Space Strategy 2030

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Abstract

Finland's space strategy has been renewed under the mandate of Minister of Economic Affairs Wille Rydman to address the changing global operational environment. The strategy update considers the transformation of the industry and technology and the challenges arising in the geopolitical landscape.

The significant development of the space sector in Finland results from long-term investments in the business environment, innovation activities, and research. This success must be harnessed more broadly to benefit Finland's growing space activities.

The space strategy defines Finland's vision and goals for space activities up to 2030. The key objectives of the strategy include utilizing space services across various sectors of society, developing the space operational environment, strengthening capabilities, and increasing international cooperation. The strategy emphasizes the importance of the space economy, security and defense policy perspectives, and the significance of security of supply.

The strategy has been prepared under the leadership of the Secretary-General of the Finnish Space Committee in a working group that included the Ministry of Economic Affairs and Employment, the Ministry of Transport and Communications, the Ministry of the Interior, the Ministry of Defence, the Ministry for Foreign Affairs, the Prime Minister's Office, Business Finland, the National Emergency Supply Agency, the Finnish Transport and Communications Agency Traficom, and the Finnish Meteorological Institute. The steering group for the strategy work was the Finnish Space Committee, which also included representatives from the Ministry of Education and Culture, the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Academy of Finland, the COSPAR National Committee, and the Defence and Aerospace Industry Association of Finland (PIA). International experts and Finnish space actors were consulted during the preparation.

Keywords space strategy, space, space economy, space services, technology, satellite, remote sensing, earth observation, satellite navigation, positioning, satellite communications, space situational awareness, space weather, security of supply, defense, security, critical infrastructure, research, education, innovation activities, digitalization, international cooperation

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Avaruusstrategia 2030

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Tiivistelmä

Suomen avaruusstrategia on uudistettu elinkeinoministeri Wille Rydmanin toimeksiannosta vastaamaan muuttunutta globaalia toimintaympäristöä. Strategian uudistamisessa on otettu huomioon toimialan ja teknologian murros sekä geopoliittisessa kentässä nousseet haasteet.

Avaruusalan voimakas kehittyminen Suomessa on tulosta pitkäjänteisistä panostuksista yritysten toimintaympäristöön, innovaatiotoimintaan ja tutkimukseen. Tämä menestys on valjastettava laajemmin kasvavan avaruustoiminnan hyödyntämiseen Suomen hyväksi.

Avaruusstrategia määrittelee Suomen avaruustoiminnan vision ja päämäärät vuoteen 2030. Strategian keskeisiä tavoitteita ovat avaruuspalveluiden hyödyntäminen yhteiskunnan eri sektoreilla, avaruustoimintaympäristön kehittäminen, toimintakyvyn vahvistaminen ja kansainvälisen yhteistyön lisääminen. Strategia korostaa avaruustalouden merkitystä, turvallisuus- ja puolustuspoliittisia näkökulmia sekä huoltovarmuuden tärkeyttä.

Strategian on valmisteltu avaruusasiain neuvottelukunnan pääsihteerin johdolla työryhmässä, johon osallistuivat työ- ja elinkeinoministeriö, liikenne- ja viestintäministeriö, sisäministeriö, puolustusministeriö, ulkoministeriö, valtioneuvoston kanslia, Business Finland, huoltovarmuuskeskus, liikenne- ja viestintävirasto Traficom sekä ilmatieteenlaitos. Strategiatyön ohjausryhmänä toimi avaruusasiain neuvottelukunta, jossa on nimitetyt jäsenet lisäksi opetus- ja kulttuuriministeriöstä, ympäristöministeriöstä, maa- ja metsätalousministeriöstä, Suomen akatemiasta, COSPAR-kansalliskomiteasta sekä puolustus- ja ilmailuteollisuus PIA ry:stä. Valmistelun yhteydessä on kuultu kansainvälisiä asiantuntijoita sekä suomalaisia avaruustoimijoita.

Asiasanat avaruusstrategia, avaruus, avaruustalous, avaruuspalvelut, teknologia, satelliitti, kaukokartoitus, satelliittinavigointi, paikannus, satelliittitietoliikenne, avaruustilannekuva, avaruussää, huoltovarmuus, puolustus, turvallisuus, kriittinen infrastruktuuri, tutkimus, koulutus, innovaatiotoiminta, digitalisaatio, kansainvälinen yhteistyö

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Rymdstrategi 2030

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Referat

Finlands rymdstrategi har reviderats på uppdrag av näringsminister Wille Rydman för att spegla den förändrade globala verksamhetsmiljön. Vid revidering av strategin har man beaktat förändringen inom rymdindustrin och teknologin samt utmaningarna inom det geopolitiska fältet.

Den starka utvecklingen inom rymdindustrin i Finland är resultat av långsiktiga satsningar på företagens verksamhetsmiljö, innovationsverksamhet och forskning. Denna framgång ska utnyttjas till en bredare användning av den växande rymdverksamheten till förmån för Finland.

Rymdstrategin fastställer visionen och målen för Finlands rymdverksamhet fram till år 2030. Huvudmålen för strategin är att utnyttja rymdtjänster inom olika samhällssektorer, utveckla rymdmiljön, stärka aktionsförmågan och öka det internationella samarbetet. Strategin betonar rymdekonomins betydelse, säkerhets- och försvarspolitiska aspekter samt vikten av försörjningsberedskapen.

