



# STRATEGY FOR ESTONIAN SPACE AFFAIRS 2011–2013

Innovation strategy for implementation of satellite based applications and services for the benefit of the society, development of space science and space business in international cooperation

Tallinn 2012



MINISTRY OF  
**ECONOMIC AFFAIRS AND  
COMMUNICATIONS**

**On the front page:**

*Ms Grete Treier - Estonian testperson - attending parabolic flight for testing Myoton device*

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## FOREWORD

On 4 October 2012, 55 years will pass from the time the first Earth satellite was successfully launched to the orbit. In these 55 years, remarkable developments have taken place in the use and exploration of near space. Manned flights laid ground for human entry into a completely new environment and that was crowned by a human being stepping on the surface of our planet's natural satellite – the Moon.

For decades, military aspect has been the driving force behind space technology. Later, a scientific aspect was added and at the end of the twentieth century people started to realise that there are more opportunities concealed in the near space – it can be a part of a new economic activity.

Yes, let us face it – the space will remain a patrimony of large countries because of their powerful human potential and financial possibilities (and the military aspect has not disappeared either).

We might ask “Why should a country with the size of Estonia participate in space economy? Isn't it a waste of money that brings us no benefits?”

Estonia is not planning to build large satellites, but participation in nano-satellite programs has already started. The student satellite Estcube-1 is planned to be launched to the orbit as soon as in 2013.

However, Estonia is participating in the European Union space programmes – GALILEO and GMES. I am convinced that Estonia's talented young scientists and business people need to be given an opportunity to participate in various space programmes. The first step would be to do it through the European Space Agency (ESA).

Estonia is on its way to becoming a full member of ESA and I hope that in 2015, we will have achieved that goal. I am convinced that the State's role in a modern life is not merely handing out grants, but rather it is primarily to create opportunities – these opportunities will be created when Estonia joins European space programmes.

**Ene Ergma,**

*Chairman of the Space Affairs Council  
President of the Parliament*



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▼ *200 years old Observatory by Tartu University*



## INTRODUCTION

Space systems and Earth applications of space technologies have a significant impact on life in Estonia today. Satellite communications, Earth observation, satellite television, weather forecasting, smart security and transport systems and location-based services are some examples of the most important applications used by state authorities, local governments and enterprises, as well as private persons.

Estonian industrial enterprises and scientific research establishments have experience in creation of space technologies and development of space equipment since the 1960s, and membership in the European Union, as well as cooperation with the European Space Agency, is opening new possibilities for businesses that have potential in space affairs. Moreover – operating in space affairs helps increase the influx of technology-intensive foreign investments and inspires young people to study natural and technical sciences, improving the synchronicity of science and business as an interdisciplinary field.

*Therefore, Estonia needs a space policy that would set development objectives and plan harmonised actions for achieving these objectives, in order to enable the country to gain the maximum benefits possible in the strategic policies related to space.*

A separate strategy on space affairs is necessary because the new industrial policy developed under the Europe 2020 strategy supports sector-based approach in the fields that have market failures or other important factors that impede development of the sector, and space is considered to be one of these fields. Therefore, this strategy has been prepared in accordance with the space policy of the European Union and considers Estonian participation in the strategic projects of the European Union - GMES and Galileo (see Section 1.1.1.), as well as implementing the possibilities created by them in both, public and private sector, important.



*Estonian space policy is not used for planning the establishment of a national space agency or implementation of a national space research programme, but it sets a goal to guarantee success to Estonia as a small country in the field of space, requiring integration into the European space structures, mainly by cooperation with the European Space Agency (ESA).*

Cooperation with the European Space Agency involves Estonian businesses and scientific research establishments into high technological development, as well as creates new possibilities for scientists, engineers and teachers. In addition, space policy supplements the Estonian Research and Development and Innovation Strategy “Knowledge Based Estonia 2007–2013” (RDI strategy) and is in accordance with the measures, prioritised directions and key technologies<sup>1</sup> defined in the strategy.

Space infrastructure is a strategic asset and its development is extremely expensive. In the European Union, a joint budget is used for both space-related research and development of base infrastructure, which Estonia is already currently contributing to through payments to the European Union.

*Therefore, the question of whether Estonia is making sufficient independent efforts as a Member State to use the joint investments into the space infrastructure better, thus maximising the benefit to the state and society of Estonia, has become strategically important.*

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<sup>1</sup> The key technologies are the information and communication technology, material technology and biotechnology stated in the strategy “Knowledge Based Estonia 2007–2013”.

#### ▼ Telescopes in modern Tartu Observatory



**The strategy sets the following central objectives:**

- **to encourage the public sector and enterprises to implement space applications** in order to enhance their work and improve the well-being of society;
- **to develop business, related to space affairs**, improve its competitiveness by innovative procurements and international cooperation;
- **to improve the relevance of Estonian natural and technical sciences in our educational system** and support the development of space technology, in order to find applications for new knowledge both in business and in the public sector.

By implementation of this strategy, Estonia demonstrates its ambition to be a recognised partner in international space cooperation, accepting the relevant UN conventions that regulate space affairs.

The strategy consists of three parts. The first one describes the current situation of Estonian space affairs. The second chapter brings out the development vision, main objectives and measures of the space affairs. Topics regarding management, implementation and assessment of the strategy have been covered in the third chapter of this document.



## 1. OVERVIEW OF THE SITUATION

*Estonia has a high level of proficiency and long tradition in space science in the fields of astrophysics, cosmology, optical sensing, atmosphere physics, materials science and technology, creating a strong base for further development of space affairs.*

More than 200 years' experience in astronomy, including also world level discoveries, space technology development for Soviet Sojuz program and excellency in Earth observation science supported by modern infrastructure is characterising **Tartu Observatory**. Strong collaboration with Estonian science strongholds - **University of Tartu, Tallinn University of Technology** and **Estonian University of Life Sciences** - have created an internationally acknowledged competence base for scientific partnerships also in space related fields.

