European Space Policy Institute

# Main lessons from the ESPI preparatory report

29-30 November 2010
ESF-ESA 'Forward Look' TECHBREAK Kick-off Conference
Brussels

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# 1. Introduction - Background of the study

•On 12 January 2010, the European Science Foundation (ESF) kicked off a study with ESPI as the preparatory work for a "Forward Look on Technological Breakthroughs for Scientific Progress (TECHBREAK)".

•On 30 September 2009, the Commission Communication "Preparing for our future: Developing a common strategy for key enabling technologies".

•On 5 March 2010, the Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn created the term *"era of i-conomy"* at the Innovation Summit of the Lisbon Council.

•On 3 March 2010 Commission releases "Europe 2020" A strategy for smart, sustainable and inclusive growth which was approved on 17 June 2010.

•Where does Europe want to be in 2020?

- Smart growth – developing an economy base on knowledge and innovation
  - Flagship Initiative: "Innovation Union"
- Sustainable growth – promoting a more resource efficient, greener and more competitive economy
  - Flagship Initiative: "An industrial policy for the globalisation era"
- Inclusive growth – fostering a high-employment economy delivering economic, societal and territorial cohesion

# 1. Introduction -Barroso's "Europe 2020" and the Space Sector

**Europe 2020: "smart, sustainable and inclusive growth"**

"…promoting innovation and knowledge transfer throughout the Union…"

"…to develop a strategic research agenda…"

"…to launch "European Innovation Partnerships" between EU and national levels to speed up the deployment of the technologies needed to meet the challenges identified…

…will include … "the key enabling technologies to shape Europe's industrial future…""

"…this will include promoting and comercialisation and take up of key enabling technologies…"

"…to develop an effective space policy to promote the tools to address some of the key global challenges and in particular to deliver Galileo and GMES …"

**⇒What does this mean for the Space Sector?**

⇒What is the relationship between science and technology to facilitate innovation?

⇒What is innovation in the space sector? What is its nature?

⇒How do other sectors deal with innovation?

⇒What can be learn from them?

⇒Can the space sector work together with them? How?

⇒What role and tasks for Member States (including legislative)?

# 1. Introduction - Aim of the Study

- Analyse the concepts "science", "technology", "innovation" and their relationship.
- Analyse how innovation occurs in different sectors and draw lessons learned that could be useful for the space sector.
- Identify technologies that could be used in the space sector as a driver for innovation.
- Report upon identified technologies in the European Research Area and projects focusing on these technologies.
- Identify institutions and mechanisms for partnership with other sectors which can be utilised using identified technologies as a common target for interaction.
- Draw recommendations for policy makers on open innovations for space through the identified technologies.

http://www.espi.or.at/images/stories/dokumente/studies/espi%20report%2024%20online_1.pdf


*In collaboration with ESF "Forward Look on Technological Breakthroughs for Scientific Progress"*

# 2. Definitions - Science, Technology and Innovation

***"Innovation is the use of new, or existing, ideas, discoveries and inventions in the space sector, stemming from other sectors (spin in), and vice versa, the use of new, or existing, ideas, discoveries and inventions in other sectors, stemming from the space sector (spin out), to create economic and social benefits. Innovation also consists of scientific, technological, organisational, financial and commercial steps, which are intended to, or actually, lead to the implementation of innovations by space-non-space partnerships (spin together)."***