Strategin har beretts under ledning av generalsekreteraren för delegationen för rymdärenden i en arbetsgrupp med deltagande från arbets- och näringsministeriet, transport- och kommunikationsministeriet, inrikesministeriet, försvarsministeriet, utrikesministeriet, statsrådets kansli, Business Finland, Försörjningsberedskapscentralen, Transport- och kommunikationsverket Traficom och Meteorologiska institutet. Styrgruppen för strategiarbetet var delegationen för rymdärenden som dessutom har utnämnda medlemmar från undervisnings- och kulturministeriet, miljöministeriet, jord- och skogsbruksministeriet, Finlands Akademi, nationalkommittén COS-PAR samt Försvars- och luftfartsindustrin PIA rf. I samband med beredningen har internationella experter och finländska rymdaktörer hörts.

Nyckelord	rymdstrategi, rymden, rymdekonomi, rymdtjänster, teknologi, satellit, fjärranalys, satellitnavigering, positionering, satellitinformationsteknik, rymdlägesbild, rymdväder, försörjningsberedskap, försvar, trygghet, kritisk infrastruktur, forskning, utbildning, innovationsverksamhet, digitalisering, internationellt samarbete

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FOREWORD

The renewed space strategy responds to the opportunities and challenges opened by the transformation in the domain and operational environment. It focuses particularly on the utilization of space services in society.

Information and services obtained from space support the infrastructure of various sectors of society. By utilizing space services, societal functions can be enhanced and streamlined, and entirely new applications can be adopted. As society's functions become digitalized, earth observation, time and location information, and ubiquitous communication links are fundamental elements on which developing applications can rely.

The transformation of the space economy, driven by new globally scalable business models, technological advancements, and the decreasing costs of space activities, has significantly increased the number of private sector actors. Investments in research, development, and innovation activities have contributed to the rapid growth of Finnish space activities and industry. There are about 200 companies operating in the space sector in Finland, many of which have grown from start-ups to internationally significant players. Finland has become one of Europe's key investment destinations for new space business. Maintaining an attractive operational and innovation environment must continue to ensure progress in the future.

At the same time, the significance of space activities to security and defense policy is continuously increasing. Creating national capabilities requires international cooperation. It is important to identify what expertise and capabilities are needed nationally and to what extent partnerships with other countries can be relied upon. Partnerships with commercial service providers and research organizations are becoming increasingly important. These partnerships should be strengthened to enable dual-use solutions.

Public authorities must ensure the continuity of critical services even in exceptional circumstances and disruptions. Space services add a significant new layer to Finland's security of supply culture, complementing other technologies and ensuring logistics.

A broad and insightful technological understanding strengthens Finland's ability to streamline everyday societal functions and build sustainable comprehensive security.

January 2025

Wille Rydman
Minister of Economic Affairs

1 Introduction

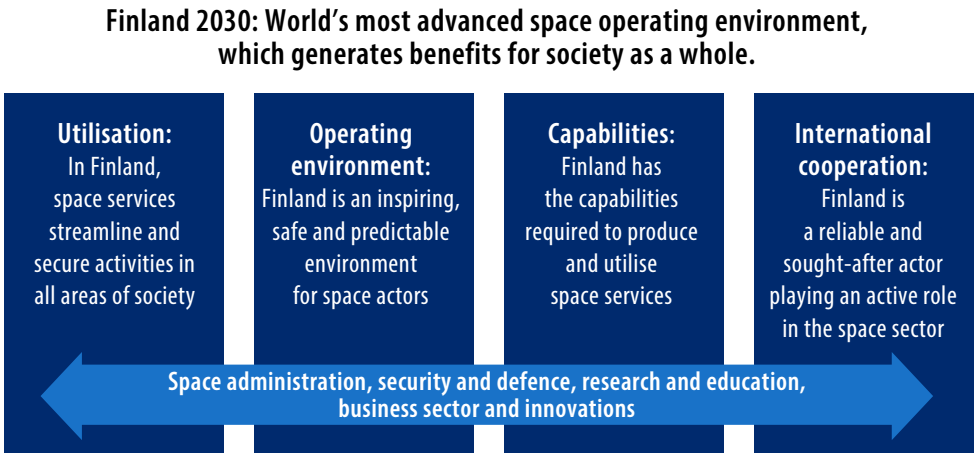
In December 2023, Minister of Economic Affairs Wille Rydman appointed a cross-administrative working group to update Finland's national space strategy. The working group was tasked with defining the vision for 2030, the strategic goals and the measures to achieve them.

The space sector and its geopolitical operating environment have changed significantly in recent years. In global scale, the sector grew by 30% between 2018 and 2022. Finland has about 200 companies operating in the space sector and their turnover from space activities has tripled over the same period. International studies have found that investments in space activities are channelled back into society through benefits generated for other sectors and that these benefits are six to seven times larger than the original inputs. At the same time, space activities are playing an increasingly important security and defence policy role, and this provides an operating environment for the intensifying competition between major powers.

The focus in the strategy is on utilising space services in different sectors of society. Space services can be used to boost productivity, streamline a wide range of everyday activities, and make society more secure and enhance its ability to defend itself. The role of space services as part of the critical infrastructure must also be taken into account in security of supply planning.

To produce and utilise space services, we need expertise, research data and an enabling operating environment. Cooperation between the private and public sectors plays a key role in this process. Within the framework of limited resources, we must identify the capabilities that we can develop nationally. They can be supported with services purchased as part of international cooperation.

Figure 1. The vision and four objectives of the space strategy.



In the strategy, the target state for 2030 is presented on the basis of four objectives. The measures set out for each objective provide the framework for achieving the target state. The economic constraints and the resources available for the work provide the basis for defining the measures.

