

THE SPACE ECONOMY AT A GLANCE 2011

Space technologies have become an important part of everyday life. Weather forecasting, global communications and broadcasting, air traffic management – these and many other essential activities would be almost unthinkable today without satellite technology.

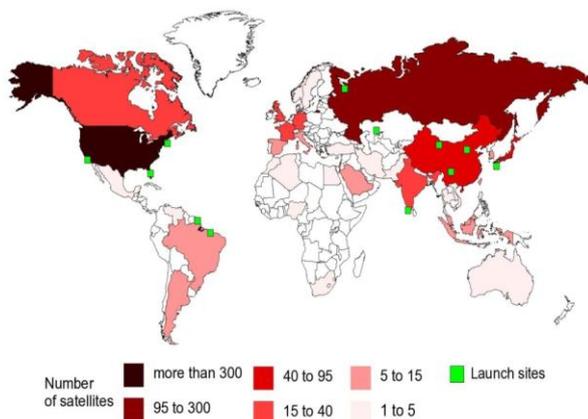
This second edition of *The Space Economy at a Glance* paints an updated and richly detailed picture of the space industry, its downstream services activities, and its wider economic and social impacts. The report provides indicators and statistics based on both official and private data, but also a strategic outlook that identifies key issues for the future. The figures cover many OECD and non-OECD countries and, for the first time, include various official statistics concerning the Brazilian, Chinese and Indian space programmes.

Why examine the space economy?

Space has been historically a key strategic sector for many OECD and non-OECD countries, with space exploration, science and security applications as key drivers. However, over the past decade the number of public and private actors involved in space activities worldwide has increased, spurring even further the development of the nascent space economy. This space economy includes many commercial activities that have been derived over the years from governmental research and development. Several mature downstream activities have reached mass markets and include information technology products and services, such as satellite television and GPS receivers. In addition, the use of satellite technology in navigation, communications, meteorology and earth observation has given rise to a growing stream of applications in such areas as air traffic control, transport, natural resource management, agriculture, environmental and climate change monitoring, entertainment and so on, which in turn are creating new downstream uses and new markets. Space can increasingly be seen as an important potential source of economic growth, social wellbeing and sustainable development.

Countries with operational satellites in orbit, 2010

Number of satellites and main space launch sites



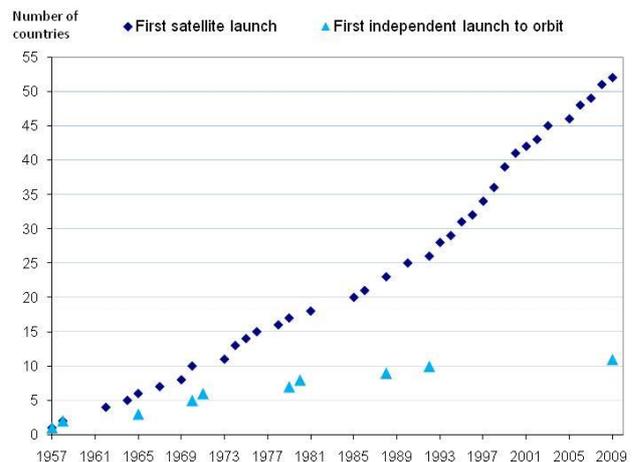
Who are the main space-faring nations?

The landscape for space activities is changing radically from the early 1990s. There have never been so many countries with satellites in orbit (more than 50 countries). China and India have risen as established space powers alongside the re-emergent Russian Federation, but also as a new nexus of space technology transfers towards developing economies. The Russian Federation has launched more rockets than any other country every year since 2006. Asian countries led by China (the same number of launches in 2010 as the United States – 15), are also gradually outdistancing Europe in terms of the number of launches and satellites sent in orbit.

The total space budget of the 35 countries examined in the report represents conservatively USD 64.4 billion in 2009 and an estimated USD 65.3 billion in 2010, with the bulk of funding in G7 and BRIC countries. All G20 countries have space programmes. Five countries have invested more than USD 2 billion in 2010 (United States, China, Japan, France and the Russian Federation), with the United States leading the way at more than USD 43 billion.