As an independent state since 1991 and member of European Union since 2005 Estonia was in need of national Space policy reflecting new possibili-

ties for the economy, science, education and society in large scale. For that reason in 2006 Estonian **Space Policy Working Group (SPWG)** as advisory body and think tank was initiated and created by the Ministry of Education and Research. It consists 20 experts from science, industry and public sector.

Estonia has been a cooperating member of the **European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)** since 2006, and a full member since 2012. EUMETSAT controls the European meteo satellites, the data of which is used to forecast weather across the entire world. Estonia has the right to use and distribute the data, products and services of the EUMETSAT. This cooperation provides the **Estonian Meteorological and Hydrological Institute (EMHI)** with real-time access to weather information based on modern technology.

Since 2006 **Estonian Space Office (EstSO) by Enterprise Estonia** is carrying on its activities dedicated to (space) awareness and knowledge rising as well industrial capacities

▼ *Significant Estonian astronomers: Struve, Öpik, Einasto*



and capabilities building. EstSO is the main intermediary between international space related organisations, national space agencies, space industry and Estonian entities.

Estonia established relations with the **European Space Agency (ESA)** in 2007 by entering into a Framework Agreement on 21 June. In September 2008, the European Space Agency (ESA) (see Section 1.1.3.) conducted a technology audit in Estonia, based on the Agreement between the Republic of Estonia and the European Space Agency concerning space cooperation for peaceful purposes. The audit report recognised the technological capability of Estonian enterprises and scientific research establishments and proposed Estonia to enter into a European Cooperating State Agreement with the ESA for five years. The agreement entered into force on 22 September 2010 with signing of the PECS Charter between Estonian and the ESA.

In the first plan accompanying the PECS Agreement, Estonia has presented 12 space technology development projects to the ESA, starting to be implemented in 2011.

Upon the initiative of the Ministry of the Environment, Estonia has been a member of the intergovernmental **Group on Earth Observations (GEO)** since 2008. The objective of the GEO is to coordinate the actions of countries in creating the Global Earth Observation System of Systems (GEOSS).

*Since 2010 the Ministry of Economic Affairs and Communications is carrying on responsibilities of the “space ministry” in Estonia.*

In June 2010, the **Space Affairs Council (SAC)** was established by the Ministry of Economic Affairs and Communications with an aim to develop Estonian space affairs policy and to coordinate its implementation, ensuring the best use of resources. The Space Affairs Council includes representatives of the Ministry of Economic Affairs and Communications, the Ministries of the Environment, Defence, Internal Affairs, Finance, Agriculture, and the Ministry of Education and Research, the State Chancellery, the Estonian Academy of Sciences, Enterprise Estonia and Tartu



Observatory. The activity of the Space Affairs Council is supported by the Space Policy Working Group under the Ministry of Education and Research.

On 12 January 2010, a **Space Studies Support Group (SSSG)** was established within the Riigikogu, with an aim of keeping the highest-level legislator informed and to include it in the developments of space affairs.

In April 2010 Estonia joined the **UN Outer Space Treaty** (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies).

In June 2010, the Government of the Republic of Estonia approved the **Estonian Research Infrastructures Roadmap** as an annex to the RDI strategy implementation plan for 2010–2013.

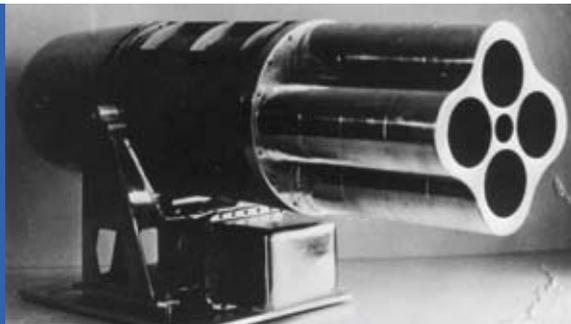
**Out of twenty objects, there are four that either directly or indirectly support the exploration of space, use of Earth applications and development of international cooperation:**

- Estonian Environmental Observatory;
- participation in the activities of the European Space Agency (ESA);
- participation in the activities of the international organisation European Southern Observatory (ESO);
- participation in the activities of the European Organisation of Nuclear Research (CERN) ;

Space affairs are also of interest to Estonian society, involving different social classes. This is demonstrated by the initiative **Estonian Space Society**, which aims to support the use of space applications in society and popularise space technologies and space education by involving active citizens from all fields of life who are able to take initiative.

In October 2012 Estonia became the 11th full member of **European Interparliamentary Space Conference**.

▼ *Estonian Contribution to Sojuz program - teleradiometer FAZA*



## 1.1. Development of international relations and cooperation

As a small country, for Estonia, cross-border cooperation is one of the most important preconditions for achieving the objectives set out in the strategy for space affairs. As an EU Member State, Estonia is already actively participating in actions, projects and institutions shaping EU's space policy. For a more effective representation of national interests and better alignment of actions with the objectives and initiatives of the EU space policy, we still need to make the organisation of national space affairs more effective.

Closer global cooperation that would, among other things, help Estonian enterprises become more international and support more efficient knowledge transfer in public and private sectors, is also important for Estonia in terms of promoting space affairs and developing a knowledge-intensive economy.

### 1.1.1. European space policy

The strategic objective of the European space policy is based on the understanding that space systems are strategic assets that demonstrate independence and preparedness for taking global responsibility. At first, space systems were developed as defence or science projects but by now, these have become part of the infrastructure on which important economic sectors depend and which are meaningful in the everyday life of people. As a Member State of the European Union, Estonia actively participates in the development of the EU programmes GMES and Galileo that are the flagship projects in European space policy.