2 Background

2.1 Starting point

2.1.1 National Space Strategy 2018–2025

"Finland 2025: The world's most attractive and agile space business environment, which benefits all companies operating here", the vision for the 2018 space strategy consisted of three key pillars: 1) prerequisites for entering the market, 2) international impact, and 3) research.[1] According to a report published at the end of 2023,[2] Finland's space operating environment has expanded considerably and become significantly more active. It was also stated in the report that most of the objectives set out in the space strategy have been achieved or are in the process of being achieved.

In 2023, the Finnish Space Committee concluded that the space sector and the security and geopolitical situation had changed significantly, prompting the Committee to launch the work to update the national space strategy.

2.1.2 Space economy

The space industry can be compared with the semiconductor, pharmaceutical and defence industries: investments in space activities are channelled back into society through benefits generated for other sectors and these benefits are six to seven times larger than the original inputs. The global space economy totalled USD 630 billion in 2023. It is projected that the market will reach the size of USD 1,800 billion in 2035. In 2022, public sector funding for space activities totalled about EUR 98 billion globally, EUR 12.9 billion in Europe and EUR 61.2 million in Finland.[3]

1 National Space Strategy 2018–2025, Ministry of Economic Affairs and Employment and Ministry of Transport and Communications, 2018

2 European Space Policy Institute ESPI, The Finnish Space Sector's Current State and Future, 22 December 2023.i

3 European Space Policy Institute ESPI, The Finnish Space Sector's Current State and Future, 22 December 2023.

Finland has about 200 companies operating in the space sector. The most of them utilise space-based services as part of their own business activities. The companies focusing on space activities and services have raised EUR 282 million in private funding, and about EUR 250 million of this total has come from outside Finland. In 2022, Finnish growth companies operating in the space sector raised EUR 119 million in private funding, which in euro terms is the fourth largest sum in Europe.[4] This shows that the space sector is growing rapidly and it is attracting foreign investments to Finland.

In 2022, Finnish space technology companies had a turnover of more than EUR 62 million. In 2018, the figure had been EUR 20 million. The key areas for space technology applications were the security and defence sector, telecommunications and climate change. The EU, the USA and China were the biggest export markets. A total of 808 persons worked in space tasks in the companies. The companies are optimistic about their business and investment prospects for the coming years.[5]

Growth in the sector is reflected in the higher number of licence applications. By the end of August 2024, the Ministry of Economic Affairs and Employment had registered 28 satellites licensed in Finland in the national registry of space objects.[6] At the same time, 32 Finnish satellites had valid radio licences granted by the Finnish Transport and Communications Agency Traficom. There has also been growing interest in earth station operations. Since the entry into force of the Act on Earth Stations, the Finnish Transport and Communications Agency has received applications for earth station licences from 11 operators. Seven licences have been granted, and four applications were under consideration at the end of August 2024.

2.1.3 Societal impact

The world is increasingly dependent on space, not only economically but also in terms of wellbeing and security. The strategic and military role of space has grown rapidly. Space activities are playing an increasingly important role in the functioning of our society and daily life. Location and time data, telecommunications and remote sensing are the most important services obtained from space.

4 Space Venture Europe 2022 Investment in the European and Global Space Sector.

5 Business Finland's sectoral survey

6 National registry of space objects, Ministry of Economic Affairs and Employment, https://tem.fi/en/registry-of-space-objects

Highly accurate location or time data is essential for many of the key functions of society, and most of this data is produced by satellites. Remote sensing satellite systems observing the earth enable a continuous data flow for monitoring the environment and weather conditions, mapping natural resources, monitoring and anticipating disasters, and for the national and international security sector. Relaying of television and radio programmes is the oldest and the most important application for satellite communications but the use of satellite broadband is also increasing. Because of their high costs, satellite telecommunications services are mainly used in sea areas and air traffic. However, broadband services based on extensive satellite constellations are already commercially available to the general public throughout Finland. As a result, satellite telecommunications services will become better suited for everyday use in terms of costs and functions.[7]

2.1.4 Security, defence and security of supply

Space activities are playing an increasingly important role in security and defence policy, and this provides an operating environment for the intensifying competition between major powers. Space activities are a dual-use environment as the capabilities that they create can be utilised for both civilian and military purposes and there is no clear distinction between the capabilities offered for these two areas. Many government actors are developing space capabilities and some of them are also intended for hostile purposes.

Using space as a support area for military operations is an important part of modern warfare. Availability of space-based services, and space-based enemy activities influence the way in which the operations are carried out. Space is utilised for early warning, creating a situational picture (satellite intelligence), secure command connections and communications as well as for position, navigation and timing services. Modern weapon systems and management of troops are often dependent on satellite-based services.

Security authorities make extensive use of satellite positioning systems for location data, and utilise remote sensing data to produce information on land and marine environments for border, maritime and environmental surveillance. They also use foresight and monitoring data for the management of natural disasters, such as floods and forest fires, as part of rescue operations. In emergencies, satellite

7 From space to everyday: Final report of societal impact of space activities in Finland (AVARTAVA) 25 March 2022 (in Finnish, with English abstract).

telecommunications ensure data transmission in places where the terrestrial telecommunications infrastructure is not available or has been destroyed. Space activities are an essential part of the comprehensive security of society and preparedness for incidents and emergencies under normal conditions.

The information and services produced by space activities are part of societal resilience and they are extensively used to secure the infrastructures, services and functions important to security of supply. Space-based services are also key to ensuring smooth running of our everyday lives and business operations. Their continuity and reliability are important to security of supply and other utilisation. The positioning, navigation and timing (PNT) services provided by GNSS satellites are the most extensively used and important services in terms of security of supply, especially in the financial sector and logistics. Satellite remote sensing plays a key role in weather, maritime and environmental services, which are also important to security of supply. Satellite communication systems help to ensure the functioning of important backup systems in sectors critical to security of supply.