More than 50 countries with some spaceflight capabilities, 2010

Number of countries which launched satellites (independently or via a third party)



An engine of economic growth

In comparison to other sectors, the space sector has fared relatively well since 2008 despite the economic crisis, thanks to its specificities as a key strategic sector (*i.e.* national imperatives and institutional research and development funding), but also because of the vibrant space economy. Mapping the space economy remains a complex process. Estimates vary widely, and many involve some degree of double counting. Estimates suggest that the revenues derived from the wide diversity of space-related products and services amounted to some USD 150-165 billion in 2009.

- Telecommunications represent the main commercial space market, and several satellite operators have earned record revenues since 2008 despite the economic crisis. They have benefited from growing mass markets (satellite television broadcasting) and a robust demand from institutional users (defence, new customers in the developing world, development of anchor contracts). The lease of transponders and communications via satellite represented some USD 11-15 billion in revenues, and satellite broadcasting (*e.g.* television via satellite) some USD 65-72 billion in 2009.
- The geopositioning market, a growing new segment building on satellite capacities (with products such as the now common car-navigation), represents USD 15 billion in revenue in 2009. With the advances in smartphones and other mobile products, all offering geopositioning capabilities, more growth is expected.
- Other sectors include the satellite Earth observation sector, a market valued in 2009 at some USD 900 million to USD 1.2 billion, and the space insurance industry, which generates around USD 750-800 million a year.
- The overall growth of space applications has impacted the rest of the value chain, particularly the main satellite manufacturers. The commercial and institutional demand for satellites remains relatively strong and geographically diversified, particularly for military / dual-use satellites. The total five-year value of satellite production is estimated at some USD 65.5 billion.

Preserving a skilled workforce...

The space economy with all its various downstream products and services employs hundreds of thousands of employees in diverse OECD and non OECD countries, although data are not known for all countries. Focussing on the narrower space manufacturing sector, some 170 000 people work in the space industry in the United

States, some 31 000 people in Europe and 50 000 in China. The space sector is generally a very concentrated industry. For example, four large industrial holdings are directly responsible for more than 70% of total European space industry employment. The dominant job categories comprise engineers and technicians involved in designing, manufacturing and operating space and ground segments, but also information technology specialists. As in other parts of the economy, the space sector is particularly affected by the large wave of retirement of the baby-boom generation. Many of the engineers and scientists who have developed space systems over the past three decades are retiring, and this situation comes in a context of a sharp decrease in the engineering and scientific population under 30 years old in most OECD countries. Although space remains a priori a very attractive field for young students, the space sector increasingly competes with other sectors for the scientifically minded students (*e.g.* game software development, biotechnologies). Taking into account the increased globalisation of the space industry and emergence of many talents in new space-faring countries, the international mobility of human resources in science and technology could become a key feature in the space industry employment strategies, although national security restrictions would still often apply (*i.e.* civilian-military nature of many space systems).

THE OECD SPACE FORUM

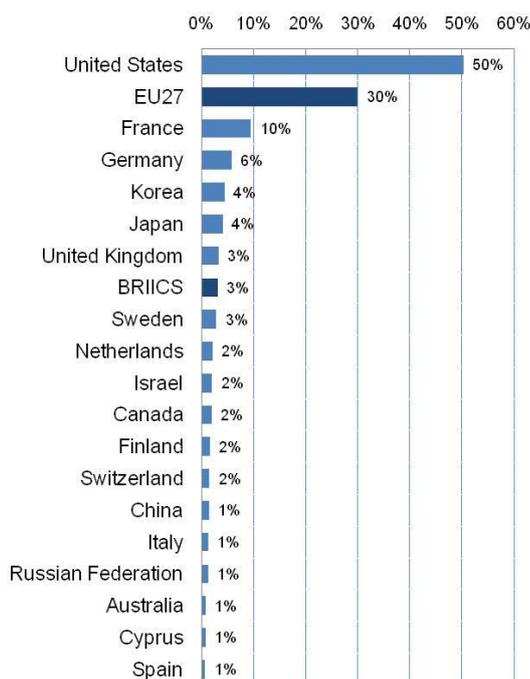
The Organisation for Economic Co-operation and Development (OECD) launched in 2006 the 'Space Forum' in cooperation with the space community. The Forum, hosted by the International Futures Programme (IFP) as part of its mission to explore emerging sectors, aims to assist governments, space-related agencies and the private sector to better identify the statistical contours of the growing space sector worldwide, while investigating the space infrastructure's economic importance and potential impacts for the larger economy. The Forum includes organisations from Canada, France, Italy, Norway, the United Kingdom, the United States, as well as the European Space Agency. The Forum builds on the recommendations presented in the OECD publication *Space 2030: Tackling Society's Challenges* (2005), which benefited from consultation with more than a hundred public and private actors in the international space community.