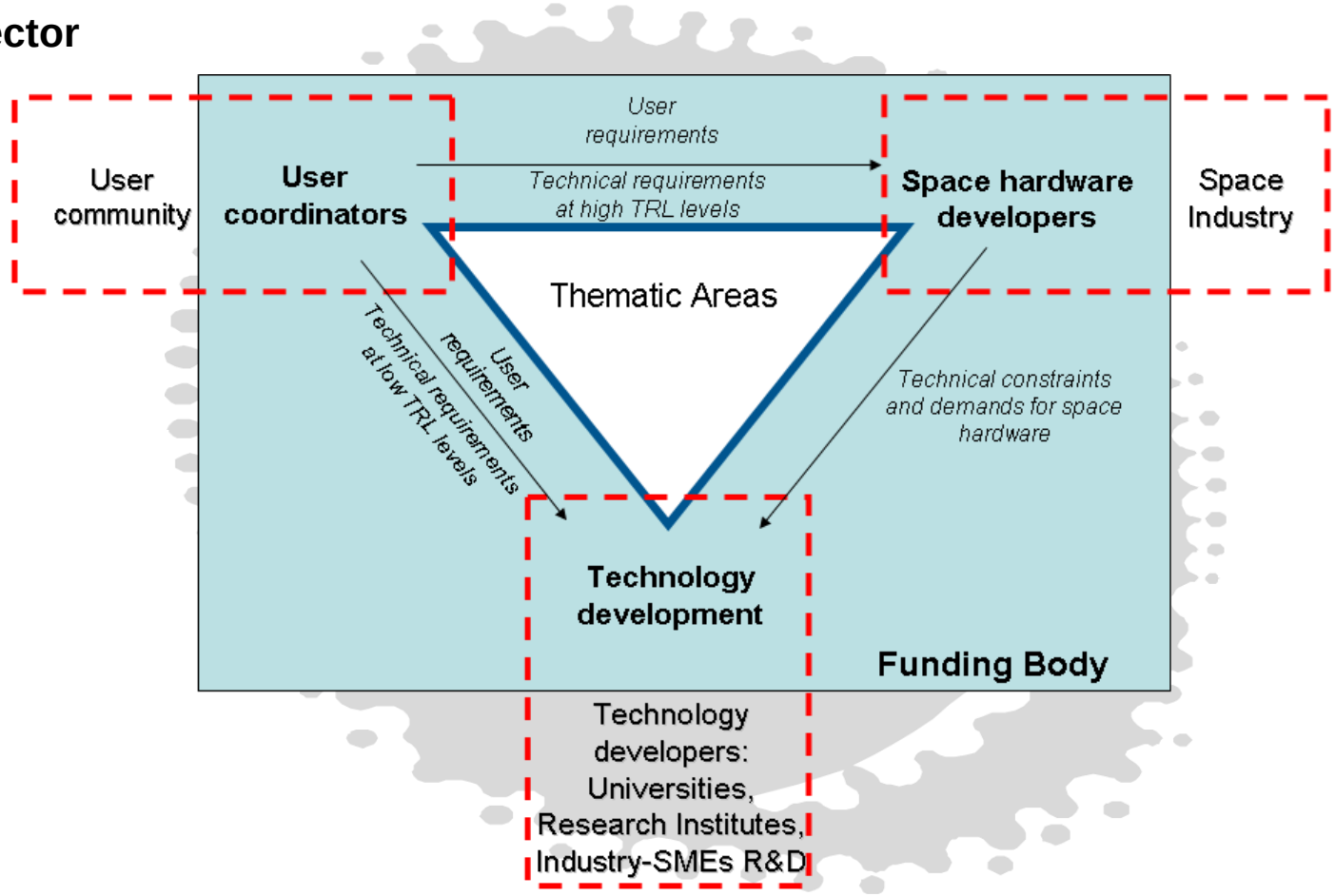
Innovation is characterised by three stages:
a) incremental,
b) breakthrough
c) utilisation.

**"Science"** refers to what is widely known as pure or fundamental science, for space and earth observation.

**"Technology "** covers the pure or applied science (space and non-space) that leads to knowledge which can be translated into technological developments for space.

