers across the entire EU due to closing of the digital divide. Businesses would benefit from the secure and reliable connection, making them less vulnerable to cyber threats and service disruptions. EU space industry, including the New Space industry, would benefit from the R&D funding, enabling innovative and competitive solutions.

1.5 EU Citizens

Citizens across the EU would benefit from the enhancements brought by the secure connectivity initiative in the area of civil protection and national security. Furthermore, the citizens, particularly those living in remote and rural areas, could benefit from access to a reliable and secure broadband connectivity. Furthermore, due to closing of the digital divide an increasing amount of the EU citizens could benefit from the digital government services such as e-governance, e-health, or e-education.

5. Summary of costs and benefits

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
N/A	N/A	There are strategic benefits related to security and reliability of governmental satcom services stemming from the deployment of an EU space-based secure connectivity infrastructure.
Indirect benefits		
Fostering the growth of the EU space sector	Six times the invested value	The initiative would enlarge the potential of the EU space sector, foster the downstream sectors with the offering of EU-based secure satellite solutions, and tackle weaknesses like the lack of ICT adoption and low investments in remote regions. Investments in Space upstream infrastructure is estimated to generate a six-fold impact in downstream sectors.
GDP increase	Six times the invested value	The initiative is estimated to generate an increase of the European GDP through transactional effects (investment in the space economy increase the value added in this sector, of suppliers and the wider economy due to expanding business and additional salaries which raise consumption), spillover effects (downstream sectors use the services, technologies and data provided by the space sector to enhance their business) and additional government revenues. Investments in Space upstream infrastructure is estimated to generate a six-fold impact in downstream sectors

Job creation	Minor impact on jobs creation in Space Industry	It is estimated that the establishment of the EU space-based secure connectivity system would create new jobs directly related to the design, deployment and operation of such system, as well as in the downstream market.

II. Overview of costs – Preferred option							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Establishment of an EU space-based secure connectivity system	Direct costs	N/A	N/A	N/A	N/A	N/A	N/A
	Indirect costs	N/A	N/A	N/A	N/A	procuring the necessary ground infrastructure – i.e. user segment	N/A

ANNEX 4: CAPACITY DEMAND GROWTH

Extract from the study 'Building Blocks Towards a Secure Space Connectivity System'

#	Group	Use case	2025-2030 Total addressable market (Mbps)	2030-2040 Total addressable market (Mbps)
1	Surveillance	Border & Coast Surveillance	600.00	1,200.00
2	Surveillance	Maritime surveillance and control	1,600.00	4,000.00
3	Surveillance	Connectivity for Vessel operators	96,000.00	192,000.00
4	External Action and Crisis Management	Maritime Emergencies	120.00	240.00
5	External action and crisis management	Police interventions	1,600.00	5,000.00
6	External action and crisis management	Civil protection	6,000.00	15,000.00
7	External action and crisis management	CSDP/CFSP missions and national defence operations	4,200.00	8,200.00
8	External action and crisis management	Humanitarian aid	360,000.00	710,000.00
9	Key Infrastructure	Institutional communications	500.00	800.00
10	Key Infrastructure	Air Traffic Management (ATM) Future Reduced Crew Operations Urban Air Mobility	1.12	2.86

11	Key Infrastructure	Flight operations and Maintenance connectivity	83.00	188.00
		GADSS (Global Aeronautical Distress & Safety System)	900.00	900.00
12	Key Infrastructure	Rail Traffic management	8,000.00	12,500.00
13	Key Infrastructure	Road Traffic Management	-	
14	Key Infrastructure	Space infrastructure – Copernicus secure data relay	5,000.00	10,000.00
15	Key Infrastructure	Space infrastructure – Galileo/EGNOS data transmission	43.75	85.00
16	Key Infrastructure	Energy production and transport	9,000.00	15,000.00
		Utilities production and transport	9,000.00	15,000.00
17	Key Infrastructure	Healthcare management (Medical connectivity)	40,000.00	250,000.00
18	Key Infrastructure	Finance – Banking (transaction data, connected branches and ATM)	600.00	800.00
		Finance – Banking (High Frequency Trading - HFT)	1,600.00	2,000.00
19	Specific Use Case for Arctic Region	N/A	-	

ANNEX 5: ENVIRONMENTAL IMPACT

Developing and launching a satellite system into space has impacts on the environment. An assessment of the extent the initiative will do harm to the climate and environmental objectives of the Green Deal, is therefore required.

For the purposes of this initiative, the "do no significant harm" principle is to be interpreted within the meaning of Article 17 of the Taxonomy regulation[127].