Under the EU and ESA Framework Agreement (2004), meetings of the ministers responsible for space affairs in the Member States of the EU and the ESA (the Space Councils) take place regularly, and they are helped to be prepared by the European High Level Space Policy Group that also includes an Estonian representative.

▼ *Soviet Cosmonauts visiting Tartu Observatory in 1975*



## GMES

**Global Monitoring for Environment and Security (GMES)** is an Earth observation initiative that is led by the European Union and carried out in partnership with the Member States and the European Space Agency (ESA). The main objective of this programme is to provide information services under the control of the European Union that would enable access to accurate data in the field of environment and safety and would be adjusted to the needs of the user. The programme should also improve the use of industrial potential of the innovation, research and technology development policies in the field of Earth observation.

The legal framework of the GMES programme entered into force on 9 November 2010. Changeover to the full-scale programme is prepared by the GMES Initial Operations (GIO 2011–2013), and shaping the contents of its activities is also done by Estonia via different working groups:

- GMES Committee
- GMES Committee Security Board
- GMES User Forum

**The preparatory activities of the GMES are divided as follows by different fields:**

- GMES service component
- GMES space component
- GMES in-situ component
- Horizontal activities: measures supporting implementation

The focuses of the GMES programme are in concordance with the prioritised fields of application of Estonian space strategy and the most important courses of action. For Estonia, the GMES service component and user-oriented activities are especially important. Free access to data is also a critical factor in the development of satellite-based services. Therefore, the GMES programme offers several opportunities to both the public sector and enterprises, wherefore participating in preparatory activities of the programme is important in the context of achieving the objectives of the strategy.

*At the national level, the GMES activities are coordinated by the Ministry of Economic Affairs and Communications.*

### ▼ Modern Tartu Observatory - Estonian Space Science Centre



## GALILEO AND EGNOS

The objective of the Galileo programme is to develop the first satellite navigation and positioning infrastructure in the world aimed for civil purposes. The European Parliament, the Council of Europe and the Economic and Social Committee have persistently supported the Galileo programme, which was initiated to improve the living conditions of European citizens in several fields. The programme is fully compatible with the transport policy directions presented in the White Paper by the Commission. The initial operational readiness of Galileo will be achieved by 2014, complete readiness by 2019.

Estonia monitors the development of the EU Galileo project, creating readiness for implementation of the new opportunities created by the Galileo system immediately after its implementation, first and foremost in the public sector.

The European Union service EGNOS that improves accuracy of satellite positioning systems has been available for users since 2009. Implementation of the EGNOS possibilities first and foremost presumes a better notification of both public and private sector users of these possibilities.

*At the national level, the Galileo and EGNOS activities are coordinated by the Ministry of Economic Affairs and Communications.*

### 1.1.2. The EU Framework Programme for research and technological development

Strengthening of the foundations of space science and technology is covered by the EU's Seventh Framework Programme's (FP7) themes of environment, space and safety. The EU's FP7 and the ESA technology programme are coordinated and the technology projects and technology transfer prepared by the GMES are funded jointly. The corresponding projects are currently on-going in the Tallinn University of Technology, the University of Tartu and the Tartu Observatory.

On 19 June 2010, the new 2011 space and safety working programmes of the FP7 were adopted, especially emphasising international cooperation, as well as involving businesses and end users. Partners from Brazil, India, Ukraine, Russia, China and other

#### ▼ *Optical radiometry laboratory in Tartu Observatory*



countries are invited to join the space projects, thus also enabling Estonia to reinforce peaceful cooperation with these countries.

The main focuses of the FP7's space affairs are the space applications of the GMES and reinforcement of the foundations of space science and technology. The latter covers a wide array of topics, including space science, research, technologies, protection of the space assets, etc. As at 2010, Estonia participated in four successful space projects financed under the FP7 and the overall success rate of applications was 23.5%.

Therefore, it is important to improve Estonian enterprises' awareness of the possibilities offered by the Framework Programme, and in the long run, also to increase the success rate.

*At national level Estonian participation in EU Framework Programme space activities is coordinated by Estonian Research Council.*

### 1.1.3. European Space Agency

Cooperation with the European Space Agency (ESA) started in 2006. Framework cooperation agreement between Estonia and ESA concerning space cooperation for peaceful purposes was entered into on 21 June 2007. Under this agreement, consultations were started to prepare for a more comprehensive cooperation. The technology audit carried out by the ESA in Estonia defined the potential areas of cooperation and on 10. November 2009, the ESA and Estonia signed a European Cooperating State (ECS) agreement for five years which entered into force on 22. September 2010 with the signature of the PECS Charter. This agreement gave Estonian enterprises and scientific research establishments an opportunity to fulfil the ESA orders under the condition that Estonia is contributing to the ESA budget (approx. €1.2 million/year). The orders directed to Estonia form the so-called PECS programme, to which 12 projects that interested both ESA and Estonia were selected. In 2012, the PECS programme is going to be updated and new projects added.

▼ [University of Tartu - Space Education pioneer in Estonia](#)



*Upon expiry of the ECS contractual period in 2015, Estonia is willing to access ESA convention as a full member of the organisation.*

Cooperation with the ESA presents Estonian enterprises and scientific research establishments a unique opportunity to participate in high-technological development with results that can also be implemented in Estonia.

**In cooperation with the ESA, the following measures are implemented:**

- Promotion of the preparation capability of the PECS projects in order to increase the ESA orders from Estonian enterprises for the development of high-technological products and services.
- Sending Estonian scientists, students and specialists to work at the ESA with an aim to promote cooperation with different ESA units and prepare the development of different projects.

- Preparation for full membership at the ESA, aimed at developing a long-term, competitive and necessary portfolio in the key areas relevant for Estonia.
- In cooperation with Estonia, the ESA carries out activities to increase awareness. ESA's training and integration of the learning programmes to the relevant educational institutions and trainings in Estonia.