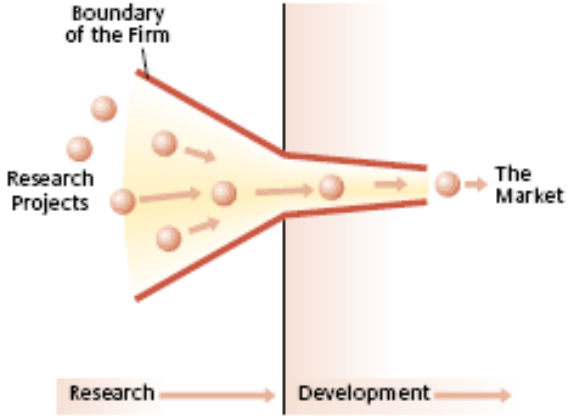
# 3. Actors Constellation Relevant for Space Innovation

## Space Sector

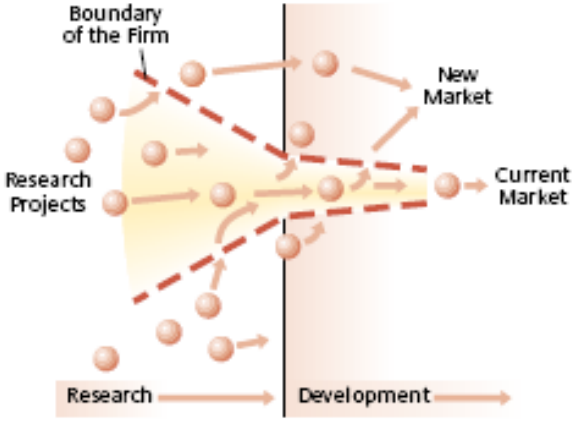


# 4. Open Innovation in the Space Sector

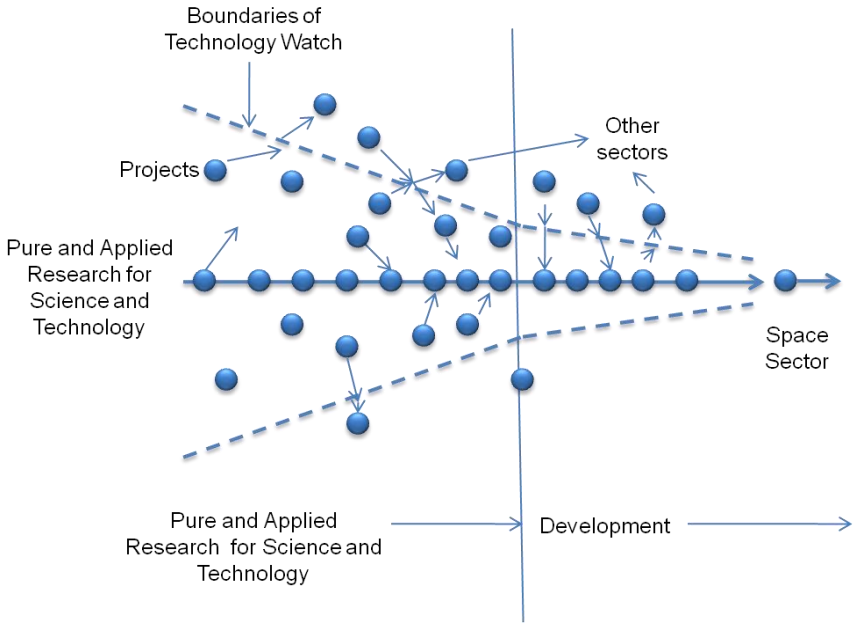
## Closed Innovation (Chesbrough, 2003)




## Open Innovation (Chesbrough, 2003)




## Open Innovation in the space sector R&D



# 5. Innovation in Different Sectors

**Does innovation occur in different sectors and how? What can be learned?**

- Different sectors have a different relationship with innovation.
- They have a shorter or longer R&D - innovation-to-market cycle.
- The sectors can be split to two categories according the length of the cycle
  - Long cycle sectors
    - Space
    - Aeronautics
    - Construction
    - Energy
    - Pharmaceuticals
  - Short cycle sectors
    - ICT
    - Biotechnology

# 5. Innovation in Different Sectors

**Aeronautics Sector**

- Since the creation of the sector in 1890 with Otto von Lilienthal first successful glider, the first fifty years of aeronautics experienced tremendous and frequent innovations that changed our everyday life. The next fifty years of aeronautics it appears that no dramatic revolutions took place but rather the focus was in fine tuning existing technologies.
- Innovation expected by breakthroughs in other sectors and introduction in the aeronautics sector.

