



GNSS INVESTMENT REPORT

An analysis of investment needs and funding gaps in support of the creation of fit-for-purpose financial instruments

2021

Submitted by





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Rue de la Loi 26, B-1040, Brussels

T: +32 49 264 08 26

E: leftferis@evenflow.eu; w: <http://evenflow.eu/>



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35 rue du Congrès, 1000 Brussels, Belgium

T: +32 2 229 19 02; F: +32 2 227 27 80

e: rflytkjaer@le-europe.eu; w: <https://le-europe.eu/space/>



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Via Torino 61, 20121 Milan (MI), Italy

T: +39 (0)2 72 733 1; F: +39 (0)2 72 733 350

e: p.testa@vva.it; w: www.vvaconsulting.net

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Executive Summary

In the last few years, Europe has maintained strong positioning in the global competitive landscape of GNSS (Global Navigation Satellite Systems) downstream solutions. These are products and services enabled by GNSS signals, such as hardware components and devices (e.g. antennas, semiconductors, receivers), solutions integrated into systems (e.g. road vehicles, consumer electronics), or value-added services (e.g. location-based services, mapping).

In a market with expected revenues of almost €220bn in 2022 and forecasted revenues of €510bn in 2032, Europe holds a share of around 25%. Moreover, several European companies hold a leading position in several sectors. This includes GNSS component and receiver manufacturers in Road and Maritime and system integrators in Agriculture. However, with European companies holding low shares in fast-growing sectors (e.g. Consumer Solutions, Drones) and with increased competition across the full spectrum of downstream GNSS activities, the positioning of Europe is being challenged. **Understanding the investment dynamics of European competitiveness and strategic autonomy against the trends in the global landscape is therefore essential.**

Recognising this need, EUSPA signed a Memorandum of Understanding (MoU) with the European Investment Bank (EIB) in September of 2019. Through the MoU, **EUSPA and the EIB seek to promote R&D investments and pilots in the GNSS market and encourage the mobilisation of GNSS funds.**

Against this background, EUSPA – in collaboration with the EIB – has commissioned the present study with the aim to **analyse investment needs and funding gaps for EU GNSS companies, ultimately producing suggestions that may help these institutions and DG DEFIS to design and implement operationally fit-for-purpose actions and financial instruments.** The study, carried out by a team of contractors with long-standing experience in measuring and monitoring the global GNSS market and the innovation ecosystem, has assembled and analysed an extensive body of knowledge formed through targeted desk research, exploitation of multiple databases and direct insights solicited through a dedicated survey and selected interviews. **Key data on large system integrators, rising stars (companies which have completed Series A with an implied equity valuation not lower than €30m) and start-ups/SMEs/Mid-Caps has been collected to help illuminate their current situation, and to also understand their future perspectives.**

A careful selection and study of European GNSS companies has been performed in an effort to analyse their investment needs and funding gaps. [EUSPA's database](#) of such companies has been utilised to construct the sample. Further sources have been included to complement the analysis with financial data (e.g. Orbis database), information on investment activities (e.g. Crunchbase), as well as related market and technological developments (e.g. EUSPA's GNSS Market Report and GNSS User Technology Report). A targeted stakeholder consultation has been carried out by reaching out to 100 companies (large system integrators, start-ups and SMEs, rising stars) from the sample with an extensive survey, followed by additional direct interviews with 10 of the companies through which key challenges, trends and opportunities around investment from their perspective were investigated.

The findings of the study are documented in the present GNSS Investment Report. Thus, as part of the analysis of the **dynamics of the European GNSS sector**, the report highlights the areas where Europe fares well (typically slowly growing segments) providing concrete market data and examples of European market leaders. Similarly, the (typically fast-paced) areas where Europe lags behind its international competitors are discussed. **Future market developments and key technology drivers** are also considered, as they are shaping potential market opportunities or pressures that define the evolution of the GNSS downstream sector.

In addition, the report evaluates the current state-of-play of **available public and private funding** for downstream GNSS companies. Public funding is directed through (i) grants for **competitions and prizes**, (ii) **acceleration and incubation programmes**, (iii) **R&D grants**, (iv) **loans** and (v) **procurement mechanisms**. These channels are designed and managed by various institutional stakeholders in the EU, most notably the EC, EUSPA, ESA (grants, acceleration/incubation, procurement) and the EIB (loans). **So far, most of the grants have been focussing on early stage innovation.**

Thanks to an **increased recognition of the importance of space-related activities, including GNSS, new major programmes have been recently launched or announced.** On the space-specific side, **for the development of the Venture Capital space sector**, this includes CASSINI, an initiative introduced by the European Commission and managed by the European Investment Fund (part of the European Investment Bank group) to support entrepreneurship and growth among space-related businesses in the EU. The initiative is **equipped with €1bn in funding.** Looking more broadly, the forthcoming largest funding programme in the EU is **InvestEU**, which with the InvestEU Fund is using loans guaranteed by the EU, combines 13 financial instruments for a total envelope of €372bn. While covering many sectors, InvestEU will provide significant opportunities to companies seeking to scale, including from the GNSS sector.

Differences in financing volumes and instruments between Europe and other global actors, mainly the US and China, are also discussed, shedding light on the readiness of the European GNSS ecosystem to withstand global competitive pressures. It must be noted that worldwide, the increase of available funds for space-related activities, including GNSS, is further reflected on the private investment side. €23bn has been invested worldwide into space start-ups between 2015 and 2020 (US-based companies accounting for 67% of investment in 2020). In just one year (between Q3-2020 to Q3-2021) and despite the global pandemic, a whopping €9.1bn was invested in upstream and downstream space companies. The market potential of space-related solutions in response to key societal and economic challenges is being increasingly recognised by the investment world.

Concerning **investment needs** for EU GNSS companies, the study sets out on different paths. Firstly, it **analyses the volume of foreign acquisitions in the sector and the major deals in the last five years.** This analysis brings to light 14 deals whereby a foreign company has acquired at least 5% of a European company operating in the downstream GNSS market. **Such acquisitions lead to a reduced share of global revenues and, potentially, a decrease in European competitiveness.** This point is further highlighted through concrete examples where the acquisition of European companies had deeper consequences in sectors such as Rail and Consumer Solutions. Using these findings, the study sought to answer the question “What would it take, in financial terms, to prevent foreign acquisition of European GNSS innovators?”. It was found that to reverse the transactions that occurred in 2016-2021 and bring the lost shares under European control would require between €5.5bn and €6.8bn.

Secondly, the study looks into **GNSS R&D expenditure.** To analyse this, the financials of companies operating in the downstream GNSS market have been extracted from Bureau van Dijk’s Orbis Database. 247 companies worldwide (predominantly very large companies and with a slight bias towards European ones) have reported their R&D expenditure. For each firm in the dataset, the percentage of revenue that the company derives from GNSS-based technologies has been estimated and further evaluations have been performed based on the individual services and products on offer. Combining these aspects, the study has concluded that the **GNSS-specific R&D expenditure by European companies in the analysed sample has been growing from €0.9bn in 2016 to €1.2bn in 2019 at a CAGR of 5.7%.** During the same period, GNSS-specific R&D expenditure by North American companies has grown at a CAGR of 8.6%, and by companies in Asia-Pacific at a CAGR of 8.7%. The results from the sample (of 247 companies) have been **projected to the whole database** of 1,466 companies in the downstream GNSS market. This resulted in an estimated **GNSS R&D**

expenditure in Europe of €1.8bn in 2016 and €2.2bn in 2019. The global GNSS R&D spending has been projected to grow from €5.6bn in 2016 to €7.3bn in 2019.

This reveals that catching up with the EU's competitors who have a significantly faster pace (and a market demand to match it) in GNSS R&D expenditure will require very focussed efforts and ambitious investments. To probe this, the study has used GNSS R&D expenditure as a proxy for the total investment need. Thus, analysing the "business as usual" (i.e. growth at 5.7% annually) and "matching competitors" (i.e. growth at 8.7% annually) scenarios has shown that **the total investment need over the next 10 years will amount to between €34.1bn and €42.7bn.**

Thirdly, the study also produces an **in-depth account of funding gaps and associated challenges** faced by EU GNSS companies and in particular current or potential rising stars. To do so, a carefully crafted sample of 249 companies was created, of which approximately 100 were targeted through a dedicated survey. In addition, 10 selected companies have been interviewed to gain deeper insight. In this process, the representativeness of the sample has been secured through direct collaboration with EUSPA market officers who have facilitated outreach to companies in the various markets. This has yielded 54 responses to the very extensive questionnaire (over 100 questions) and has allowed the collection of extensive insights into the **needs, gaps and ambitions of EU GNSS companies and rising stars.** The findings of this analysis have strongly pointed to the fact that **rising stars are keen to have an alternative/additional path to foreign investment.** To get a measure of this, an in-depth investigation of the total private funds raised by European GNSS rising stars has been performed. This has yielded an estimated €1.25bn of private funds raised until 2022. Projecting this into 2030 with the CAGR for the GNSS market (i.e. 5.7%) yields €1.96bn. Thus, **a funding envelope of ca. €710m (upper limit) would be required until 2030 to provide such alternative path.** These are preliminary estimations, but point to the urgency to monitor the space innovation eco-systems carefully, as European rising stars are vulnerable to seek foreign investors, if they cannot access funding in Europe.

Synthesising the findings in relation to investment needs and funding gaps as gathered through the aforementioned analytical paths, the report concludes with a series of **suggestions that can inform the key institutional stakeholders (EC – DG DEFIS, EUSPA, EIB) in designing and running fit-for-purpose financial instruments and complementary activities.** These are summarised below:

- **Staying competitive requires significant investment:** The analysis of acquisitions, GNSS R&D expenditure and rising stars funding provides ample evidence to the urgency to mobilise significant investment envelopes.
- **Staying competitive requires robust market foresight:** The report lays out key parameters around the establishment of a dedicated foresight facility that would allow monitoring of the progress vis-à-vis global market dynamics in key sectors for European competitiveness and autonomy.
- **Making more funds available through tailored instruments:** The report unveils the complex market dynamic of the GNSS and space innovation eco-system in general, which would warrant ad-hoc financial and technical expertise and on-going market intelligence directed to meet the financial needs of both rising stars and established companies.

1 Introduction

1.1 The European Space Programme

The new [European Space Regulation](#), adopted on the 28th of April 2021, sets the strategy for 2021-2027 and highlights, amongst others, the aim to enhance European innovation and competitiveness in the European Space Sector and related applications, as well as to reinforce the EU's strategic autonomy and leadership on the global stage.

In that regard, the European space policy supports the EU's plans for a twin transition to a more sustainable and digital future, as documented both in the [New Industrial Strategy](#) and the [SME Strategy](#). The latter effectively launched the new Space Entrepreneurship Initiative [CASSINI](#), a €1bn European Space Fund to boost start-ups and space innovation, through acceleration, incubation, seed-funding, pre-commercial procurement and other activities.

The achievement of these objectives and the implementation of the corresponding programmes will be supported by the European Union Agency for the Space Programme (EUSPA¹), also established under the new EU Space Regulation.

The mission of EUSPA is to *contribute to the EU Space Programme, particularly with regards to security accreditation as well as market and downstream applications development*. Thus, EUSPA will **build on its positive track-record in promoting the user and market uptake of Galileo and EGNOS and extend its efforts to cover Copernicus and GOVSATCOM**. To that end, EUSPA has been undertaking a wide range of activities to monitor, stimulate and help grow the market for EGNSS solutions. This includes a set of **flagship publications**:

- The [GNSS Market Report](#), produced every two years since 2010, provides in-depth analysis of global trends and the latest developments in terms of shipments, revenues and the installed base of GNSS devices and applications in key GNSS market segments – both mass market and professional. For its 7th edition, the Market Report also covers the Earth Observation markets.
- The [GNSS User Technology Report](#), produced every two years since 2016, provides insights into the latest state-of-the-art GNSS receiver technology as well as an overview of technological trends shaping the GNSS landscape.
- The [Reports on GNSS User Requirements](#) which capture the needs of users of positioning, timing and navigation services across several market segments through a comprehensive process.

In addition, **EUSPA supervises the implementation of R&D&I projects** funded under the EU's Research Framework Programmes ([Horizon Europe](#) for the 2021-2027 period) and the [Fundamental Elements](#). EUSPA also **provides a diverse portfolio of [resources to start-ups](#)**, realised for instance through competitions.

¹ Replacing and succeeding the European GNSS Agency (GSA)

1.2 The MoU between EUSPA and the EIB

Within this context, EUSPA (then still operating under the name European GNSS Agency, GSA) signed a **Memorandum of Understanding with the European Investment Bank (EIB)** in September of 2019. This MoU foresees close cooperation between EUSPA and the EIB on supporting investment in the European space-based service economy.

This was done in recognition of the strong momentum that the EU Space Programme has gained and the fact that space-related activities and GNSS applications become more commercial, requiring greater involvement of private sector and a significant **scaling-up of European investments**. Thus, through the MoU, EUSPA and EIB seek to promote R&D investments and pilots in the GNSS market and encourage the mobilisation of GNSS funds.

In line with the MoU, EUSPA and the EIB have contracted a team of GNSS market experts – involved with monitoring market uptake activities around EGNSS for more than 10 years – to analyse the investment needs and funding gaps of the European GNSS industry, and to formulate recommendations to accelerate the creation of suitable financial instruments to provide Europe with the right financial ecosystem strategy to secure technological leadership.

1.3 Understanding investment needs and gaps for EU GNSS companies

To achieve this overarching objective, this GNSS Investment Report 2021 has been produced and seeks to:

- **Understand investment needs**
 - Capturing the dynamics of the European GNSS market
 - Projecting the development of EU companies against global competition
 - Documenting challenges to Europe's strategic autonomy
- **Analyse funding gaps**
 - Presenting the currently available and planned financial instruments for downstream GNSS companies
 - Collecting first-hand insights from EU GNSS companies on their status and growth projections
 - Shedding light onto the challenges rising stars and smaller companies face towards scaling
- **Synthesising findings towards the formulation of recommendations to EUSPA, EIB and DG DEFIS**

The methodological approach adopted to meet these objectives is described below.

1.4 High-level methodological approach

The high-level methodological approach deployed to produce the GNSS Investment Report 2021 is depicted below followed by a discussion of the different steps carried out.

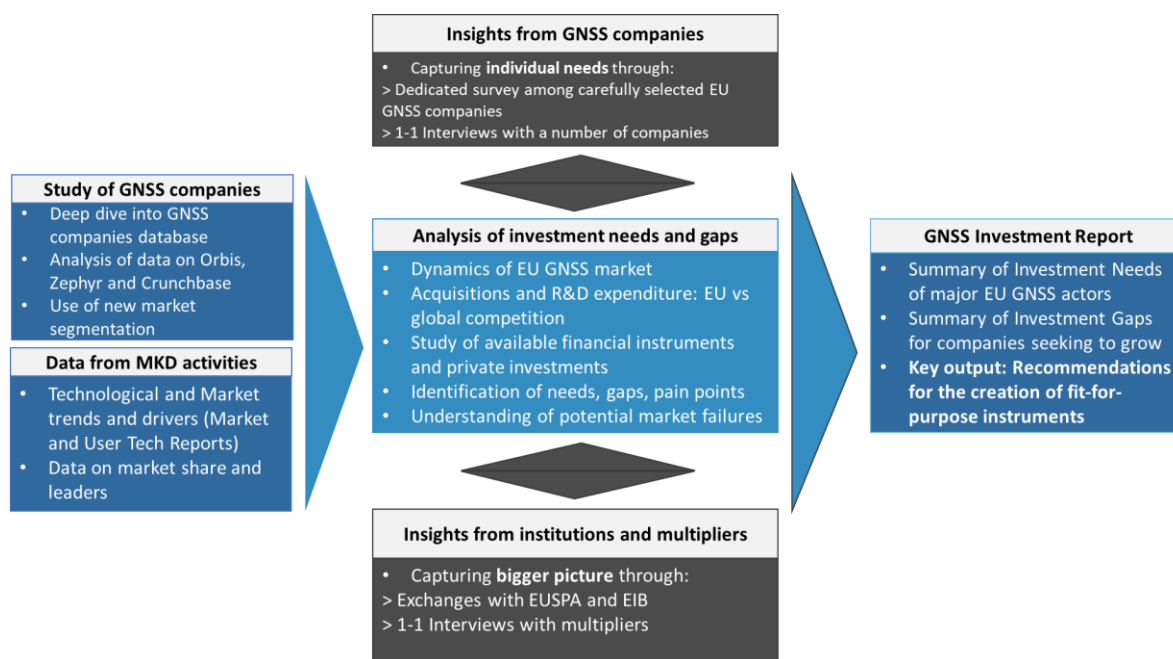


Figure 1: High-level methodological approach

The starting point of the methodological approach was a **careful selection and study of GNSS companies**. This was undertaken in a threefold manner:

- I. A **deep dive into the [database of GNSS companies](#)** maintained by EUSPA was performed to construct a sample that would include typically smaller (in size, turnover, age) companies across all market segments. This process was aided by EUSPA Market Development officers providing recommendations in their respective segments.
- II. In parallel, a **thorough analysis of GNSS companies in Bureau van Dijk's [Orbis](#) database** was carried out to collect in depth financial data where available.
- III. Finally, the **[Crunchbase](#) platform** was consulted to retrieve investment-related data especially for companies qualifying as “rising stars” (companies which have completed at least a Series A investment round with an implied equity valuation not lower than €30m).

Through these three streams, information on nearly 1,600 companies has been collected.

In parallel, the study team has collected the **latest relevant data from a wide range of Market Development activities** carried out by EUSPA. Thus, leveraging its role in producing the GNSS Market Report and the underlying market monitoring tools, the study team has incorporated technological and market trends and drivers, data on market shares (and their evolution over time) and information on the leaders of the different market segments into the analysis.

The extensive desk research activities described previously were complemented by **targeted stakeholder consultation** seeking to gather up-to-date **insights from GNSS companies, and from institutions and multipliers**. In the former case, a **structured questionnaire with more than a 100 questions** was developed and shared with more than 100 companies of small to medium size (selected by a first shortlisting of 249 companies, ensuring coverage of all market segments, value chain, and different sizes of companies) – the main aim of this effort was to obtain a deeper understanding of their perceived challenges and ambitions along different stages of growth and in

different markets². This process has been enriched through **direct interviews** with 10 selected companies, EUSPA and the EIB, as well as [SpaceY](#) (formerly known as Galileo Services) and the European Association of Remote Sensing Companies ([EARSC](#)). These interviews have helped to shed more light on key challenges, trends and opportunities around investment from their perspective of three groups of companies, as described below.

Large system integrators	Rising stars	Start-ups/SMEs
<ul style="list-style-type: none"> • Large companies from automotive, aviation, rail, etc. • Turnover: over €50m • Main source: Orbis and Zephyr 	<ul style="list-style-type: none"> • Completed series A with implied valuation of €30m • Turnover: typically over €10m • Main source: Crunchbase 	<ul style="list-style-type: none"> • Companies involved in EUSPA-managed activities • Turnover: typically under €10m • Main source: Survey and interviews

Figure 2: The three types of companies analysed in this study

Exploiting these different inputs, the study team has performed an **in-depth analysis of the investment needs and funding gaps** for EU GNSS companies. This has produced:

- A study of the **dynamics of the EU GNSS market** (utilising inputs from the EUSPA Market Report),
- An account of **mergers and acquisitions** as well as **R&D expenditure** with focus on the comparison between EU and global competitors,
- An overview of the **available funding** for GNSS companies either through public financial instruments or through private investment.

These aspects have helped to **identify needs, gaps and shortcomings** experienced by EU GNSS companies and to **highlight potential areas of market failure**. The outputs of the analysis are documented in this report and provide a solid basis for **recommendations on actions to accelerate the creation of fit-for-purpose instruments**. The following sections presented these results in detail.

1.5 How to read this report

The GNSS Investment Report 2021 provides an overview of the state-of-play of investment for EU-based GNSS companies.

Following this introduction, Chapter 2 defines and describes the characteristics of Europe’s GNSS sector, including the downstream value chain, markets, revenues, key players, competition, and key technology drivers. This chapter conveys the **context** of European GNSS companies.

Chapter 3 provides an overview of available European funding and investment opportunities enabling the growth and development of GNSS companies, comparing these to opportunities and conditions in competing regions. Chapter 4 proceeds with analysing status and growth projections of EU GNSS companies and their challenges in scaling. Together, these two chapters provide the **analysis of investment needs** of EU GNSS companies and the **funding gaps** they are faced with.

Chapter 5 concludes with **synthesising the findings** towards action fields through which growth and competitiveness of EU GNSS companies could be further supported.

² Survey details can be found in the appendices in chapter 6

2 The dynamics of the European GNSS sector

2.1 The GNSS Market

In line with EUSPA's GNSS Market Report, the downstream GNSS market is defined as "activities where GNSS-based positioning, navigation and/or timing is a significant enabler of functionality". Thus, the revenues discussed here include those derived from the sale of GNSS devices and those from the provision of augmentation and added-value services attributable to GNSS. It should be noted that **augmentation services** include software products and content such as digital maps, as well as GNSS augmentation subscriptions, whereas **added-value** services include location-based applications (such as navigation), fleet management services and drone services.

The corresponding **value chain** is depicted below, followed by a brief description of each link.



Figure 3: Generic GNSS value chain

- **International organisations and standardisation bodies:** Regulated segments such as Maritime, Aviation etc. include a first link in their value chain dedicated to bodies setting GNSS standards and requirements. This is not present in each segment (see discussion of segments below).
- **Component manufacturers:** they underpin the industry by producing chips, antennas and other inputs for GNSS receivers.
- **Receiver manufacturers:** they develop the GNSS receiver taking into account specific user requirements for the different applications/market segments they are active in.
- **System integrators (and design consultancies):** responsible for the technical implementation of the GNSS equipment into a complex system.
- **Added-value service providers:** these companies provide either added-value or augmentation services to end users (not present in each segment).
- **End users/users of positioning information:** the final users who benefit from the applications and services offered by system integrators.

These value chains take shape in the different market segments. The latest EUSPA EO and GNSS Market Report includes 16 segments with considerable GNSS relevance³:

- Agriculture
- Aviation and Drones
- Biodiversity, Ecosystems and Natural Capital
- Climate Services
- Consumer solutions, tourism and health
- Emergency Management and Humanitarian Aid
- Energy and Raw Materials

³ The 17th segment in the Market Report is Environmental Monitoring for which no GNSS applications are considered in this context.

- Fisheries and Aquaculture
- Forestry
- Infrastructures
- Insurance and Finance
- Maritime and Inland Waterways
- Rail
- Road and Automotive
- Space
- Urban Development and Cultural Heritage

Following this brief overview, the next section presents key market data and the position of Europe.

2.2 The position of Europe in the GNSS market

The global space economy has been growing at a CAGR of 4.5% between 2010-2020, reaching nearly €400bn of revenue in 2020⁴. Commercial space activity, amounting to 80% of the global space market in 2020, has grown even faster at a CAGR of 6.6%⁵, prompting the start of the so-called “New Space” era. It is estimated that around 60% of space revenue comes from the downstream market⁶, which includes, among others, the downstream GNSS market. The **revenue from the global downstream GNSS market is expected to reach almost €220bn in 2022 and is forecasted to grow to almost €510bn in 2032**, with the vast majority originating from added-value services. The next largest contributor is forecast to be GNSS device shipments followed by GNSS-based augmentation services⁷.

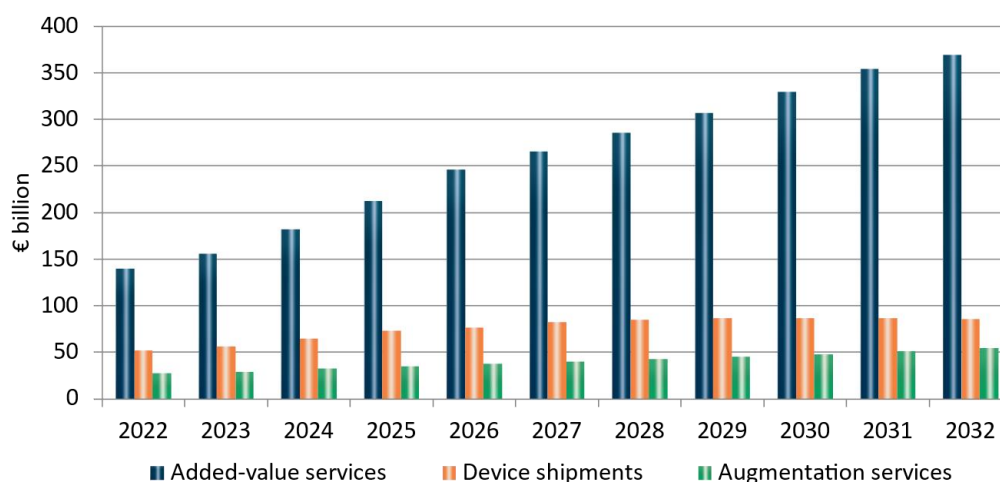


Figure 4: Revenue from GNSS devices sales and services

Even though recent years have seen a gradual saturation across European and North American markets, the global installed base of GNSS devices and associated service revenues are expected to continue to grow steadily. This trend will be supported by **increasing market maturity and the continuous evolution and diversification of services**. Furthermore, the next decade is likely to bring

⁴ Space Foundation, 2021. The Space Report 2021

⁵ Ibid.

⁶ Ibid.

⁷ GSA, 2019. GNSS Market Report. Issue 6.

a rapid adoption of various technologies and applications which utilise GNSS as the most efficient source of positioning and timing in outdoor environments, including⁸:

- The Internet of Things (IoT)
- Big Data
- Augmented Reality
- Smart Cities
- Multimodal Logistics

The increasing use of GNSS-based technologies creates an excellent opportunity for European companies to enter new geographical markets and expand their services on offer. For instance, employing Big Data processing techniques on collected GNSS data increases data reliability by cross-checking information received about an object (vehicle, aircraft, people). In addition, supply chain logistics combining GNSS and blockchain technologies allow end-users and manufacturers to trace the product through all stages of production and delivery.

Moving back to the bigger picture one notes that although employing just 5% of the global space workforce and having a 16% share of global space spending⁹, Europe is the second-largest satellite manufacturer with a market share of 30%, and the second-largest actor in the global downstream commercial market with a share of 25%. Europe is here defined as European Economic Area countries and the United Kingdom. This includes the downstream GNSS market, where Europe captures 24.7% of global revenues¹⁰.

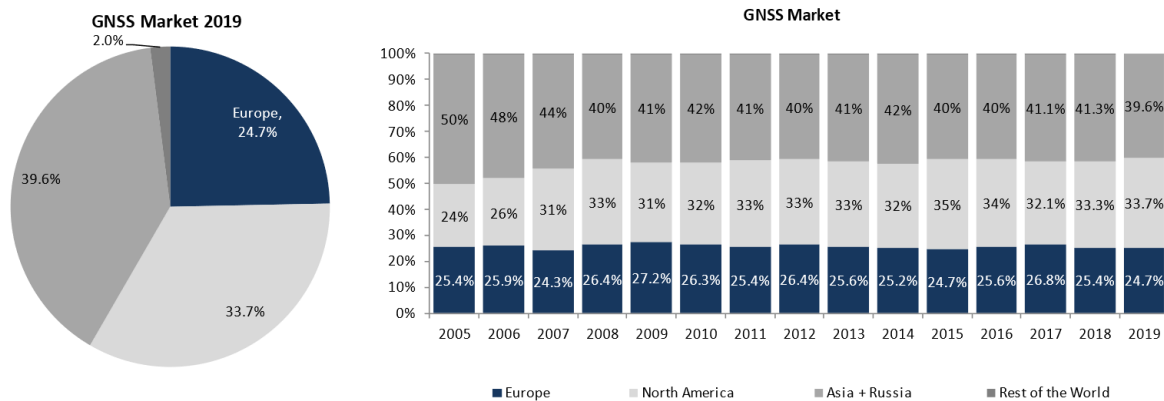


Figure 5: Regional market share in the downstream GNSS market

To better understand the structure of the downstream GNSS market, an extensive analysis of Bureau van Dijk’s Orbis database has been performed, whereby the financials of GNSS companies have been analysed. Thus, the downstream GNSS market is considered to consist of at least 1,466 companies:

- 369 enterprises with annual turnover below €2m¹¹
- 259 enterprises with annual turnover between €2m and €10m¹²

⁸ GSA, 2019. *GNSS Market Report. Issue 6.*

⁹ European Space Agency, 2021. *ESA Agenda 2025.*

¹⁰ Internal EUSPA analysis on GNSS Market Share. Please note, in the market share analysis companies are attributed to regions based on the headquarters of the ultimate owner of the company. In this section, therefore, a company may be listed for regions that do not appear logical based on the language in the company’s name. The quoted data is from 2019.

¹¹ Companies in the group include Ecofleet Holding, Intermodal Telematics, 4TS Corporation

¹² Companies in the group include Mobisoft, United Electronic Industries, Abeeway

- 210 enterprises with annual turnover between €10m and €50m¹³
- 628 enterprises with annual turnover exceeding €50m¹⁴

Recent years have seen a stable performance from European enterprises and the robust growth of well-established non-European companies, which have been increasing their market share. **These companies are particularly concentrated in North America and have been strengthening their market dominance with bold expansion plans, company acquisitions, and major investments.** In combination, these factors have left Europe lagging behind its foreign competitors. Thus, whilst currently well-positioned in some segments, the European downstream GNSS market will require significant investments to bolster its competitiveness in global markets and enhance European strategic independence.

In the largest market segments, just a few main players control most of the market, making it particularly difficult for smaller entities to increase their share of revenue. Additionally, their entry into new business areas (e.g. Google autonomous cars, Amazon Web Services) requires development of GNSS-based products, resulting in cross-subsidies from other sectors, which are not financially viable for smaller GNSS-specialised companies. The fusion of (new) technologies enables some of these companies to aggressively enter GNSS-relevant market segments and to disrupt existing business models and structures. Consequently, the lack of global leaders from Europe results in the loss of European market share, leaving small and GNSS-only companies competing in these fast-growing market segments.