The space situational picture is an important part of modern warfare and preparedness under normal conditions, including the activities of the security authorities (comprehensive security). The conditions in space and the reliability of the systems also have a significant impact on the functioning of society and security of supply. Space has become an operating environment for hybrid influencing.

2.1.5 National legislation and international obligations

Finland is a party to four UN space conventions: treaty on the principles governing the exploration and use of outer space (Finnish Treaty Series 56–57/1967),[8] rescue agreement (Finnish Treaty Series 45 and 46/1970),[9] liability convention (Finnish Treaty Series 8 and 9/1977),[10] and the registration convention (Finnish Treaty Series

8 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies; opened for signatures on 27 January 1967 and entered into force internationally on 10 October 1967.

9 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space; opened for signatures on 22 April 1968 and entered into force internationally on 3 December 1968.

10 Convention on International Liability for Damage Caused by Space Objects; opened for signatures on 29 March 1972 and entered into force internationally on 1 September 1972.

9/2018).[11] Under these conventions, states are responsible for national space activities and for damage caused by space activities. States must maintain national registers of the objects that they have launched into space and notify the UN of the space objects that they have registered.

In Finland, the licensing, supervision and registration procedures for space activities are laid down in the Act on Space Activities (63/2018), which entered into force in January 2018. Under the Act on Space Activities, a licence is also required for satellite remote sensing exceeding the thresholds laid down in the Government Decree (892/2023). Provisions on earth station operations and their supervision are laid down in the Act on Earth Stations and Certain Radars (96/2023, *Act on Earth Stations*), which entered into force in February 2023. In Finland, a licence is required for establishing and operating earth stations and radars. Certain components of space and satellite operations are also dual-use items specified in the EU regulation 2021/821 and they require an export licence granted by the Ministry for Foreign Affairs.

Finland has undertaken to comply with the Radio Regulations of the International Telecommunication Union (ITU). The Radio Regulations and the maintenance of the Master International Frequency Register of ITU impose rights and obligations on Finland, which have a major impact on the space sector due to its global nature. Under the Act on Electronic Communications Services (917/2014), the radio systems of Finnish objects sent into space, such as satellite control and command connections and payloads, require a radio licence granted by the Finnish Transport and Communications Agency. The Act on Electronic Communications Services also contains provisions on the tasks of the national PRS authority.

For the space sector, the NIS2[12] and CER[13] directives of the EU are relevant to the activities specified in the Act on Earth Stations. This is because the parties maintaining the terrestrial infrastructure that support the provision of space-based

11 Convention on Registration of Objects Launched into Outer Space; opened for signatures on 14 January 1975 and entered into force internationally on 15 September 1976.

12 Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148.

13 Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities and repealing Directive 2008/114/EC.

services meeting specific criteria fall within the scope of the directives. The EU Space Law initiative, one of the priorities of the European Commission, is intended to supplement the NIS2 and CER directives and extend EU regulations to cover the space segment.

Finland became a full member of the European Space Agency ESA in 1995. Finland joined the EU SST partnership in 2023 and has pledged to maintain a national contact point and provide observation data for the partnership programme.

2.1.6 International cooperation

International cooperation plays a key role in space activities. Finland's national-level capability to engage in space activities is largely based on European cooperation. Finland has also concluded bilateral cooperation agreements and letters of intent with a number of countries. Multilateral forums work to promote international cooperation and common rules for space activities and their aim is also to enhance the prerequisites for business activities.

The EU Space Programme, the key partner for Finland in operational activities, provides Member States with services in satellite navigation, earth observation, satellite telecommunications and in space surveillance and tracking. The EU Space Strategy for Security and Defence and Finland's NATO membership serve as the key international frameworks for comprehensive security actors. The European Space Agency ESA is the key partner in the building of research and expertise, and its programmes give Finnish actors access to international joint projects.

International cooperation is also promoted within the framework of the United Nations. The International Telecommunication Union (ITU) coordinates the use of satellite radio frequencies and slots on the geostationary orbit. Agreeing on international space legislation and the rules for the sustainable use of space and space traffic management are the responsibility of the Committee on the Peaceful Uses of Outer Space (COPUOS) of the United Nations. Space and aviation law issues are jointly considered by the International Civil Aviation Organization (ICAO), COPUOS and the Office for Outer Space Affairs (UNOOSA) of the United Nations. Space issues can also be discussed within the framework of the UN arms control and disarmament process in Geneva.

2.2 Analysis

The rapid growth of the sector, changes in the operating environment and the increasingly importance role of space in security and defence have prompted the updating of Finland's national space strategy. As part of the work, the strategy will also be expanded to consider other sectors of society as well as comprehensive security, in addition to direct space activities.

Cooperation between the business sector, research community and public administration in the development of the operating environment and international cooperation is essential for realising the development potential.

2.2.1 Utilisation of space services

The space sector is developing rapidly. The services and opportunities that it offers for different actors in society are constantly expanding. By utilising the information obtained from space, we can streamline the functioning of society in a wide range of fields and enhance its effectiveness. The use of space-based security services is increasing and will provide security in new and cost-effective ways. As a result of the multiplier effects, the investments in space activities are channelled back into society from other sectors, and these benefits are six to seven times larger than the original inputs.[14]

Space-as-a-service business models open up space services for all actors and reduce the investments required to integrate them into sector-specific applications. Sharing expertise and lessons learned and cooperation in procurement between end user groups is important in the work to increase the use of space services. As applications and uses based on space services are globally scalable, they can be utilised in exports, development cooperation and crisis management.