**Construction Sector**

- New technologies are developed separate from those that can implement them, and they are not aware of them.
- A technology watch can monitor technology advancements, process the information turning it into knowledge using their language and stimulate networking.

**Pharmaceutical Sector**

- Slowdown in innovation is related to strict regulation, high cost, industry restructuring.
- To improve innovation it is necessary to streamline and simplify regulations, stimulate faster market access, restructure pricing and stimulate better cooperation between public and private research organisations.

**Energy Sectors**

- Public policies are expected to be drivers for innovation.

# 5. Innovation in Different Sectors

**ICT Sector**

- In the last 15 years the sector has been booming. A strong technology push has resulted in many new products and services. Not all new technologies have lived up to their potential. Some reasons relate to failure of traditional marketing tools to capture properly the "user needs" and deliver to the user the right message about the potential of the new technology.
- New marketing tools are needed that allow technology push to develop using better captured "potential user needs". Continues monitoring of the potential user needs is essential.

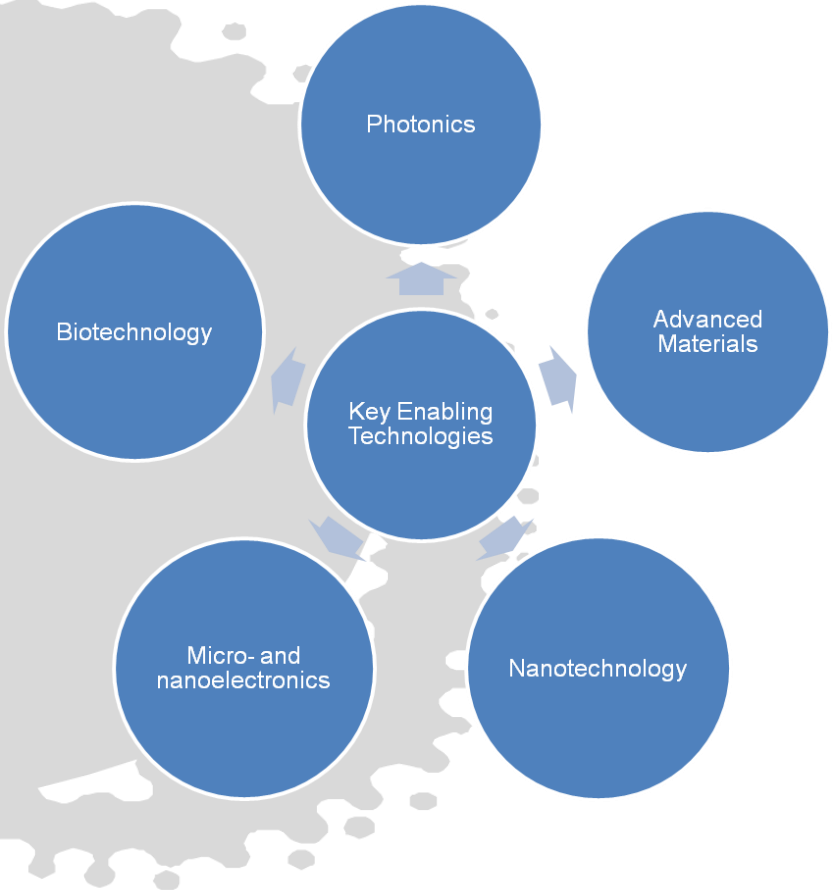
**Biotechnology Sector**

- Fast growth in the sector from technological perspective is related to automation, system integration and in particular in advancements to sensory technology as well as lab-on-a-chip principles.