Nevertheless, **European companies tend to be market leaders in slow-growing market segments.** This includes several mature market segments, where a small number of large European companies capture a relatively large share of global revenues:

- GNSS components and receiver manufacturers in **Road** (53%)
- GNSS components and receiver manufacturers in **Maritime** (46%)
- System integrators in **Agriculture** (40%)
- GNSS components and receiver manufacturers in **Timing** (36%)

On the other hand, **Europe trails North America and Asia-Pacific regions with a relatively low market share in several fast-growing segments,** including:

- System integrators in **Drones** (9%)
- GNSS components and receivers manufacturers in **Consumer Solutions** (6%)
- System integrators in **Consumer Solutions** (3%)

As a result, even if Europe manages to retain its market share in each particular segment, it is projected that **the overall market share** will be gradually falling over time, reaching **24.2% in 2022 and 22.8% in 2032.** If Europe fails to retain its current market share in fast-growing segments, the decline in the overall market share will be even more pronounced. In spite of the declining share and as mentioned previously, total European revenues will be growing as **the global downstream GNSS market is expected to expand from €220bn in 2022 to €510bn in 2032.**

¹³ Companies in the group include Navionics, Septentrio, Meinberg Funkhuren

¹⁴ Companies in the group include Here International, Orolia, Hi-Target Surveying Instrument Co

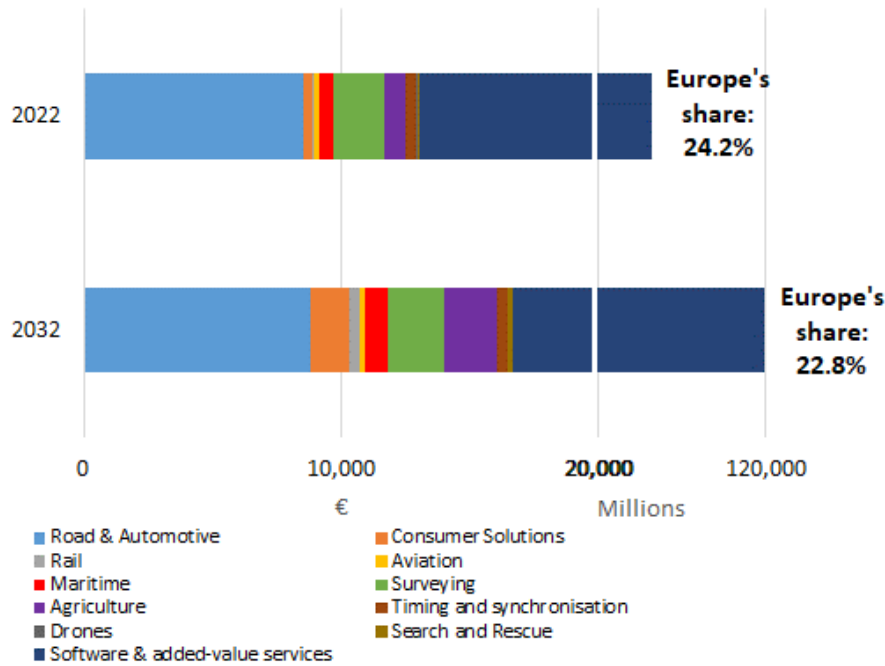


Figure 6: Forecasted European share in the downstream GNSS market

Europe’s low share in the Consumer Solutions segment, which includes smartphones, wearables, and personal tracking devices, is particularly notable. As of 2022, the global revenue from device shipments in the segment is expected to amount to €7.8bn, equal to 14% of all device shipments revenues, and this number is forecasted to grow almost five-fold to €38.2bn in 2032, reaching a global share of 44% of global revenues from device shipments. European companies in the segment included Fairphone, which has failed to create a globally recognisable brand, and BQ, a Spanish company acquired by Vietnamese conglomerate Vingroup in 2018 and eventually by Chinese Huawei (see 4.1.1).

Additionally, Europe is the second largest provider of added-value and GNSS-based augmentation services, the segment which accounts for roughly 75% of all downstream GNSS market revenues. The segment includes GNSS-based augmentation systems (RTK, PPP, PPP/RTK, DGNSS) used in Agriculture, Surveying, and Maritime segments, as well as software and mobile apps that use geolocation (maps, delivery services, games, etc.). Europe’s share (25%) is higher than that of the Asia-Pacific region (17%), but only half of North America’s share – which stands at 51%. This comes despite the fact that the majority of the consumption of these services is located in the Asia-Pacific region (40%), followed by North America (23%), and Europe (18%). Therefore, **structural investments in development of superior products, expansion, and consolidations allowed American companies to dominate the global market and use their competitive advantage to export their services to other regions, particularly to the fast-growing Asia-Pacific market.**

2.3 European market leaders and main players outside of Europe

Following the earlier high-level overview, it is instructive to take a closer look into **10 specific market segments** of the downstream GNSS market¹⁵ and understand who the European market leaders are and who are the main players outside of Europe. The analysed segments include:

- Consumer Solutions
- Road
- Aviation
- Rail
- Maritime
- Agriculture
- Surveying
- Search & Rescue
- Drones
- Timing & Synchronisation

Each of these segments has been further split between:

- GNSS components and receiver manufacturers – this includes production of chips, antennas, and other inputs for GNSS receivers, as well as market specificities and added value conferred by device/product manufacturers
- System integrators – this includes technical implementation of GNSS equipment into a complex segment (e.g. manufacturers of cars, aircrafts, mobile phones)











The analysis also included the market for GNSS-based software and added-value services.

Each company in the database has been assessed on an individual basis to estimate the GNSS-related share in its products and services on offer. Similarly, each company's activity has been investigated on expert basis to classify the company's position in the value chain and attribute shares of revenue derived from each market segment.

Components and receiver manufacturers

The figure below presents the European share in **Components and receiver manufacturers** market across 10 market segments.

¹⁵ This segmentation is consistent with the last GNSS-only Market Report published in 2019 rather than the more recent Market Report published in 2022, which includes EO applications. Here, the 10 market segments with the highest use of GNSS have been selected.

Components & Receiver Manufacturers (Europe: 25%)							
	Europe	North America	Asia-Pacific		Europe	North America	Asia-Pacific
	7%	45%	47%		20%	47%	33%
	53%	25%	22%		35%	31%	33%
	17%	81%	2%		41%	39%	13%
	14%	15%	71%		10%	42%	48%
	47%	27%	26%		36%	50%	12%











Components & Receiver Manufacturers (€ millions)							
	Europe	North America	Asia-Pacific		Europe	North America	Asia-Pacific
	252	1,620	1,692		120	282	198
	2,544	1,200	1,056		567	502	535
	221	1,053	26		41	39	13
	14	15	71		10	42	48
	780	448	432		180	250	60

Figure 7: Components and receiver manufacturers' market shares across segments¹⁶

In the **Consumer Solutions** segment, which includes smartphones, wearables, and personal tracking devices, Europe holds a mere 7% share. The largest subsegment, smartphones, lacks European representatives, resulting in a small share for the entire segment. The market is dominated by companies from North America and Asia-Pacific, namely Qualcomm (US), Broadcom (US), and MediaTek (Taiwan), which hold a combined share of 78%. European companies, STMicroelectronics (The Netherlands) and Infineon Technologies (Germany), have a 2% share of the global market each.

In the **Road** segment, the top 3 European companies – Robert Bosch (Germany), Valeo (France), and TomTom (The Netherlands) – hold over a third of the global market. The largest non-European competitors include Garmin (US), the current market leader, and Alpine Electronics (Japan).

European companies in the **Aviation** segment are overshadowed by American counterparts, with Garmin (US), Honeywell International (US), and United Technologies Corporation (US) capturing 75% of global revenues. The largest European representatives are Safran (France, 7%), Thales (France, 3%) and Cobham (UK, 3%).

The **Rail** segment leader, Hitachi (Japan), controls almost half of the global market. Trimble (US) and Sierra Wireless (US), rank 2nd and 3rd, above the biggest European player in the segment - Grupo Tecnológico e Industrial (GMV Innovating Solutions, Spain).

Garmin (US) is the leader in the **Maritime** Segment, controlling a quarter of the global market for components and receivers. Europe's leaders – NAVICO (Norway), Kongsberg Maritime (Norway),

¹⁶ Rest of the World is omitted in the table, hence the shares may not always add up to 100%.

and Wartsila (Finland) – hold a combined share of almost 50% and rank above other foreign competitors.

In the **Agriculture** segment, Trimble Navigation (US) ranks first with a share of 30% of the global sales. Hexagon AB (Sweden) – the European leader is second with a 20% share, followed by Topcon Corporation (Japan), Deere (US), and AgJunction (Canada).

In the **Surveying** segment, the biggest players include Trimble Navigation (US) and Hexagon AB (Sweden), both with their shares equal roughly to 25%. They are followed by companies from Asia-Pacific – Topcon Corporation (Japan), Hi-Target Surveying Instrument (China), and Beijing Unistrong Science & Technology (China).











The two largest companies in the **Search & Rescue** segment are Heico Corporation (US) and Orolia (France), each capturing roughly a quarter of global revenues. They are followed by Astronics Corporation (US) and Standard Communications (Australia).

The market for **Drones** with European players such as U-Blox Holding (Switzerland), Infineon Technologies (Germany), and SBG Systems (France) is falling short of global leaders such as Trimble Navigation (US), DJI Baiwang Technology (China), and Beijing UniStrong Science & Technology (China), hold a combined share of 50%.

Finally, Europe performs relatively well in the **Timing** segment, where the biggest European players are Orolia (France), U-Blox Holding AG (Switzerland), Meinberg Funkuhren (Germany), and STMicroelectronics (The Netherlands), who together capture a third of global revenues. A similar share goes to American companies - Trimble Navigation (US) and Microchip Technology (US). The largest company from Asia-Pacific is Furuno Electric (Japan, 7% share).

System Integrators

The figure below presents the European share for **System Integrators** across 10 market segments.

System Integrators (Europe: 24%)							
	Europe	North America	Asia-Pacific		Europe	North America	Asia-Pacific
	3%	34%	63%		40%	39%	21%
	30%	16%	53%		10%	53%	37%
	37%	57%	3%		51%	29%	19%
	36%	41%	23%		10%	4%	86%
	29%	15%	56%		35%	0%	65%











System Integrators (€ millions)							
	Europe	North America	Asia-Pacific		Europe	North America	Asia-Pacific
	306	3,468	6,426		176	172	92
	10,020	5,344	17,702		70	70	259
	170	262	14		5	5	2
	50	57	32		14	6	120
	29	15	56		245	0	455

Figure 8: System Integrators market shares across segments¹⁷

Similar to the components and receiver manufacturers market, Europe lacks major players in the **Consumer Solutions** segment. Global leaders include key smartphones manufacturers: Samsung (South Korea), Apple (US), and Huawei (China), followed by Garmin (US), a manufacturer of wearables.

The **Road** segment is geographically balanced, with global leaders capturing similar shares of global revenues. The top companies include Toyota Motor (Japan), China First Automobile Group (China), Ford Motor (US), Volkswagen (Germany), and General Motors (US).

The **Aviation** segment is dominated by two aircraft manufacturers: Boeing (US, 35% market share), and Airbus (France, 31% share).

In the **Rail** segment, VTG Aktiengesellschaft (US)¹⁸ is the leader with a 35% share of the global market. It is followed by Alstom Transport (France), CRRC Corporation (China), and finally, Siemens (Germany) and Thales (France).

The largest European companies in the **Maritime** segment include Volvo (Sweden) and Inmarsat. Nevertheless, they fall short of global leaders: Mitsubishi Heavy Industries (Asia-Pacific), Pronav (North America), Xiamen Yaxun Network (Asia-Pacific), and Guangxi Beibu Gulf International (Asia-Pacific), who capture a combined share of 50% of global revenues.

Deere & Co (US) and AGCO Corporation (US) lead the ranking in the **Agriculture** segment. They are followed by Kubota International (Japan), and finally CNH Industrial (The Netherlands), Bernard Krone Holding (Germany), J.C.B. Service (UK), and Claas KGaA (Germany).

The **Surveying** segment is largely dominated by three companies: Caterpillar (US), Deere & Co (US), and Komatsu (Japan), with a combined share of global revenues equal to 80%. Main European players include J.C.B. Service (UK) and CNH Industrial (The Netherlands).

European companies capture over a half of global revenues in the **Search & Rescue** segment, with only three companies: Kongsberg Maritime (Norway), Wartsila (Finland), and Airbus (France), controlling over 40% of the global market. The main foreign competitor is Boeing (US).

¹⁷ Rest of the World is omitted in the table, hence the shares may not always add up to 100%.

¹⁸ In regional categorisation, we consider the primary location of the Global Ultimate Owner of the group. VTG Aktiengesellschaft is owned by Morgan Stanley, hence classified as North America.

In the **Drones** segment, DJI Baiwang Technology (China) captures almost 70% of global revenues. Hi-Target Surveying Instrument (China) is second (10%), whereas Airbus (France) is third (6%). Other European companies include Parrot Drones (France) and Saab AB (Sweden).

Finally, the **Timing & Synchronisation** segment has an undisputed leader – Huawei (China) – with a 64% share of global revenues. European best performer include Ericsson (Sweden) and Nokia (Finland), with a combined share of 34%.

Software and added-value services

The Software and added-value services market, worth €15bn in 2021 revenues, is dominated by Alphabet (US), the parent company of Google, with a share of 21%, 3 times larger than the second-placed Tencent Holdings (China) and third-placed HERE International (The Netherlands). Trimble Navigation (US), Environmental System Research (US), Garmin (US), Microsoft (US), and Denso Corporation (Japan) rank below and all have a global share in the range of 4%-6%.

2.4 Future market developments

Shipments of GNSS devices in Europe are expected to grow from 200m in 2021 to almost 350m in 2031, with the installed base of such devices increasing from 620m to 1,250m during the same period. Despite the recent drop in shipments caused by the COVID-19 pandemic outbreak, most of the segments have already returned to their pre-pandemic growth trajectory. The aviation segment has been affected the most and the shipments are forecasted to remain lower for a number of years. Similarly, **silicon production and manufacturing are not expected to recover until 2023/24** which has been quoted by smartphone chip producers as a possible disruption factor in the Consumer Solutions segment. Nevertheless, **the next decade will see the demand for GNSS components double in Europe**¹⁹. As a consequence, European companies are likely to face increasing pressure from foreign competitors if they fail to supply the domestic market. It is expected that markets will be characterised by continued consolidations and the creation of global leaders with significant market share. Therefore, **capital investments and R&D expenses are paramount to increase competitiveness and strive on global markets.**

The Software and added-value services market, which is particularly dependent on innovation and cutting-edge technologies, will see the revenue in Europe more than double from €25bn to an expected €52bn in the next decade. In Asia-Pacific, revenue is expected to grow from €50bn to €150bn during the same period, an increase of €100bn, which is close to the global 2021 revenue of €125bn. This creates an **opportunity for European companies to expand to other markets, provided they match competitiveness of foreign companies with high-value investments in organic growth and strategic acquisitions across the value chain.** While Alphabet (US) has a strong market advantage over its competitors with a market share of 21%, more than its three largest competitors combined, several European companies are well-positioned to benefit from the overall growth of the market. These include HERE International (The Netherlands), Hexagon AB (Sweden), Radius Payment Solutions (UK), although they all have recently lost some of their respective market shares, and NRC Group (Norway), which has reported an impressive growth in the last 5 years (CAGR of 49%), significantly increasing its market share.

¹⁹ GSA, 2019. GNSS Market Report. Issue 6.

2.5 Key technology drivers

GNSS has a number of defined Key Performance Parameters, which are also reflected in technological developments and trends²⁰. Depending on the application, the following parameters have different degrees of priority:

- **Accuracy:** difference between true and computed position and time
- **Authentication:** verification of authenticity of signals
- **Availability:** percentage of time where positioning, timing, and navigation can be computed in a given area
- **Continuity:** uninterrupted performance of functions
- **Indoor penetration:** of the signal, dictated mostly by the sensitivity of the receiver
- **Integrity:** ability of the system to warn users when it should not be used or does not perform correctly
- **Latency:** difference between reference time and time of availability of solution
- **Power consumption:** amount of energy required by devices to provide a position
- **Robustness:** against spoofing and jamming
- **Time to first fix:** time between activation of a receiver and availability of solution

Much of the downstream GNSS innovation potential lies in the receivers themselves as well as in the chips built into them. **Low power consumption is one key trend**, in particular for devices operating on battery. A recent solution to this is snapshot positioning, where receivers – at the cost of sensitivity and accuracy – turn on for a brief moment only to capture signals which can be processed at a later moment. Another approach is duty cycling, where all components of a receiver are powered off except those currently needed to perform a task. Further options lie in outsourcing the power-consuming processing of signals to the Cloud. Assisted GNSS supplies the receiver with data through communication networks, also reducing power consumption. New generations of chips provide smart power management, low-voltage circuits, and other energy-saving design features. Finally, alternative energy sources (e.g. solar, body heat) are integrated into the powering of receivers.

Another major development is the **rise of multi-frequency receivers**. Having access to a higher number of signals improves accuracy and robustness to interference. This capability requires specific design of several components and functions of receivers. It supports critical applications in e.g. maritime and aviation, but will also contribute to the mass market uptake for applications in need of high accuracy, such as autonomous vehicles.

Further contributing to accuracy and seamless positioning are the concepts of **hybridisation** and **sensor fusion**. In the case of hybridisation, a seamless handover to other wireless signals enabling positioning is performed where GNSS signals are weak or unavailable (e.g. indoors, underground). Here, technology such as Wi-Fi and ultra-wideband (UWB) is utilised, both of which are increasingly supported by most mobile devices (i.e. smartphones). Sensor fusion refers to the combination of information from a number of sensors and sources. GNSS data combined with e.g. visual navigation systems improves accuracy and continuity of positioning. A further complementing source comes from the 5th generation mobile network technology, commonly known as **5G**. For GNSS applications, 5G will enable higher accuracy for mass markets. Beyond mobile voice and data, it will allow a myriad of low-power devices to be connected – the Massive Internet-of-Things (MIoT). It has highly accurate positioning built-in, including for areas where GNSS signals are difficult to receive. 5G base

²⁰ EUSPA, GNSS User Technology Report, 2020

stations can even serve as GNSS reference stations. Enabling low-latency car-to-car and car-to-infrastructure communication, 5G will also be a key enabler of autonomous vehicles.

Just like the advance of digitalisation requires advances in cybersecurity solutions to mitigate attacks, the increased use of GNSS in critical applications requires ensuring trust in information and its availability. An important area of development to secure against the manipulation of GNSS signals (referred to as spoofing, e.g. to pretend a different position) is that of **authentication**. Receivers verify the authenticity of the GNSS information (i.e. navigation messages) and the transmitting entity. Other approaches of spoofing detection might be built-in into chips e.g. verifying a GNSS signal against that of other GNSS constellation.

GNSS applications such as navigation and logistics can further benefit from upcoming **quantum technologies**. Quantum computing can solve difficult routing problems, reducing commute and delivery times significantly. Quantum sensing in GNSS applications have the potential to improve indoor navigation and spoofing detection. And encryption of GNSS signals using quantum cryptography is a development much needed to prepare for quantum attacks on encrypted signals.

Advancements in these and other technologies and the capability of GNSS companies to use the state-of-the-art relevant for their solutions and markets require constant innovation and thus appropriate investment into research and development. This is supported by public grants and private investment which is the topic of the next chapter.

3 Funding and investment available for downstream GNSS companies

Companies providing solutions that exploit GNSS signals and services, but also those developing their own GNSS-enabled devices, have been attracting an increased volume of investment over the past years. Globally, the broader space industry has experienced a boost in available funds with **total private-sector space investment growing by a factor of 3.5 between 2012–2017 compared with the previous six-year period**²¹. This trend has vastly intensified since then. Thus, whereas €23bn have been invested into space start-ups between 2015 and 2020 (US-based companies accounting for 67% of investment in 2020)²², in just one year (between Q3-2020 to Q3-2021) and despite the global pandemic, a whopping €9.1bn was invested in upstream and downstream space companies²³. The cumulative investment in all space-focused companies worldwide amounted to €116.8bn in 2020 (including non-space companies; two thirds of which went to SpaceX and OneWeb alone)²⁴.

This surge of private investment is supported by venture capitalists and business angels representing the two biggest groups of investors in space ventures and accounting for approximately two thirds of all investments, while satellite operators are the biggest single group of private investors overall²⁵.

Despite this increase in private investment, **institutional investors remain the primary funding source for enterprises in the space industry**. This trend applies to the overall start-up ecosystem too²⁶, but seems more pronounced in the space sector. Moreover, substantial gaps can be seen for the early-stage and growth phases with the total volume of early-stage investments remaining relatively small and fragmented. This has led many companies to largely rely on public funding in the early years even if only to attract further private investments; however, there are many cases where such companies seem “trapped” or too comfortable in this state, targeting grants but not venturing into the market. These aspects are discussed in further detail in subsequent chapters.

Source	EUSPA	ESA	Horizon Europe, EIC Accelerator, CASSINI	InnovFin Space Equity Pilot, InvestEU	InvestEU
Type	Zero equity finance, grants, procurement	Zero equity finance, procurement	Grants, seed capital, blended finance	Equity co-investment via Venture Capital funds	Loan guarantees
Ticket Size	€10k-5m	€50k-3m	€10k-15m	€7.5m-75m	€7.5m-75m
Target companies	Start-ups onwards	Start-ups onwards	Start-ups onwards	Early-stage onwards	Growth and mature

Figure 9: European public funding mechanisms suitable for European GNSS companies²⁷

²¹ The future of the European space sector, EIB, 2019

²² BryceTech Start-up Space, Update on Investment in Commercial Space Ventures, 2021

²³ Seraphim SpaceTech Venture Capital Index Q3 2021, <https://seraphim.vc/research/>

²⁴ SpaceTech Analytics, SpaceTech Industry Landscape Overview Q3 2021, 2021

²⁵ The future of the European space sector, EIB, 2019

²⁶ With up to 40% of funding coming from government subsidies – [EU Startup Monitor 2019](#)

²⁷ Based on Space Venture Europe 2020, European Space Policy Institute, 2021

Public funding is directed through (i) **grants for competitions and prizes**, (ii) **acceleration and incubation programmes**, (iii) **R&D grants**, (iv) **loans**, and (v) **procurement**. These channels are designed and managed by various institutional stakeholders in the EU, most notably the EC, EUSPA, ESA (grants and procurement) and the EIB (loans). The next sections expand on this topic further. In particular, section 3.1 and 3.2 look at grant funding and 3.3 at the other funding instruments managed by the EIB.

3.1 EU grant funding and investment for GNSS companies

A variety of public grant financing instruments and programmes are available at EU-, Member State or regional level that target specific priorities or objectives. These may aim at space-related companies directly or at sectors that potentially could benefit from space-based solutions.

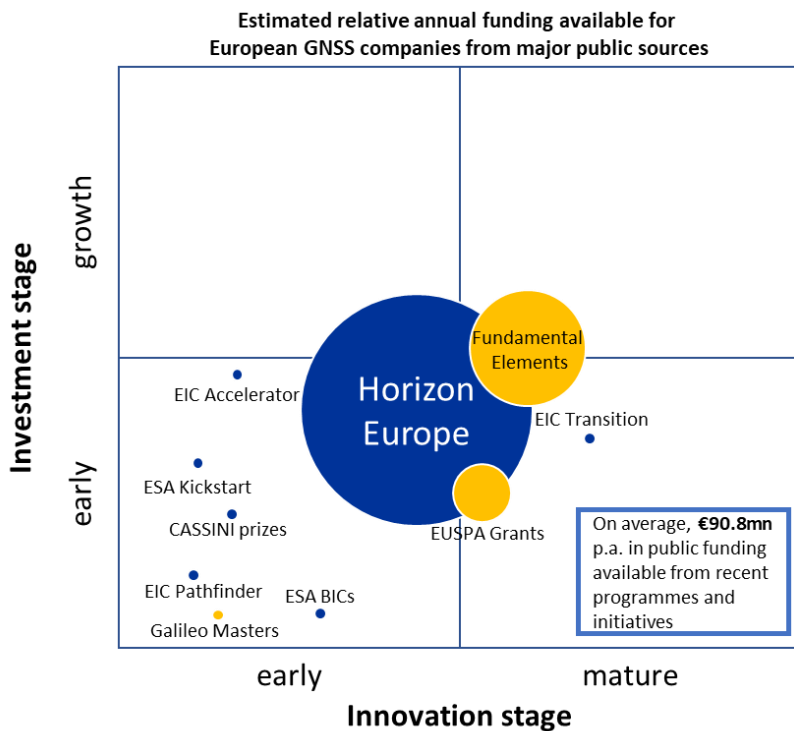


Figure 10: Relative annual public funding available for European GNSS companies²⁸

Looking specifically into space-related activities, the flagship programme is **CASSINI**²⁹, an initiative introduced by the European Commission and managed by the European Investment Fund, part of the European Investment Bank group, to support entrepreneurship and growth among space-related businesses in the EU and **equipped with €1bn in funding**. CASSINI prizes and competitions include the **CASSINI Hackathons**³⁰ targeting early-stage innovators and supporting winners with cash prizes of varying amounts, vouchers, incubation and coaching. The **CASSINI Business Accelerator** will provide coaching and training, networking and seed capital to support growth of start-up and scale-up space companies. Other activities facilitate **matchmaking** between space companies and

²⁸ This includes equity-free funding in the form of grants and prizes, not (public) procurement, loans, or debt-equity. At the stage of the analysis, CASSINI was not yet considered.

²⁹ https://ec.europa.eu/defence-industry-space/eu-space-policy/space-research-and-innovation/cassini-space-entrepreneurship-initiative_en

³⁰ <https://hackathons.cassini.eu/>

investors and businesses to foster growth. The CASSINI **Seed and Growth Funding Facility** (implemented by the European Investment Fund) aims to attract venture capital for start-ups and growth companies in the space sector.

The EU's biggest research and innovation programme providing grants is **Horizon Europe**³¹ with an **overall budget of €95.5bn** over the 2021-2027 period. Companies can apply to open calls and compete for these grants. Many calls of its recent Work Programmes specifically encourage the use of GNSS in the implementation of projects; **for more than 100 of the 2021/2022 Grants, the use of EGNSS and/or Copernicus is mandatory**. Horizon Europe Grants directly managed by EUSPA amount to €80.7m for 2021/2022.

The Horizon 2020 programme: which is Europe's Framework programme for Research and Innovation, acting as a policy instrument and funding tool for R&D. It supports space research under the priority "Industrial Leadership", with the main objectives being to ensure Europe's independent access to space and the development of competitive space technologies. The programme is positioned even further downstream than Fundamental Elements. It lies more with value-added service providers and focuses on aiding the development of innovative content and applications.

EUSPA-managed calls within the Horizon 2020 and its successor Horizon Europe research programmes aim to foster the adoption of Galileo, EGNOS and Copernicus mostly via content and application development and support the integration of services and their commercialisation. The synergetic relationship between the R&I funding programmes and their projects is a key component in the interest of rapid market uptake of developed technologies and solutions and to ensure the extensive exploitation of cross-fertilisation.

The H2020 programme has funded 81 projects through five calls starting from 2015. Over the last few years, EUSPA has applied a market-oriented approach to innovation in downstream applications which is key to supporting the competitiveness of the EU's EGNSS industry. This has also proven to be a major factor in the market uptake of EGNOS and Galileo. The successful implementation Horizon 2020 have led to the creation of a portfolio of products and advanced prototypes already developed:

- 16 patent
- 78 products
- 188 prototypes
- 419 demonstrations & tests

In addition, there are several capacity building and awareness raising projects that promote EGNSS solutions across markets, and regions, both in Europe and globally.

Complementing Horizon Europe – and also managed by EUSPA, the EU's **Fundamental Elements**³² funding mechanism utilises grants and procurement (€101m for 2015-2020, €43m for 2021-2027) for the development of EGNSS-enabled chipsets, receivers and antennas.

The EU's Fundamental Elements (FE) R&D programme is supporting the designing, development, and production of EGNSS-enabled receivers, chipsets, antennas, and devices. The FE Programme is a part of the overall European GNSS strategy for market uptake, led by EUSPA, driving:

³¹ https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

³² <https://www.euspa.europa.eu/opportunities/fundamental-elements>

1. The facilitation of the adoption of the European GNSS systems leveraging their differentiators
2. The improvement of the EU industry competitiveness
3. The address of user needs in priority market segments
4. The maximisation of benefits to European citizens

A successful project portfolio driving commercialisation and technology independence in the EGNSS market

43 research projects covering nine different topics have been funded with an EU contribution of 101€ from 2014 to 2020. The projects aim to develop market-ready end-products for end-users in all segments from aviation, automotive and critical infrastructures to agriculture. FE projects are essential in advancing the TRL levels of the concerned technologies and have encouraged their pursuit or adoption. A first portfolio analysis has shown TRL growth between 1 to 2 levels per project towards commercialisation. Additionally, the FE project portfolio has shown a significant impact in achieving strategic non-dependence in this crucial domain and fostering innovation.

Industria, academia, SMEs and start-ups were strongly supported by the FE funding mechanism as they play an essential role in supporting the growth and development of the European industry. This resulted in a strong impact on education with many PHD funded and on employment increase.

After the successful first edition, the FE programme is being continued in a second edition, ensuring continued Galileo uptake driven by user needs and oriented for commercial use. An EC budget of 43 M€ is allocated to adopt EGNSS differentiators such as HAS and OSNMA and emerging, disruptive technologies. Likewise constituting a large part of EU funding are the **European Structural and Investment Funds**³³, the EU's main investment policy tool. These funds aim to deliver a critical mass of investment in key EU priority areas, supporting job creation and sustainable growth of the European economy.

Another recent EU funding programme is **Digital Europe**³⁴, which is focused on bringing digital technology to businesses, citizens and public administrations. Implemented through different work programmes and issuing calls, it provides strategic funding to address the challenges of digitalisation and of making Europe greener. It supports projects in the key capacity areas of supercomputing, Artificial Intelligence (AI), cybersecurity, advanced digital skills and ensuring a wide use of digital technologies across the economy and society, including through **Digital Innovation Hubs**³⁵.

COSME³⁶ is a further large programme specifically targeting SMEs. It supports access to finance (guarantees, loans and equity capital) across company stages of development through different financial instruments³⁷.

The European Innovation Council (EIC) provides equity from €0.5m to €15m to SMEs and start-ups through their highly competitive **EIC Accelerator**³⁸. The accelerator also provides non-dilutive grant funding of up to €2.5m for innovation development costs. Further support includes coaching and mentoring and access to investors and businesses. Through **EIC Pathfinder**³⁹, early-stage

³³ https://ec.europa.eu/regional_policy/en/funding/

³⁴ <https://digital-strategy.ec.europa.eu/en/activities/digital-programme>

³⁵ <https://digital-strategy.ec.europa.eu/en/activities/edihs>

³⁶ https://ec.europa.eu/growth/smes/cosme_en

³⁷ https://ec.europa.eu/growth/access-finance-smes/cosme-financial-instruments_en

³⁸ https://eic.ec.europa.eu/eic-funding-opportunities/eic-accelerator_en

³⁹ https://eic.ec.europa.eu/eic-funding-opportunities/eic-pathfinder_en

development of new technologies is supported with grants of up to €3-4m. **EIC Transition** provides grants of up to €2.5m to validate and demonstrate new technologies.