The development of space activities and their new applications and extensive impact on all areas of society also generate challenges and threats to security of supply and other sectors of security. At the same time, changes in the geopolitical situation and rivalry between major powers have highlighted the role of space in warfare and comprehensive security. These developments have also blurred the

14 European Space Policy Institute ESPI, The Finnish Space Sector's Current State and Future, 22 December 2023.

division between civilian and military space infrastructure. The heightened need for self-sufficiency, regional industrial policy, business subsidies and technology export restrictions may distort free competition and research in the space sector.

2.2.2 Space operating environment

Up-to-date legislation, agile public administration and well-targeted financing are prerequisites for the development of space activities in Finland. As the international and national operating environments are changing, the space administration must adapt and renew itself so that it can actively react to change. However, Finland has only limited resources for developing its space activities and achieving international impact in space matters. Decentralised national space administration enables broad-based utilisation of expertise but it also poses challenges to coordination and makes decision-making more fragmented. Optimal allocation of resources, consistent decision-making and seamless cooperation between administrative branches is essential.

The space sector has good prospects for growth in direct turnover, exports and employment.[15] In a rapidly developing sector, the innovation environment is of key importance to the actors. In addition to public funding, boosting private investments and supporting the growth of new business in the form of business accelerators, for example, is also essential for transforming Finnish-based expertise into applications benefiting other sectors. Innovative public procurement is also a prerequisite for adopting new technologies.

Research and education play a key role as factors boosting the vitality of the rapidly changing operating environment. They produce information and expertise for developing the activities and generate innovations for the sector.

A significant part of the growth in the space sector in Finland has been driven by new start-up companies and their rapid expansion. These entities have developed into important partners for several actors in the security of supply, safety, and defence sectors both domestically and internationally. Long-term investments in maintaining and further developing the operational and innovation environment must continue to ensure this progress also in the future.

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Information on space activities should be disseminated to a wide range of different stakeholders and sectors of society so that the awareness of their potential can encourage the adoption of end-user applications.

2.2.3 Critical expertise and capabilities

Finland has only limited resources for investments in the construction of national space systems. For this reason, we must identify the required critical capabilities, the areas in which Finland must be self-sufficient and the capabilities that can be built with partnerships. Management of the space situational awareness plays a key role in the assessment of systems and their utilisation as a whole. The expertise of Finnish companies and our research community should be comprehensively utilised in the building of national capabilities.

The expertise required for the utilisation of space services, availability of workforce, the required infrastructure and the continuity of operations must be secured. A sufficient level of research and education is a prerequisite for the growth of the sector. Ensuring that private sector actors are committed to Finnish-based operations should be a key consideration. The risks arising from the supply chains used to provide space services must be identified and the continuity of these chains ensured. Potential disruptions to the services must be identified and prevented and the recovery process must be on a systematic basis.

In international cooperation, cutting-edge space technology and research make Finland more attractive as a partner and boost our image as a pioneer in high technology.

2.2.4 International cooperation

Active and constructive international cooperation has created an extensive network for both public and private sector actors. The level of Finnish space expertise, business and research is high, which provides a good basis for future planning. Finland's location in the Arctic is also a special feature making us more attractive as a partner in earth station and satellite operations.

To optimise its impact, international cooperation must be strategically planned and coordinated. The resources for different types of cooperation must be set in accordance with the objectives specified for them.

The EU Space Programme and the programmes of the European Space Agency ESA are the key international cooperation forums for Finland in which the space services for society are produced. The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the World Meteorological Organization are also important partners in the field of weather services. Sustainable use of space and international agreements should be promoted primarily through UN organisations. Bilateral and multilateral cooperation with Nordic countries, the United States and other partners and allies is also important.

Due to the special characteristics of the sector, cooperation between business actors, the research community and public administration in marketing the Finnish space sector and promoting its exports is a prerequisite for developing the field. It can also be boosted through bilateral partnerships and by opening up cooperation with emerging regions. However, security aspects and responsible international approach must be a consideration in the activities.

In defence cooperation, Finland's NATO membership, EU Space Strategy for Security and Defence as well as bilateral and multilateral cooperation create an operating framework that Finland can use to enhance its space-related military capabilities. Effective cooperation must be based on the ability to use and utilise the services generated by the partnerships and reciprocity in the provision of services.

3 Vision and objectives of the strategy

3.1 Vision and values

Finland 2030: World's most advanced space operating environment, which generates benefits for society as a whole.

Values

- **Sustainable use of space**
  Space activities must be carried out in accordance with international agreements and the principles of sustainable use of space. Space must also be kept usable for future generations.
- **Space belongs to all**
  Everyone has equal rights to exploit space in accordance with international agreements.
- **Rules-based cooperation**
  Common rules for space activities must be promoted through international agreements and cooperation.

3.2 Objectives and goals

The vision set out in the space strategy is pursued through four objectives. Actors in different sectors will be taken into account in the goals and measures specified under each objective.

Figure 2. The four objectives of the space strategy.

3.2.1 Utilisation of space services

> ***Utilisation: In Finland, space services streamline and secure activities in all areas of society.***

Applications utilising the information and services obtained from space will streamline activities in a wide range of different areas. Public sector actors will be able to produce services for society in a more diverse, reliable and efficient manner.

Research and development carried out in the space sector will produce innovations for the business sector and the public sector. Finnish business actors are able to enhance their competitiveness and business models by utilising space services in their operations. The services and products will be scaled for the global market.

The security of supply for society's critical infrastructure and functions will be strengthened by utilising space services. The dependence of terrestrial systems on satellite systems has been identified. The availability and continuity of the space services required for the critical functions of society has been secured. Resilience and cybersecurity of society will be strengthened.

Defence and security actors will utilise space services for public order, security and national defence.