In addition, Estonian doctoral and post-graduate students have an opportunity to practice in the ESA – a prospect so far used by four doctoral students. Estonian representatives have been involved in the administrative work of the ESA. Estonia is a member of the ESA PECS Committee (Chairman in 2011) and is an observer in the ESA International Relations Committee and other Committees and program boards.

*Relations with the ESA are managed by Enterprise Estonia EstSO that also acts as an ESA delegation in Estonia.*

▼ *Tallinn University of Technology - potential for space technology development*



### 1.1.4. EUMETSAT

Membership in the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) takes place through the Estonian Meteorological and Hydrological Institute (EMHI) governed by the Ministry of the Environment (MoE). Estonia is full member of EUMETSAT since 1 January 2012. The EUMETSAT is the partner of the EU and ESA in operative running of the GMES satellites (the Sentinel series); therefore full membership offers additional opportunities in developing the field of GMES.

In addition, the new priorities according to the EU space policy are space and climate change. The latter may have an especially serious effect on Europe, including Estonia. Climate change is monitored by the GMES programme and the Climate Change Initiative (CCI) also operates within the ESA. The ESA and the EUMETSAT have long time series and the new satellites produce great amounts of additional data. Currently, 44 Essential Climate Variables (ECV's) are constantly monitored; on 31 of them, the information is received mostly of only from satellites. Since Estonian scien-

tists are highly capable in analysing the aforementioned data, joining the EUMETSAT supports the development of the prioritised areas of application in this strategy, that mostly in the viewpoint of science, but also potentially the public sector and business.

*Relations with EUMETSAT are managed by Estonian Meteorological and Hydrological Institute (EMHI), industrial cooperation by Enterprise Estonia EstSO.*

### 1.1.5. European Southern Observatory (ESO)

The European Southern Observatory (ESO) is an intergovernmental organisation comprised of 14 member states which develops terrestrial astronomy and technology in Europe. Since astronomy with its 200-year history is one of Estonia's proudest achievements in the field of science, becoming a member of the ESO in the period of 2012–2014 is an important step that helps ensure the continuous development of our astronomy in the frontline of global science.

▼ *Estcube Student Satellite - to be launched in March 2013*



ESO membership has also been added to the object list of the Estonian Research Infrastructures Roadmap. In addition to gathering voluminous observation data, the ESO has an important role in coordinating astronomy in the whole Europe, developing technology, training new astronomers, and popularising astronomy. The main technical concepts used in modern telescopes, such as active optics, adaptive optics and optical interferometry, have been developed in the ESO. In these fields, Estonia has several successful enterprises that could also participate in ESO procurements in the future.

*Relations with ESO are managed by Tartu Observatory.*

### 1.1.6. Regional cooperation of the Baltic countries and the Baltic Sea Strategy

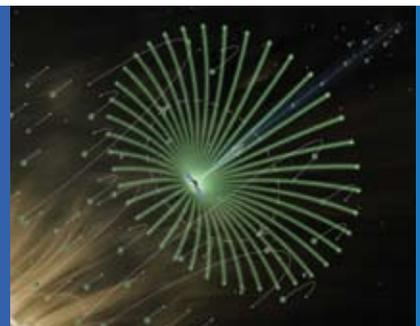
The European Union Baltic Sea strategy that was approved in 2009 and sets an objective to achieve new synergy through cooperation between the Baltic States in different fields and to

ensure the sustainable competitiveness of the region in the European Union and the rest of the world. The cooperation network has to involve politicians on both national and regional level, as well as practitioners and scientists. In the context of the Baltic Sea strategy, development of cooperation is also important in space affairs.

Upon Estonia's initiative, the Baltic Space Roundtable was established in 2009, participated also by Latvian and Lithuanian space organisations. To date, three meetings have taken place and information has been exchanged in very different fields, ranging from policy shaping to specific projects. Henceforward, the objectives set out in the strategy and the prioritised areas of application will be taken as a basis when identifying cooperation possibilities. The activity of the Baltic Space Roundtable will continue with one or two meetings a year.

*In cooperation between Latvian and Lithuanian Space entities Estonia is represented by Enterprise Estonia EstSO.*

#### ▼ Estcube Student team



## 1.2. Global cooperation

Although the European Space Agency is the most important partner, Estonia also seeks cooperation possibilities with American, Russian and Ukrainian space agencies and different international organisations. In the framework of global cooperation, mostly participation in the work of international organisations, visiting important conferences and industrial exhibitions on space affairs in other regions, analysing the received information and communicating it to Estonian enterprises and scientific research establishments is intended. Gathering information and communicating it to the interested parties in Estonia is a part of the duties of Enterprise Estonia EstSO. EstSO has contacts with the most important enterprises and national agencies of space affairs in the world.

### 1.2.1. Worldwide Group on Earth Observations (GEO)

The worldwide organisation Group on Earth Observations (GEO) consists of 86 countries, the European Commission and 61 international organi-

sations (the UN local organisations, CEOS, COSPAR, ESA, etc.). The aim of the GEO is to create a Global Earth Observation System of System (GEOSS) to ensure sustainable development of the mankind, improve its safety and health, and to protect the global environment. Therefore it is necessary to systematically understand the variability of the Earth's climate, oceans, land and ecosystems and to estimate the impact of human activity and natural factors on the mankind. However, gathering and analysing such data is only possible in global cooperation, since data is needed for the entire world, and they must match certain quality criteria and be comparable.