The EU Chips Act⁴⁰, proposed on 8th February 2022 targets mobilisation of more than €43bn from public and private sources until 2030. If adopted, it can also provide funding and support to the companies in the GNSS ecosystem that manufacture receivers and other types of hardware.

3.2 Available EUSPA and ESA grant funding opportunities for GNSS companies

Inspired by the success of thematically oriented competitions such as e.g. Farming by Satellite⁴¹ in creating communities of practice and in attracting young entrepreneurs, EUSPA has launched and is managing a number of prizes such as MyGalileoApp⁴² (€180k prize money for three finalists, mentoring), MyGalileoSolution⁴³ (€1.45m prize money for 50 teams), Geomatics on the Move⁴⁴ (€30k for 10 teams) or MyGalileoDrone⁴⁵ (€230k for four winning teams). The long-running Galileo Masters⁴⁶ provides support to satellite navigation innovations at earlier stages of development (€1.23m prizes in 2021). Recently, it has been complemented with its own incubation programme⁴⁷.

EUSPA also leads several competitions under CASSINI, including the CASSINI Hackathons as well as the #myEUspace⁴⁸ competition which offers financial support (€1m for 54 selected teams) for prototype and product development.

Further, EUSPA provides grants through calls for proposals for both Galileo (varying annual budgets) and EGNOS (€6m for 2015-2021) through annual grants plans. Through these, EUSPA launches calls for proposals in the field of GNSS. Finally, EUSPA procures⁴⁹ products, services and solutions for their operations. In 2020, procurement value amounted to €44.5m, including overhead expenses to run EUSPA.

The European Space Agency (ESA) is funding research and development activities through tenders⁵⁰ and a number of initiatives. For example, ESA's **Kick-start Activities** programme⁵¹ funds SMEs and start-ups (up to €60k per contract) to develop new business applications. It is part of ESA's Business Applications programme, which provides further capital through calls for proposals. **ESA Business Incubation Centres** (BICs, ca. 21 centres at more than 60 European locations)⁵², managed by partners across Europe, provide access to facilities and expertise and offer seed money and access to equity loan facilities, VCs and other finance opportunities.

⁴⁰ https://ec.europa.eu/commission/presscorner/detail/en/ip_22_729

⁴¹ <http://www.farmingbysatellite.eu/>

⁴² <https://www.euspa.europa.eu/mygalileoapp>

⁴³ <https://www.euspa.europa.eu/mygalileosolution>

⁴⁴ <https://www.euspa.europa.eu/Geomaticsonthemove>

⁴⁵ <https://www.euspa.europa.eu/mygalileodrone>

⁴⁶ <https://galileo-masters.eu/>

⁴⁷ <https://galileo-masters.eu/incubation/>

⁴⁸ <https://www.euspa.europa.eu/myeuspacecompetition>

⁴⁹ <https://www.euspa.europa.eu/opportunities/procurement>

⁵⁰ <https://doing-business.sso.esa.int/>

⁵¹ <https://business.esa.int/news/kick-start-activities-new-funding-opportunity-for-innovative-applications-ideas>

⁵²

https://www.esa.int/Applications/Telecommunications_Integrated_Applications/Business_Incubation/ESA_Business_Incubation_Centres12

3.3 EIB funding instruments for GNSS and Space Companies

The EIB has historically supported the main European players in the space sector through its standard loans and EFSI. Recently, it has further enhanced its commitment by actively implementing the MoU signed with ESA and the former European GNSS Agency (GSA), transformed in May 2021 into EUSPA.

Within the European Climate Action agenda, the Bank (the Climate Bank) is also increasing its activities in the field of the Earth Observation system, Copernicus. Two events are organised with DG MARE and DG DEFIS to foster innovation of satellite-based companies operating in the domains of ocean and environmental monitoring technologies and services.

In the recent year, the collaboration between all European institutions has increased and it is expected that together with DG DEFIS, this common vision would open the way for setting up an integrated financial system to support space companies.

In the past, based on the demand, EIB funding activities were mainly focused on the upstream space market. Just to mention a few of EIB's projects in the sector, it is worth mentioning that in 2016, the EIB provided financing to develop an innovative satellite platform based on an all-electric propulsion system. The Bank has also supported Europe's access to space through the financing of the next generation launcher of Arianespace in 2019 – the Ariane 6 launcher. The project represents a large multiannual programme to develop a new family of European space launchers by Ariane Group with improved technical flexibility and modularity to respond to the latest trends in the satellite market. Most recently, in 2020, the EIB has financed two European innovative New Space companies that will enable activities related to climate action; Spire, which develops and operates earth/weather observation satellites, and D-Orbit, which develops ride-share launch solutions for small satellite operators in the Earth Observation business. In addition, in 2021, the Bank financed Endurosat, a fast-growing Bulgarian company that provides innovative, high-performance and affordable Nanosatellites and space services to the market.

For the future, it is expected that the pipeline for space funding, including GNSS operations will increase following the launch of the **InvestEU** Programme. InvestEU supports diverse EU policy objectives, including funding for space. Out of the €26.2bn of EU budgetary guarantee available to Implementing Partners, 75% (€19.6bn) is granted to the EIB Group. Overall, the InvestEU Programme aims at mobilising more than EUR 370 billion in additional investment across Europe, of which 30% must contribute to EU climate objectives.

Table 1: InvestEU Policy Windows

Policy Window	EU Guarantee	Eligibility
Sustainable Infrastructure SIW general debt –	€9.9bn	Development of in-orbit and ground space infrastructure, supporting Union Space Programme and Space Strategy for Europe objectives.
Research, Innovation and Digitalisation RIDW general debt	€6.6bn	Wide policy focus on space technologies, products, applications or services supporting manufacturing of components, launch systems, use of space data,

Policy Window	EU Guarantee	Eligibility
		adaptation/application to non-space sectors. GNSS Services mainly fit this Window.
Social Investment and Skills	€2.8bn	N.A.
SMEs	€6.9bn	Mainly EIF "CASSINI"

While well established companies continue to be supported via EIB’s standard loans, earlier stage space companies could be financed with the support of InvestEU, without any specific ceilings for financing space, based on current negotiations. In practice, the EIB will finance companies, either via debt or equity type, under the Sustainable Infrastructure and Research, Innovation and Digitalisation Windows.

Moreover, space projects could be financed by the Green transition thematic finance, focusing on areas of higher risk to foster greening and transition to sustainable development of the space sector (launchers, space crafts, infrastructure, Earth Observation systems).

The EIB has already started engaging with project promoters in order to provide financing to the market. Financing is conditional on ad-hoc financial and technical due-diligence appraisal, which considers the projects’ specific activities/policy areas in focus, size of project/financing needs, and promoter’s credit worthiness.

The **EIB Venture Debt** financing⁵³ is destined to late-stage start-ups, usually small caps with no more than 500 FTEs. The usual target is an R&D driven enterprise which has already raised a Series A/B equity round, possibly provided by primary venture capital funds. EIB usually supports a 3-year R&D investment programme by financing 50% of the eligible costs with a ticket size ranging from €7.5m to €35m. The loan is usually bullet, 5 years maturity with an availability period on average of 2 years. The remuneration is a mix of interests and warrants, the latter to get a possible upside. It is key that the company has already achieved a product and technical validation from the market and additionally, already has a clear go-to-market strategy and serial production process in place.

⁵³ <https://www.eib.org/en/products/equity/venture-debt.htm>

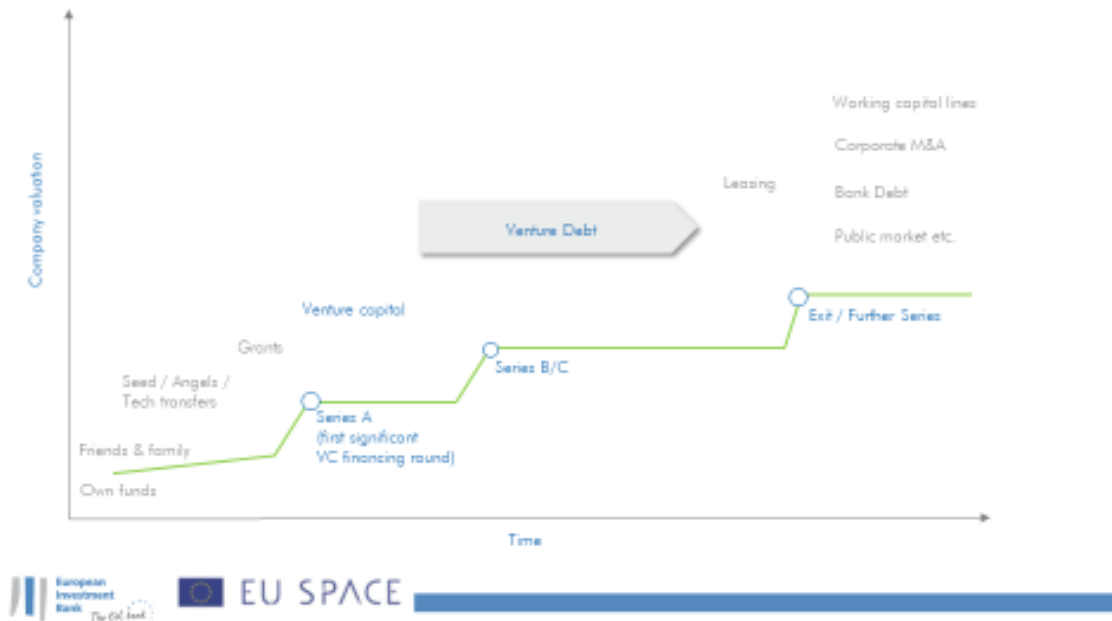


Figure 11: Venture debt in the life cycle of a company, Source: EIB

The **European Investment Fund**, which is part of the EIB group and has the EU and a number of European privately owned financial institutions as shareholders, provides funding and guarantees (equity, debt, loans) to SMEs specifically. Its priorities are set on supporting EU’s objectives such as employment, growth, innovation and regional development. As a joint initiative of EIB and EIF, InnovFin fosters access to finance for European companies undertaking innovation efforts. Financing tools include loans, guarantees and equity funds, all provided through local financial intermediaries. The **InnovFin Space Equity Pilot**⁵⁴ is dedicated to supporting innovation and growth amongst European companies active in the space sector across the EU (upstream and downstream) through venture capital funds (€300m). EIF’s **European Angels Fund**⁵⁵ provides equity (€800m) not to companies directly, but to business angels and other non-institutional investors for the financing of innovative companies in the form of co-investments.

3.4 Private investment opportunities for GNSS companies

Beyond public funding opportunities, companies may also look to private investors which may be, for example, individuals, investment firms, corporate investors or banks. Both equity-based and equity free forms are common. Investors may focus on specific geographical markets, sectors and investment stages. Early-stage investors (e.g. angel investors) take higher risks and expect higher returns, thus typically offer equity- or debt-based investment. Venture capital (VC) firms typically provide equity investment to early stage and growth phase companies. Corporate VCs invest in companies not necessarily as a financial venture, but more often to advance their own operations or to achieve diversification. Beyond money, they may bring in valuable sectoral knowledge and access to business. Private equity firms invest in grown companies, often for significant shares in these with the aim to exit the company when the shares are more valuable. Debt financing from private investors, banks or other financial companies or institutions provides loans to be repaid, typically with interest.

⁵⁴ https://ec.europa.eu/commission/presscorner/detail/en/IP_21_89

⁵⁵ https://www.eif.org/what_we_do/equity/eaf/index.htm

In recent years, investors with a focus on space have emerged. Additionally, awareness among those with broader portfolios or a focus on markets that may benefit from space-based solutions have increased. In Q3 2021 alone, VCs globally invested ca. €3.5bn into space companies (€1.8bn of which went to US-based companies)⁵⁶. Cumulative investments in space companies since 2012 amount to €206bn, 60% of which went into the Positioning, Navigation and Timing (PNT) sector.

In Europe, few examples of investors solely focusing on space exist. Belgium-based EBAN Space, a network of angel investors, is one of them. Another such angel group and VC is UK-based Seraphim Capital, who also run their own accelerator. Yet, many European space companies have succeed in receiving investment from different types of investors. Notable investments into companies that are part of the sample for the survey are listed below.

Table 2: Private investors with notable investments in the space sector. Own analysis based on survey sample, Crunchbase.

Investor	Country	Type of investor							Investment stages						Notable investments (GNSS-related/ EO/ other Space)		
		Incubator	VC	Private Equity	Angel	Family	Micro Capital	Corporate VC	early	pre-seed	Seed	Series A	Series B	Series C		Growth	
10x Group	DE				x				x		x					x	Quantum Systems
3LB Seed Capital Srl	IT								x		x						D-Orbit
Airbridge Equity Partners	NL		x						x							x	roam.ai
Airbus Ventures	US							x	x		x						Astrocast, Isar Aerospace, Humatics (US), Apex.AI (US), uAvonix (US)
Ananda Impact Ventures	DE		x						x		x						OroraTech
Apeiron Investment Group	MLT			x													Isar Aerospace
APEX Ventures	AT		x						x		x						OroraTech
Ardian	FR			x													CLS
Azini Capital Partners	UK			x												x	1Spatial, antenova m2m
BASF Venture Capital	DE							x									Hummingbird
Breega	UK		x						x		x						SENCROP
Como Venture	IT		x														D-Orbit, Leaf Space
DeepTech Ventures	CH				x				x								Fixposition
DNX Ventures	US		x						x		x						ICEYE

⁵⁶ Space Capital, Space Investment Quarterly Q3 2021

Funding and investment available for downstream GNSS companies

Downing Ventures	UK		x						x	x				x	Hummingbird
Draper Associates	US		x						x	x				x	ICEYE
Draper Esprit	UK		x											x	ICEYE
Earlybird Venture Capital	DE		x	x					x	x				x	Isar Aerospace
Elysian Capital LLP	UK		x												D-Orbit
Equity Gap	UK					x			x						Global Surface Intelligence
Finch Capital	NL		x						x	x					Hiber
Foundation for Technological Innovation (FIT)	CH								x	x					timeon, Astrocast
Freigeist Capital	DE		x						x						EnduroSat
Green Arrow Capital	IT		x												D-Orbit
HV Capital	DE		x	x					x	x				x	Isar Aerospace
Indaco Venture Partners	IT		x							x				x	D-Orbit
Index Ventures	US		x						x	x				x	Kayrros
Invitalia Ventures	IT		x						x						D-Orbit
Korelya Capital	FR		x						x					x	Kayrros
Lakestar	CH		x						x	x				x	Isar Aerospace
Lifeline Ventures	FI		x	x					x	x					ICEYE
Monkfish Equity	DE		x						x	x				x	Tractive
Newable Ventures	UK		x		x				x	x				x	Hummingbird
Noosphere Ventures	US		x						x						D-Orbit
Nova Capital Management	UK		x	x											D-Orbit
OTB Ventures	PL		x						x						ICEYE
Par Equity	UK		x						x	x					Global Surface Intelligence
Primwest	CH		x												Kayrros
Promus Ventures	US		x						x	x					ICEYE
RedSeed Ventures	IT		x												Leaf Space
Samos Investments	UK		x						x	x					Hummingbird
Seraphim Capital	UK		x		x				x					x	D-Orbit, ICEYE
Space Angels	US		x		x				x	x					ICEYE

SpaceTec Capital	DE			x														OroraTech
Tesi	FI			x														ICEYE
True Ventures	US		x						x	x							x	Fixposition, ICEYE
Venture Kick	CH	x																Fixposition
Verve Ventures	CH		x						x	x							x	Astrocast
Vito Ventures	DE		x						x	x								Isar Aerospace
Vsquared Ventures	DE		x								x	x	x					Isar Aerospace, Morpheus Space

Further investors potentially relevant for space-related companies are listed in EUSPA’s Venture Capitalist Database⁵⁷.

Private investment does come with the risk of losing control over the company and, in case of foreign investors, European autonomy, if strategically important companies are affected. Rising stars among European GNSS companies have received an estimated private investment of €1.25bn up to 2022⁵⁸. At a CAGR of 5.7% for the GNSS market, this is expected to grow to €1.96bn by 2030. To provide an alternative to (foreign) private investment, a funding envelope of ca. €710m would thus be required over the next eight years to substitute such private funding.

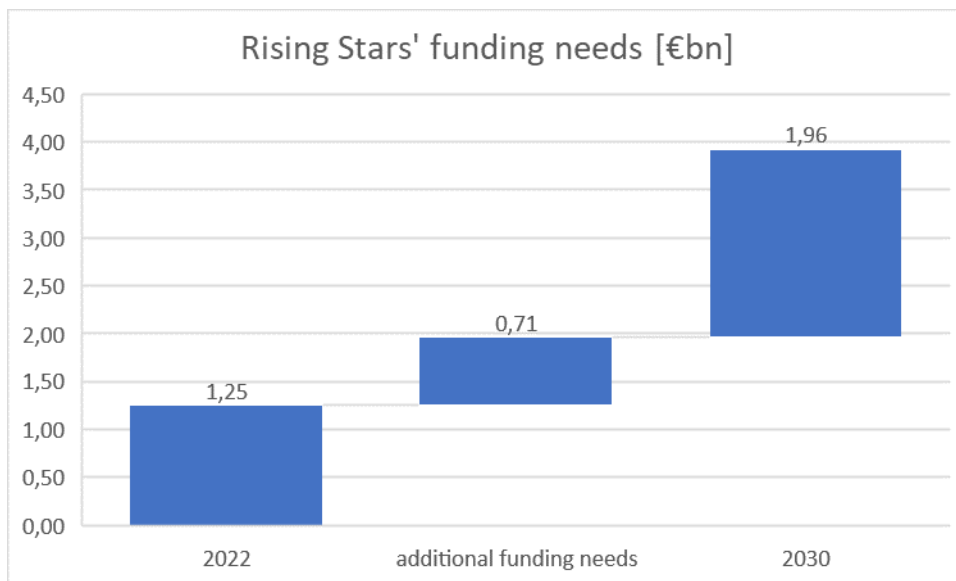


Figure 12: Estimated €710m funding needs for GNSS Rising Stars

The below examples show the risk of GNSS Rising stars struggling to secure sufficient funding or investment in Europe and finally turning to or being contacted by foreign investors.

Case study: Tractive

Case study: Fixposition

⁵⁷ <https://www.euspa.europa.eu/euspace-applications/venture-capitalist-database>

⁵⁸ Estimation based on Crunchbase data

- **Offering:** GNSS collars for cats and dogs
- **HQ:** Austria
- **Founded:** 2012
- **Funding Raised:** \$37.7m
- **Story:** After almost 10 years of business angel and acceleration/incubation funds, Tractive raised \$35m from US-based Guidepost Growth Equity

- **Offering:** High-precision navigation sensors for autonomous robots
- **HQ:** Switzerland
- **Founded:** 2015
- **Funding Raised:** \$9.8m
- **Story:** After small grants and “kicks” (incl. Galileo Masters and H2020), raised seed funding worth €8.5m (in 2019 and 2021) incl. from US-based True Ventures

3.5 Differences in financing between Europe, USA and international players

R&D expenditure across all geographies are inevitably linked to the funding available to private companies, whereas regional R&D patterns are similar across all industries. According to OECD data, total European R&D by private companies grew from €203bn to €279bn between 2013 and 2018. While exhibiting the fastest growth rate across the regions, total European R&D expenditure in 2018 was only 70% of that of North America and a half of expenditure in the Asia-Pacific region. Historically, European industries have been heavily dependent on bank lending rather than capital markets, resulting in their inability to raise funds for more risky projects. This effect has been further compounded by higher risk aversion of European academic and scientific communities. These communities exhibit lower mobility of staff than other regions, leading to a lower share of privately funded science and research activities - activities which incentivise business risk-taking⁵⁹.

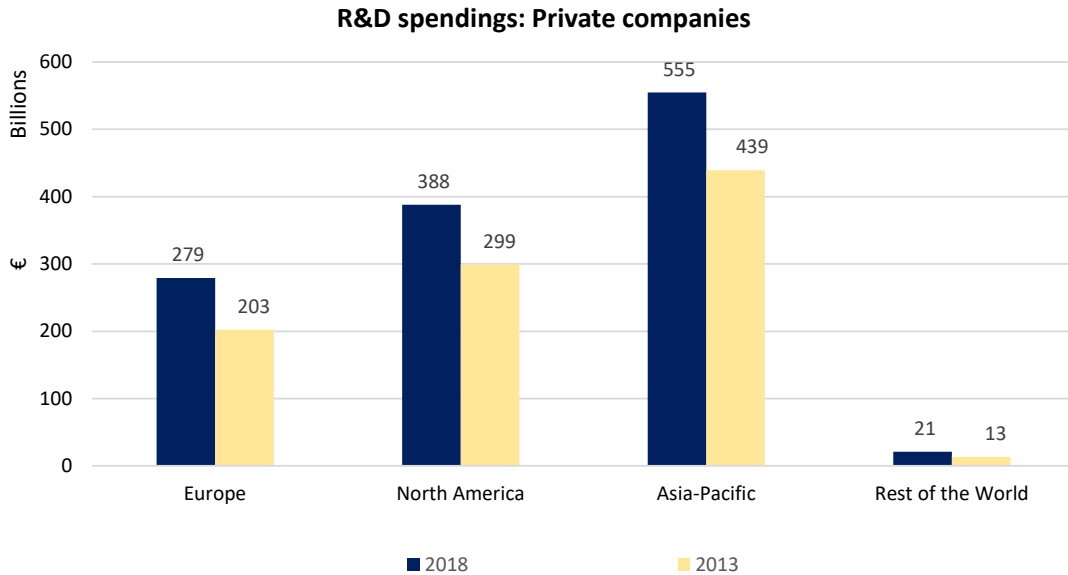


Figure 13: R&D expenditure: private companies. Source: Own elaboration based on OECD data

Funding opportunities in the wider space industry, which might serve as a proxy for the downstream GNSS market, are affected by similar factors. Whilst for many years, space ventures have been predominantly funded by national space agencies, recent years have seen a flurry of private

⁵⁹ Yassen Iliev, Lluç Diaz, 2018. *Assessment of the financing needs of space SMEs in Europe*.

investments into so called “New Space” companies. The total value of such investments totalled €11.7bn⁶⁰ over the last decade. In 2019, US companies accounted for a little less than 50% of all funded space enterprises but they received almost 80% of available funds⁶¹. This is driven mainly by the fact that US space companies are usually at later stages of business maturity, with ready-to-market products, an established customer base and hence more predictable revenue flows which entice investors. R&D spending at early stages of companies’ development is one of the main reasons behind the success of US companies in increasing their attractiveness to private investors, and subsequently propelling their future expansion.

In 2019, **71% of all worldwide funding provided to space companies came from venture capital (VC) and private equity (PE) companies**⁶². While the former group tends to invest at relatively early stages of company development, investors in the latter are characterised by higher risk aversion and require predictable revenues, making it difficult for early-stage companies to secure funding for their expansion from such companies. It is expected that in the near future, the share of investments coming from these two sources will increase owing to the prevailing macroeconomic conditions, low rates of return from alternative investments and abundance of liquidity. In fact, investors have reported a widespread availability of cash and they continue to seek space companies with high growth potential⁶³. It is expected that while this trend continues, new generations of space companies will emerge in market segments with high return potential, including Consumer Solutions, GNSS-based software and other added-value services.

The new trend among space companies to raise funds on capital markets includes reversed mergers, achieved through a special purpose acquisition company (SPAC). This novel way of obtaining funds has recently gained momentum, allowing companies to go public without extensive disclosures usually associated with IPOs. In 2019, Virgin Galactic was the first space company to go public via a SPAC, with its valuation reaching a high of six-fold the initial offering price. In fear of missing out on lofty valuations that characterise such companies, several other space companies have joined the SPAC bandwagon, increasing the total funds raised by space companies to \$5.1bn worldwide, with an estimated valuation of \$27.1bn⁶⁴.

However, the role of governments and public institutions should not be underestimated. On the contrary, governments play a crucial enabling role in the start-up space investment landscape. Not only can they provide direct funding to bring companies to the later stages of business maturity, but they also strengthen confidence among private investors by providing their endorsement to companies. This way, governments play a key role in shaping the growth of strategic industries. By providing their “approval stamp”, they are able to influence the segments into which private funds will flow. As an additional benefit, the space industry works as an important source of innovation for governments. Therefore, governments face a unique opportunity to leverage start-up space companies to achieve more with less spending.

For instance, the US government agencies are believed to have played an important role in increasing business confidence among venture capital firms by awarding study contracts and doing business with US space start-ups. In 2014, NASA awarded Boeing and SpaceX with fixed-price contracts of \$4.2 billion and \$2.6 billion respectively under the Commercial Space Program for the development of CST-100 and Dragon V2 spacecrafts⁶⁵, which allowed both companies to gain a

⁶⁰ Goldman Sachs, 2017. *Space. The Next Investment Frontier*.

⁶¹ BryceTech, 2020. *Start-Up Space Report 2020*.

⁶² Ibid

⁶³ Ibid.

⁶⁴ BryceTech, 2021. *Start-Up Space Report 2021*.

⁶⁵ <https://www.nasa.gov/content/commercial-crew-program-the-essentials>

significant advantage in the competitive market. A recently created initiative called Commercial Space Futures serves as a bridge between the US government and new commercial entrants and its goal is to “make sure those entities will, in fact, succeed”⁶⁶.

Chinese companies, having secured VC investments worth only a quarter of those of the US in recent years⁶⁷, also depend on government contracts to speed up their growth. China’s government opened the space sector to private investments in 2014, leading to the rapid expansion of the commercial space sector in the country. Initiatives are not only limited to large projects, such as the construction of the Tiangong space station, but also include the support from provincial and local governments. For example, Galactic Energy will construct a local research centre for the development of rocket propellant in the city of Jianyang⁶⁸.

Having realised the growth potential of the space segment and the struggle of a limited number of national space start-ups, the Japanese government announced the creation of a fund of \$940 million to support the development of space companies and decided to establish an agency to distribute the funds and facilitate a cooperation of local space start-ups with JAXA and the industry leaders, such as Mitsubishi Heavy Industries⁶⁹. As a result, several Japanese space SMEs have transformed into high-value companies, with Astroscale securing private funding to become the only company solely dedicated to on-orbit servicing, and government backed Ispace developing a robotic spacecraft to serve during lunar exploration missions.

Israel positions itself as a space technology hub, being one of the leaders in space engineering education, led by the Israel Space Agency. Other initiatives to boost Israel’s space landscape include space dedicated accelerators (e.g. Space-Nest, Starburst), government contracts for Israel Space Agency’s missions support (e.g. Beresheet – the lunar landing mission) and dedicated funds from the Israel Innovation Authority. In 2021, an Israeli venture capital fund was established with the goal to become Israel’s Space-tech pioneer. The space market, previously considered too risky for Israel’s Venture Capital firms, finally became a target for private investors, whose confidence has been boosted by government’s initiatives⁷⁰.

These countries have recognised the innovation potential emerging from the space industry and have played a key role in shaping their domestic space industries. Lucrative government contracts helped to shape a new generation of SMEs and offset the previously slow development of some strategic market segments⁷¹. As a result, almost 80% of all available VC and PE funds in 2019 were captured by US companies⁷². Japanese space companies also performed well, followed by firms from Israel, the UK and Europe.

The funding issue is also visible on the supply side. US venture capital funds invested five times more than European VC firms despite similar GDP and population size across the two regions⁷³. Therefore, only large enough and already successful companies manage to secure funding from European VCs. It has been reported that European SMEs with annual revenues below €1m are most likely to quote “access to finance” as the main obstacle to faster development⁷⁴. It can be consequently concluded

⁶⁶ <https://spacenews.com/u-s-military-looking-to-build-lasting-relationships-with-commercial-space-industry/>

⁶⁷ <https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/>

⁶⁸ <https://spacenews.com/chinese-rocket-companies-secure-local-government-support-for-research-production-facilities/>

⁶⁹ <https://www.cnbc.com/2018/03/20/japan-offers-940-million-to-boost-nations-space-startups.html>

⁷⁰ <https://www.haaretz.com/israel-news/business/.premium-new-venture-capital-fund-aims-to-become-israel-s-space-tech-pioneer-1.9702687>

⁷¹ BryceTech, 2019. *Start-Up Space Report 2019*.

⁷² BryceTech, 2020. *Start-Up Space Report 2020*.

⁷³ Acevado, Adey, Bruno, del Bufalo, 2016. *Building Momentum in Venture Capital across Europe*.

⁷⁴ Yasen Iliev, Lluç Diaz, 2018. *Assessment of the financing needs of space SMEs in Europe*.

that market inefficiencies are the most prevalent at the scaling up stage, where companies are most dependent on R&D expenses to speed up their development. There is also an increasing risk of foreign VC investments in European companies, which will result in the loss of European strategic independence in the downstream GNSS market.

The Space Strategy for Europe envisages a crucial role of R&D investments in the downstream GNSS market in fulfilling key objectives of EU policies. It is noted that with the full operational ability of the European GNSS, the focus should be shifted to promoting European leaders and developing their industrial capabilities to improve their competitiveness on the global markets and to fully exploit the benefits brought by European GNSS differentiators⁷⁵. Nonetheless, one of the major hurdles faced by European GNSS companies is the limited availability of funding necessary to pursue their development plans. As presented in the section GNSS R&D expenditure (4.1.2), **European R&D expenditure in the downstream GNSS market in 2019 amounted to at least €0.9bn**, compared to €0.7bn in Asia-Pacific and €1.2bn in North America⁷⁶. According to the analysis, almost **85% of GNSS-related R&D spending in Europe comes from a group of only five companies** (Volkswagen, Daimler, Airbus, BMW, Siemens). Whilst larger companies are more likely to reinvest their profits and raise debt or equity funds on capital markets, the whole new generation of potential European leaders lack this ability and relies on public grants and Venture Capital investors. Unfortunately, public grants on offer are limited in size and usually focus only on initial technology development. On the other hand, venture capital investors tend to finance companies at later stages of technological maturity, leaving a gap in available funding for companies that passed the initial development phase yet lack the necessary capacity to secure venture funding.