More innovation for future economic growth...

The space sector has often been considered one of the main frontrunners of technological development, since the beginning of the space age. Benefiting from advances in related domains (e.g. material sciences), the number of space-related patents has almost quadrupled in fifteen years. The countries' share in space-related patents over the 2000-08 period shows the United States and Europe leading, followed by Korea and Japan. However, in terms of revealed technological advantage, several countries demonstrate a level of specialisation in space technologies patenting, particularly the Russian Federation, France, Israel and the United States. Over the next five years, many advances are expected in the classical sphere of space applications (telecommunications and navigation applications), where satellites could contribute further to the development of commercial information systems and networks (e.g. more broadband to rural areas, high definition and 3-D television via satellite, air traffic management). But in addition, several relatively new space systems could be moving from demonstrations to potentially routine systems for more countries. They include automatic identification systems (AIS) via satellite which allow countries to monitor ship traffic along their coasts, and space situational awareness, which serves to track the trajectories of operational satellites and large space debris in orbit.

Country share in space-related patents, 2000-08

Patent applications filed under the Patent Co-operation Treaty by priority date and applicant's country



Source: OECD Patents database, 2010

Space activities and returns on investments...

The investments in space programmes are often justified by the scientific, technological, industrial and security capabilities they bring. But these investments can also provide interesting socio-economic returns such as increased industrial activity, and bring cost efficiencies and productivity gains to other fields (e.g. weather forecasting, telemedicine, environmental monitoring and agriculture provisions).

- In a majority of countries, space programmes are contracted out to national industry. Although possible economic impacts may vary depending on the country and the level of its specialisation (e.g. applications versus manufacturing), documentation of positive industrial returns from institutional investments are growing. Norway, which has a small but active space programme, has detected a positive multiplier effect since the 1990s, i.e. the Norwegian space sector companies have on average generated turnover well in excess of the support provided by the European Space Agency (ESA) or the national investment, usually as new exports or new activities outside the space sector. In 2009, 1 million kroner invested provided a return of some 4.7 million. In Denmark too, each million euro of Danish contributions to ESA has generated a turnover of EUR 3.7 million on average. In the United Kingdom, the space industry's value-added multiplier has been estimated to be 1.91. Finally, the most recent Federal Aviation Administration (FAA) study on the economic impacts of the US commercial space activities has also shown a rather stable multiplier ratio since 2002. In 2009, for every dollar spent in commercial space transportation industry, USD 4.9 resulted in indirect and induced economic impact.

- Earth observation data and geopositioning products are benefitting an increasingly large number of sectors, via cost efficiencies and productivity gains. Weather prediction, which relies particularly on meteorological satellite coverage, has become a routine service for citizens, companies and governments alike. In economic terms, a recent study in the United States estimated that the benefit of the investment in public weather forecasts and warnings represents annually about USD 31.5 billion, compared to the USD 5.1 billion cost of generating the information. Adequate irrigation is also essential to improve food productivity in many regions, especially as water is becoming scarcer. In India, under the 'Rajiv Gandhi National Drinking Water Mission' of the Ministry of Rural Development, Indian satellite remote sensing technology is already used for preparing groundwater maps in ten states. Since the success rate of bore wells has already reached around 90% in these states, the project has been extended to cover the entire country.

Outlook for the space economy...