#### **The activity of the GEOSS is divided into nine themes:**

- Disasters – reduction of casualties and economic loss caused by human activity and natural disasters
- Health – understanding the environmental impacts on human health and well-being
- Energy – better management of energy resources
- Climate – understanding, assessing and forecasting climate change

#### ▼ *Making contracts with ESA*



- and adapting to climate change
- Water – better management of water resources through better understanding of the natural circle of water
  - Weather – improving weather forecasts
  - Protection of ecosystems – better management and protection of the land, coast and sea ecosystems
  - Agriculture – sustainable agriculture and fight against desertification
  - Biological diversity – understanding, monitoring and preserving biological diversity.

Most of the GEO areas of activity are also important for Estonia and in concordance with the prioritised areas of application of this strategy.

The GMES programme represents the European Union's contribution to the establishment and development of the GEOSS. Therefore, Estonian scientists and enterprises participate in the establishment of a GEO regional component through the activities of the GMES. For solving the global problems, the GEOSS working plan includes global activities, participation in which is possible for both scientists

and enterprises of Estonia. Participation in the work of GEO as an intergovernmental organisation is important for Estonia, since the political decisions taken by the GEO (i.e., the principle of satellites and free exchange of in-situ data) have a direct impact on the activity of all space organisations.

*Estonia's participation in the GEO activities is coordinated by the Ministry of Education and Research and the Ministry of the Environment.*

## 1.2.2. International Astronautical Federation IAF

Full membership of Enterprise Estonia in the International Astronautical Federation (IAF) gives a free pass to the Federation events, archive of the submitted scientific articles and offers to Estonian enterprises and scientists an opportunity to publish their papers in the Federation publications, also participate in the meetings of administrative and technical committees, partnership events organised for the members, working group meetings, and conferences. Membership also enables access to the network of

### ▼ Estonian delegation after signature of PECS Charter



global business partners and experts, and contributing to the discussion of global space policy, transnational legislative drafting on space affairs and space education. The IAF is the initiator and the main organiser of the most reputable event on space affairs – the International Astronautical Congress (IAC). Enterprise Estonia is a member of IAF since 2009.

*Estonian enterprises and scientific research establishments have an opportunity to get involved in the activities of the IAF through Enterprise Estonia EstSO.*

### 1.2.3. EURISY

The objective of the association EURISY that unites European space agencies is to develop public sector services by introducing and integrating satellite applications (Bridging Space and Society).

In order to achieve this objective, raising awareness and providing supporting activities for involving small and medium-sized enterprises in the development of satellite applications play an important role in the work of the organisation. Another important activity of the EURISY is the coordination and organisation of information and training activities related to space affairs. The recurrent method of the organisation is to spread good experiences. Enterprise Estonia is a member of EURISY since 2008.

*Estonian enterprises and scientific research establishments have an opportunity to get involved in the activities of the EURISY through Enterprise Estonia EstSO.*

#### ▼ Estonian Entrepreneurs on study trip in ESA ESTEC



## 2. STRATEGY FOR ESTONIAN SPACE AFFAIRS 2011–2013

### 2.1. The role and prioritised areas of application of Estonian space policy

Estonian space policy is based on the principle of peaceful use of outer space and is in line with the space policy approved by the Space Council of the European Commission in 2007.

Furthermore, Estonian space policy is based on the European space policy priorities announced by the European Commission in 2011 that consider space industry as an integral part of the Europe 2020 strategy.

Estonian space policy is aimed towards the development of coordinated joint activity of Estonian science, business and public sector for the benefit of whole society, mainly resting upon cooperation with the European institutions and organisations, also considering it important to strengthen ties with the international space community in other parts of the world.

#### **The role of the Estonian space policy is to:**

- Define the national objectives for the development of this field, to create a specific development plan and a plan for its implementation;
- ensure the interdisciplinary development of this field in Estonia, synchronising the relevant activities of the public sector, business, research and education;
- coordinate the national activities with the European and worldwide developments of space affairs.

#### **Implementation of Estonian national space policy is aimed towards the following prioritised areas of application:**

- Safety & security: prevention of emergencies; crisis regulation and communication, maritime safety, protection of citizens.
- Health & environment: meteorology; environmental monitoring and protection.
- Forestry & agriculture: developments and systems related to identifying land units and controlling

▼ *Estonian doctoral student Ms. Aire Olesk in ESA ESRIN during her traineeship*



the use of land; development of precision farming; forest monitoring and management of reserves.

- Science & education: popularisation of natural, exact and technical specialities; participation in joint programmes of the European Union; preparation of specialists in the field of space affairs.
- Transport and logistics: intelligent system for planning and directing traffic; monitoring of means of transport and goods.

## 2.2. Vision 2020

### The vision of Estonian space policy by 2020:

- Estonia systematically uses satellite-based applications in the provision of efficient and high-quality public services for the benefit of the state, businesses, and individuals.
- Estonian space policy encourages interest in the natural sciences and technology, information and communication technology, and innovative business.
- Estonian scientific research establishments and enterprises have

been integrated into the chain of values of the European space industry, creating research-intensive export-oriented products and services with high added value.

- Estonia participates in European space policy and joint projects as a valued partner
- Estonia is a respected full member of ESA with positive industrial return.

### The vision of Estonian space policy is based on long-term traditions of space science and technological education, as well as the values and attitudes that have emerged in society and businesses in the last few decades:

- society's readiness for quick implementation of innovative products and services;
- the internationally acknowledged high level of Estonian space science;
- the potential of Estonian science and business for creation of new space applications, especially in the field of satellite-based services;
- the capability of Estonia's ICT sector to create innovative hard- and software, also for space equipment.

▼ *Enterprise Estonia - host of the Estonian Space Office*



**Furthermore, the vision of space policy is compatible with several other important national development objectives, such as:**

- increasing the capabilities of Estonian science and business (also starting businesses);
- in developing and exporting research-intensive products and services;
- improving of the business support structure;
- improving of the administrative organisation and coordination necessary for more efficient national and international cooperation.