The existence of this financing gap only serves to reiterate the importance of providing additional funding to close the gap between opportunities available to European SMEs and their North American counterparts. The focus should be directed towards devising financial instruments which clearly address the pre-existing market inefficiency. Such instruments need to support companies currently in the middle-stage development to scale up their operations before they can obtain further funds from private investors. Finally, the financial support should focus on strategic market segments where the gap between European and non-European companies is the widest and the potential growth is the highest. In particular, the Consumer Solution segment is dominated by few multi-billion non-European companies, which keep increasing their market share. It is paramount to support investments in that segment, as a result triggering a growth of European leaders, able to compete on the market. This will enable the development of European industries of strategic importance, producing spillovers to other market segments, and as a result, bring wider benefits to the European economy. The establishment of CASSINI may be considered a step in that direction.

The results of the online survey revealed that the majority of respondents⁷⁷ (65%) are not informed nor interested in financing opportunities offered by international players, as their main focus lies in European instruments – both at national and EU levels. With regard to companies willing to raise funds from foreign investors, 17.5% are targeting the US market, 10% the UK, 7.5% the Chinese market and 10% other international players. Exploring the reasons behind this strategic choice, 43% of respondents stated that these players offer more accessible funding compared to European ones. Furthermore, 14% of respondents would consider international financing opportunities because they were not successful in raising funds in the EU, 14% to target foreign sales and 10% for other reasons (e.g. to be open to all possible funding opportunities).

⁷⁵ European Commission, 2016. *Space Strategy for Europe*.

⁷⁶ Based on reported R&D expenditure from Bureau van Dijk's Orbis database. Not all companies report their R&D expenditure, hence the reported value is the lower boundary on total value of R&D expenses.

⁷⁷ The sample under analysis: n=40.

With specific regard to the **US**, some respondents highlighted that more funding instruments are available for start-ups in the space domain, also due to the high dynamism of the US market and attitude to risk. This is also due to the existence of a very liberalised market and easier access to private financing. As a consequence, competition between European GNSS companies and those that have access to US investments can be unsustainable, especially for start-ups in the absence of a level-playing field. Moreover, in particular for VCs and corporate VCs, some respondents find average negotiation terms to be more unfair compared to conditions proposed by European players.

Concerning available **Chinese** financing opportunities, the perception of respondents is that these are among the easiest ones to access at the international level. Chinese investors are very open to invest in foreign R&D projects and technologies. However, respondents indicated their general aversion to rely on Chinese investors. Their main concerns are caused by intellectual property ownership issues and their enforcement at regional level, as well as the risk of interference of the Chinese political system in their business affairs.

4 Analysis of investment needs and funding gaps

Having collected and presented the key contextual aspects on the dynamics of the GNSS market and the currently available or planned public and private funds for downstream GNSS solutions, this section seeks to **analyse investment needs and funding gaps**. The analysis of investment needs is informed by extensive desk research that includes novel investigations in the EUSPA market monitoring tools as well as in depth study of relevant databases with focus on the state of play around acquisitions and GNSS R&D expenditure. The identification and discussion of funding gaps is driven by the direct insights collected via a dedicated survey and interviews with selected companies and complemented by a dedicated analysis of rising stars in Crunchbase.

4.1 Investment needs

4.1.1 Analysis of Acquisitions

Table 3: The ten largest acquisitions of companies operating in the downstream GNSS market between 2016-2021

Acquirer name	Acquirer country	Target name	Target country	Deal type	Deal Value (€ million)
United Technologies Corporation	United States	Raytheon Company	United States	Acquisition 100%	49,783.7
Nippon Telegraph and Telephone Corporation	Japan	NTT Docomo Inc.	Japan	Acquisition increased from 66.4% to 100%	33,697.0
Microsoft	United States	LinkedIn	United States	Acquisition 100%	24,355.4
United Technologies Corporation	United States	Rockwell Collins	United States	Acquisition 100%	20,776.7
Stellantis NV	Netherlands	Peugeot SA	France	Acquisition 100%	19,876.4
Analog Devices Inc.	United States	Maxim Integrated Products	United States	Acquisition 100%	17,766.1
Nokia OYJ	Finland	Alcantel-Lucent	France	Acquisition 100%	15,600.0
Harris Corporation	United States	L3 Technologies	United States	Acquisition 100%	13,794.5
State Street Corporation	United States	Lockheed Martin Corporation	United States	Minority stake 16.4%	11,531.0
State Street Corporation	United States	Boeing Company	United States	Minority stake 10.4%	9,395.4

Since 2016, a major wave of acquisitions involved companies acquiring GNSS competitors operating at the same level of the value chain, with a general focus on expanding their product range, saving costs on economies of scale, and increasing their customer base.

The prevalent trend observed in the last five years is the tendency to acquire GNSS companies from the same geographic region, with each of the ten largest deals following this pattern. The market is characterised by a small number of large players with significant market power. This fosters intraregional deals, which allow companies to move their focus from competing over domestic customers to broader expansion plans bolstered by reduced financing cost, and consequently, sustain higher investments in new technological solutions.

Despite the intraregional consolidation trend, there has been a number of transactions that involved cross-continental acquisitions. From a European perspective, **an acquisition of a European company by a foreign competitor implies a reduced share of global revenues, as well as a decrease in European competitiveness**. Additionally, many GNSS-based technologies can serve both commercial and military purposes, making the **foreign acquisitions of European companies a**

potential threat to European strategic independence. During the analysis, **14 deals** completed over the last 5 years have been identified where a foreign company acquired at least a 5% stake of a European company operating in the downstream GNSS market. These deals are presented in the table below.

Table 4: Notable foreign acquisitions of European GNSS companies operating in the downstream GNSS market between 2016-2021

Acquiror name	Acquiror country	Target name	Target country	Acquired stake (%)	Completed date	Deal Value (€ million)
CK HOLDINGS CO., LTD	Japan	MAGNETI MARELLI SPA	Italy	100.0%	02/05/2019	5,800.0
FMR LLC	United States	INDRA SISTEMAS SA	Spain	10.6%	n.a.	211.8
SICHUAN GLOPORT INVESTMENT DEVELOPMENT GROUP CO., LTD	China	META SYSTEM SPA	Italy	22.0%	16/10/2019	76.3
LUCERNE CAPITAL MANAGEMENT GP LLC	United States	FUGRO NV	Netherlands	9.6%	13/02/2019	71.0
KILTEARN PARTNERS LLP	United Kingdom	FUGRO NV	Netherlands	5.2%	13/03/2017	65.6
PANASONIC CORPORATION	Japan	FICOSA INTERNATIONAL SA	Spain	20.0%	04/07/2017	65.0
LUCERNE CAPITAL MANAGEMENT GP LLC	United States	FUGRO NV	Netherlands	4.8%	04/12/2019	33.5
TELEIOS GLOBAL OPPORTUNITIES MASTER FUND LTD	Cayman Islands	ADVA OPTICAL NETWORKING SE	Germany	4.9%	07/03/2018	14.4
GUANGZHOU STONEX SURVEYING AND MAPPING TECHNOLOGY CO., LTD	China	STONEX SRL	Italy	60.0%	05/10/2016	5.6
BATTERY MANAGEMENT CORPORATION	United States	AED-SICAD AG	Germany	100.0%	25/07/2017	n.a.
CHANGYUAN GROUP LTD	China	OPTOFIDELITY OY	Finland	100.0%	31/08/2017	n.a.
COMPLETE INNOVATIONS INC.	Canada	ECOFLEET HOLDING OU	Estonia	100.0%	31/01/2018	n.a.
AVELLAN SPACE TECHNOLOGY & SCIENCE LLC	United States	NANOAVIONIKA UAB	Lithuania	51.0%	06/03/2018	n.a.
VINGROUP JOINT STOCK COMPANY	Vietnam	MUNDO READER SL	Spain	51.0%	03/12/2018	n.a.
INTEL CORPORATION	United States	HERE GLOBAL BV	Netherlands	15.0%	n.a.	n.a.
COSCO SHIPPING PORTS LTD	The Bahamas	REEFER TERMINAL SPA	Italy	49.9%	n.a.	n.a.

Deal value has been reported for 7 deals, totalling **€6.26bn**. The largest one, CK Holdings' acquisition of Italian Magneti Marelli, has been valued at €5.8bn, over 90% of the total for all deals identified. Consolidations appear to follow the observed pattern of a small number of global players, based in few main geographical markets, increasing their market dominance by acquiring smaller competitors. In fact, European firms have been purchased mainly by companies from the United States, China, and Japan, countries with an already well-established market position. The loss of European representatives in specific market segments leads to a further decline of Europe's share and hampers the growth of global leaders from the continent. For instance, in 2018, Mundo Reader SL (BQ) was acquired by Vingroup, the largest Vietnamese conglomerate. As a result, the European manufacturer of smartphones, tablets, and 3D printers has discontinued its operations and the brand became dormant. In 2021, the brand has been acquired by Huawei, giving the Chinese

company an opportunity to expand its product range with the BQ-branded smartphones and increase its market share in this strategic market. As further consolidations are expected, there is an increasing risk of Europe losing the control over established companies and being ousted of such segments completely.

Case study: Acquisition of Ansaldo

- **2006:** Merger of several major railway companies leads to the creation of Ansaldo – an Italian manufacturer, designer and system integrator of a range of train control systems and equipment
- Over the years, Ansaldo has been an overwhelming leader in the market, with its share equal to roughly 35% of the global revenue in the Rail segment
- **2015:** Hitachi – a Japanese conglomerate – acquired majority shares in Ansaldo, ending European dominance in the strategic segment and transferring 35% of the market to Asia.

Case study: BQ Aggressive Acquisition

- **2016:** BQ – a Spanish tech company introduced Aquaris X5 Plus as the first European Galileo-ready smartphone
- **2018:** Having a significant share of the Spanish market (10,3% in 2017 and €190m revenues) and seeking to scale, BQ sold 51% of its stakes to Vingroup – Vietnam’s largest company by value
- **2021:** Seeing its market share shrinking and losing the power of its brand, BQ filed for bankruptcy. Huawei acquired shares from Vingroup.

For the purpose of this report, a high-level analysis of acquired businesses’ finances over time has been conducted. Combined with information on prevalent deal market conditions, such as various deal multiples (e.g. Company value/turnover, EV/EBITDA), this helped us to infer the current market value of acquired shares of European businesses. It has been estimated that **the provisional amount of funds necessary to reverse the transactions that occurred in 2016-2021 and to bring the aforementioned businesses under European control would lie in a range between €5.5bn and €6.8bn**. This constitutes the first important indicator on the basis of which one can substantiate investment needs. The second indicator concerns R&D expenditure and is discussed below.

4.1.2 GNSS R&D expenditure

One of the main challenges faced by stakeholders concerned with the growth of the European GNSS Industry are the structural changes in the market and underinvestment by European companies, which as a result fall behind foreign competitors and lose market power. This relates both to markets where European companies currently perform well and to those where American and Asian companies have been already established as market leaders. In the former case, European companies have seen a steady decline in their market share, even losing the leader status in several market segments. Numerous factors played a role, including a rapid demand growth in the Asia-Pacific region, often served by domestic companies, but also limited investments in R&D, hampering the efforts to raise a new generation of market leaders equipped with cutting-edge technologies. In the latter, where there is little European presence and global leaders have a considerable advantage over competitors, the challenge is even more demanding. The dominant market position allows these companies to access cheap finance, take bigger risks in their R&D investment opportunities, quickly acquire smaller competitors, and as a result, continuously expand their products and services on offer.

As part of the analysis, the financials of companies operating in the downstream GNSS market have been extracted from the Bureau van Dijk's Orbis Database. Out of the total sample of 1,610 companies fitting the category (that includes Manufacturers of GNSS components and receivers, System integrators, and Software and added-value services providers), **247 companies** worldwide reported their R&D expenditure in years 2016-2019. It must be noted that the sample is biased towards large and traded companies as these entities are more likely to provide publicly available information on their financials - 177 companies from the sample of 247 identified are classified as very large, with their annual revenues exceeding €400m. Additionally, the database is slightly skewed towards European companies, and hence the value of European investments compared to other regions might be overestimated. Out of the sample of 247 companies that reported their R&D expenditure, 63 originate from Europe, 79 from North America, 100 from Asia Pacific, and 5 from other regions. The evolution of R&D spending by region is presented below.

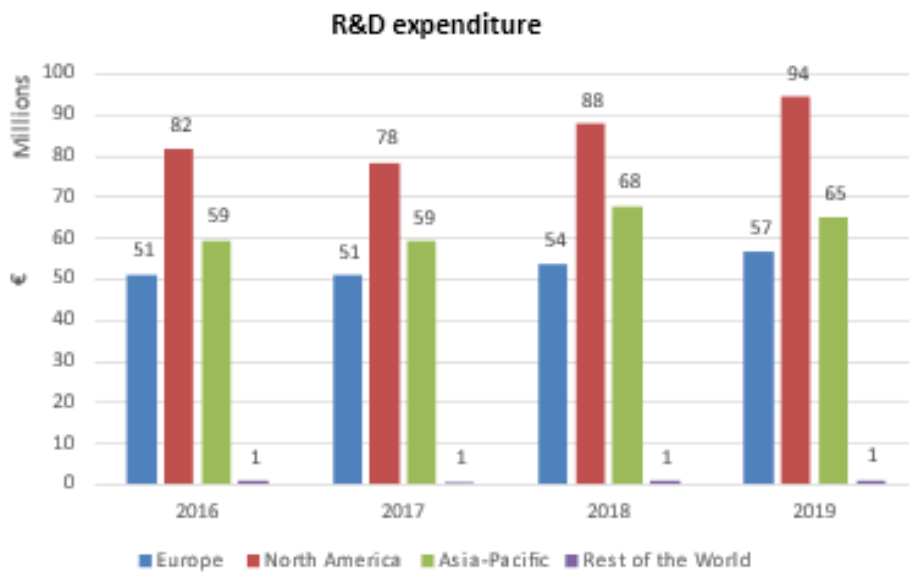


Figure 14: R&D expenditure in the downstream GNSS market by region (for 247 companies)

R&D expenditure by European companies operating in the downstream GNSS market grew at a CAGR of 3.7%, compared to a CAGR of 3.0% in Asia-Pacific and 4.7% in North America. Over the analysed period, the size of R&D investments in Europe was equal to roughly 60% of the R&D investment level in North America and 85% of that in Asia-Pacific.

Additionally, results of the previous research have been used to estimate the size of **GNSS-related** R&D investments. For each firm in the dataset the percentage of revenue that the company derives from GNSS-based technologies has been estimated. This has been performed based on a combination of publicly available information on companies' turnover segmentation and evaluation of individual companies' products and services on offer. It is further assumed that the proportion of GNSS-related R&D spending to total R&D spending is equivalent to the proportion of GNSS-based revenues to total revenues.

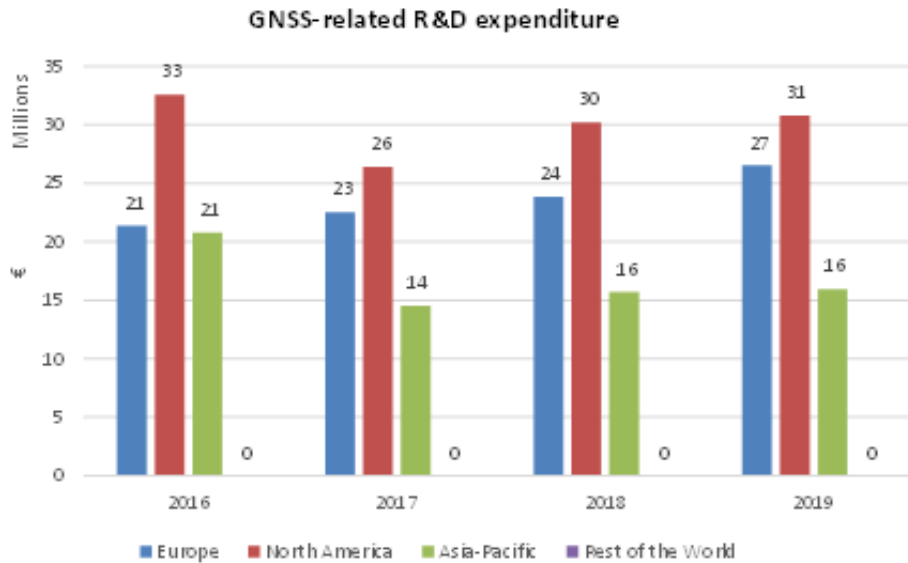


Figure 15: GNSS-focused R&D expenditure by region

European GNSS-related R&D expenditure has grown at a CAGR of 7.4%, the fastest pace across the regions. The size of R&D investments was equal to 65% of North American spending in 2016 and 86% in 2019.

The System Integrators segment reported the highest R&D spending, led by car manufacturers, and then followed by aircraft manufacturers and producers of mobile devices. This is partly driven by high-value investments in electric and autonomous vehicles development. GNSS-related technologies form an integral part of these new technologies, even though they account for only a small share of total R&D investments in the segment. Nonetheless, the sheer size of these costs overwhelms other segments by an order of magnitude, making **GNSS-related R&D expenses among car manufacturers the largest across all markets.**

The largest GNSS-related R&D investments in Europe have been reported by the following companies:

- Airbus Group
- Volkswagen
- Volvo
- Daimler
- Bayerische Motoren Werke (BMW)
- Renault
- Ericsson

Another indicator of R&D intensity is the number of R&D personnel employed by private companies. In absolute terms⁷⁸, Asia-Pacific has the largest number of staff, but North America becomes the leader when looking instead at R&D personnel per million inhabitants. With the personnel of 3,200 per million inhabitants in 2013 and 4,500 in 2018, it recorded an impressive growth rate of almost

⁷⁸ R&D personnel in all private companies, not GNSS-specific.

40% over this period. The R&D personnel in Europe grew by 17.5% over the same 5-year timeframe, from 2,950 per million inhabitants in 2013 to almost 3,500 in 2018.

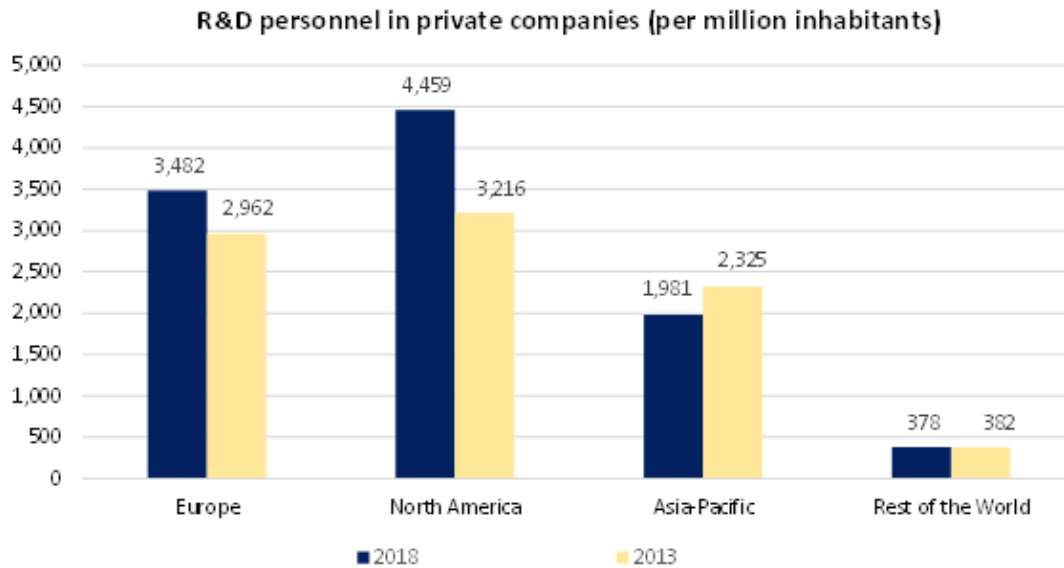


Figure 16: Overall R&D personnel in private companies (per million inhabitants)

Considering the diminishing marginal returns to R&D investments, the proportion of staff engaged in R&D activities needs to grow over time to uphold the associated benefits at a constant level. Nonetheless, several countries have already reported problems in employing qualified staff. The UK Space Agency's space sector skills survey identified a number of challenges relating to recruitment and staff qualifications – particularly in engineering and scientific areas⁷⁹. Similarly, the Canadian Space Agency reported that almost 60% of space companies find it difficult to hire qualified staff⁸⁰. The same issues are visible in Europe, where EARSC reports that 80% of its respondents face difficulties in finding suitable candidates⁸¹. The most sought-after skills identified are programming, development capability, and analytical skills.

4.1.3 Total investment needs for Europe

As presented above, the **GNSS-specific R&D expenditure by European companies in the analysed sample has been growing from €0.9bn in 2016 to €1.2bn in 2019 at a CAGR of 5.7%**. During the same period, GNSS-specific R&D expenditure by North American companies has grown at a CAGR of 8.6%, and by companies in Asia-Pacific at a CAGR of 8.7%.

Subsequently, the results from the sample have been **projected to the whole database** of 1,466 companies in the downstream GNSS market. This resulted in the estimated **GNSS R&D expenditure in Europe of €1.8bn in 2016 and €2.2bn in 2019**. The global GNSS R&D spending has been projected to grow from €5.6bn in 2016 to €7.3bn in 2019.

⁷⁹ OECD, 2021. *Space Economy for People, Planet and Prosperity*.

⁸⁰ Canadian Space Agency, 2020. *State of the Canadian Space Sector Report 2019*.

⁸¹ <https://earsc.org/industry-facts-figures/#1596545548918-2f23ec39-6805>

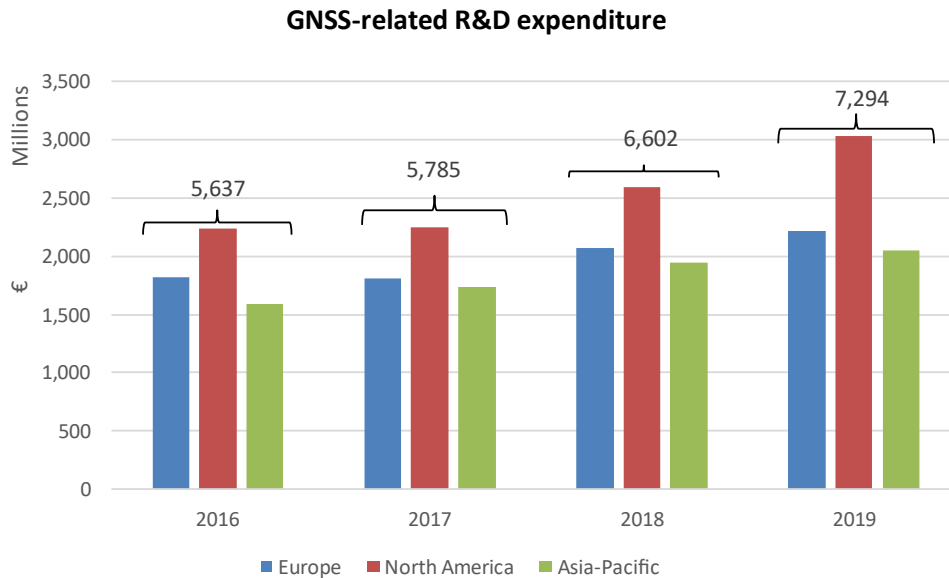


Figure 17: GNSS-focused expenditure by region – projection to the whole database

Based on these projections, two scenarios for the future development of European GNSS R&D have been identified:

- “Business as usual” scenario
- “Matching competitors” scenario

Under the “Business as usual” scenario, European GNSS R&D expenditure will continue growing at its current rate of **5.7% per annum**. Consequently, European companies will be underinvesting relative to non-European competitors. This will likely result in the erosion of European competitiveness, and subsequently to the loss of Europe’s share in major market segments, as well as the overall share in the downstream GNSS market. Taking the current GNSS R&D expenditure and **projecting over the next ten years**, assuming the rate of growth of 5.7% annually, yields a **total investment need of €34.1bn**.

Under the “Matching competitors” scenario, European GNSS R&D expenditure will grow at **8.7% per annum**, the current rate of growth observed in other regions. As a result, Europe will manage to retain its current market share. Taking the current GNSS R&D expenditure and projecting over the next ten years, assuming the rate of growth of 8.7% annually, results in a **total investment need of €42.7bn**.

In summary, using GNSS R&D expenditure as a proxy for the total investment need, and testing two different scenarios, **yields total investments need over the next 10 years between €34.1-42.7bn**. On an annual basis, this is slightly lower than what was probed through the analysis on acquisitions.

4.2 Funding Gaps

4.2.1 Overview of GNSS-related R&D investments in Europe

To further probe into funding gaps with a focus mainly on mid-caps and start-ups, a dedicated survey with over 100 questions was shared with a well-crafted sample of EU GNSS companies. From EUSPA’s database of GNSS companies, 249 companies have been shortlisted as relevant in the context of this study. 100 of these have been targeted with the survey, ensuring an even coverage

across market segments, value chain, company sizes, and geographical regions. 54 of these have provided their feedback, offering an up-to-date insight on several topics. Specifically, information concerning the **share of the workforce employed in R&D**, the way the **company's turnover** is redirected towards **GNSS-related R&D**, and the estimated **R&D and capital expenditure** for the next 5 years were collected through the survey. 10 selected companies have been interviewed to gain deeper insight.

As already argued in the previous parts, R&D is a major driver of innovation and competitiveness, arguably more so in the Space Tech industry. The survey showed that **almost half (47%) of the people employed by the responding companies are directly involved in R&D**. For GNSS-related R&D this is as many as 40% of the workforce⁸², whereby companies recruit these skilled workers mostly from universities (89.7%) but also from competitors (69.2%) and start-ups (35.9%)⁸³.

Looking into the percentage of annual turnover invested in GNSS-specific R&D⁸⁴, one sees different approaches within the targeted companies.

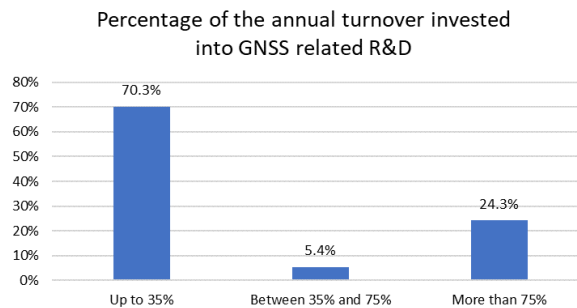


Figure 18: Percentage of annual turnover invested into GNSS-related R&D. Source: Own elaboration based on the outcome of the survey

A more detailed analysis, contained in the figure below, reveals a significant **difference in R&D spending patterns across companies with different levels of turnover**.

⁸² The sample under analysis for employees in R&D: n=38; for employees in GNSS R&D: n=34.

⁸³ The sample under analysis: n=39.

⁸⁴ The sample under analysis: n=37.

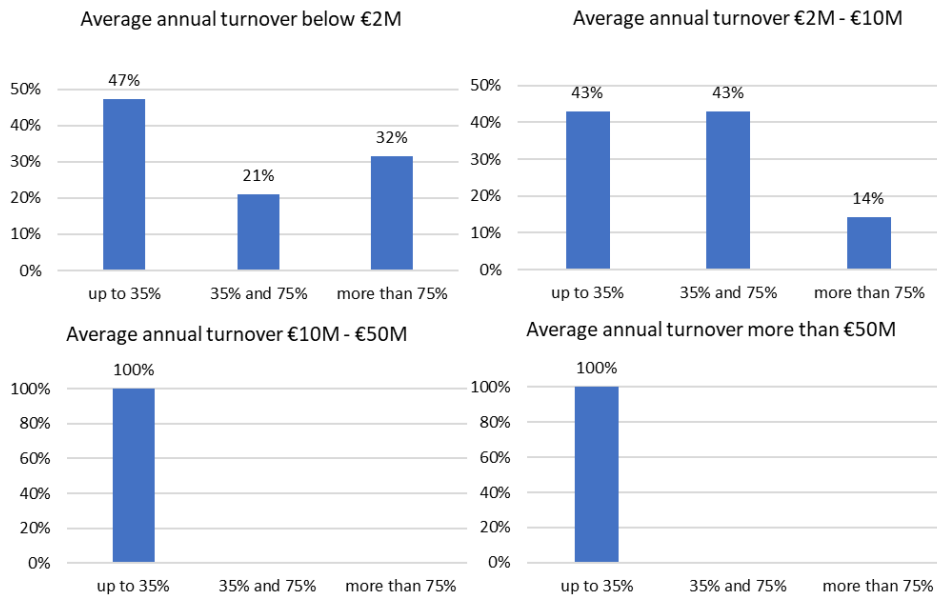


Figure 19: Percentage of the annual turnover invested into GNSS related R&D by company size

Early-stage companies and companies in their growth phase tend to invest a larger part of their turnover into GNSS-related R&D, which may be owed to their need to build up capabilities. Still, as shown in the earlier analysis presented in section 4.1.3 it is large system integrators commit the biggest investment in GNSS R&D.

In order to quantify the associated funding needs and gaps of mid-caps and small companies, respondents were also asked to estimate the **volume of capital expenditure and R&D expenditure needed for the next five years** to enable sustained turnover growth. From the responses gathered across all categories of surveyed respondents, it was concluded that **on average there was a need of up to €8.8m (€1.8m per annum) per company on capital expenditure and €7.8m (€1.6m per annum) for GNSS-related R&D expenditure over the next five years**. The size of the companies surveyed, and their investment needs, did differ significantly, ranging from individual companies needing €250k to €100m. However, as previously mentioned, **the sample is mostly representative of smaller companies**, and the reported results seems to indicate that they are **currently “tuned” to relatively slow growth**.

4.2.2 Investing in EU GNSS companies: needs, gaps, and ambitions

As discussed earlier, the GNSS companies that participated in the study’s survey were targeted to represent different growth stages, with a slight over-representation of smaller enterprises. This is also highlighted by the fact that close to **60% of companies are currently going through a round of investment**. From those companies, approximately 30% indicated to be in the first round of investments, followed by 19% in the second round and 11% in the third round of investments.

The survey also looked at the funding amount raised in the last two years by these companies, and the amount they expected to raise in the coming two years. Overall, the survey results indicate that **only few of the targeted companies are on the cusp of scaling up, as most seek steady development, with the majority of companies expecting or planning to raise under €5m**. More specifically, the last funding or investment, of any kind, that 46% of the companies obtained in the last 24 months was mostly up to €5m, as can be seen in the figure below. **Targeting the next investment “bracket” is relatively rare**, with especially micro and small SMEs (whose turnover is up to 10M€) expecting to have ambitions that would coincide with the next financing bracket (i.e. going

from €1-5m to €5-10m). When closely analysing the companies, the profile of the most ambitious respondents show that those with **increased financing needs** (going from one bracket to the next) **typically correspond to chipset manufacturers or software developers**.