Measures:

a. Public sector actors (administrative branches, regional administration and municipalities) will be encouraged to carry out pilot projects utilising space services with universities and other higher education institutions, research institutes and companies. The innovative public procurement model will be used in the launching of pilot projects.
b. Support will be granted to projects managed by universities and other higher education institutions, research institutes and business actors in which the aim is to utilise research findings in practical applications in accordance with Finland's RDI objectives.
c. Information on the opportunities provided by space services is actively disseminated to potential users, and space actors will take part in events and seminars.
d. The Ministry of Transport and Communications will prepare action programmes for satellite navigation and earth observation to promote their utilisation in different sectors of society.
e. Support will be provided for the utilisation of satellite telecommunications, development of Finnish expertise and services, and the construction of an encouraging innovation and piloting environment. At the same time, the development of the convergence of satellite and terrestrial networks will be monitored.
f. In its programmes, Business Finland will take into account the opportunities offered by space services in new applications, business models and more efficient operations.
g. Business Finland and business and innovation accelerators will support the launching of multi-sectoral pilot projects utilising space services.
h. The National Emergency Supply Agency will map out the opportunities and potential of space services to strengthen security of supply, take them into account in security of supply action plans and promote the necessary development measures in cooperation with other actors.
i. Society's resilience and cybersecurity will be strengthened by deploying, as applicable, certified satellite services provided by the EU Space Programme for public authorities and critical infrastructure (such as Galileo PRS, GOVSATCOM and IRIS2).
j. The cybersecurity of space systems will be taken into account in licences/licence terms and the life-cycle management of systems. Cybersecurity will be monitored as part of the space situational picture in cooperation with a variety of different actors.

k. The opportunities provided by space services will be taken into account in the implementation of the Security Strategy for Society, Foreign and Security Policy Report, Defence Report and the Internal Security Report.
l. The threats and opportunities arising from space activities will be taken into account in the development of Finland's defence system, including its space-related capabilities. These will be outlined in the Government Defence Report.

3.2.2 Space operating environment

> ***Operating environment: Finland is an inspiring, safe and predictable environment for space actors.***

Finland has a uniform and systematic space administration, which is responsible for developing the operating environment and operating conditions. The space administration is able to coordinate sector-related policies and decision-making on a cross-administrative basis.

The legislation and licence processes guiding space activities cover the areas of space activities relevant to Finland and create a predictable and encouraging environment for space business, support Finland's image as a safe partner and ensure national security. The legislation and licence processes will be updated to meet the requirements of the developing operating environment.

Space research will produce the necessary knowledge and expertise to support space activities and to anticipate future trends. Research and education will produce knowledge and experts to ensure that space services can be used more extensively and generate more benefits. The needs of the space activities will be taken into account in the planning of research and education proactively and over the long term. Implementation of the STEM strategy[16] will support these objectives.

Workforce in a wide range of different expertise areas will be available for space actors in the private and public sectors. All relevant parties are aware of the career opportunities offered by the space sector and they are seen as attractive.

16 Finnish National STEM Strategy and Action Plan: Experts in natural sciences, technology and mathematics in support of society's welfare and growth, Ministry of Education and Culture 15 March 2023, http://urn.fi/URN:ISBN:978-952-263-733-8.

The Finnish innovation environment will encourage and support the development of space services and applications utilising them. Public funding will help in the launching of new innovations and business in the space sector and attract private sector funding. Space activities will be prioritised as a strategic expertise area, and long-term domestic ownership in the sector will be supported by developing the venture capital market.

Space actors operating in Finland will invest in measures ensuring the resilience of the country's infrastructure. Sufficient guidance will be available for the implementation of the requirements set out in the CER and NIS2 directives in the field of space activities.

Public sector actors will engage in active cooperation, take into account the opportunities offered by the private and research sectors and utilise the synergy potential in the security and defence sector. Public and private sectors will engage in intensive cooperation, which will generate added value to all parties.

Measures:

a. The Ministry of Economic Affairs and Employment and the Finnish Space Committee will assess how the operating model of the national space administration meets the needs of the developing space operating environment and how the role of the space administration should be strengthened so that it can optimally promote the objectives set out in the space strategy.
b. The processing of license applications related to space activities will be centralized at the Finnish Transport and Communications Agency, Traficom.
c. Interaction between public administration, companies, research institutes and higher education institutions will be strengthened through meetings and exchange of information.
d. The Finnish Space Committee will establish a cooperation group for space sector licence authorities, which will act as a intersectoral working group of the Committee. Its purpose is to promote the smooth processing of licences for space activities and to monitor changes in the operating and regulatory environment.
e. Higher education institutions will examine the priorities of space research and education in their own strategic planning in addition to the implementation of the National STEM Strategy. Research institutes will take into account the objectives set out in the space strategy in their own action plans. The Academy of Finland will grant competitive

research funding and Business Finland will provide R&D funding to top-class shared research and testing infrastructures that support space research and the development of space technology and services.

f. A uniform study module will be compiled based on the space education offered in higher education institutions. Students from other fields can include the module in their degrees as a minor subject, for example. Space sector companies will offer traineeships and jobs to students of the study module in a targeted manner.
g. Business Finland and research institutes will work together with innovation and business accelerators to support the development of innovations and business models utilising and offering space services.
h. Measures will be taken to strengthen domestic ownership in space sector companies by boosting capital markets and utilising the investment strategies of Finnish Industry Investment Ltd. (Tesi) and Solidium. The Ministry of Economic Affairs and Employment, Business Finland and Finnvera will facilitate patient financial capital for projects in the sector.
i. Supervisory authorities will prepare guidelines for and advise Finnish space actors on enhancing the resilience and information security of the infrastructure in accordance with the requirements specified in the CER and NIS2 directives. In addition to ensuring compliant operations, the supervision carried out in accordance with the above directives will also take into account the enabling of the operators' operating prerequisites and the growth of their business.
j. Actors in the defence and security sector and security of supply will intensify cooperation with business actors and the research community and disseminate information on the needs of the space services that they have identified.