### 2.3. Objectives and measures

The space industry is a research-based economic sector with great potential that helps develop innovative high technological applications and knowledge-intensive services. As a versatile sector, the space industry is more flexible in regards to economic fluctuations and therefore recovers from crises relatively quickly, wherefore continuous development of this field will contribute to the long-term growth and stability of economy.

Regardless of the considerable economic potential, the space sector is still a high-risk sector and the investments an enterprise needs to make are extremely voluminous and thus carry a high level of risk. Therefore, the public sector has an opportunity to reduce the risks of enterprises by developing public services and a favourable business environment, which also presumes both improvements in awareness, knowledge and skills of the public sector, and increasing the popularity and quality of higher education and science.

**Due to the aforementioned vision of policy development, Estonia has set the following objectives for the development of space affairs:**

- implementation of space applications that support achieving of strategic objectives important to the state and are in concordance with the business potential of the enterprises and the needs of the citizens;
- encouragement of cooperation between the Estonian high technology sector and science to develop new services and applications for achieving sustainable growth in the economy and quality of life;

▼ *Estonian Space Office is bringing high-tech business to Estonia*

**Estonian  
Space Office**  
Enterprise Estonia



[www.eas.ee/space](http://www.eas.ee/space)

- increase the level of awareness of the public sector regarding modern space applications in order to be a driving force in the introduction of services offered to citizens;
- complementing Estonia's achievements in space science;
- provide inspiration and promote interest in the natural sciences and technology, information and communication technology and innovative business, as well as creation of synergy between these fields.

In order to achieve the objectives set in this strategy, the measures stated in the following chapters will be implemented in the public sector, business, science and education.

### 2.3.1. Development of public sector services based on space applications

The public sector develops the public sector services that are based on modern space applications in cooperation with enterprises and scientific research establishments.

#### **Under the measure, the following activities are planned:**

- increasing the awareness of public sector employees regarding developments in space applications and their possibilities, and monitoring public sector needs in prioritised fields of application;
- using innovative procurement models to support development of space applications and promotion of research and development activities; development and implementation of an intellectual property regime encouraging commercialisation of the application;

#### ▼ *Estonian Space Office stand on International Astronautical Congress in Prague*



- developing specific plans of action for development of services and technologies in prioritised fields of application, and monitoring these;
- participating in shaping European space policy and the work of the directing bodies of the European space at a high national level.

### 2.3.2. Development of an economic environment that would encourage competitiveness of enterprises in the field of space

**The public sector supports competitiveness of the enterprises in the field of space through the following activities:**

- Systematic increasing of knowledge of enterprises regarding the developments in space affairs and possibilities, including creation of a webpage to further improve the knowledge;
- Supporting enterprises in entering chains of supply with high added value, opening of institu-

tional markets, including cooperation with the ESA.

- Increasing awareness and motivation of enterprises to participate in national and EU framework programmes (FP7, Horizon 2020), as well as European R&D programmes (EUREKA, Eurostars, etc.).
- Developing cooperation with the Baltic States and other Baltic Sea partners for better implementation of the business potential<sup>2</sup> of the region in development of developing projects and joint services in this region;
- Creating an integrated satellite-based demo-centre for applications within the Tallinn University of Technology (TTÜ);
- Organising participation in competitions for enterprises, including the ones just starting out, for creation of new and innovative satellite-based applications.

<sup>2</sup> A strategy (2009) approved by the Council of the Baltic Sea has been created for Baltic Sea cooperation and several development projects have been initiated, incl. EfficienSea.

▼ *MP-s Ms. E.Ergma and Mr M.Raidma (on the left) on the meeting at EISC in Warsaw*



### 2.3.3. Performance of scientific research in the fields of space technologies and applications, and provision of educational support

Scientific research and educational support in the fields of space technologies and applications enhance improvement of Estonian enterprises and the public sector in the prioritised areas of application.

Therefore it is necessary that educational programmes and creative learning environments would evolve around high-technological space projects to inspire and motivate students to continue with their careers in research and technology.

#### **Under the measure, the following activities are planned:**

- The environmental scientific applications will be harmonised with the Estonian Environmental Protection and Technology Programme (EPTP) that is a part of the application plan of the

Estonian research and development and innovation strategy (RD&I) Knowledge-Based Estonia 2007–2013;

- The quality of space science will be promoted by establishing a relevant infrastructure at the Tartu Observatory, in cooperation with the University of Tartu, Estonian University of Life Sciences and Tallinn University of Technology.
- The students of technology and natural sciences, as well as economics, will be provided with opportunities in the form of elective courses to acquire knowledge, skills and practical experience related to the business models, industrial relations and quality requirements related to implementation of the key strategies in space affairs;
- Participation in international cooperation programmes and networks for research and development of space applications and technologies;
- Developing centres of excellence and competence for satellite-based services and a corresponding infrastructure in cooperation with the Baltic Sea partners and

▼ *FP7 Nordic BaltSat project final Conference in Tallinn, 2012*



large enterprises of the European space industry;

- In order to popularise space science and technology, educational programmes will be created, inspiring students to take up natural sciences and technical specialities, help better associate the implementation potential of the key technologies in space affairs and strengthen cooperation between universities and enterprises.

## 2.4. Financing of the strategy

The activities related to the public sector and increasing awareness of the space affairs, as well as training will be funded from the Business and Innovation Knowledge and Skills Development and

Awareness Increasing Programme that allocates budget section every year for the development plan activities<sup>3</sup>. The ESA membership fees are an additional source for implementing the strategy, on the basis of which orders are made for development of space technologies in Estonian enterprises.