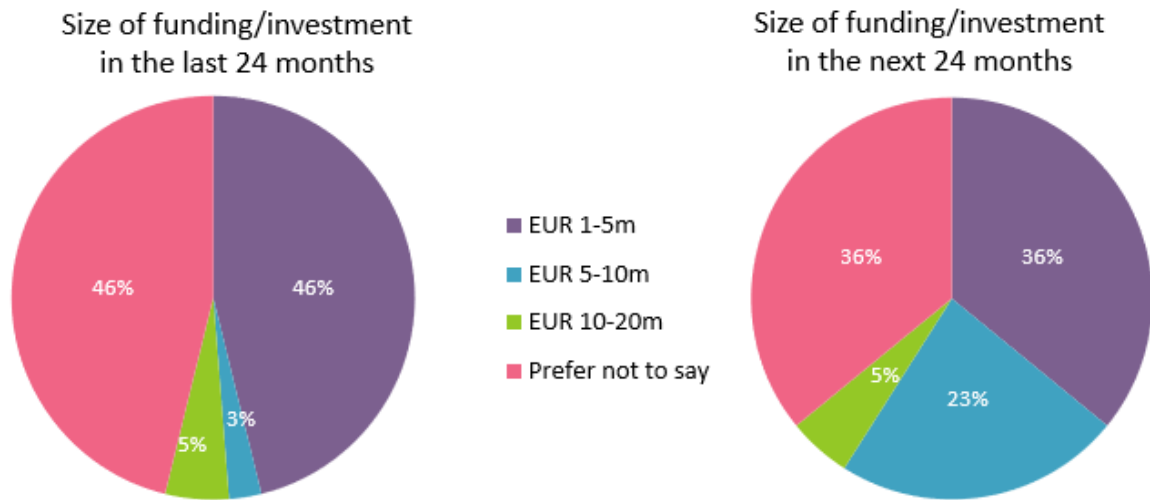


Figure 20: Size of funding or investment obtained in the last 24 months (left) and the next 24 months (right). Source: Own elaboration based on the outcome of the survey.

The survey provided additional insights on some “fine” aspects. For instance, approximately three in four companies (75%) had been successful in raising funds to drive the development of innovative products and/or services, even though the vast majority found the experience to be particularly complex (84%). What is more, the difficulties to access funding opportunities are jeopardizing the survival of 6% of surveyed companies.

The respondents have used various **instruments** to raise funding or investments, as can be seen in the figure below. The instruments that have been targeted in the past 24 months are represented by the darker bars on the left. The companies also expressed their preference as to the **types of funding instruments** they would be targeting in the near future, which has been represented by a lighter coloured bar on the right.

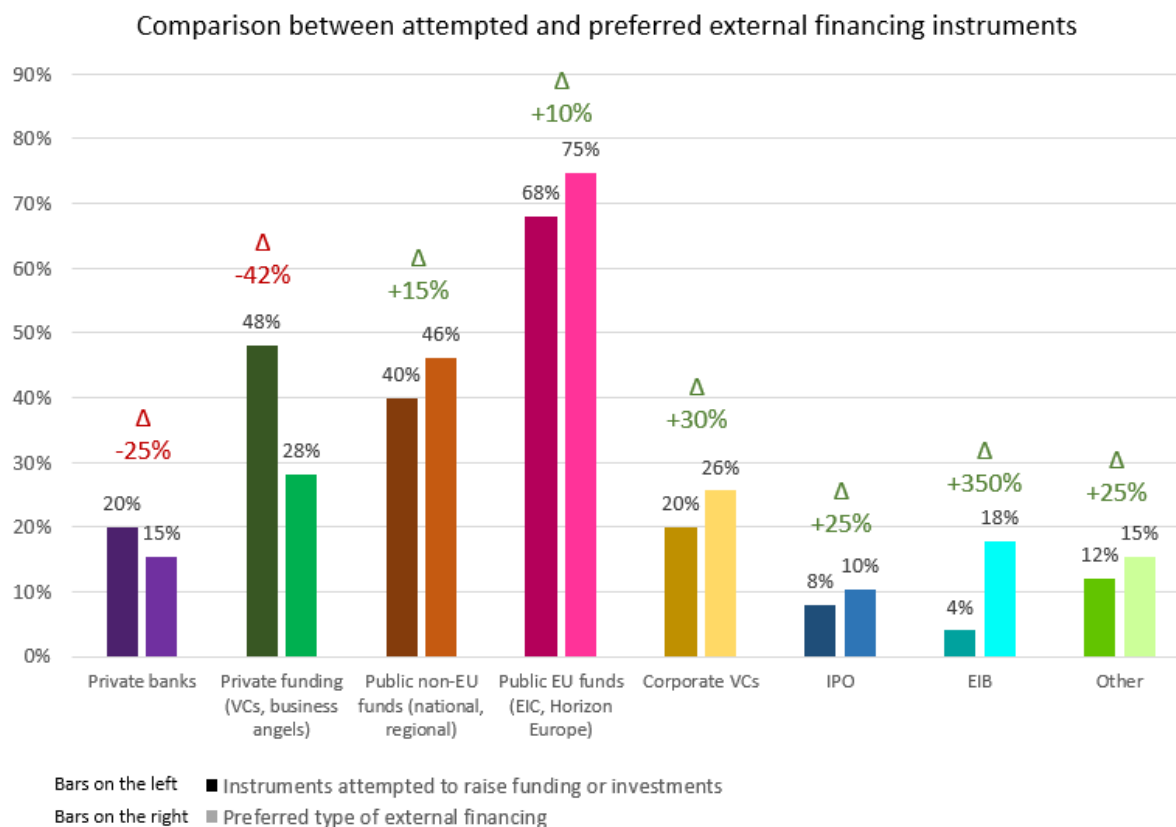


Figure 21: Attempted and preferred type of external financing. Source: Own elaboration based on the outcome of the survey.

A joint analysis of both the attempted funding instruments in the past, and the preferred types of instruments in the future, shows that **EU Funds** (i.e. EIC or Horizon Europe) **are the preferred go-to option in any case**. This preference for public EU funds is followed by public national/regional funds and private funding.

However, a closer look at the difference between these two aspects, expressed by the delta of 10%, actually represents the most modest increase when compared to the deltas of all other types of financing instruments. By comparing the two figures, all but two types of financing instruments follow a positive trend, the exceptions being private instruments from private banks and VCs or business angels. This potentially points to the relative lack of experience in and exposure to such funding options.

On the other hand, the EIB has the **highest relative increase (350%) between both variables**. This may indicate that there is an **untapped market for EIB funding instruments**, as the preference clearly outweighs the funding these respondents had attempted in the recent past. Nonetheless, **EIB funding instruments** are not accessible for all Mid-Caps and SMEs, as they may not fit the profile, leaving many early-stage companies left out from these opportunities (instead, in the past EIB has supported SMEs with smaller tickets through EFSI and continues to do so through InvestEU). Similarly, IPO requirements are too specific for some stakeholders of the industry. However, the reasons why some companies preferred funding from the **EIB**, as opposed to other types of funding, were related to the good business execution the EIB offers, together with advantageous loan conditions. The institution was also seen as a stable brand, and a collaborative partner that provided the needed funding.

As for the individual company profiles, as a general conclusion, it appears that **“growth” companies are targeting banks or private investors, while most other companies largely rely on publicly funded R&D.** In fact, **most companies have strong exposure to publicly funded R&D,** as it allows to **de-risk development,** and often serves as a **prerequisite for private investors** who value highly the “seal of excellence” companies succeeding in EU R&D grants get. This conclusion is also confirmed by the finding number 9 of the EIB Space Economy study carried out in 2019⁸⁵ (“European public innovation instruments play an important role in unlocking private capital for the space sector”). Additional reasons for companies’ involvement in EU public funds were stated: they allow to keep Intellectual Property Rights (IPR) within the company; offer the possibility to enter consortia; and enable collaborative R&D. What should be highlighted, however, is that even if EIC or Horizon Europe were the 1st options for past and preferred fundraising attempts, many respondents (61.5%) consider their **size not to be sufficient,** especially when considering **space-specific funding schemes.** Moreover, a few players highlighted the difficulty in accessing this type of funding due to high levels of competition, and time-consuming application and reporting procedures.

When it comes to **access to private funds this clearly remains a crucial gap.** Thus, many respondents indicated they were struggling **to raise funding through private means** (e.g. venture capital) **at the initial stages of growth.** With specific reference to **VCs and corporate VCs,** these were recognised as the most suitable options for start-ups, given their propensity to take risks at initial level of growth of companies. Among the reasons motivating such a choice, there is the possibility of raising higher financing through a more result-oriented and less bureaucratic approach, as well as leveraging and expanding the companies’ network. On the other hand, **corporate VCs** were perceived as rapid strategic investments, which put commercial pressure on the company. Finally, respondents who indicated **private banks** as their preferred sources of financing found it easier to negotiate and raise more debts without taking the risks VCs would pose. Moreover, private banks offer long-term investment opportunities and require simpler application procedures. However, the perception of the industry is that there is a **lack of culture concerning deep-tech and space-related investments with regards to European private funding.** This is especially the case for innovative products that are subject to long sales cycles, long-term ROI and that may require long-term investment horizons. This echoes both key finding number 3 (“The space ecosystem lacks investors with a space background and space investment expertise”) and number 5 (“Space innovations have a longer development cycle than general tech”) of the **EIB Space Economy study** carried out in 2019⁸⁶. Another conclusion suggested by some results of the online survey is that companies struggle to find the right programme for products that link multiple fields of application (e.g. space and rail).

The survey has also helped to shed light into key challenges experienced by EU GNSS companies in their efforts to grow, as can be seen in the graph below:

⁸⁵ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

⁸⁶ Ibid.

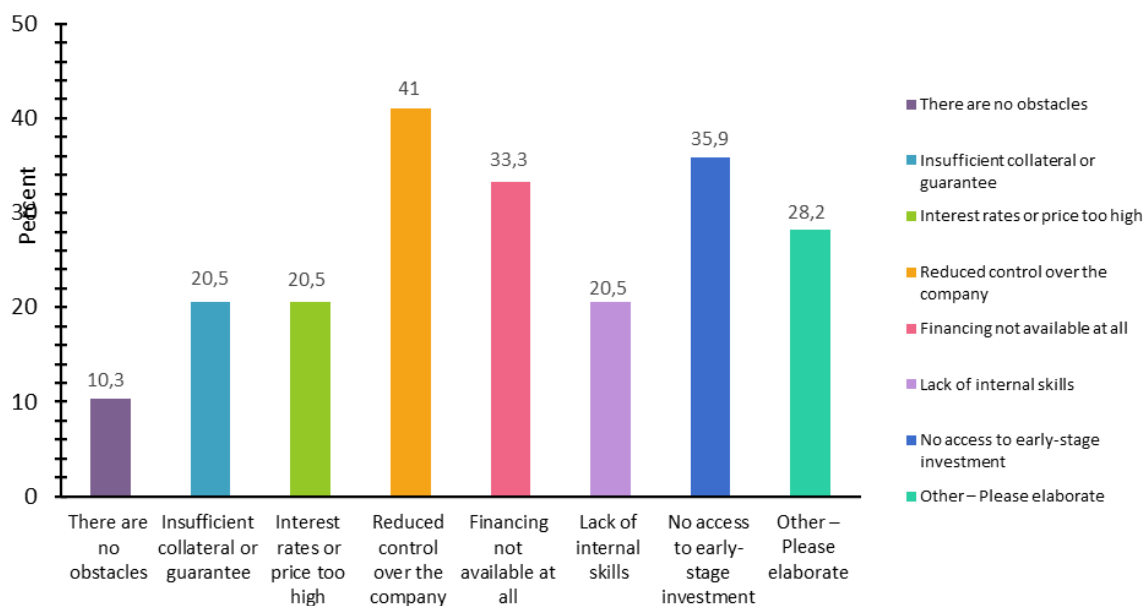


Figure 22: Key challenges in access to funding or investment

Respondents found that reduced control over the company (41%), the difficulty to access early-stage investments (35.9%) and the availability of funding (33.3%) were the **top three most limiting factors of external financing**. Additionally, **access to advisory services** is also an important **gap** (for 51% of surveyed companies), which was preventing companies from **moving from the pre-production to the commercialisation stage**.

Another interesting finding is that, among 26 respondents that expressed a potential interest in selling shares of their company, 23% (six companies) had already initiated this process. Three of these six companies are active in the aviation and drones market segment.

For many EU GNSS companies, **scaling up is often done through foreign funds**, whereby “rising stars” in particular had attracted foreign investment more than other types of companies. The survey indicates that in the absence of financing from Europe-based investors, companies may accept offers from overseas investors. **Companies declared to be similarly open to EU and US corporate investors** (with a difference of 12.5% in favour to EU investments). This is probably due to the characteristics of the EU private capital landscape, which is characterised by a lack of available funding and risk aversity towards the GNSS sector when compared to the US corporate investors. This result also appears to be in line with key finding number 4 of the EIB Space Economy study carried out in 2019⁸⁷, which found that “European space entrepreneurs feel there is a lack of private financing sources and keep an eye on the US”. This finding also echoes the previous analysis carried out in this report and highlights, once again, a gap in the EU market. Quantifying the gap of funding remains complex. Impacts of new initiatives that have just started (e.g. CASSINI) need to be observed and learned from.

The overall assessment indicates that there is both a funding gap for companies seeking financing of smaller ticket sizes, as well as for bigger ticket sizes, corresponding to the scaling up of Mid-caps. The types of financing may involve both equity, debt and hybrid debt. The scaling up of commercial operations in these development stages typically involve investments into larger manufacturing

⁸⁷ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

capacity, the manufacturing of products or provisioning of services at larger scale, and capital for the scaling up of distribution channels. Many companies primarily look for debt funding at this stage, since they may already have raised significant equity financing and want to avoid further dilution of their ownership, or because it is more accessible to them. For relatively new entrants on the various space markets, it can be very challenging to find commercial banks or credit institutes to lend in the range of €20-200m, even for companies that have secured high value contracts. This is evidence of the need for complementary financing from institutional investors.

Companies facing this funding gap may operate in market segments such as the manufacturing of GNSS components and receivers, system integrators, and software and added-value services providers. The survey results show that there is a multitude of suppliers of these market segments and that it is likely the field will grow further in the coming years. The survey indicates that in the absence of financing from Europe-based investors, companies may accept offers from overseas investors.

5 Conclusions

This study has analysed investment needs and funding gaps for EU GNSS companies with the ultimate aim of informing future actions that will help these companies in scaling up. The study has assembled and analysed an extensive body of knowledge formed through targeted desk research, exploitation of multiple databases and direct insights solicited through a dedicated survey and selected interviews. Key data on large system integrators, rising stars and start-ups/SMEs has been collected, helping to illuminate their current situation while also understanding their future perspectives. **Whilst the study does not provide recommendations *per se*, it formulates in the next sections a series of suggestions that can help the key institutional stakeholders (EC – DG DEFIS, EUSPA, EIB) to design and run fit-for-purpose financial instruments.**

5.1 Staying competitive requires significant investment

The study has highlighted the investment needs for EU GNSS companies following different paths. Firstly, looking through the lens of acquisitions, the study sought to answer the question “What would it take to prevent foreign acquisition of European GNSS innovators?” It was found that to **reverse the transactions that occurred in 2016-2021 and bring the lost shares under European control, it would require between €5.5bn and €6.8bn.** If in this context one also considers the deeper-reaching consequences of acquisitions such as some of those highlighted here (e.g. Ansaldo, BQ) on European competitiveness in the longer term, it becomes clear that this is a critical aspect to consider.

Further evidence to the urgency to mobilise significant investment envelopes was provided by the analysis of GNSS R&D expenditure. As analysed in chapter 3, the current Horizon Europe envelope is limited compared to the investment needs, despite the significant results obtained in its implementation by EUSPA. Catching up with the EU’s competitors who have a significantly faster pace (and a market demand to match it) in GNSS R&D expenditure will require very focussed efforts and ambitious investments. Analysing a “business as usual” and a “matching competitors” scenarios has shown that **the total investment need over the next 10 years will amount between €34.1bn and €42.7bn.**

These figures gain **further gravity when one considers the overall competitive landscape.** This is well exemplified by the recent plans of the US; challenged by Russia and China, it plans to increase R&D budgets significantly, including in areas such as precision navigation and timing signals.

5.2 Staying competitive requires robust market foresight

GNSS is a key enabler for several domains that have gained significant importance both in policy and market terms. Thus, autonomous driving, digital agriculture, supply chain traceability and several other domains rely, to a large extent, on GNSS-enabled solutions and innovations. Establishing a dedicated foresight facility to allow monitoring of the progress vis-à-vis global market dynamics in such key sectors would (i) inform the design of future actions and instruments, (ii) act as a catalyst for the maximisation of their impact. This would need to follow **robust market foresight practices**, including rigorous horizon scanning (which is already implemented for the GNSS downstream market by EUSPA’s market monitoring activities), megatrends analysis (which would need to gain insight from parallel activities at EC level), scenario planning (projecting various possible futures) and visioning (typically represented by well-defined roadmaps). Such foresight facilities can support, for instance, the development of a “competitiveness index” that takes into account market size, growth rate, EU share now and projected, and EU strategic interest vis-à-vis global competition. The

market foresight could include testing the impact of the new funding instruments. This in turn could help define in which sectors the need for supporting R&D intensity through dedicated funds is greater or rather how much of the overall investment in “space” activities should be dedicated to companies active in GNSS in a given segment (e.g. autonomous driving).

When combined with a **thorough monitoring of the progress of European market leaders** (who may need further support to remain so) and an **early identification/scouting of potential rising stars**, this facility, based on already developed market monitoring process of EUPSA, would turn into a “360° Observatory” **enabling strategic oversight**.

5.3 Making more funds available through tailored instruments

The case for significant investment in GNSS R&D has been made earlier. What is important, however, is that this is channelled through a combination of instruments that takes into account the specific needs of different types of companies. This is discussed below.

- **Rising Stars:** The study has documented the fact that the majority of EU rising stars have attracted foreign investment. When juxtaposed with the more detailed insights from the dedicated survey (which many rising stars filled in), one sees that they would be keen for an alternative or additional path to raising foreign private funds. Thus, a **dedicated financial envelope tuned to the needs of GNSS rising stars is required**.
- **Start-ups and SMEs:** As analysed in chapter 3, at present start-ups and SMEs are the primary target of the majority of EU instruments, especially those that are in early stages market traction. The survey has further highlighted the fact that many GNSS start-ups and SMEs are operating with a “grant-constrained growth” (as indicated by the fact that most companies use the grant funding for OPEX). These companies, therefore, require beyond a solid access to funds, a “push” into the real market that can be supported by **additional advisory services** (one of the key challenges reported in the survey). Such could be supported leveraging the sector-specific market intelligence existing at EUSPA.
- **Large companies** (typically system integrators): As an engine of GNSS R&D expenditure and a pillar for European competitiveness in the global markets, these companies require **incentives to maintain or increase their investment in innovation** and support to increase their **intrapreneurship** (especially companies which whilst not GNSS per se can strongly benefit from related innovations in their respective fields).

5.4 Strengthening the capacity of key communities to promote and adopt GNSS-enabled innovations

Making more public funds available is essential but additional actions are required. Thus, for EU GNSS companies to thrive they need (i) access to private funding, (ii) access to markets. In the former case, the interviews conducted in the context of this study have illuminated the need to **provide training to investors**, supporting them in the identification and valuation of companies with strong GNSS proposition. This is an essential prerequisite for them to eventually increase their investment in EU GNSS companies and offer a viable alternative option to foreign investment. In the latter case, **training of public organisations who are responsible for innovation procurement** around activities that benefit from GNSS-enabled solutions will provide long-term benefits. It will ease the burden of complex procurement procedures, open the door to innovative companies (e.g. rising stars) and, very importantly, provide **anchor tenancy opportunities**.

5.5 Supporting increased risk-taking and nurturing bigger ambitions

As analysed in chapter 3, the presently available public funds are mostly focussing on earlier stages of innovation and investment and therefore are supporting smaller-sized tickets. Bigger tickets supported by public funds, through EIB/EIF and the InvestEU going forward, are so far rare among EU GNSS downstream companies. Instead, as seen throughout this report, the companies that seek over €10m in a single funding round typically get that from EU or, very often, foreign based VCs. In light of this, this study has highlighted a **gap of higher-risk funding**. Filling this can be pursued by developing a **robust pipeline of support interconnecting the different stages and grooming the companies to make the next steps**. This could **leverage** “filtering” processes of earlier stages (through CASSINI, Horizon Europe) where high-flying companies are recognised as such. In such process, one would need to **embrace potential failure** for some of the supported companies; this would however be offset by the support provided to future market leaders.

In parallel, and in view of the earlier point about access to markets, **fostering focussed public-private partnerships as boosters to the competitiveness of the whole ecosystem** may be an essential complement. As argued throughout the report, with GNSS being an enabler in several fast-paced, critical (from market or policy perspective) sectors, it is essential that Europe strengthens its innovation potential and competitive output in such strategic sectors. In such instances, **partnering between public institutions, corporates and even local or regional actors in a mission-oriented approach** (similarly as prescribed throughout Horizon Europe) would help to (i) mobilise greater sums and “smarter” funds, (ii) accelerate uptake of GNSS solutions (as there would be in-built market traction). Such an effort can take the shape of partnerships with existing accelerators (thematically-oriented or corporate-driven), Digital Innovation Hubs or incubation centres.

5.6 Final takeaway

Europe has a strong positioning in the global competitive landscape of GNSS downstream solutions. Its market share has been mostly steady over the last 15 years despite a much bigger pie. Several of its companies hold a leading position in their respective thematic sectors utilising GNSS in their innovative products and services. However, with global competitors increasing their investment in GNSS R&D expenditure faster than Europe and with foreign investors acquiring shares of EU companies, the positioning of Europe is being challenged. To overcome these challenges and grasp opportunities associated with increased focus on digitalisation and green innovation (together underpinning the EU’s twin transition and driving multiple relevant strategies), **Europe needs more funds, more strategic oversight, increased risk-taking and bigger ambitions**. To that end, this study has provided robust evidence stemming from extensive desk research, analysis of several databases and a targeted consultation process. This, in turn, has allowed a compilation of a set of conclusions that can help EU institutions in designing the necessary actions and instruments to support the scaling efforts of EU GNSS companies and thus help realise the full potential of EU space programmes (EGNSS).

Annex 1 Online survey – Methodological note

Introduction

At the core of the analysis of the GNSS Investment Report there has been stakeholder consultations. These were performed mainly through a structured questionnaire, that was launched in the form of an online survey. Stakeholders consulted include companies from across the downstream GNSS value chain, other space-related companies considered “rising stars” as well as investors.

Methodology

As a first step, stakeholder groups have been consolidated, drawing from EUSPA’s Market Report Database (a complete database of all European GNSS companies), business information databases covering investment and funding, as well as network organisations representing European space companies, such as the European Association of Remote Sensing Companies (EARSC) or SpaceY. This approach allowed the team to consider all possible segments of the industry, as the initial target sample was based on the most comprehensive database currently existing.

To ensure a representative sample, it has been paid attention to equally cover the whole downstream GNSS value chain as well as all relevant market segments for GNSS solutions. The full roster for this exercise included 249 shortlisted companies. However, based on certain criteria selected to identify the most relevant survey participants, 100 companies were targeted and, therefore, solicited multiple times to participate in the study.

Focusing on potential growth companies, a questionnaire has been designed and launched to explore investment needs and preferences, as well as experience with available funding and investment among downstream GNSS companies at different stages of growth. More specifically, the team designed and disseminated a survey which comprises 106 questions. The questionnaire included both closed and open-ended questions to allow for a quantitative comparison of results across targeted companies while also enabling respondents to provide additional qualitative information to enrich the analysis. To ensure user-friendliness and accessibility in navigating the questionnaire, the survey was hosted on the online platform Alchemer. Exploratory interviews with representatives of such companies have been used to shed more light on key challenges, trends, and opportunities around investments from their perspective. The survey remained open for six weeks, between 14 October and 26 November 2021. Survey invitations were sent by email to the entire roster of selected companies by the Consortium and in close cooperation with the EIB and EUSPA, to ensure the widest possible participation.

Insights gained from stakeholder consultations have been complemented by desk-based research to present a complete picture of the European downstream GNSS landscape and to provide benchmarks against international players.

The combined analysis of stakeholder consultations and desk-based research has formed the basis for deriving conclusions regarding investment needs and gaps, as well as for developing recommendations to tackle potential existing gaps.

Sample size and characteristics

This section sheds light on representativeness and key features of the sample considered for the elaboration of the GNSS Investment Report.

In total, the survey link has been accessed 146 times by involved companies. Based on the full roster of 249 invited companies, we could assume that 58.6% of stakeholders accessed the online survey. Nevertheless, it has to be noted that information concerning who accessed the survey is not available for all users. For this reason, it is not possible to eliminate double counting of those who accessed the link multiple times.

Based on the responses received, two clusters can be identified:

- **Complete answers:** including 34 respondents who submitted a complete questionnaire
- **Partial responses:** including 20 surveys partially answered. These responses have been selected as their level of completion can be considered satisfactory for the evaluation of responses. More specifically, the study team considered only those partial answers where at least 20% of the questionnaire was replied. The average response rate of the sample of partially complete surveys is 39% (ranging from 21% to 76%)

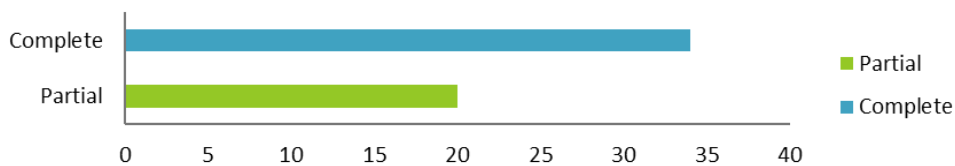


Figure 23: Response rate

However, for the purposes of the analysis in question and to base the study on the widest possible representativeness of the European GNSS industry, the study team took into consideration a sample that combines both complete (63% of the full database of responses) and partial answers (37% of the full database of responses). When taking into consideration the 146 accesses reached on the online survey, the full database of 54 received responses represents about 37% of stakeholders who were redirected to the link. The response rate drastically falls when comparing the number of received surveys against the full roster initially contacted (21.7%). However, the small sample taken into consideration can be considered sufficiently representative of the industry given that it was carefully crafted to meet the study’s objectives.

For this reason, the number of responses analysed for each topic will vary between 34 and 54. For a better understanding of the sample taken into consideration, the exact number of respondents who provided information on each analysed topic can be found on the GNSS Investment Report in footnotes. In order to have a better overview of the characteristics of the sample, please refer to the description below.

Concerning the **core business** of companies included in the sample, some 65% of respondents affirmed that their main activities focus on the Downstream GNSS domain, while 29% focus on other upstream or downstream space (e.g. New Space, Earth Observation), and 6% on the upstream GNSS.

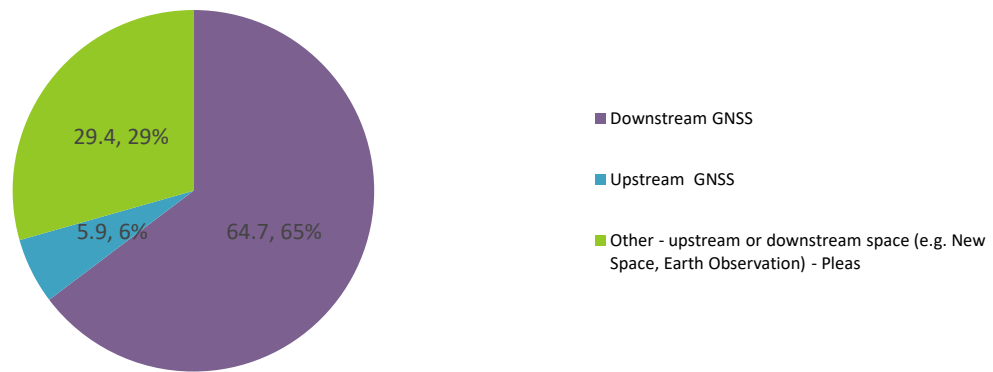


Figure 24: Main business activities of surveyed companies

Looking at the **turnover** declared by the involved in the sample, it can be noted that companies with lower turnover result to be widely represented. In fact, the majority of surveyed companies (41.5%) indicated that their turnover in the last 3 years is below €2m, 22% between €2m and €10m and 14.6% between €10m and €50m. On the other hand, only 14.6% of respondents had an annual turnover of more than €50m in the last 3 years and 7.3% of respondents preferred not to provide this type of information.



Figure 25: Average turnover of surveyed companies

Based on the average turnover declared by involved companies, the study team clustered surveyed companies in the following four categories:

1. Enterprises whose average turnover is **up to €2m**
2. Enterprises whose average turnover **more than €2m and up to €10m**
3. Enterprises whose average turnover **more than €10m and up to €50m**
4. Companies whose average turnover is **above €50m**

Where relevant, this categorisation has been used by the study team for computing correlations to further analyse information provided by the surveyed companies. However, it has to be noted that 16 companies out of 54 did prefer to not indicate such information and, therefore, cannot be identified in none of the four categories. For a clearer overview on the number of companies belonging to each category please refer to the figure below.

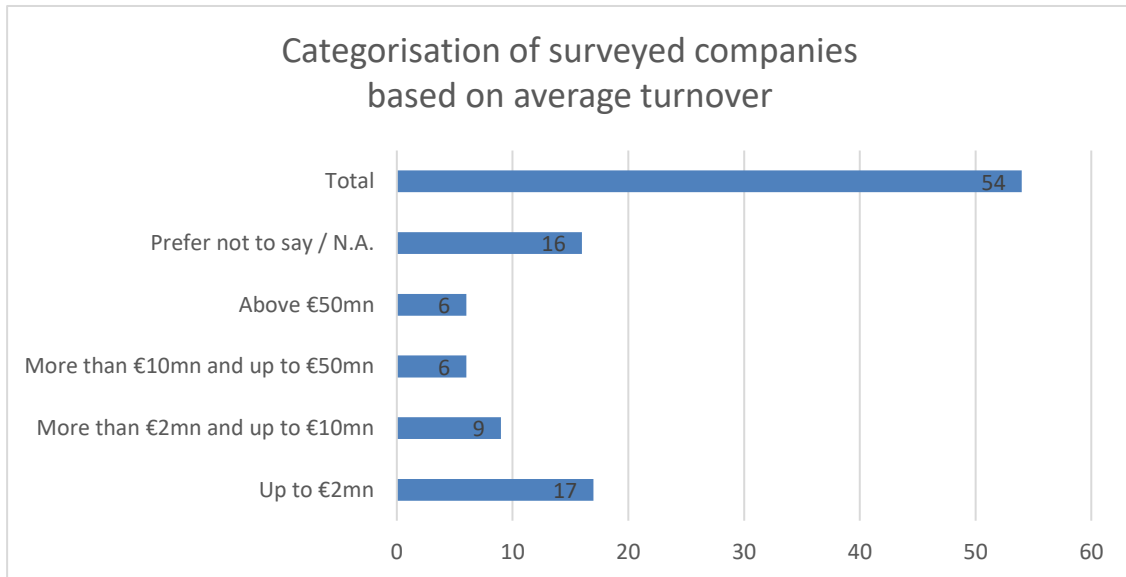


Figure 26: Categorisation of surveyed companies

With regards to **market segments** served by respondents, the majority of companies (62.7%) focusses on Aviation and Drones domains, followed by those active in the Infrastructure domain (39.2%), Road and Automotive (39.2%) and Agriculture (35.3%). For a more complete overview of market segments served by the sample in question, please refer to the picture below.