3.2.3 Capabilities

> ***Capabilities: Finland has the capabilities to produce and utilise space services.***

Administrative branches will maintain and develop expertise, resources and infrastructure for efficient use of space services. At the same time, measures will be taken to minimise overlaps.

Finland will have the necessary self-sufficiency and partners in the utilisation and provision of space services, and the continuity of their supply chains is ensured. The business sector, the research community and the public sector are committed to cooperation in the provision and utilisation of space services and the construction of the necessary infrastructure.

Finland has the ability to construct and utilise the space situational awareness and is well-prepared for potential disruptions in space services and for recovering from them.

Finland will participate in research on space science and emerging technologies and will adopt the best practices learned from them for use in new applications. There is awareness of the research and training needs in the field of space activities, and they will be promoted on a systematic basis.

Finnish society will become more streamlined and efficient with the adoption of new applications and operating methods that utilise space services.

Measures:

a. The Finnish Space Committee, ministries in charge, defence and security authorities and the National Emergency Supply Agency will examine which space capabilities (expertise, resources, infrastructure) must be available in Finland and to what extent they must be supplemented through international cooperation.
b. Administrative branches will work together to develop and purchase space capabilities, and measures will be taken to avoid overlaps. Partnerships with the private sector will be taken into account in the development of the capabilities.
c. Measures will be taken to develop national capabilities for maintaining the space situational awareness. The aim is to establish a national centre by utilising the EU SST partnership, international cooperation and the resources of domestic actors.
d. Administrative branches will take into account the shared national potential, needs and priorities for the utilisation of space services in the planning and resourcing of their own activities. Administrative branches will be actively involved in the domestic and international development of space services in their own areas of responsibility and in accordance with the joint objectives of Finnish actors.
e. The availability of radio frequencies will be ensured to support the growth of the Finnish earth station and satellite business.

f. The defence administration will draw up a space strategy for defence, which specifies the development of the space operating environment and the space-related objectives and priorities of the defence administration as well as the required measures.
g. Information about emerging national and international research programmes and projects will be disseminated proactively, and measures will be taken to influence their contents so that they support the prerequisites for participation by Finnish actors. National funding for research and development programmes will be allocated as necessary and in accordance with Finland's objectives and priorities.
h. Higher education institutions and the research community will engage in a dialogue with the space administration on national needs and priorities in the field of space activities and take them into account in the planning of their own activities.
i. Business Finland and the Ministry of Economic Affairs and Employment will disseminate information on the support and funding opportunities for public innovative procurement to potential customers of end-user applications utilising space services. Public sector actors will make innovative purchases in cooperation with business actors and the research community to provide space sector actors with their first reference.

3.2.4 International cooperation

> ***International cooperation: Finland is a reliable and sought-after actor playing an active role in the space sector.***

Finland will play an active, constructive and responsible role in selected European and international cooperation projects. Bilateral and multilateral cooperation will be intensified, especially with Nordic countries, the United States and other partners and allies. Finland has set strategic goals for influencing decisions and possesses the resources for cooperation. Finnish space actors are able to anticipate changes in the international operating environment.

European and international cooperation will provide Finland with the space services required to supplement domestic self-sufficiency. International cooperation will generate added value and support the implementation of the national space strategy.

Finnish actors will play an important role in international research projects. Finnish actors will build an extensive network of partners. Research cooperation will strengthen Finland's image as a reliable space actor possessing cutting-edge expertise. In addition to training Finnish experts, the efforts to attract international talent to Finland and to encourage them to stay in Finland will be promoted in accordance with the objectives of the Talent Boost[17] programme.

The joint export promotion efforts by the public sector, research community and business actors will boost the business opportunities of Finnish actors in existing markets and open up markets in new areas.

Finland will identify the special features resulting from its northern location and the opportunities that this creates for earth station operations. These opportunities will be utilised in the construction of the required national infrastructure, international cooperation and business activities.

The security risks associated with international space cooperation have been identified and brought to the attention of administrative branches, research community and business actors. National perspectives have been taken into account in international cooperation in the public and private sectors.

Measures:

a. The Finnish Space Committee will prepare and prioritise a cross-administrative plan for international cooperation. The ministries in charge will allocate resources for participation in international cooperation and take part in international cooperation relevant to their own administrative branches, taking the target plan into account.
b. The ministries in charge will coordinate international lobbying work in cooperation with other ministries and agencies. The aim is to boost the effectiveness and efficiency of the activities and to balance the available resources. The necessary coordination of the international lobbying will be carried out by the secretariat and working groups of the Finnish Space Committee.
c. The Ministry of Economic Affairs and Employment and other ministries in charge will monitor changes in the European and international

17 Talent Boost 2023–2027: Programme for international recruitment and work-based and education-based immigration, Ministry of Economic Affairs and Employment/Ministry of Education and Culture 21 November 2023, http://urn.fi/URN:ISBN:978-952-383-688-4.

legislative and agreement framework in the space sector and, if necessary, will play an active role in the efforts to develop them.