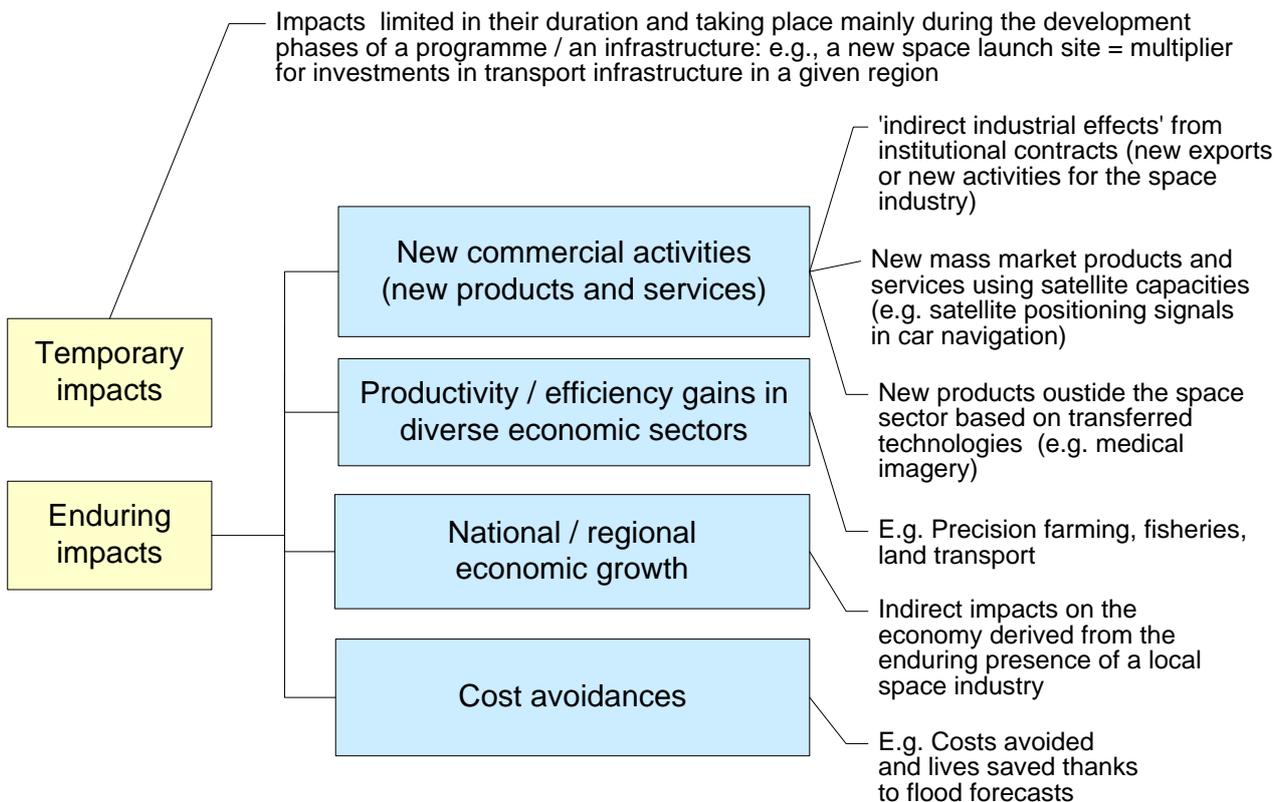
Societal challenges – such as the environment, the use of natural resources, the increasing mobility of people and goods, growing security threats, and the move towards the information society – are intensifying in both OECD and non-OECD countries. In parallel, a number of countries are rapidly emerging as new actors in the world’s economy, with ambitions to develop further their science and technological capabilities, including via the development of indigenous space programme.

In that context, although current economic conditions will probably affect selected countries (which may see their institutional space budgets reduced at least in the short term), two key factors point to further growth in the space economy: the ongoing globalisation of space activities (more actors with more budgets), as well as the growing importance of space applications in decision makers’ portfolio to meet key societal challenges.

TACKLING SOCIETY’S CHALLENGES WITH SPACE APPLICATIONS:

- **Space Technologies and Food Security** (upcoming 2011): Second OECD publication on the value chains and socio-economic contributions derived from the use of innovative space applications (e.g. monitoring crops from space);
- **Space Technologies and Climate Change: Prospects and Implications for Water management, Marine Resources and Maritime Transport** (2008): OECD publication which provides findings on the socio-economic contributions that may be derived from the use of space applications, with an extensive review of existing assessing methodologies.

Review of possible impacts derived from investments in space programme



<p>For more information on the OECD IFP Space Forum: Contact : Claire Jolly, Claire.Jolly@oecd.org Tel : +33 1 45 24 80 26</p>	<p>Website: www.oecd.org/futures/space Date of brochure: 23 May 2011</p>
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