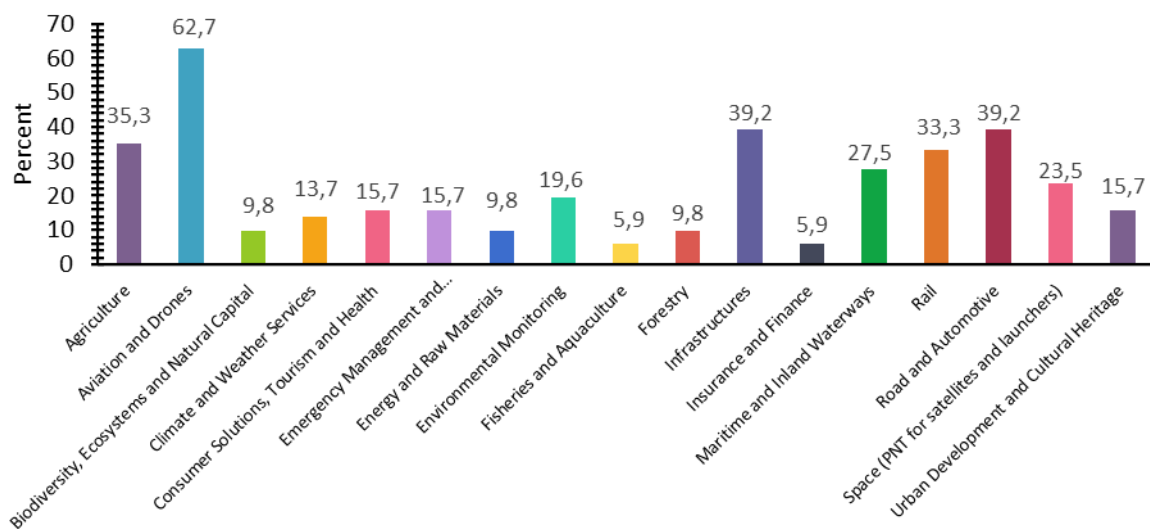


Figure 27: Market segments in which surveyed companies are active

Concerning the parts of the **value chain** represented in the sample, the majority of respondents (49%) are Service and Content providers, followed by System Integrators (39.2%) and Device Manufacturers (35.3%). Finally, 19.6% are Component Manufacturers, while 17.6% represent other parts of the value chain.

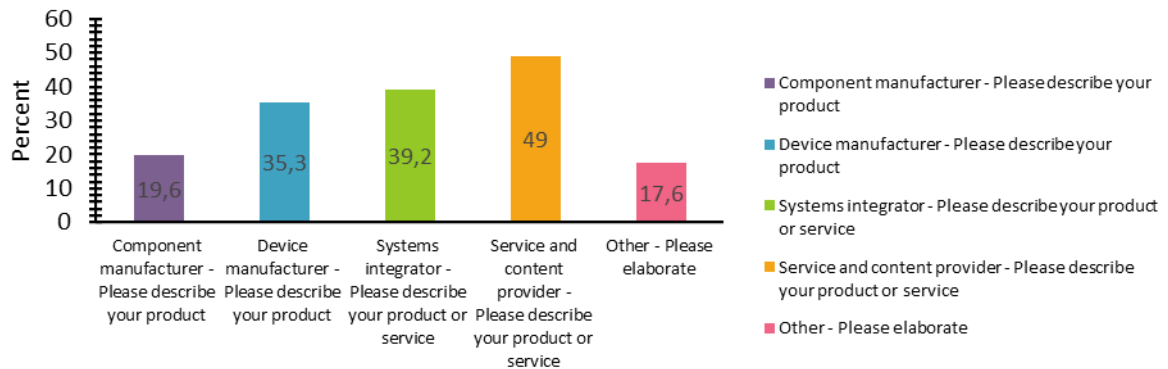


Figure 28: Parts of the value chain represented by the surveyed companies

Limitations of the sampling strategy

This section focuses on the key limitations of the survey, particularly those inherent to the sampling methodology and the small sample size.

First, as respondents could freely choose whether or not to participate in the survey, the sampling approach incurs issues of self-selection bias, i.e. the population of companies that chooses to participate may not be equivalent (in terms of characteristics) to the population of businesses that opts out. Indeed, the relatively low survey response rate makes some form of self-selection bias very likely. For instance, the length of the online questionnaire, which included 106 questions, might have discouraged some participants. More specifically, we could hypothesize that companies that did not complete the survey are less relying on EU funding and might be more experienced and autonomous in raising financing through different means.

Second, the relatively low number of fully completed surveys (34 out of 54 responses) affects the explanatory power of the findings.

Based on these limitations, the study team opted for a more qualitative study rather than adopting a purely statistical approach that was not reachable in such a short timeframe.

For this reason, survey findings can only be used to a limited extent to prioritise policy interventions, and supporting investment programmes. Nonetheless, the survey provides valuable insights into the current level of preparedness to raise funding of involved companies operating in the European space industry.

Annex 2 Questionnaire

The questionnaire has been structured into sections capturing the context of responding companies, their financials, perspectives for growth, as well as investment needs and previous experience with investment. The questionnaire has been made available online and shared with actors that have a role linked to the finances of their company.

Value proposition & investment readiness

1. What is the **main** activity of your company?
 - Downstream GNSS
 - Upstream GNSS
 - Other upstream or downstream space (e.g. New Space, Earth Observation) – please elaborate

2. Which of the following parts of the value chain are you representing?
 - Component manufacturer (e.g. chips, antennas and other inputs for GNSS receivers) – Please describe your product
 - Device manufacturer (e.g. receivers, mobile devices) – Please describe your product
 - Systems integrator (technical implementation of GNSS equipment into complex systems) – Please describe your product or service
 - Service and content provider (e.g. software, end-user services) – Please describe your product or service
 - Other – please elaborate

3. Can you please describe your target customers?
 - B2B
 - B2C
 - B2G
 - Defence agencies

4. What is your **main** business model?
 - Direct sales (including distributors)
 - Leasing
 - Service usage fee (pay-as-you-go)
 - Service subscription fee
 - IP licencing
 - Bespoke; one product for one customer
 - Other – Please elaborate

-
5. Which of the following market segments does your company serve?
- Agriculture
 - Aviation and Drones
 - Biodiversity, Ecosystems and Natural Capital
 - Climate and Weather Services
 - Consumer Solutions, Tourism and Health
 - Emergency Management and Humanitarian Aid
 - Energy and Raw Materials (incl. Mining)
 - Environmental Monitoring
 - Fisheries and Aquaculture
 - Forestry
 - Infrastructures
 - Insurance and Finance
 - Maritime and Inland Waterways
 - Rail
 - Road and Automotive
 - Space (PNT for satellites and launchers)
 - Urban Development and Cultural Heritage
6. Does your Business Plan / Corporate Plan include the following well-developed aspects?
- Market analysis
 - Financial modelling
 - Governance
 - Competitive analysis
 - Marketing plan
 - Technological benchmarking
 - HR development
 - Risk analysis
7. Have you received market validation for your product or service?
- Yes – please elaborate
 - Customer demo
 - Co-development with key customers
 - Letter of intent from potential client
 - Clients' orders
 - Other – Please elaborate
 - No
8. Have you received technological validation for your product or service?
- Yes – please elaborate

- EUSPA technical validation
 - Relevant certification
 - IP protection
 - Customer validation
 - Publications in top journals
 - Other – Please elaborate
- No

9. Which TRL does your product / service have for which you seek funding?

- < TRL4
- TRL 4-5
- TRL 6-8
- > TRL 8

Comment:

10. Do you have a management board dedicated to innovation / commercialisation?

- Yes
- No

11. Do you have an advisory board dedicated to commercialisation?

- Yes
- No
- Planning to have

12. Do you have an audit- and risk committee/supervision?

- Yes
- No
- Planning to have

Comment:

13. Do you have a financial director/CFO?

- Yes
- No

Comment:

14. Do you have a financial controller?

- Yes
- No

Comment:

15. Have you ever raised one or several of the following types of funding or investment?

- From private banks
- From promotional banks
- From private funding (VCs, business angels)
- From public non-EU funding (national, regional)
- From public EU funds (e.g. EIC, Horizon Europe)
- IPO
- EIB
- Other – please specify

16. Has any of the raised funding or investment been related to

- GNSS?
 - o Yes – Please elaborate funding or investment type and purpose
 - o Above EUR 10m
 - o Below 10m
 - Below EUR 5m
 - o No
- Earth Observation (EO)
 - o Yes – Please elaborate funding or investment type and purpose
 - o Above EUR 10m
 - o Below EUR 10m
 - Below EUR 5m
 - o No
- Other space
 - o Yes – Please elaborate funding or investment type and purpose
 - o Above EUR 10m
 - o Below EUR 10m
 - Below EUR 5m
 - o No

Comment:

17. What has been your experience in raising the funds driving the development of your innovative product/service?

- o Very straightforward
- o Complex but in the end successful
- o Took several different attempts before success
- o Am still struggling to raise finance
- o Lack of access to finance is jeopardising the survival of my company
- o Forced to be self-funded
- o Other – Please elaborate

Comment:

18. How would you evaluate the readiness of your company to raise **private** investment (risk capital), concerning for instance preparedness to pitch, capability to provide the required

documentation, experience to understand different types of instruments and their implications, etc.?

- o Very experienced
- o Experienced, but in need of financial advisory service
- o Minor experience, need of support for technical and financial business case

Please provide any additional detail you consider relevant:

19. Are you receiving advisory support through

- an incubation centre
- a technology transfer office of a university
- networks of other companies in your ecosystem
- other – please elaborate
- none

Financials in your organization

20. What was the average annual turnover of your company in the last 3 years?

- o Up to EUR 2 million
- o More than EUR 2 million and up to EUR 10 million
- o More than EUR 10 million and up to EUR 50 million
- o More than EUR 50 million
- o Prefer not to say / N.A.

21. [If downstream or upstream GNSS] Roughly, what percentage of your turnover is related to the sale of **GNSS technologies / solutions**?

- o Percentage:
- o Thereof how much relies on EGNSS (i.e. Galileo, EGNOS) data or services specifically, i.e. the value proposition or the customer requirements including the need for Galileo capability)? If none, why?:

22. [If other upstream or downstream space] Roughly, what percentage of your turnover depends on the use of **satellite-based earth observation**?

- o Percentage:
- o Thereof how much relies on Copernicus data or services specifically?:

23. What is the geographical distribution of your turnover in %?

- In Europe (EU-27, CH, NO):
- Outside of Europe:
 - Thereof UK:

24. What percentage of your annual turnover do you invest into R&D?

- In total:
- GNSS-related R&D:
- EO-related R&D:
- Other Space-related R&D:

25. What percentage of your annual turnover is coming from

- Sales of products/solutions
 - B2B:
 - B2C:
 - B2G:
- Grants or other public financial support:
 - i. Thereof EU grants:

26. What is your average EBITDA for the last 3 years?

- o Average EBITDA:

27. In your opinion, what are the **up to two major drivers** of the annual turnover change in the last 3 years, on top of the pandemics?

- o Newly developed and released products and solutions
- o Technology development
- o Regulatory changes
- o Change in competition
- o Change in demand
- o Other – Please elaborate

Comment:

28. During the past 3 years, have you introduced

- A new or significantly improved product or service to the market?
 - o Yes – Please elaborate
 - o No
- A new way of selling your goods or services?
 - o Yes – Please elaborate
 - o No

Employment in your organisation

29. How many persons does your company currently employ in full-time?

- In total:
- In Europe (EU-27, CH, NO):

30. Over the last 3 years, how much did your company grow on average per year in terms of employment (number of full-time or full-time equivalent employees)?

- o Over 20% per year
- o Less than 20% per year
- o No growth was experienced

31. How many of your employees are involved in R&D in %?

- In total:
- GNSS-related R&D:
- EO-related R&D:
- Other Space-related R&D:

32. From where do you recruit your R&D experts?

- From universities
- From other established companies
- From start-ups
- Other – Please elaborate

Future outlook of your organisation

33. What is the expected annual turnover of your company in the next 5 years?

- o Up to EUR 2 million
- o More than EUR 2 million and up to EUR 10 million
- o More than EUR 10 million and up to EUR 50 million
- o More than EUR 50 million
- o Prefer not to say / N.A.

What is the main driver for the projected growth?:

34. What is the volume of R&D expenditure that will enable your turnover growth in the next 5 years?

- *Specify figure of the overall investment needed*

35. What is the volume of capital expenditure that will enable your turnover growth in the next 5 years?

- Specify figure of the overall investment needed

36. What are the barriers for your company growth?

	1 (not at all)	2	3	4	5 (very much)	n.a.
Finding customers						
Lack of technology development partnerships						
Competition						
Access to finance						
Costs of production or labour						
Availability of skilled staff						
Availability of experienced managers						
Regulation						
Certification						
Standards						
Administrative burdens						

Market acceptance						
Other – Please specify						

Comments:

Access to finance in the EU

37. Are you planning to raise funds needed for your growth in the next 5 years:

- No
- From private banks
- From promotional banks
- From private funding (VCs, business angels)
- From Corporate VCs
- From public non-EU funding (national, regional)
- From public EU funds (e.g. EIC, Horizon Europe)
- IPO
- EIB
- Other – Please elaborate

Comments:

38. How difficult/easy, based on your experience, will it be for you to raise funding:

	1 (very easy)	2	3	4	5 (very difficult)
From private banks					
From public/promotional banks					
From private funding (VCs,					

business angels)					
From public non-EU funding (national, regional)					
From public EU funds (e.g. EIC, Horizon Europe)					
Corporate VC					
IPO					
EIB					
Other – Please specify					

Comments:

39. How would you rate the difficulty of raising funds in below regions for your company:

	1 (very easy)	2	3	4	5 (very difficult)	n.a.
EU27						
UK						

North America						
China						
Other – Please specify						

Comments:

40. Are you planning to raise funds from foreign investors:

- UK
- North America
- China
- Others – Please specify
- No

41. [If above “yes”] What are your reasons to search for foreign investors:

- Not possible to raise funds in the EU
- Less difficult than to raise funds in the EU
- Targeting foreign sales markets
- Other – Please elaborate

42. Would you consider selling your company/shares of your company to:

- EU corporate investors
 - o Yes
 - o No
- Chinese corporate investors
 - o Yes
 - o No
- Other Asian corporate investors
 - o Yes
 - o No
- North American corporate investors
 - o Yes
 - o No
- Other – Please specify

Please explain your reasons (e.g. regulatory, ethical, commercial):

43. [if above “yes” or “other”] Have you already initiated such process?

- Yes
- No

44. In the past 24 months, was your company object of an acquisition bid?

- No
- Yes
 - When
 - Price (optional)
 - Country of the bidders

Investment needs

In this context, we define “investment” as the acquisition of tangible assets (e.g. infrastructure, lab equipment), intangible assets (e.g. patents, licences), as well as capitalised R&D expenditure and R&D staff development cost (e.g. recruitment, training etc. of highly specialised experts).

45. In the past 24 months, have you attempted (or are you currently in the process) to raise funding or investment through any of the following instruments?

- No
- From private banks
 - Successful – Please elaborate (amount, purpose)
 - Unsuccessful – Please elaborate (why?)
- From promotional banks
 - Successful – Please elaborate (amount, purpose)
 - Unsuccessful – Please elaborate (why?)
- From private funding (VCs, business angels)
 - Successful – Please elaborate (amount, purpose)
 - From foreign investors
 - From European investors
 - Unsuccessful – Please elaborate (why?)
- From public non-EU funding (national, regional)
 - Successful – Please elaborate (amount, purpose)
 - Unsuccessful – Please elaborate (why?)
- From public EU funds (e.g. EIC, Horizon Europe)
 - Successful – Please elaborate (amount, purpose)
 - Unsuccessful – Please elaborate (why?)
- Through an IPO
 - Successful – Please elaborate (amount, purpose)
 - Location of stock exchange: _____
 - Unsuccessful – Please elaborate (why?)
- EIB

- Successful – Please elaborate (amount, purpose)
- Unsuccessful – Please elaborate (why?)
- Other – please specify

46. Are there sufficiently available financing instruments dedicated to space-related sectors?

- National
 - Yes
 - Sufficient
 - Not sufficient
 - No
 - I don't know
- European
 - Yes
 - Sufficient
 - Not sufficient
 - No
 - I don't know
- Non-European
 - Yes
 - Sufficient
 - Not sufficient
 - No
 - I don't know

47. Do you see any difference in terms of accessibility between space-specific financing instruments and non sector-specific financing instruments?

- No – Please elaborate
- Yes – Please elaborate

48. What round of investment are you currently going through?

- First
- Second
- Third
- Other – please specify

49. Have you already reached/exceeded EUR 10m raised funds?

- Yes
- No

50. What is the size of the last funding or investment, of any kind, that your company has obtained in the last 24 months?

- EUR 1-5m
- EUR 5-10m
- EUR 10-20m
- > 20m
- Prefer not to say

51. Approximately, what percentage of this last funding or investment did you use for:

- CapEx:
- OpEx:
 - Thereof R&D expenditure:

52. What is the size of the next funding or investment, of any kind, that your company intends to obtain in the next 24 months?

- EUR 1-5m
- EUR 5-10m
- EUR 10-20m
- > 20m
- Prefer not to say

53. What percentage of this funding or investment do you intend to use for:

- CapEx:
- OpEx:
 - i. Thereof R&D expenditure:

54. If you need external financing to realise your growth ambitions, what type of external financing would you prefer most?

- From private banks – Why?
- From promotional banks – Why?
- From private funding (VCs, business angels) – Why?
- From Corporate VCs – Why?
- From public non-EU funding (national, regional) – Why?
- From public EU funds (e.g. EIC, Horizon Europe) – Why?
- IPO – Why?
- EIB – Why?
- Other – Please specify what and why

Which of these do you struggle to get and why?

55. What amount of financing (overall investment across sources) would you aim to obtain within the next 24 months?

- Amount: _____
- Prefer not to say / I don't know

56. What do you see as the **3 most important** limiting factors to get external financing?

- There are no obstacles
- Insufficient collateral or guarantee
- Interest rates or price too high
- Reduced control over the company
- Regulatory framework
- Financing not available at all
- Lack of internal skills
- No access to early-stage investment
- Other – Please elaborate

Comment:

Thank you & follow-up

Thank you very much for taking the time to provide your valuable input and feedback. Should you have any further comments or feedback, please share below. If you are interested in our **Investment Day**, please indicate below and **we will inform and invite you**. Finally, we would appreciate the possibility to deepen our understanding of your perspective through a short interview. **Please indicate your availability below. Thank you!**

57. Further comments:

58. I would like to be informed about the Investment Day

- Yes
- No

59. I am available for a 30-minute interview to elaborate further on the topics addressed by the questionnaire.

- Yes – Your email address
- No

Additional information

60. Can you please specify your name, role, and the name of your company?

- First Name, last name:
- Role:
- Company name:

61. In which year was your company registered?*

- *Numerical answer (four digits)*

* In case of a past acquisition, please refer to the year when the acquiring company was registered, or, in case of a merger, the registration year of the largest company involved (in terms of employees).

62. Where is your company based? (Country and city of headquarters)

63. Does your company operate at other locations inside and outside the EU?

- Yes – please elaborate, where
- No

Annex 3 Online survey – extended results: investing in EU GNSS companies. Needs, gaps, and ambitions

One of the objectives of this study was the investigation of GNSS-related R&D performed by European companies, not from a general, macroeconomic perspective, but more from a microeconomic perspective that allows to generate more specific, detailed insights. The study team launched a rather small, but tailored survey for this purpose, in which relevant GNSS companies (of different sizes and active in multiple segments) were asked to provide their views and experience with regards to raising financing and other financial aspects that could drive or hamper the financial and economic viability of their companies, and the wider sector as a result. The following sections illustrate the extended findings of the survey, starting from a more general overview of GNSS-related R&D investments in Europe, to the main gaps and challenges faced by surveyed companies.

A3.1 Overview of GNSS-related R&D investments in Europe

The objective of the present study includes the investigation of GNSS-related R&D performed by European companies. Specifically, information concerning the **share of the workforce employed in R&D**, the way the **company's turnover** is redirected towards **GNSS-related R&D**, and the estimated **R&D and capital expenditure** for the next 5 years were collected through the survey.

R&D is a major driver of innovation and competitiveness, arguably more so in the Space Tech industry. The survey showed that almost half (47%) of the people employed are directly involved in R&D. For GNSS-related R&D this is as many as 40% of the workforce⁸⁸, whereby companies recruit these skilled workers mostly from universities (89.7%) but also from competitors (69.2%) and start-ups (35.9%)⁸⁹.

Companies⁹⁰ dedicate varying amounts of their annual turnover to **GNSS-specific R&D**, as can be seen in the figure below:

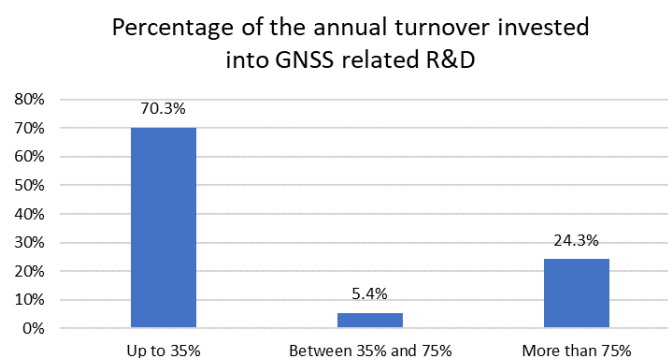


Figure 29: Percentage of annual turnover invested into GNSS-related R&D. Source: Own elaboration based on the outcome of the survey

A more detailed analysis, contained in the figure below, reveals a significant **difference in R&D spending patterns across companies with different levels of turnover**. Companies with an annual turnover below €2m display a similar distribution as presented above. These companies dedicate

⁸⁸ The sample under analysis for employees in R&D: n=38; for employees in GNSS R&D: n=34.

⁸⁹ The sample under analysis: n=39.

⁹⁰ The sample under analysis: n=37.

varying percentages to GNSS related R&D, with almost a third spending more than 75% on GNSS specific R&D. Out of all companies, it is those with an average annual turnover between €2m and €10m that occupy the percentage range 35-75% dedicated to GNSS related R&D. The two largest categories with turnover higher than €10m all dedicate up to 35% on GNSS related R&D. **The smaller the companies in terms of their annual turnover, the more they spend on GNSS related R&D. As larger the companies grow, the more this spending is contained.** This result might suggest that GNSS-related R&D is crucial for initial stages of growth of companies, as well as for enterprises with smaller turnover.

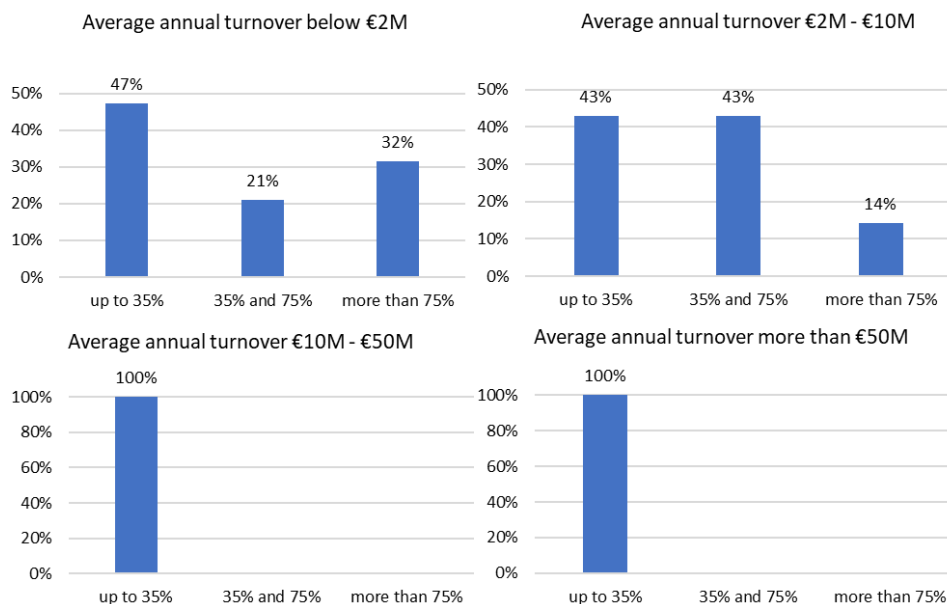


Figure 30: Percentage of the annual turnover invested into GNSS related R&D by company size

Companies dedicate on average 30% of their annual turnover to **GNSS-specific R&D**. On the higher end of the scale, 24% of respondents invest more than 75% of annual turnover of GNSS-related R&D. On the lower end of the scale, there are 55% of respondents that indicate dedicating up to 35% to this purpose. The fact that 13.5% dedicate 100% of their turnover to R&D indicates how the sample is skewed towards start-ups/early-stage ventures, which are very strongly driven by research. However, there is clear divide observed between dedicating most or little of annual turnover to GNSS-driven R&D.

The respondents⁹¹ were also asked to estimate the **volume of capital expenditure and R&D expenditure needed for the next 5 years** to enable sustained turnover growth. From the responses gathered across all categories of respondents, it was concluded that **on average there was a need of up to €8.8m per company on capital expenditure and €7.8m for R&D expenditure over the next 5 years**. The size of the companies surveyed, and their investment needs, did differ significantly, ranging from individual companies needing €250k to €100m.

The following four tables complement the general findings and contain the detailed responses received, classified according to the annual average turnover of the companies. The tables include a minimum and maximum amount of **R&D expenditure** and the estimated minimum and maximum volume of **capital expenditure**, as well as the ratio of R&D to capital expenditure.

91 The sample under analysis: n=24.

Table 5: Volume of R&D expenditure and capital expenditure for the next 5 years of companies with an average turnover of less than €2m

1 – Companies with an average turnover of up to €2m							
Respondent	Volume of R&D expenditure (5 years) Min	Volume of R&D expenditure (5 years) Max	Avg. yearly volume of R&D expenditure	Volume of capital expenditure Min	Volume of capital expenditure Max	Avg. yearly volume of capital expenditure	Ratio R&D to capital expenditure
1	€ 1,000,000	€ 1,000,000	€ 200,000	€ 500,000	€ 500,000	€ 100,000	2:1
2	€ 2,500,000	€ 2,500,000	€ 500,000	€ 500,000	€ 500,000	€ 100,000	5:1
3	€ 500,000	€ 1,000,000	€ 150,000	€ 2,000,000	€ 4,000,000	€ 600,000	1:4
4	€ 2,500,000	€ 2,500,000	€ 500,000	€ 2,000,000	€ 2,000,000	€ 400,000	5:4
5	€ 2,500,000	€ 2,500,000	€ 500,000	Empty	Empty	Empty	n.a.
6	€ 2,000,000	€ 2,000,000	€ 400,000	€ 1,000,000	€ 1,000,000	€ 200,000	2:1
7	€ 1,000,000	€ 1,000,000	€ 200,000	n.a.	n.a.	n.a.	n.a.
8	€ 1,000,000	€ 1,000,000	€ 200,000	€ 1,000,000	€ 1,000,000	€ 200,000	1:1
9	€ 300,000	€ 300,000	€ 60,000	€ 350,000	€ 350,000	€ 70,000	6:7
10	€ 10,000,000	€ 10,000,000	€ 2,000,000	€ 5,000,000	€ 5,000,000	€ 1,000,000	2:1
11	€ 1,000,000	€ 1,000,000	€ 200,000	€ 2,000,000	€ 2,000,000	€ 400,000	1:2
12	€ 14,000,000	€ 14,000,000	€ 2,800,000	€ 5,000,000	€ 5,000,000	€ 1,000,000	14:5
13	€ 1,000,000	€ 1,000,000	€ 200,000	€ 1,000,000	€ 1,000,000	€ 200,000	1:1
14	€ 1,500,000	€ 1,500,000	€ 300,000	€ 250,000	€ 250,000	€ 50,000	6:1
Average	€ 2,914,286	€ 2,950,000		€ 1,716,667	€ 1,883,333		

Table 6: Volume of R&D expenditure and capital expenditure for the next 5 years of companies with an average turnover of more than €2m and up to €10m

2 – Companies with an average turnover of more than €2m and up to €10m							
Respondent	Volume of R&D expenditure Min	Volume of R&D expenditure Max	Avg. yearly volume of R&D expenditure	Volume of capital expenditure Min	Volume of capital expenditure Max	Avg. yearly volume of capital expenditure	Ratio R&D to capital expenditure
1	€ 15,000,000	€ 15,000,000	€ 3,000,000	€ 100,000,000	€ 100,000,000	€ 20,000,000	3:20
2	€ 1,000,000	€ 1,000,000	€ 200,000	€ 2,000,000	€ 2,000,000	€ 400,000	1:2
3	€ 3,000,000	€ 3,000,000	€ 600,000	€ 10,000,000	€ 10,000,000	€ 2,000,000	3:10
4	€ 1,500,000	€ 1,500,000	€ 300,000	€ 1,500,000	€ 1,500,000	€ 300,000	1:1
5	€ 16,000,000	€ 16,000,000	€ 3,200,000	€ 16,000,000	€ 16,000,000	€ 3,200,000	1:1
6	€ 5,000,000	€ 10,000,000	€ 1,500,000	€ 20,000,000	€ 30,000,000	€ 5,000,000	1:4 / 1:3
Average	€ 6,916,667	€ 7,750,000		€ 24,916,667	€ 26,583,333		

Table 7: Volume of R&D expenditure and capital expenditure for the next 5 years of companies with an average turnover of more than €10m and up to €50m

		3 – Companies with an average turnover of more than €10m and up to €50m					
Respondent	Volume of R&D expenditure	Volume of R&D expenditure	Avg. yearly volume of R&D expenditure	Volume of capital expenditure Min	Volume of capital expenditure Max	Avg. yearly volume of capital expenditure	Ratio R&D to capital expenditure
1	€ 2,000,000	€ 2,000,000	€ 400,000	€ 1,000,000	€ 1,000,000	€ 200,000	2:1
2	€ 15,000,000	€ 15,000,000	€ 3,000,000	€ 500,000	€ 500,000	€ 100,000	30:1
3	€ 10,000,000	€ 10,000,000	€ 2,000,000	€ 2,000,000	€ 2,000,000	€ 400,000	5:1
4	€ 40,000,000	€ 40,000,000	€ 8,000,000	€ 10,000,000	€ 10,000,000	€ 2,000,000	4:1
5	€ 15,000,000	€ 15,000,000	€ 3,000,000	€ 500,000	€ 500,000	€ 100,000	30:1
Average	€ 16,400,000	€ 16,400,000		€ 2,800,000	€ 2,800,000		

Table 8: Volume of R&D expenditure and capital expenditure for the next 5 years of companies with an average turnover of more than €50m

		4 – Companies with an average turnover of more than €50M					
Respondent	Volume of R&D expenditure Min	Volume of R&D expenditure Max	Avg. yearly volume of R&D expenditure	Volume of capital expenditure Min	Volume of capital expenditure Max	Avg. yearly volume of capital expenditure	Ratio R&D to capital expenditure
1	€ 30,000,000	€ 30,000,000	€ 6,000,000	€ 15,000,000	€ 15,000,000	€ 3,000,000	2:1
Average	€ 30,000,000	€ 30,000,000		€ 15,000,000	€ 15,000,000		

The tables show that the average volume of **R&D expenditure** increases as the company gets bigger in size. Still, these results cannot be considered conclusive due to the sample size, especially concerning companies whose turnover is above €50m. However, despite this limitation, a different pattern seems to emerge for the expected volume of **capital expenditure**: in this regard it is the category of companies whose turnover is between €2m and €10m that has the largest need for funding. This need for funding could be an indication of their **readiness to scale up** in order to grow and become a medium-sized SME.