# 6. Open Innovation in the Space Sector

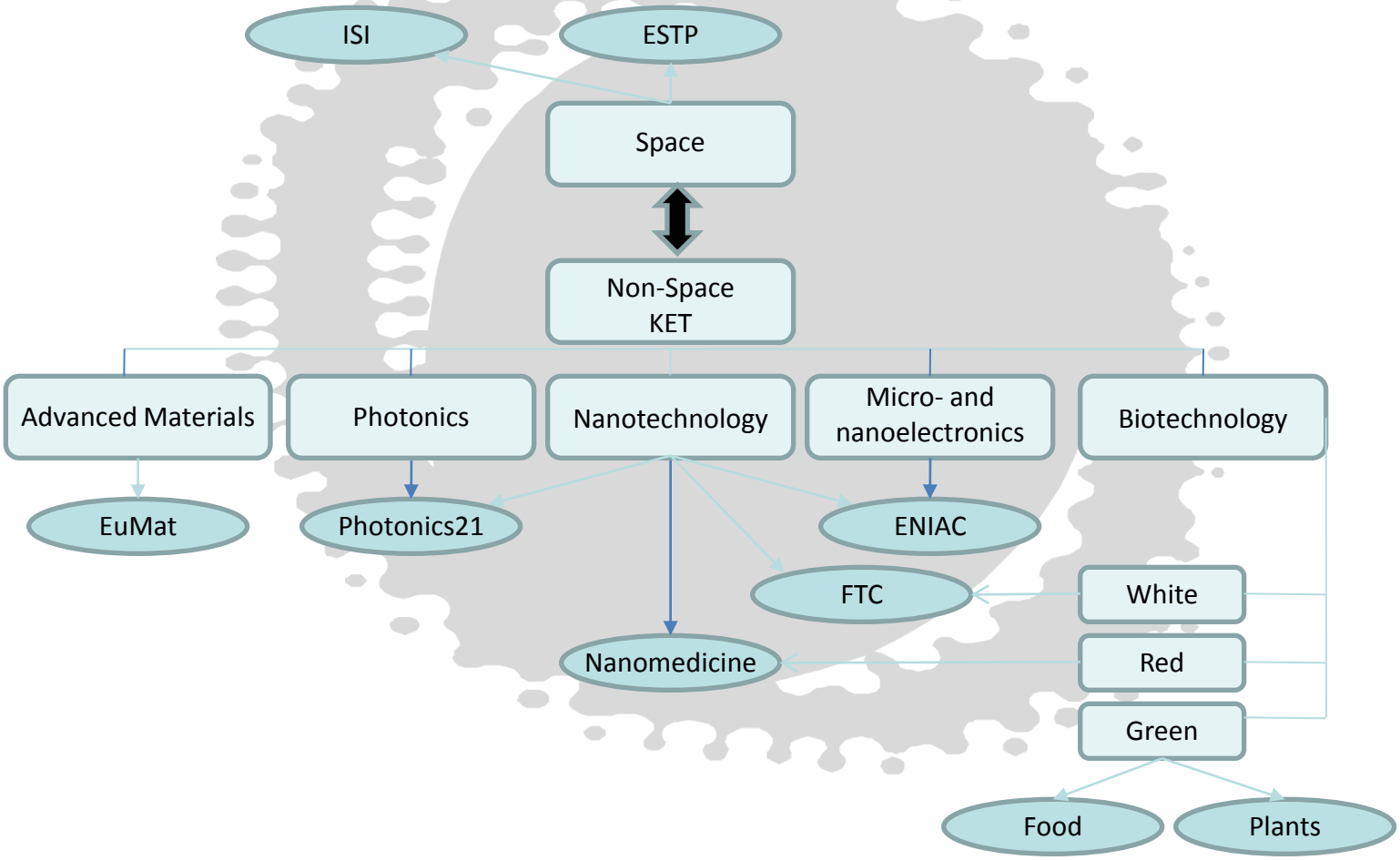
**Which technologies can be used for implementing open innovation?**

- For many years it has been realised that certain technologies can be used as a core for different scientific and industrial developments but without having identified them in a systematic way.
- In 2009 the European Commission identified them and refers to them as **Key Enabling Technologies** (KET).
- They are typically associated with high R&D intensity, rapid innovation cycles, high expenditure and highly-skilled employment.
- KET's are expected to be driving forces behind future development and of key strategic importance.
- United States and Japan are concentrating more on these than in Europe.