Art. 17	Metric	Option 1	Option 2	Option 3
(a)	An activity is considered to do significant harm to **climate change mitigation** if it leads to significant greenhouse gas (GHG) emissions;	Compared to other industry sectors, the manufacturing of spacecraft does not emit significant GHG emissions[128]. Moreover, once in service, the system does rely only on solar power. The initiative has similar positive contribution towards environmental objectives as the Galileo and Copernicus components of the Space Regulation[129]. A dedicated study on the environmental benefits stemming from the use of the components is approximately 2 orders of magnitude higher than the environmental footprint generated by the construction, deployment (including the launches and the production of launchers) and use over the complete life time (22 years) of these systems.		No further environmental impact as it rely only on existing satcom capacities.

[127] The 'Taxonomy Regulation' refers to Regulation (EU) No 2020/852 on the establishment of a framework to facilitate sustainable investment, by setting out a classification system (or 'taxonomy') for environmentally sustainable economic activities.

[128] Eurostat Manual of Supply, Use and Input-Output Tables (2008)

[129] Note that even though of the number of satellites are bigger in this activity than in Galileo or Copernicus, the small size and mass of the satellites coupled with the possibility to launch them in groups of large numbers (e.g. from 12 to 36 satellites in one launch) results in relatively comparable footprint evaluation.

			Option 2 and 3 allows for a wider range of downstream applications that can have positive benefits for climate change mitigation. For example, by improving connectivity in the EU population can lead to a higher uptake of environmental friendly solutions, such as ‘smart’ systems and applications, and create less pressure on polluting transportation.
(b)	An activity is considered to do significant harm to **climate change adaptation** if it leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets;	The initiative will have positive impact on the climate change adaptation, by providing a continuous communications infrastructure in situation of disrupted infrastructure, notably caused by floods, hurricanes or other extreme weather events caused by climate change. Satcom services for maritime surveillance supports pollution detection and response environmental monitoring. See also application of article 17 (a).	
(c)	An activity is considered to do significant harm to the **sustainable use and protection of water and marine resources** if it is detrimental to the good status or the good ecological potential of bodies of water, including surface water and groundwater, or to the good environmental status of marine waters;	The infrastructure will provide communication through space, hereby avoiding the deployment of ground networks, submarine cables, high power cables or fibres (buried in the ground or above the ground). No significant harm will therefore be done to the sustainable use and protection of water and marine resources.	
(d)	An activity is considered to do significant harm to the **circular economy,** including waste prevention and recycling, if it leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources, or if it significantly increases the generation, incineration or disposal of waste, or if the long-term	In general connectivity and IoT constitute a key enabler of circular economy solutions.	

	disposal of waste may cause significant and long-term environmental harm;	A number of applications enabled by the present initiative will therefore enhance the circular economy. For instance, applications developed to ensure traceability of industrial goods (e.g. industrial gas containers, rolling stock material) and hence their recyclability could rely on the provision of a ubiquitous IoT connectivity service.[130]	
(e)	An activity is considered to do significant harm to **pollution prevention and control** if it leads to a significant increase in emissions of pollutants into air, water or land;	The system would be built in compliance with the REACH regulation and the EU Directive on Hazardous Waste. In addition, what concerns the potential long-term environmental impact in space, adherence to voluntary international standards on the protection of the space environment (COPOUS and IADC) and with national legislation (e.g. French LOI n° 2008-518 relative aux opérations spatiales)	As the infrastructure is built without EU involvement, adherence to environmental standards can therefore not be guaranteed.
(f)	An activity is considered to do significant harm to the **protection and restoration of biodiversity and ecosystems** if it is significantly detrimental to the good condition and resilience of ecosystems, or detrimental to the conservation status of habitats and species, including those of Union interest.	• Similar to the benefits related to the application of 17 (b). • In addition, satcom supports IoT applications that can be used to track wildlife extension.	

Figure 13: "do no significant harm" analysis

[130] Where the circular economy and the Internet of things meet | | European Commission (europa.eu)

In conclusion, the secure connectivity does not significantly harm any of the environmental objectives, and even more can contribute to reduce the environmental impact of other activities. **The benefits are therefore much higher than any harm**. Finally, it is important to recall that the Commission has decided to impose environmental objectives to its partners in the Financial Framework Partnership Agreement concluded with the EUSPA and ESA, when implementing the Space Programme with EU funds. The same will be foreseen for tasks to be entrusted to EUSPA and ESA in the framework of the secure connectivity initiative.