A3.2 GNSS companies face gaps to succeed in their ambition

This study also set out to describe the needs, possible gaps, and ambitions of GNSS companies in Europe. It thus investigated aspects such as the **companies' growth stage, past and future funding needs**, or the way that **funding is used to cover CapEx or OpEx**. Further, the **attempted and preferred funding**, as well as the TRL of the companies' product/service pipeline for which they are seeking funds have been analysed.

The GNSS companies participating in the study are at different growth stages, as reflected by the different rounds of investments that respondents⁹² indicate going through at the moment. This can be seen in the figure below:

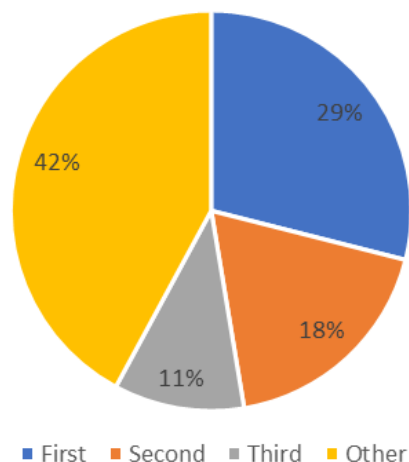


Figure 31: Current round of investment. Source: Own elaboration based on the outcome of the survey.

58% of the respondents are currently going through a round of investment, whereas the remaining 42% indicated as response *other*. The category *other* mostly corresponds to companies currently not going through any round of investment (29%); respondents going through internal investments (8%), companies not looking for general investments but only project-related investments (2.5%), and a minority of respondents (2.5%) not providing further details.

From those currently raising funds, 29% are in the first round, followed by 18% in the second round and 11% indicating to the third round of investments.

The last funding or investment, of any kind, that 46% of the companies obtained in the last 24 months was up to €5m, as seen on the left in the below figure.

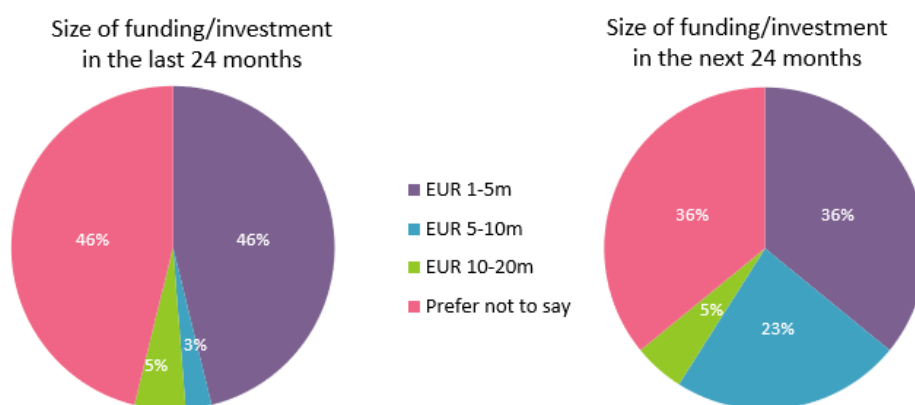


Figure 32: Size of funding or investment obtained in the last 24 months (left) and the next 24 months (right). Source: Own elaboration based on the outcome of the survey.

92 The sample under analysis: n=38..

The amount of funding just described for the sample as a whole, has also been broken down by company size, disclosing different needs, with the most notable change in funding observed amongst the smaller companies, in the figure below:

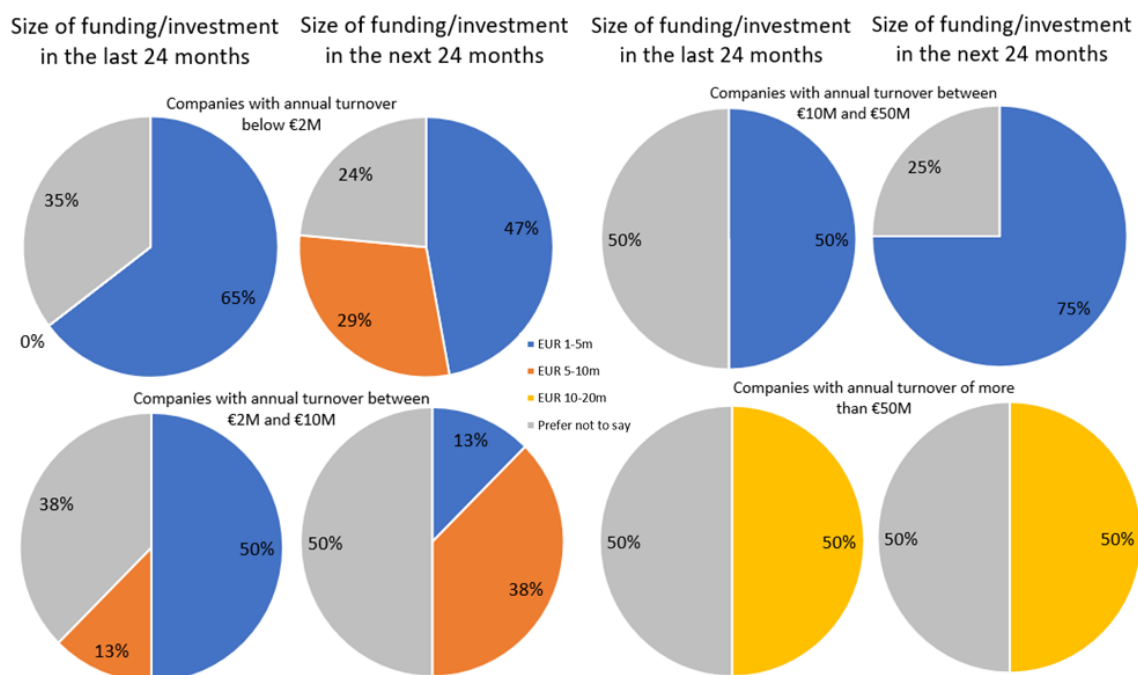


Figure 33: Funding needs in the last 24 months and the next 24 months of companies with varying amount of annual turnover in the last 3 years

The top left two pie charts represent the **funding needs in the last 24 months and the next 24 months for companies⁹³ that have an average turnover of up to €2m**. These companies display an increase in the funding needs. There are 3 respondents that indicate growing needs, going from €1m to €5m in the last 24 months to needing €5m to €10m in the next 24 months. All three respondents preferred public EU funds, with one respondent indicating a preference for private banks as they were less aggressive than VCs and involved less risk.

The bottom left corner contains the **funding needs in the last 24 months and the next 24 months for companies⁹⁴ that have an average turnover between €2m and €10m**. The most notable change in funding observed amongst the different categories was seen amongst companies with revenues between €2m and €10m. The largest share of companies (50%) had obtained up to €5m in the last 24 months. For the next 24 months the largest share of companies (50%) was expecting to raise up to €20m, leaving a much smaller share (13%) expecting to raise the same amount up to €5m.

The two pie charts in the top right corner describe the **funding needs in the last 24 months and the next 24 months for companies⁹⁵ that have an average turnover between €10m and €50m**. This section seems to show an irregularity in terms of the pattern shown otherwise across the other categories, given that the respondents only indicated needing €1m to €5m, whereas more

⁹³ The sub sample under analysis: n=17.

⁹⁴ The sub sample under analysis: n=8.

⁹⁵ The sub sample under analysis: n=4.

funding/investment needs was to be expected. This could be due to the limited number of companies that make up this category.

Finally, the two pie charts on the bottom right corner **the funding needs in the last 24 months and the next 24 months for companies⁹⁶ that have an average turnover of more than €50m**. This is the only category of companies that indicates needing between €10m to €20m of funding in any period.

For a better overview of the financing preferences of the most ambitious companies of the sample, namely those that want to scale-up their investment plans for the next 24 months, please refer to the figure below.

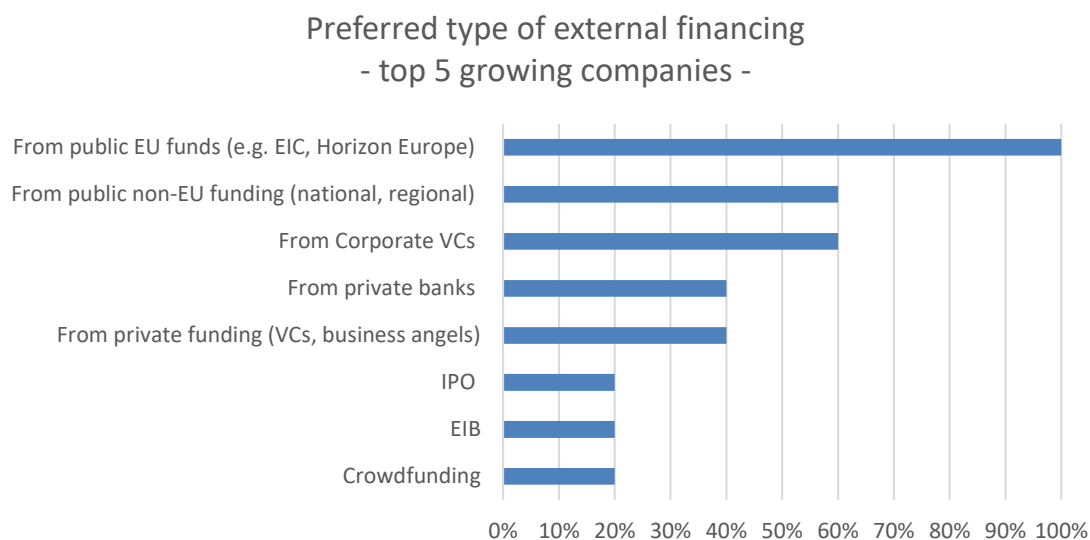


Figure 34: Preferred type of external financing – top 5 growing companies

As can be observed, all companies whose funding ambitions grew the most would rely on public EU funds. On the other hand, 60% would be interested in opportunities offered both by public non-EU funding. This is also due by the fact that public co-funding is a requirement for private investors, as confirmed by the finding number 9 of the EIB Space Economy study carried out in 2019⁹⁷ (“European public innovation instruments play an important role in unlocking private capital for the space sector”). 60% of involved companies declared to be interested also in Corporate VCs, due to their business-oriented investment approach. Some 40% of the companies under analysis would likely rely on private banks financing and private funding, because of their less aggressive approach if compared to VCs. Finally, 20% would be interested in IPOs, crowdfunding and EIB opportunities, which is considered as an ideal institution for guiding major investments and changes.

With regard to the funding obtained in the last 24 months, it was used for both **CapEx and OpEx**. The split between CapEx and OpEx needs is represented in the figure below:

⁹⁶ The sub sample under analysis: n=4.

⁹⁷ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

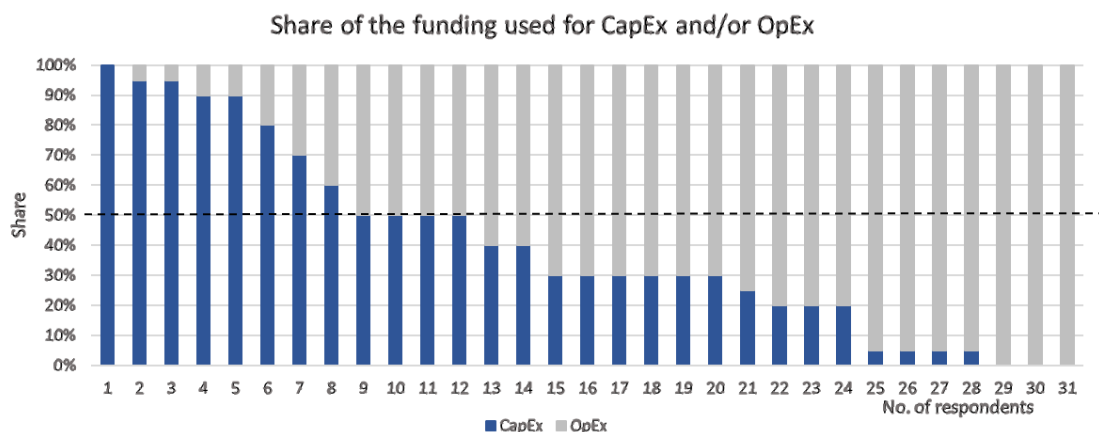


Figure 35: Percentage of funding that is used for CapEx and/or OpEx. Source: Own elaboration based on the outcome of the survey.

The bar chart shows that companies use and need **funding for both types of expenses**, whereby a slightly larger share of companies mostly use the funds for OpEx than for CapEx. Focussing on CapEx should lead to generating a long-lasting value and competitive advantage. The bar chart does show, however, that many companies are still having to meet their daily operating expenses.⁹⁸ This is especially the case for companies with the lowest annual turnover under €2m. Of the 7 companies that dedicate 5% or less to CapEX, 4 belong to this category. On the left hand side of the graph, there are 5 companies, of which none belong to the smallest size, that dedicate 90% or more of funding to CapEx, with 3 out of 5 being companies that have an annual turnover of more than €50m.

98 The sample under analysis: n=31.

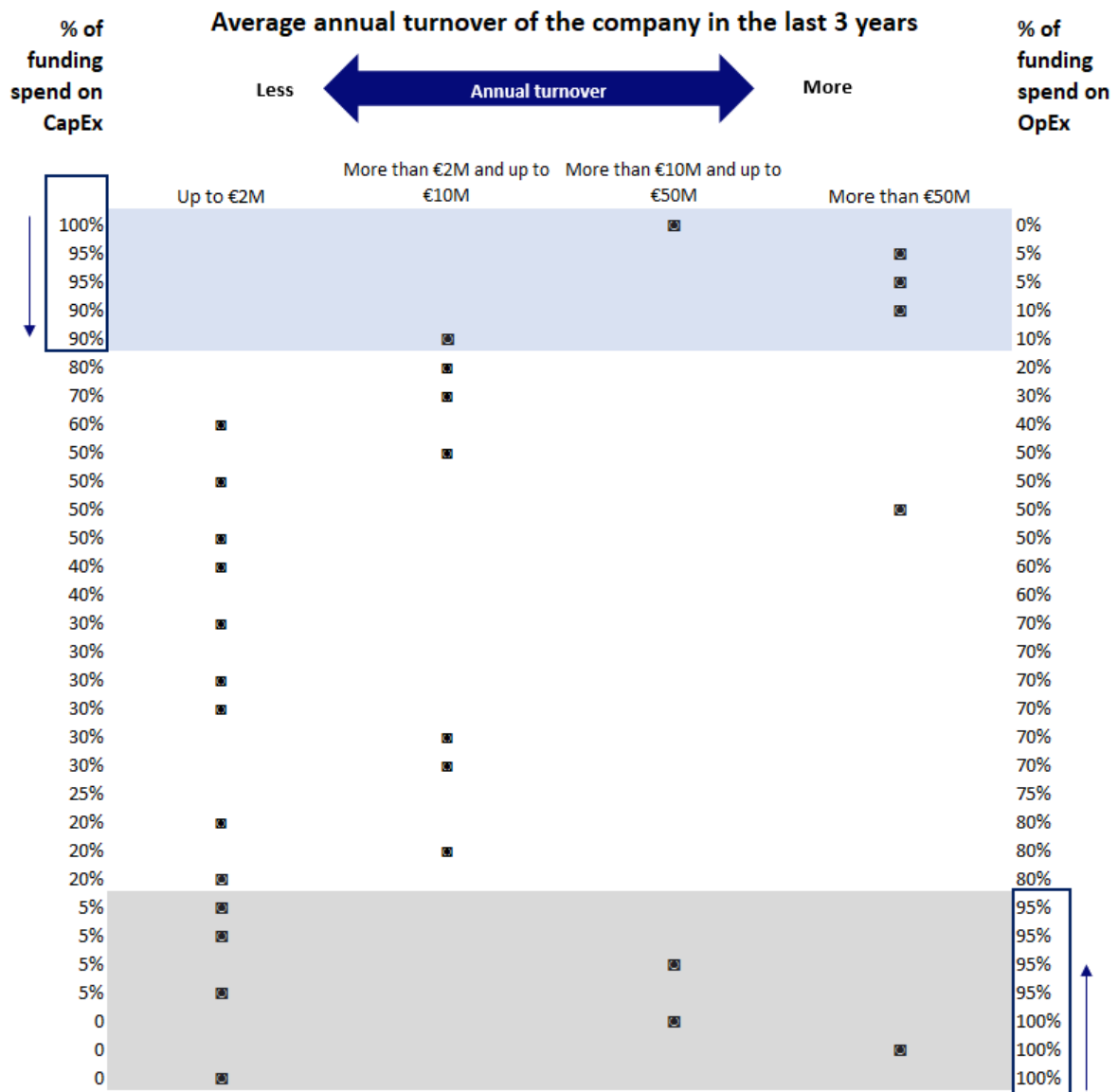


Figure 36: Correlation between CapEx/OpEx and company size

The companies that spend almost nothing on CapEx are mostly the smallest companies, but it is important to note that part of the OpEx are also dedicated to R&D, with companies⁹⁹ dedicating on average 53% of OpEx to R&D expenditure.¹⁰⁰

The survey further revealed that 64% of the respondents¹⁰¹ had attempted or were in the **process of raising funds in the past 24 months**, which happened through various means, as can be seen in the figure below.

99 The sample under analysis: n=39.

100 The sample under analysis: n=38.

101 The sample under analysis: n=39.

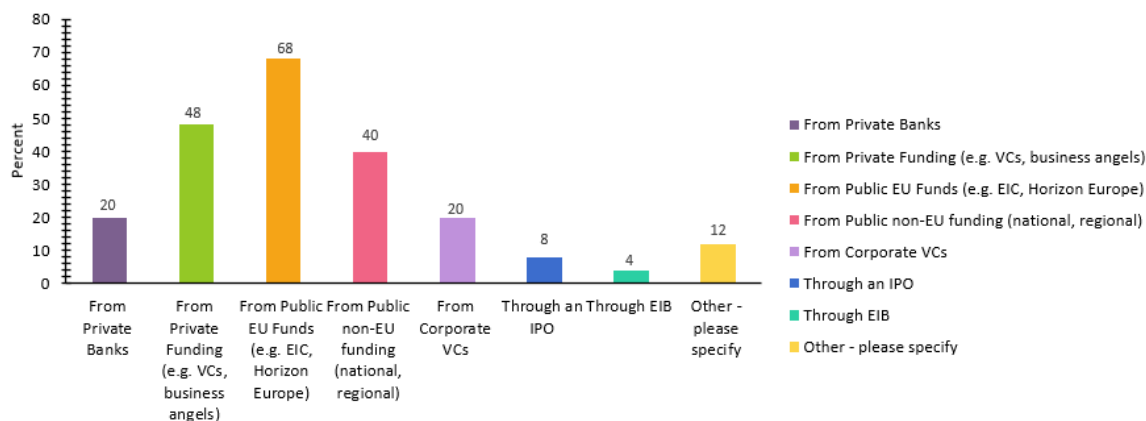


Figure 37: Instruments attempted to raise funding or investments. Source: Own elaboration based on the outcome of the survey.

Some 68% of respondents¹⁰² indicated that the **instruments attempted to raise funding or investments** had been **mostly EU Funds** (EIC or Horizon Europe), **followed by private funding and non-EU funding** (through national or regional funds). A small fraction of just 4% of respondents indicated that the EIB had been the source of funding.

Companies were also asked to express their preference for different types of external financing to realise their growth ambitions, as can be seen in the figure below:

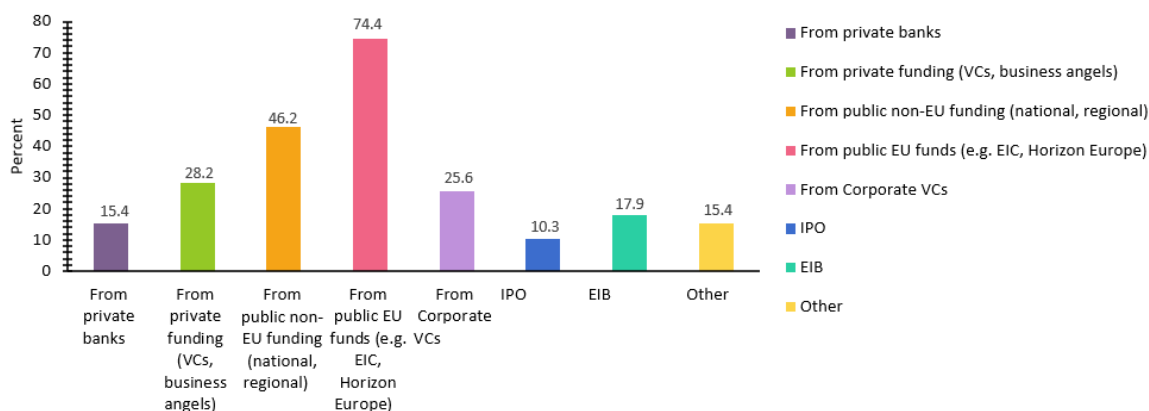


Figure 38: Preferred type of external financing. Source: Own elaboration based on the outcome of the survey.

For a clearer overview of the different preferences expressed, the figure below shows the results divided by company category. Please note that, in light of the fact that the majority of respondents have an average turnover of up to €2m, the figure below cannot be considered representative of the whole industry. However, it sheds light on indicative trends of preferences indicated by targeted stakeholders.

102 The sample under analysis: n=39.

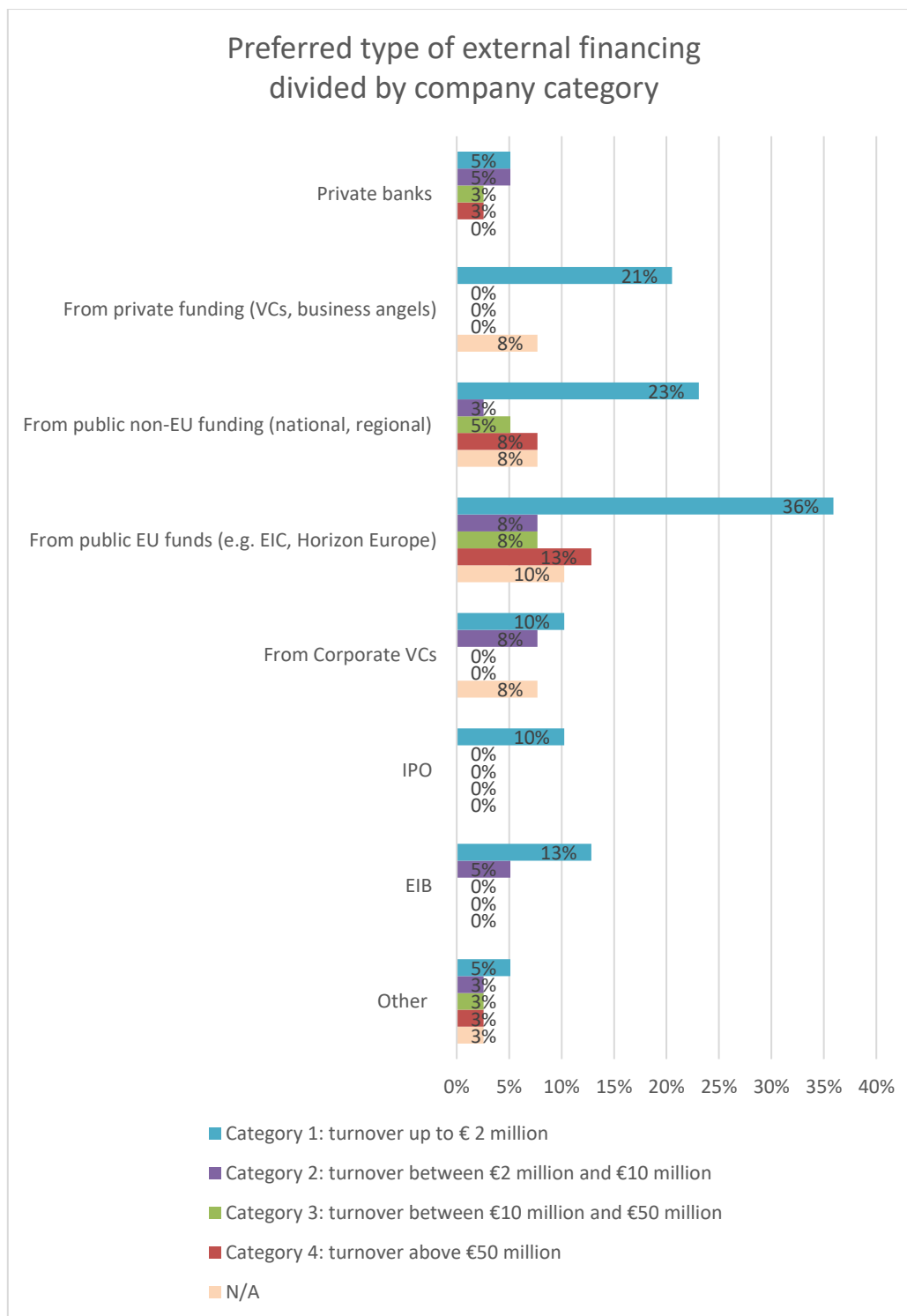


Figure 39: Preferred type of external financing, divided per company category. Source: Own elaboration based on the outcome of the survey.

Overall, 31% of the sample under analysis indicated only one type of preferred financing support, showing a more focussed approach in terms of financing strategy. On the other hand, while 26% of companies indicated two preferences, 28% indicated three types of external financing and the remaining 15% preferred a more diversified approach, as shown in the matrix below. In the type of preferred approach, no particular pattern was identified based on available responses.

Table 9: Matrix of responses concerning most preferred type(s) of external financing to realise growth ambitions

Most preferred type(s) of external financing to realise growth ambitions								Average turnover	No. answers
Private banks	Private funding	Public non-EU funding	Public EU funds	Corporate VCs	IPO	EIB	Other		
	X	X	X	X	X	X		Up to € 2 m	multiple
	X		X		X			Up to € 2 m	3 choices
	X	X	X					Up to € 2 m	3 choices
	X	X	X					Up to € 2 m	3 choices
			X					Up to € 2 m	1 choice
			X					Up to € 2 m	1 choice
		X	X					Up to € 2 m	2 choices
							X	Up to € 2 m	1 choice
							X	Up to € 2 m	1 choice
		X	X		X			Up to € 2 m	3 choices
X						X		Up to € 2 m	2 choices
	X		X	X	X			Up to € 2 m	multiple
	X		X	X		X		Up to € 2 m	multiple
						X		Up to € 2 m	1 choice
	X	X	X					Up to € 2 m	3 choices
		X	X			X		Up to € 2 m	3 choices
		X	X					Up to € 2 m	2 choices
	X			X				Up to € 2 m	2 choices
X		X	X					Up to € 2 m	3 choices
						X		€2 m - € 10 m	1 choice
			X					€2 m - € 10 m	1 choice
X			X	X		X		€2 m - € 10 m	multiple
				X				€2 m - € 10 m	1 choice
X								€2 m - € 10 m	1 choice
		X	X	X			X	€2 m - € 10 m	multiple
							X	€2 m - € 10 m	1 choice
		X	X					€ 10 m - € 50 m	2 choices
			X					€ 10 m - € 50 m	1 choice
X		X	X					€ 10 m - € 50 m	3 choices
		X	X					More than € 50 m	2 choices
			X				X	More than € 50 m	2 choices
X		X	X					More than € 50 m	3 choices
		X						More than € 50 m	1 choice
		X	X					More than € 50 m	2 choices
	X	X	X	X				N/A	multiple
			X				X	N/A	2 choices
	X	X		X				N/A	3 choices
	X		X	X				N/A	3 choices
		X	X					N/A	2 choices

The respondents' experience in raising the funds to drive the development of innovative products and/or services shows that the process was complex even if successful for 47% of the companies. The **companies indicate that overall, the preferred option to raise external financing is public EU funds, followed by national and regional funds, and private funding**. The **fourth** option was funding from the **EIB**. According to the respondents, **EU public funds** stood out because of multiple reasons, including:

- Enabling long-term development, linked to new European technological capabilities
- Leaving IPR with the company
- Possibility to enter consortia
- Fostering collaborative R&D
- Willingness to invest in high-risk innovation technologies

The type of funding that is preferably raised by the surveyed companies¹⁰³ **in the next 5 years are EU funds, public non-EU funds and private funding** (i.e. VCs, business angels, corporate VCs). More specifically, when asked to provide multiple answers, 75% of respondents would prefer to raise funds via EU programmes, as there is an overall satisfaction concerning their functioning. Nevertheless, a few players highlighted the difficulty in accessing this type of funding due to high competition, and time-consuming application and reporting procedures.