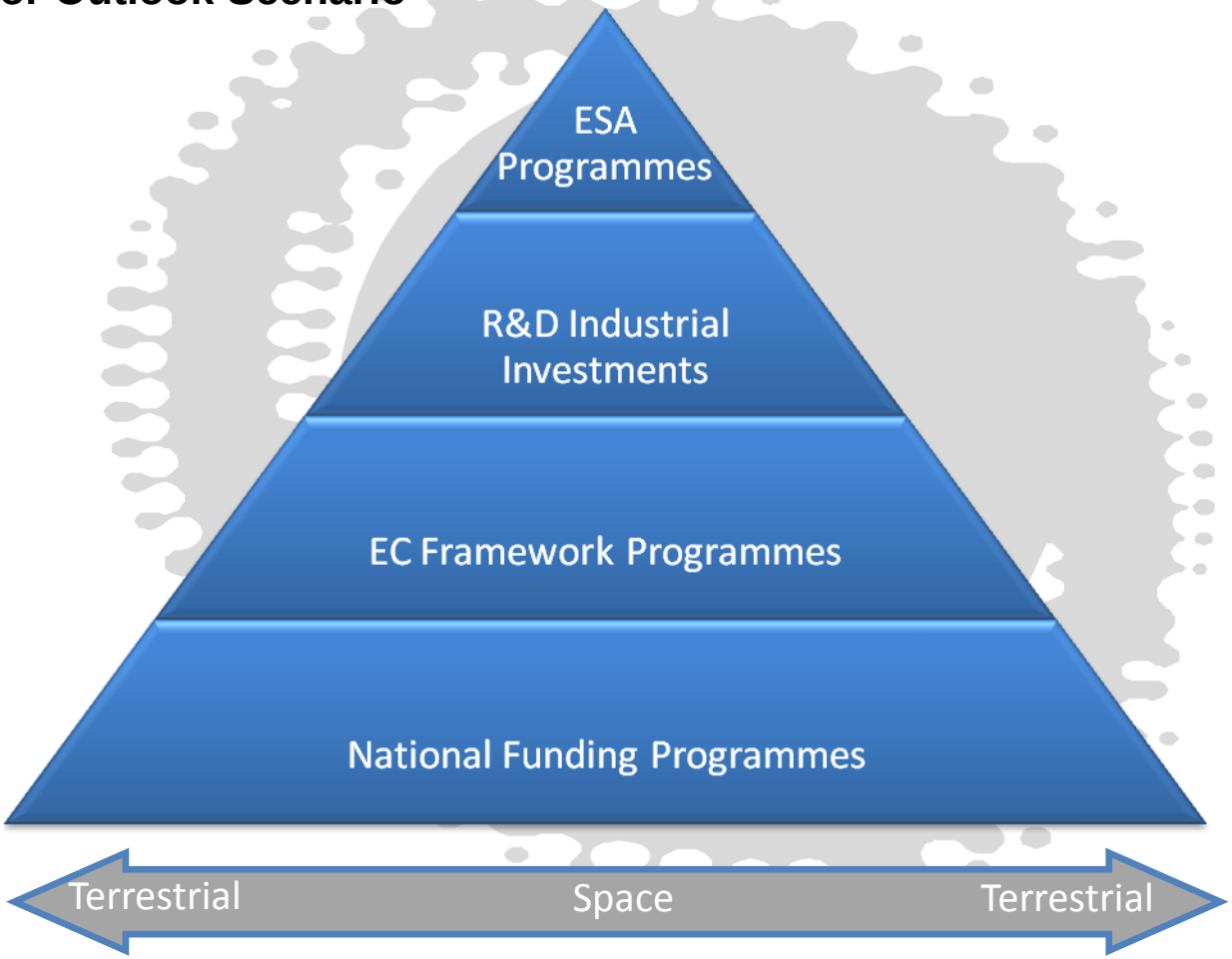
# 6. Open Innovation in the Space Sector