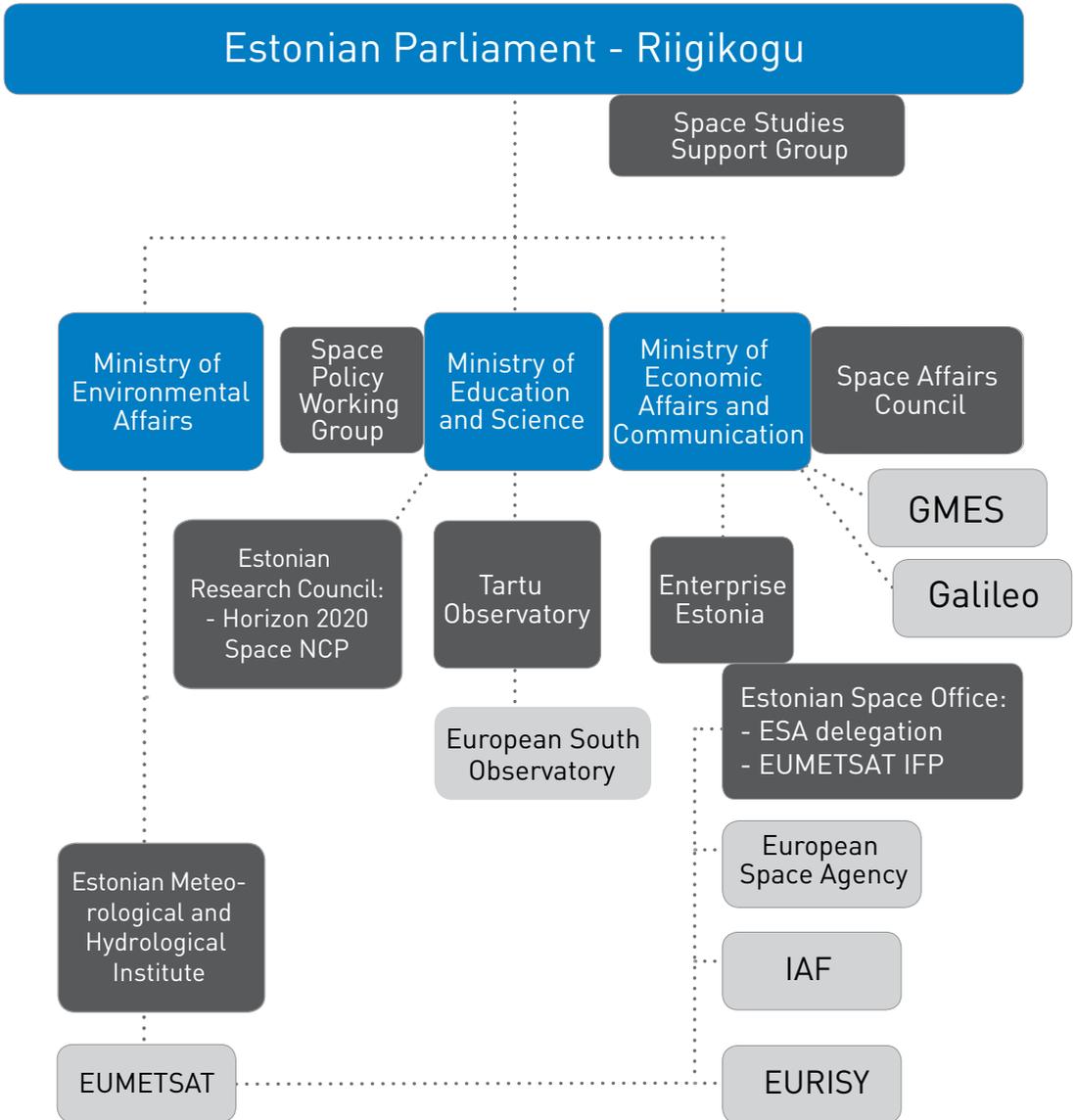
Furthermore, financing of the activities aimed at implementation of the objectives of this strategy in the period of 2011- 2013 is also possible through the existing horizontal financing instruments, and activities and measures are being simultaneously prepared for the next structural fund period, based on the objectives and prioritised fields of implementation of the strategy. Therefore, additional funding of the activities related to implementation of the strategy is possible from 2014.

Activity	2011 (EUR)	2012 (EUR)	2013 (EUR)	Total (EUR)
EstSO support activities	59 000	68 000	214 000	341 000
EstSO awareness raising projects	100 000	100 000	175 000	375 000
TO space R&D activities funding	980 000	1 002 000	1 002 000	2 984 000
ESA PECS contribution	1 440 000	1 250 000	1 290 000	3 980 000
EUMETSAT annual fee	130 000	460 000	266 000	856 000
<b>TOTAL</b>	<b>2 709 000</b>	<b>2 880 000</b>	<b>2 947 000</b>	<b>8 536 000</b>

### ▼ Ms. Kristiina Kitsik giving a speech on space awareness



## SPACE GOVERNANCE in ESTONIA



- Governmental institution
- Public institution, committee
- Foreign Space Organization

## 3. IMPLEMENTATION AND MONITORING OF THE STRATEGY

### 3.1. Management of the strategy

Estonian space policy is managed by the Ministry of Economic Affairs and Communications of the Republic of Estonia whom the Government of the Republic of Estonia also mandated to supervise the preparation of the Strategy and its implementation.

*Implementation of the Strategy and allocation of resources is coordinated by the Space Affairs Council (SAC).*

### 3.2. Implementation of the strategy

In order to implement the strategy, a plan of action is prepared with the participation of the public sector enterprises, scientific research establishments and other enterprises. In the framework of this strategy, the Ministries are responsible for development of the areas of application under their governance:

- Ministry of the Interior of the Republic of Estonia: safety & security;

- Ministry of the Environment of the Republic of Estonia: environment and health;
- Ministry of Economic Affairs and Communications of the Republic of Estonia: transport and logistics;
- Ministry of Agriculture of the Republic of Estonia: agriculture & forestry;
- Ministry of Education and Research: science & education.