Another element highlighted by some respondents is that EU funding instruments might be more easily granted to big consortia, while the management of some projects could be more efficient if handled by individual companies. Moreover, accessing EU funding might be difficult for low-TRL solutions, and this could potentially lead to missed opportunities for the European GNSS market. In fact, it is perceived that most EU funding programs are focused on more mature TRL rather than on technology development. Finally, few respondents stated that EU funding programmes are more oriented towards pure research projects, rather than those more business-oriented. With regards to public non-EU funds and, more specifically, to national ones, there is a widespread perception that these are not only very burdensome in terms of bureaucratic requirements, but also very competitive.

Based on the motivations provided by some companies, it can be noted that at their initial stage of growth they may struggle to raise funding through private means, as well as through opportunities offered by the EIB and, as expected, through IPOs. Concerning EIB funding instruments, these are often perceived by SMEs as being hard to access. This relates in particular to the requirements concerning mature TRL to access the funding, leaving many early-stage companies left out from these opportunities (instead, in the past EIB has supported SMEs with smaller tickets through EFSI and continues to do so through InvestEU). Similarly, IPO requirements are too specific for some stakeholders of the industry. However, the reasons for which some companies preferred funding from the EIB were related to the good business execution offered, together with advantageous loan conditions. The institution was also seen as a stable brand, and a collaborative partner that provided the needed funding.

Concerning **private funding** and with specific reference to VCs and corporate VCs, these are recognised as the most suitable option for start-ups, given their propensity to take risks at initial level of growth of companies. However, the perception of the industry is that there is a lack of culture concerning deep-tech and space-related investments with regards to European private funding. This seems to be particularly true for the innovative products under analysis, which are

¹⁰³ The sample under analysis: n=40.

subject to long sales cycles, long-term ROI and that may require long-term investment horizons. This echoes both key finding number 3 (“The space ecosystem lacks investors with a space background and space investment expertise”) and number 5 (“Space innovations have a longer development cycle than general tech”) of the EIB Space Economy study carried out in 2019¹⁰⁴.

Another conclusion suggested by some results of the online survey is that companies may struggle to find the right program for products that link multiple fields of application (e.g. space and railway).

Overall, 15% of surveyed companies prefer to rely on financing from **private banks** for their growth ambitions. The profile of these companies is quite diverse, both in terms of core business and average annual turnover, which ranges from up to €2m to more than €50m. The reasons for this preference are to be attributed to the possibility to negotiate and raise more debts without taking the risks VCs would pose, but also for the long-term investment possibility offered by such opportunities and the simplicity of their application procedures. On the other hand, 18% of enterprises involved in the survey positively consider relying on **private funding** (such as VCs, business angels) in the future. Despite the difference in their core business, all companies that provided all requested information appear to have an average annual turnover of up to €2m and to have obtained a funding between €1m and €5m over the past 24 months. Among the reasons motivating such a choice, there is the possibility of raising higher financing through a more result-oriented and less bureaucratic approach, as well as leveraging and expanding the companies’ network. Finally, 26% of surveyed companies would prefer to receive financing from **Corporate VCs**. The annual turnover of these respondents is up to €10m and the size of the last investment/funding round was between €1m and €5m over the past 24 months. Corporate VCs are perceived as rapid strategic investments, which put commercial pressure on the company and that are able to foster growth and market penetration.

To better understand the ambition of GNSS companies, the product pipeline has been investigated. The figure below shows the maturity or TRL of the products/services for which the companies are seeking funds:

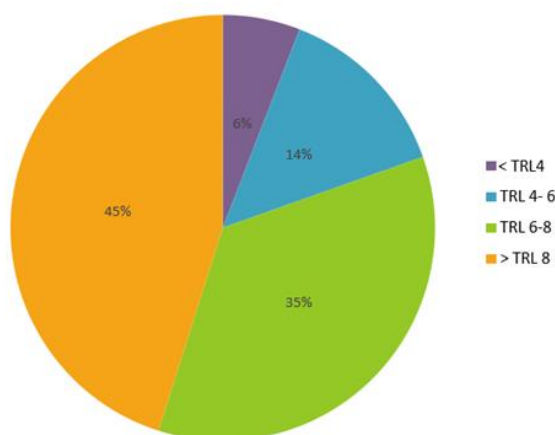


Figure 40: Technology Readiness Level of the products/services for which companies seek funding. Source: Own elaboration based on the outcome of the survey.

¹⁰⁴ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

As many as 80% of the products/services have at least TRL 6. TRLs 1 to 5 capture a technology’s idea and its prototype, whereas levels 6 and 7 seek to validate the prototype by means of testing and demonstrating. TRL 8 and 9 fall under the production stage, with the first commercial system being tested in level 8 and the full technical solution being commercially available under TRL 9. Therefore, the fact that **45% indicate being in TRL 8 shows these GNSS products/services are very close to market.**¹⁰⁵ Almost 70% of the companies¹⁰⁶ expressed that they had received market validation, this being actual clients’ orders mostly (70%), as well as customer demonstrations and close development with key customers. 70% indicated having received technical validation, this being by large (86%) customer validation.

A3.3 Main challenges for companies seeking investment

A main focus of the study regards **potential market gaps and failures** that might hamper the full development of the European GNSS Industry, therefore constraining European leadership in the domain. In particular, these gaps might relate to the financing needs of companies that the market is not fully able to cover yet. These gaps were, indeed, confirmed by the responses provided to the online survey.

Respondents¹⁰⁷ indicated that the reduced control over the company (41%), the difficulty to access early-stage investments (35.9%) and the availability of funding (33.3%) are the **top three most limiting factors of external financing**, as can be seen in the below figure.

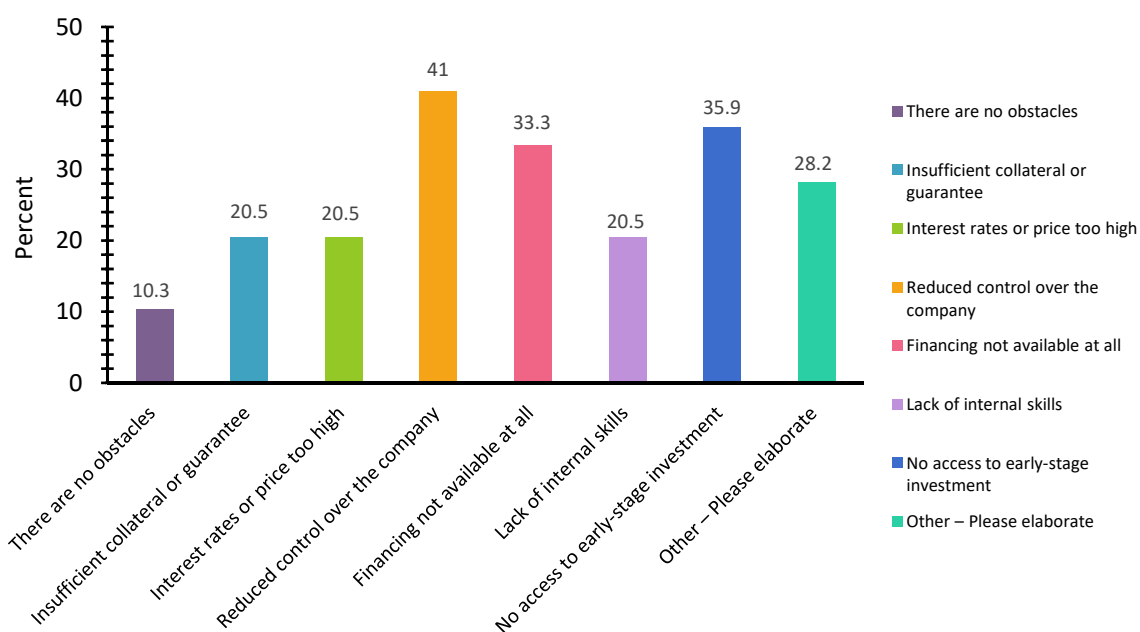


Figure 41: Most important limiting factors to access external financing. Source: Own elaboration based on the outcome of the survey

For a clearer overview of the limiting factors signalled by different company categories, please refer to the figure below. The percentages illustrated in the bar chart refer to the number of companies that signalled each limiting factor compared to the whole number of companies included in each category.

¹⁰⁵ The sample under analysis: n=51.

¹⁰⁶ The sample under analysis: n=51.

¹⁰⁷ The sample under analysis: n=39.

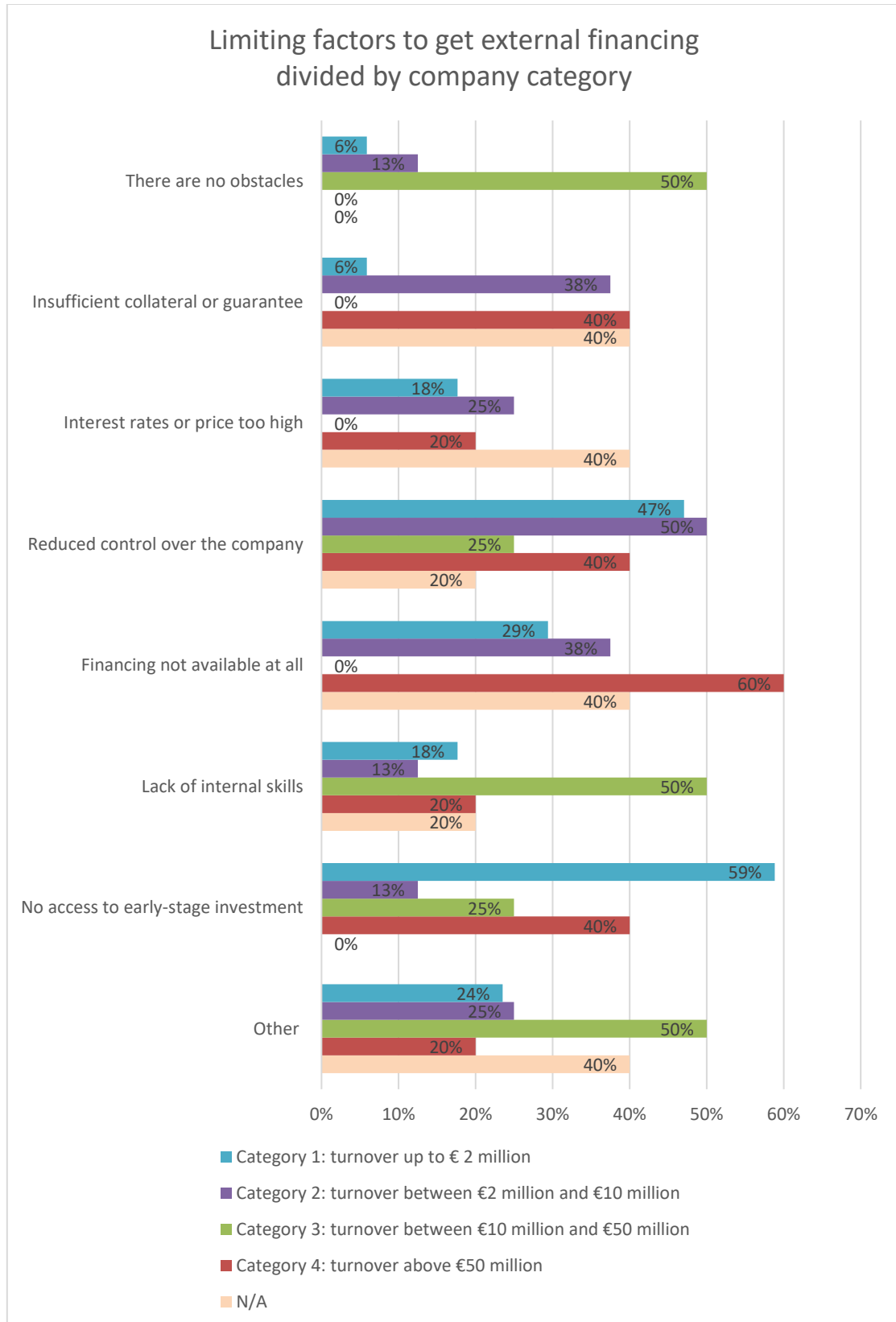


Figure 42: Limiting factors to get external financing – divided per company category

By isolating responses provided by **companies whose average turnover is up to €2m**¹⁰⁸, even though the results appear slightly different than those previously illustrated, the top three limiting factors to get external financing remain the same. It has to be noted that this is also due to the fact that responses from companies whose average turnover is up to €2m, representing 41.5% of the sample under analysis, have a high incidence on the overall results of the survey. In this case, the first limiting factor for this category of companies is the difficulty in accessing early-stage investment (59%), followed by the reduction of control over their company (47%) and the lack of available financing (29%). This result is in line with obstacles that this type of companies typically encounter when seeking financing opportunities, due either to initial stages of growth either their small structures. Among other factors mentioned by surveyed companies whose average turnover is up to €2m we can find difficulties in accessing Round B investments, high aversion to risk, limited market traction and awareness on financing opportunities.

Concerning **enterprises whose average turnover is more than €2m and up to €10m**¹⁰⁹, as can be noticed, the limiting factors slightly differ from the previous category. In fact, reduced control over the company (44%) results to be the top limiting factor to access financing, followed by lack of financing (33%) and insufficient collateral or guarantee to offer (33%). Concerning the latter, we could assume that companies whose average turnover is between €2m and €10m are more oriented towards private financing opportunities, for which their raise attempts are not always successful.

The feedback of companies concerning the topic was quite different for both those whose average turnover ranges between €10m and €50m¹¹⁰ and more established companies whose turnover is above €50m¹¹¹. Regarding **enterprises whose turnover is between €10m and €50m**, while 33% of respondents did not find difficulties in raising needed funding, the top limiting factors to access financing are quite different from those indicated by smaller companies. An interesting information regards 33% of respondents who highlighted that the lack of internal skills is among the biggest obstacles encountered in fundraising.

Similarly, also for more established **companies whose turnover is above €50m** the distribution of responses on factors limiting fundraising activities differ from previous categories. In this case, there is an even distribution of responses on five factors: insufficient collateral or guarantee (33%), high interest rates (33%), reduced control over the company (33%), lack of financing opportunities (33%) and of internal skills (33%). This differentiation might be due to the different structure of companies that reached a more mature stage of growth.

Conditions for European companies to be financially autonomous

As previously showed, inputs provided through the online survey seem to indicate that the majority of stakeholders (41%¹¹²) are **relatively reluctant to lose control over the ownership of their companies**. More specifically, 53% of respondents that identified the reduction of company ownership among the biggest limiting factors to access financing are enterprises whose turnover is up to €2m. This percentage represent 47% of the overall sample of this category. On the other hand, 27% of companies whose turnover ranges between €2m and €10m (representing 44% of this category), 13% of companies whose turnover is above €50m (namely 33% of this category of

¹⁰⁸ Category 1. Please refer to the methodological note for a clearer overview of the methodology used for the categorisation of surveyed companies.

¹⁰⁹ Category 2. Please refer to the methodological note I for a clearer overview of the methodology used for the categorisation of surveyed companies.

¹¹⁰ Category 3. Please refer to the methodological note for a clearer overview of the methodology used for the categorisation of surveyed companies.

¹¹¹ Category 4. Please refer to the methodological note for a clearer overview of the methodology used for the categorisation of surveyed companies.

¹¹² The sample under analysis: n=39.

companies) and 7% of companies whose turnover is from €10m and up to €50m (representing 17% of the category) follow, as shown in the figure below.

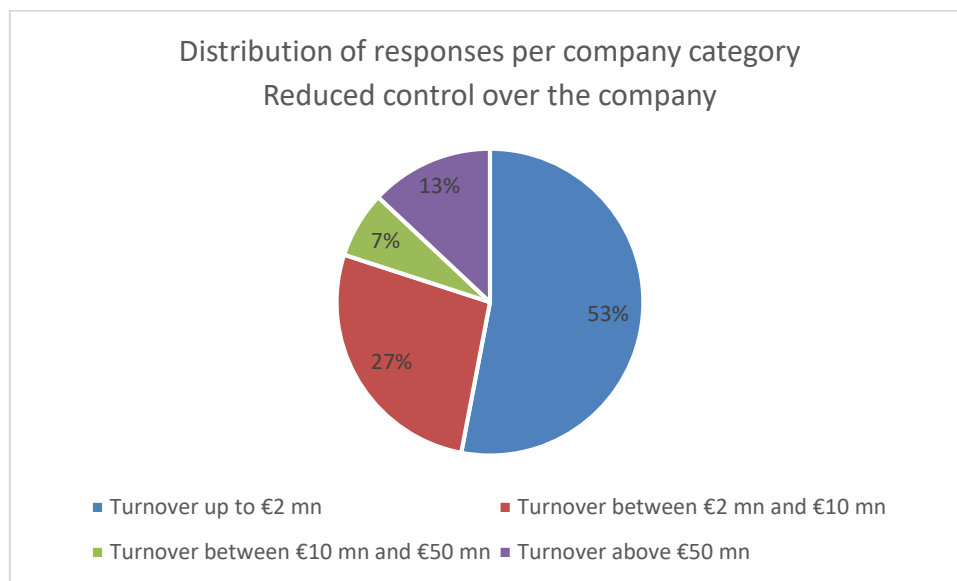


Figure 43: Distribution of responses per company category – top limiting factor to access external financing: reduced control over the company

The below table¹¹³ indicates the segments covered by the 16 companies in question, the majority of which are active in more than one segment. Please note that the companies were able to provide multiple answers concerning the segments covered and, for this reason, the table below shows the total number of multiple options indicated (namely a total of 62 multiple options provided by the 16 companies under analysis).

Table 10: GNSS segments representation in the survey sample

Segment	Total number of responses per segment	% on total number of respondents
Infrastructures	8	50%
Aviation and Drones	7	44%
Road and Automotive	7	44%
Agriculture	6	38%
Rail	5	31%
Space (PNT for satellites and launchers)	5	31%
Consumer Solutions, Tourism and Health	4	25%
Maritime and Inland Waterways	4	25%
Emergency Management and Humanitarian Aid	3	19%
Environmental Monitoring	3	19%
Urban Development and Cultural Heritage	3	19%
Biodiversity, Ecosystems and Natural Capita	2	13%
Energy and Raw Materials	2	13%

¹¹³ Please note that the majority of the respondents declared to be active in more than one segment. For this reason, the 17 respondents were able to provide multiple answers to the question under analysis.

Climate and Weather Services	1	6%
Forestry	1	6%
Insurance and Finance	1	6%
Fisheries and Aquaculture	0	0%

In line with this result, many companies stressed the importance of accessing public funding programmes, in particular EU funds (e.g. EIC, Horizon Europe), to keep control over their business. However, when asked if involved stakeholders¹¹⁴ are considering selling shares of their company, **65% of respondents stated they would positively consider this opportunity with EU corporate investors.**

Following this preference, **52.5% of respondents** would be **interested in exploring such opportunities with North American corporate investors**, both for cultural similarities and the existence of numerous opportunities. The relatively small difference (Δ 12.5%) between the preference indicated for EU corporate investors and North American ones might suggest that European GNSS companies do not perceive major differences between these options. This is probably due to the characteristics of the EU private capital landscape, which is characterised by a lack of available funding and risk aversity towards the GNSS sector when compared to the US corporate investors. This result also appears to be in line with key finding number 4 of the EIB Space Economy study carried out in 2019¹¹⁵ which indicates that “European space entrepreneurs feel there is a lack of private financing sources and keep an eye on the US”. This finding shall be taken in consideration when analysing the independence of the European GNSS industry.

With regards to Asian players, **only 17.5%** of respondents would evaluate the possibility to sell shares of their company to **Chinese corporate investors** and **25% to other Asian corporates**. The majority of remaining respondents (22.5%) would not consider selling shares mainly for keeping complete control over their company, for ethical reasons and, for some companies, because they are state-owned.

Table 11: Survey respondents’ preferences in selling their company or company shares to EU and foreign corporate investors. Source: Own elaboration based on the outcome of the survey

	Yes		No		Responses
	Count	%	Count	%	Count
EU corporate investors	26	65.0%	14	35.0%	40
Chinese corporate investors	7	17.5%	33	82.5%	40
Other Asian corporate investors	10	25.0%	30	75.0%	40
North American corporate investors	21	52.5%	19	47.5%	40
Other	9	22.5%	31	77.5%	40

¹¹⁴ The sample under analysis: n=40.

¹¹⁵ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

An interesting finding is that, among the 26 respondents that expressed a potential interest in selling shares of their company, **23% (6 companies) have already initiated such process**. It also has to be noted that three of these six companies are active in the aviation and drones market segment.

Available financing opportunities

With regards to the **availability of effective financing instruments dedicated to space-related sectors**, targeted companies¹¹⁶ agreed on the fact that **funding opportunities are not sufficient at national, European nor non-European level**. This is particularly true at national level, where 69% of respondents stated that financing instruments are not sufficient (39%) or not available (31%) to cover the business needs of the industry. On the other hand, the remaining 10% of respondents find the financing opportunities to be adequate to meet the demand of space-related sectors, while 20.5% of the sample were of the opinion not to have enough expertise on the topic to be able to provide a response.

The results are quite different **at European level**, where 61.5% of respondents find the financing instruments offered to space-related companies not to be sufficient to meet their demand. More specifically, 54% revealed that available instruments are not fully sufficient, while 8% declared that existing EU instruments are not at all sufficient to cover their business needs. A more positive result can be observed concerning the number of companies satisfied by the currently available EU financing for space-related investments, accounting for 15% of the sample, while 23% declare themselves not to be informed enough on existing funding opportunities.

Finally, regarding **non-European available financing instruments**, and as can be seen in the table below, the majority (69%) of targeted European companies are not familiar with such instruments, which could also indicate an overall preference to only tap into European and national funding. This data can also explain why only 26% of respondents do not find available financing to be fully (20.5%) or at all (5%) sufficient for their needs. Nevertheless, 5% of surveyed companies find these non-European instruments to be adequate to their demand.

Table 12: Companies' feedback on available financing instruments dedicated to space-related sectors. Source: Own elaboration based on the outcome of the survey

	Yes, sufficient		Yes, but not sufficient		No		I do not know		Responses
	Count	%	Count	%	Count	%	Count	%	Count
National	4	10.3%	15	38.5%	12	30.8%	8	20.5%	39
European	6	15.4%	21	53.8%	3	7.7%	9	23.1%	39
Non-European	2	5.1%	8	20.5%	2	5.1%	27	69.2%	39

Despite the presence of differences at national, European and non-European level, there seems to be a market asymmetry concerning a relative **lack of awareness** of stakeholders **with regard to available financing instruments**. In fact, between 20.5% (at national level) and 69% of respondents (at non-European level) stated that they do not have enough expertise on these types of instruments. Therefore, awareness-raising activities could be launched to support space-related fundraising. Secondly, when focussing specifically on national and European financing instruments, we can notice that those that are currently available are perceived not to be fully sufficient to cover the industry's needs, highlighting the existence of an important market gap. This is

¹¹⁶ The sample under analysis: n=39.

particularly relevant for the national instruments, whereby a higher number of companies stated that these are not at all sufficient to serve their funding objectives.

Space-specific and non-sector specific financing instruments

Based on the sample¹¹⁷ taken into consideration, **41% of respondents did signal differences in terms of accessibility between space-specific financing instruments and non-sector specific financing instruments**. However, it has to be noted that among the 59% of companies that did not see any difference between space-specific and non-sector specific financing instruments, 8 out of 20 respondents declared to not have much experience and knowledge about space-specific or non-sector specific financing instruments to properly compare them.

With regards to why 41% of respondents affirmed to have noticed a difference between space-specific and non-sector specific financing instruments, the reasons are quite diverse. On the one hand, some companies find **space-specific funding instruments much harder to access** compared to other industry-related ones. This seems to be relevant in particular for smaller companies, because space is a niche market and there are **fewer financing opportunities available**. Also, the level of **competition and quality requirements** needed to seize funding opportunities **are higher**. Moreover, other tech-specific financing instruments seem to be backed by larger amount of funding.

Another group of companies find **space-specific instruments to be more effective** than non-specific ones and to be well established, also in light of intergovernmental agreements supporting them. However, based on this result, we are not able to identify univocal findings, as it can be expected in a variegated sample of companies (i.e. involving companies of different size, covering multiples domains and multiple segments of applications).

Complexity of fundraising activities

The results of the online consultation seem to indicate that a large part of the respondents¹¹⁸ find the experience of **fundraising particularly complex**. As shown by the figure below, only 10% of the companies stated that their attempts to raise funding to develop innovative products and services had been easy and successful. However, **84% of respondents had experienced difficulties** to reach their financing objectives. Of these, 47% successfully obtained the funding despite the complex procedure. 18% of respondents had to make different attempts before reaching their objective and 20% were not able to raise funding yet. **The difficulties to accessing funding opportunities are jeopardizing the survival of 6% of surveyed companies.**

¹¹⁷ The sample under analysis: n=39.

¹¹⁸ The sample under analysis: n=51.

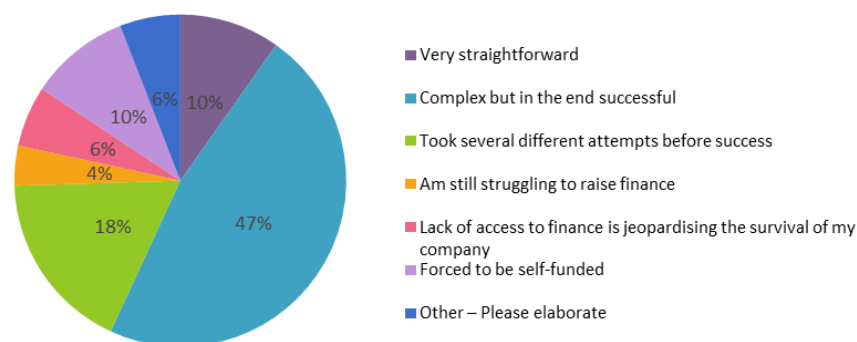


Figure 44: Feedback concerning survey respondents' experience in raising funds. Source: Own elaboration based on the outcome of the survey.

Among the **reasons of these difficulties**, respondents reported a general lack of opportunities for innovative deep-tech products. The application procedures were complex and hard to manage without proper advisory support. Furthermore, there is an overall preference for software over hardware-based projects and a preference for short-term investments, among other factors.

Readiness to raise private investments

Only 29.4% of the sample under analysis¹¹⁹ positively assessed their readiness (e.g. preparedness to pitch, to provide required documentation, knowledge of different types of instruments) **to raise private investments**. For the remaining 71% of respondents, while 29% affirmed to be experienced but in need of financial advisory support, 41% declared to have little experience and would require more support for the preparation of technical and financial business cases. This result seems to indicate a widespread need of European companies to have stronger support to ease their access to private financing.

Available advisory support

In this context, it can be useful to also observe what kind of advisory support is in place in the surveyed companies¹²⁰. As shown in the figure below, some **51% of respondents do not have any advisory support** for guiding their business development strategy. The remaining 49% of companies were asked to provide multiple answers to describe the type of advisory support they rely on. The results show that 29% of respondents rely on networks of other companies of the ecosystem, 12% on incubation centres, 10% on universities and 18% on other types of support.

¹¹⁹ The sample under analysis: n=51.

¹²⁰ The sample under analysis: n=51.

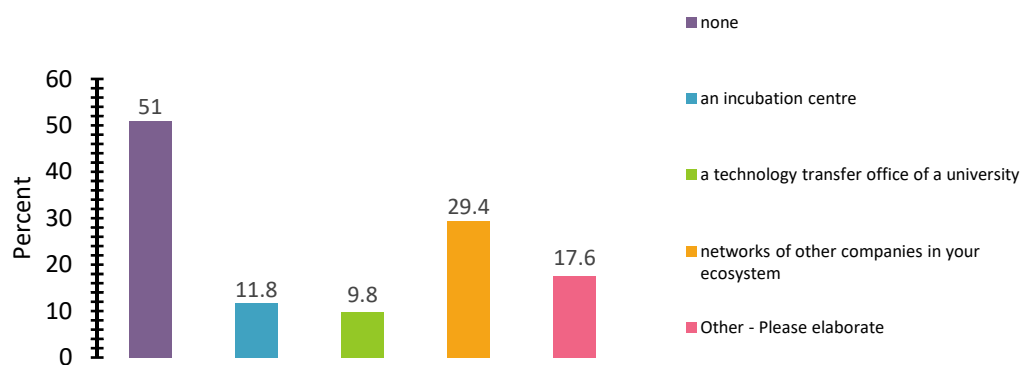


Figure 45: Types of advisory support received by surveyed companies. Source: Own elaboration based on the outcome of the survey.

The above-mentioned observations may suggest that **many European GNSS companies might keep finding difficulties in moving from the pre-production stage to the volume production-level stage if no measures will be put in place to address the existing issues hampering the industry’s full scale-up.** It has to be noted that, the fact that “the European space sector experiences funding hurdles similar to those of other tech companies, particularly at scale-up phase” was already highlighted as the first key finding of the study concerning “the future of the European space sector”¹²¹ carried out by the EIB in 2019.

¹²¹ The future of the European space sector - How to leverage Europe’s technological leadership and boost investments for space ventures, Innovation Finance Advisory in collaboration with the European Investment Advisory Hub, part of the European Investment Bank’s advisory services, 2019. Available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf

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List of acronyms

bn	billion
CAGR	Compound Annual Growth Rate
CapEx	Capital expenditures
DEFIS	Defence Industry and Space
DG	Directorate General
DGNSS	Differential Global Navigation Satellite System
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortisation
EFSI	European Fund for Strategic Investments
EGNOS	European Geostationary Navigation Overlay Service
EGNSS	European Global Navigation Satellite System
EIB	European Investment Bank
EIF	European Investment Fund
EO	Earth Observation
EU	European Union
EUSPA	European Union Agency for the Space Programme
EV	Enterprise Value
FTE	Full-time equivalent
GNSS	Global Navigation Satellite System
IoT	Internet of Things
IPO	Initial Public Offering
k	thousand
m	million
MARE	Maritime Affairs and Fisheries
MoU	Memorandum of Understanding
OpEx	Operational expenditures

PNT	Positioning, Navigation, and Timing
PPP	Precise Point Positioning
R&D	Research and Development
R&D&I	Research and Development and Innovation
RTK	Real-time Kinematic
SME	Small and medium-sized enterprise
TRL	Technology Readiness Level
UK	United Kingdom
US	United States of America
VC	Venture Capital



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