d. Finnish companies and research organisations will actively participate in the work of selected working groups of standardisation and industrial organisations (such as ISO, 3GPP, Eurospace, EAK and ECSS).
e. Finland will increase its ESA contribution to correspond to the targeted share of GDP (in 2024–2026 1.38% of the member states' total funding). It will be allocated to ESA programmes in accordance with national priorities. Finland's representatives will actively work to develop the rules and contents of funding programmes supporting the competitiveness, investments, research, development and innovation of the ESA, the EU and NATO in accordance with national objectives. Companies, research institutes and universities will participate in the programmes as active and responsible actors.
f. The Ministry for Foreign Affairs, Business Finland and other Team Finland actors will support the sector's national and international networking by organising networking events in Finland, participation in international events and targeted export promotion trips. The activities will also build Finland's image as an attractive environment for international companies and experts.
g. Measures will be taken to boost the opportunities of Finnish actors to utilise the cooperation and business opportunities offered by international research infrastructures, such as R&D purchases. This will be done by providing more advice and information on open calls and invitation to tenders.
h. The Ministry of Defence and the Finnish Defence Forces will promote the networking of Finnish business actors and the research community and opportunities for participation in international defence cooperation through such organisations as NATO.
i. Security authorities will maintain a situational awareness of security risks associated with space cooperation between different authorities and also provide information to business actors, research institutes and universities and other higher education institutions.
j. Defence and security authorities will review the needs of their own sectors for space services purchased through international cooperation and the opportunities for such purchases and coordinate cross-administrative priorities and a plan for acquiring the necessary capabilities. The most important cooperation channels are EU Space Programme, NATO, ESA, EUMETSAT and bilateral cooperation.

k. The National Emergency Supply Agency will examine and develop space capabilities boosting security of supply as part of international security of supply cooperation.

4 Funding and implementation of the strategy

4.1 Implementation programme and cooperation across sectoral boundaries

The Finnish Space Committee and its secretariat will create a framework for cooperation between administrative branches and actors for the implementation of the space strategy. The launch and implementation of the measures set out in the strategy will be monitored by the Finnish Space Committee. The secretariat will coordinate the timing of the measures and organise the provision of information, as necessary. The ministries in charge and other actors will be responsible for implementing the measures and for making the necessary decisions.

The active participation of companies and research and educational institutions, cooperation between all actors and the allocation of available resources will also play an important role in the implementation of the strategy.

4.2 Available resources and funding needs

As a rule, the administrative branches and other actors should carry out the measures specified in the strategy within the framework of their existing responsibilities and budgets. The administrative branches participating in the implementation of the strategy must make their own decisions on the allocation of or application for resources and funding that may be required for the implementation.

The administrative branches should produce the analyses and reports mentioned in the strategy measures as part of their official duties. If necessary, the parties in charge should provide the appropriations required for producing the reports from their own operating expenses. If, as a result of the reports, need for further measures or purchases that have impacts on appropriations outside the allocated spending limits is identified, the proposals for them must be prepared as part of the General Government Fiscal Plan or the Budget proposal.

The parties in charge must carry out the measures relevant to space administration, international representation and lobbying as well as communications as part of their official duties within the framework of their operational expenditure.

Business Finland and the Academy of Finland will allocate funding to research, development and innovation activities within the existing framework. RDI funding will be allocated to the RDI activities and research infrastructures of higher education institutions and research institutes within the spending limits. Finland's ESA funding will be increased with the aim of achieving the targeted GDP share (in 2024–2026 1.38% of the member states' total funding) in ESA programmes selected in accordance with national priorities. The increase in funding will be carried out within the spending limits of the administrative branch of the Ministry of Economic Affairs and Employment by reallocating funding or by allocating increases in R&D funding in the General Government Fiscal Plan or the Budget.

Funding for the implementation of measures in the field of defence, security and security of supply will be allocated in accordance with the plans prepared by the administrative branches in charge, for example from the defence budget and the National Emergency Supply Fund. Applications for grants for external funding from such sources as the European Union's Home Affairs Funds can also be submitted.

Companies are expected to use their own resources to fund their investments and to seek private sector funding, which will be supplemented with public sector RDI support funding. As a rule, the services provided by companies are expected to be on a profitable basis that allows cooperation with public sector actors.

Higher education institutions are expected to implement the educational measures and to allocate the higher intake within the spending limits and in accordance with the objectives set out in the Government Programme.

4.3 Communication plan

The SpaceFinland.fi website and other related media will serve as the channel for disseminating information about space activities and the strategy to different target groups. Its news, articles and permanent content provide an overview of the sector in Finland. Administrative branches and other actors will provide information about the implementation of the strategy in their respective areas of responsibility on their own communication channels. SpaceFinland.fi will provide information about

the strategy for the space administration, summarise the information disseminated by the administrative branches and refer readers to the administrative branches' communication channels.

The aim of the communications is to improve general awareness of space activities and their impact on society, to disseminate information on topical events and to support the growth of the sector and its exports. The purpose of the communications is also to create a positive country image highlighting Finland as an attractive partner for international experts, companies and investors.

The communications will target citizens, decision-makers, and professionals and students in the sector in Finland and internationally.

5 Monitoring

The objectives and goals of the strategy and the measures set out to achieve them are described in section 3.

The secretariat of the Finnish Space Committee will monitor the implementation of the strategy and the achievement of its objectives. It will also assess the impact of changes in the rapidly developing sector on the topicality, effectiveness and appropriateness of the objectives and measures of the strategy.

Progress on the measures set out to achieve the objectives will be assessed by monitoring:

- their launch and progress
- the impact of the operating environment on their feasibility
- the effectiveness of their results.

The secretariat will report to the Finnish Space Committee at least once a year on the implementation of the strategy, its impact and changes in the sector. The Finnish Space Committee will steer the secretariat in the implementation of the strategy by specifying the annual priorities for the implementation. Taking into account changes in the operating environment, the Finnish Space Committee may specify existing measures or introduce new measures to achieve the objectives of the strategy.

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