*The coordinated actions and close cooperation of the Ministries and other public sector institutions ensure efficient use of the space affairs resources and help to achieve the objectives set out in the strategy better.*

In addition to the Ministries, **Enterprise Estonia (EE)** also has a central role, being the technology and business competence centre of Estonian space affairs and also performing the functions of the Estonian Space Office. The purpose of the Space Office is to manage the international relations related to business and technology of Estonian

▼ *Three of 12 Estonian PECS projects with ESA*



space affairs, communicating information and participating in the work of the corresponding consultative and decision-making councils.

**Tartu Observatory** is the competence centre of space science, space research Earth observation and space technology.

The activities of education, science and innovation, including financing of space and security programmes are coordinated by **Estonian Research Council**.

As a Member State of the European Union, Estonia is involved in the preparation of the GMES, participates actively in the governing bodies that develop the Galileo, and is represented in other working groups related to space affairs (for more information, see Section 2.3.5).

▼ *Myoton device – creation of Estonian scientists and engineers in test on Parabolic flight*



### 3.3. Strategy monitoring

Monitoring of Estonian Strategy for Space Affairs takes place through assessment of the output and results indicators proceeding from the objectives and measures described in the strategy.

*Monitoring of the strategy is done by the Space Affairs Council.*

The outcome indicators are:

Indicator	2011 - 2013 (persons)
Involvement in general awareness raising activities	3000
Involvement in specific trainings on standards and international procurements in aerospace and high-tech field	100

The most important results indicators of the measures to be implemented under this strategy are:

Indicator	Base level 2010 (EUR)	Objective 2013 (EUR)
Increase in space technological development capability in the supported enterprises (added value per employee)	23 000 EUR	33 200 EUR
Export turnover of Estonian space-based applications	4,9 mln EUR	8,0 mln EUR
Number of patent applications submitted by businesses operating in the field of space	N/A	3
More widespread implementation of space technologies in the public sector (number of demo procurements initiated)	N/A	2

#### ▼ Rocket science demonstration for schoolchildren



The ministries responsible for prioritised areas of application shall present a report of their activities towards the objectives of the strategy to the Space Affairs Council, also taking into consideration the aforementioned outcome indicators. The Space Affairs Council will assess the efficiency of the work of the Ministries and makes or approves the motions to supplement or amend the strategy and the plan of action.

## DEFINITIONS AND ACRONYMS

**Archimedes** – the Archimedes Foundation, coordinates the EU FP7 activities and funding of education, science and innovation in Estonia, including space and security.

**CEOS** – Committee on Earth Observation satellites

**COPUOS** – Committee on the Peaceful Uses of Outer Space

**COSPAR** – Committee on Space Research

**EAS** – Enterprise Estonia

**EU** – European Union

**EU FP** – The EU Framework Programme for research and technological development (currently the Seventh FP) is the main source of funding international science projects in Europe.

**ECS** - European Cooperating State

**EDA** - European Defence Agency

**EGNOS** – European Geostationary Navigation Overlay Service

**ESA** - European Space Agency

**ESO** – European South Observatory

**EstSO** – Estonian Space Office

**EUMETSAT** – European Organisation for the Exploitation of Meteorological Satellites

**ESERO** – European Space Education Resource Office

**EUSC** – European Union Satellite Centre

**GEO** – Group on Earth Observations

**GEOSS** – Global Earth Observation System of Systems

**GMES** – Global Monitoring for Environment and Security, the Earth monitoring project of the European Union related to the environment, safety, emergency reaction and climate change

**GALILEO** – global satellite navigation system of the European Union meant for civil use

**GPS** – Global Positioning System

**ICT** – Information and Communications Technology

**SAC** – Space Affairs Council

**SPWG** – Space Policy Working Group

**SSSG** – Space Studies Support Group

**PECS** – Plan for European Cooperating State

## RELEVANT SPACE RELATED LINKS in ESTONIA

### **Ministry of Economic Affairs and Communications**

([www.mkm.ee](http://www.mkm.ee))

### **Ministry of Education and Research**

([www.hm.ee](http://www.hm.ee))

### **Enterprise Estonia**

([www.eas.ee](http://www.eas.ee))

### **Estonian Space Office**

([www.eas.ee/space](http://www.eas.ee/space))

### **Tartu Observatory**

([www.aai.ee](http://www.aai.ee))

### **University of Tartu**

([www.ut.ee](http://www.ut.ee))

### **Tallinn University of Technology**

([www.ttu.ee](http://www.ttu.ee))

### **Estonian Science Council**

([www.etag.ee](http://www.etag.ee))

### **Estonian Student Satellite**

([www.estcube.eu](http://www.estcube.eu))

## NOTES

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## ESTONIA – BASIC FACTS

**Population:** 1 323 000

**Total area:** 45 227 km<sup>2</sup>

**National currency:** euro

**Capital city:** Tallinn

**Administrative division:** 15 counties,  
226 administrative units, including 33 cities  
and 193 rural municipalities

**Number of islands:** 1 521

**Largest islands:** Saaremaa, 2 671 km<sup>2</sup> Hiiumaa,  
989 km<sup>2</sup> Muhu, 198 km<sup>2</sup>

**Longest rivers:** Võhandu, 162 km; Pärnu, 144 km;  
Põltsamaa, 135 km

**Largest lakes:** Peipus, 3 555 km<sup>2</sup> (including the part  
belonging to Estonia 1 529 km<sup>2</sup>), Võrtsjärv, 271 km<sup>2</sup>

**Highest point:** Suur Munamägi, 318 m

**Average daily temperature:** Annual mean  
+5.1 °C in January -11.4 °C in July +22 °C (2010)

**GDP (2011):** \$22,5 billion

**GDP growth (2011):** 7,6 %

**GDP per capita:** \$20,600

**Main industries:** ICT, engineering, electronics,  
wood, food, textiles