## Technology Platforms and Key Enabling Technologies and Strategic Research Agendas



# 6. Open Innovation in the Space Sector

**Space Sector Outlook Scenario**



# 7. Recommendations

**Concepts**

- Clear definitions are needed in the space sector for the terms "science, technology and innovation" for good communication with non-space sector stakeholders.
- ESPI definition on "space innovation" focused on "spin in", "spin out", and "spin together" as essential components for interaction with other sectors.
- Open innovation is essential for breakthroughs in the space sector, in particular in exchanging ideas and perusing joint developments with non-space sectors.
- "Space key enabling technologies" and their relation to the general "key enabling technologies" need to be identified as a "common language" for cooperation with other sectors.
- The "technology push" and "need pull" model can be used as a driver for technology development through "potential user need". Appropriate models are needed for constantly monitoring "potential user needs" and for communicating the potential use of technology in order to shorten the need identification to use cycle.

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# 7. Recommendations

**Cooperation**

- Enhance cooperation in aligning strategic visions and funding mechanisms across Europe.
- Strengthen existing partnerships between ESA, EU and Member States.
- ESA and EC should strengthen existing partnerships and create new in particular with ESA, DG-Research, DG Enterprise, JRC and ERC.
- ESA and the EC should continue working together under the Framework Programme under the space component on the basis of bringing together and aligning funding means, time scales as well as programmatic content, and by jointly defining roadmaps; should further expand this cooperation in the non space areas.
- Promote "innovative partnerships" between space and non-space actors. Focus the alignment of programmes, strategies and roadmaps and use KETs as the "common language" for cooperation.
- ESA and the EC should also work closer under other components of FP with focus on KETs and align their programmes, strategies and roadmaps.
- ESA should be involved in non-space Technology Platforms focused on KETs and should partner with non-space sectors stakeholders for the development of KETs.
- Public-Private-Partnerships between space and non-space stakeholders should be stimulated to co-finance R&D in KETs.
- Space research is still mostly handled at national level. European coordination and integration should be further stimulated.

# 7. Recommendations

**Mechanisms**

- Establish adequate mechanisms for bringing together and aligning funding means, time scales as well as programmatic content, and by jointly defining roadmaps.
- Enhance links between space and non-space European Technologies Platforms as the first step in aligning strategic agendas with advancement, promotion and commercialisation of KET's.
- The space sector and ESA invest mostly in R&D needed for future missions. They need to strengthen investment and technology programmes in basic and applied research for generic and disruptive technologies which are not related today to a future mission.
- New mechanisms are needed to allow "technology push" development based on "potential future user needs". It is necessary to develop effective mechanisms to:
  - regularly monitor "potential user needs";
  - inform the user about the benefits of new technologies.
- The space sector needs an effective "technology watch" regarding new and disruptive technologies developing from other sectors. Space and non-space communities should be involved.
- Intellectual Property Rights need special attention in open innovation. The current ESA IPR system where IPR stays within the agency for space use only, does provide the basis for open innovation in technology development with non-space sectors partners.

# 7. Recommendations

**Mechanisms**

- ESA should develop adequate mechanisms to participate in non-space FP projects as an active researcher utilising its laboratories in order to gain technical know-how from other sectors regarding KET's.
- ESA and EC co-financing under Framework Programme non-space scenarios:

  1) Use ESA existing technology programmes in combination with FP for KETs. This already partially exists but it is mostly uncoordinated. There is a need to develop coherent coordination mechanisms.

  2) Develop new funding programmes. A new science and technology programme can be envisaged to be jointly created together with ESA and other funding bodies like DG Research.

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