



INTERNATIONAL FUTURES PROGRAMME

OECD Global Forum on Space Economics

Descriptive Overview

March 2007

This paper describes the key attributes of the OECD Global Forum on Space Economics for potential participation of new actors.



OECD GLOBAL FORUM ON SPACE ECONOMICS

Within the framework of its International Futures Programme (IFP), the Organisation for Economic Co-operation and Development (OECD) is hosting a new platform for international dialogue on the social and economic aspects of space infrastructure and space-based applications: the OECD Global Forum on Space Economics.

WHY AN OECD GLOBAL FORUM ON SPACE ECONOMICS?

Mankind is facing a daunting array of challenges in the coming decades, ranging from climate change and over-exploitation of natural resources to growing security concerns, and problems of adequate health and education provision.

Space applications have the potential to play an important role in meeting these challenges and to make a significant contribution to the generation of economic, social and environmental benefits world-wide, provided certain obstacles in the framework conditions in which they operate (regulatory, institutional, economic) can be addressed satisfactorily. The uniqueness of some space capabilities already brings important societal benefits, such as in the case of meteorology, where satellite data provides key information for helping individuals, public administrations and businesses to cope better with natural hazards, such as hurricanes, and thus reduce loss of lives and property. But more economic benefits could potentially come. For example, according to the Tennessee Valley Authority in the United States, annual electricity costs would decline by at least USD 1 billion if the accuracy of weather forecasts was improved by one degree Fahrenheit.

In that context, improved framework conditions for space activities could result in additional economic growth for OECD and non-OECD economies alike. Useful research and dialogue to improve those general framework conditions could be conducted through an OECD Global Forum on Space Economics, focussed on the economic issues surrounding space activities.

WHY THE OECD?

The OECD Global Forum on Space Economics complements the existing institutional architecture (e.g. CEOS and United Nations COPUOS) by providing a focal point for addressing obstacles and incentives of an economic nature and share lessons-learned.

- The OECD has an *outstanding reputation as an international centre of economic analysis and policy debate*, not just in the macro-economic arena but in many industrial and service sectors and across almost all policy fields.
- Most of the *key players in the space sector are in the OECD area* and, through its outreach programme, the Organisation has good co-operative relations with many non-OECD countries who are space-faring nations -- such as Russia, China, India and Brazil.
- The OECD *advises its Member Countries* on a wide range of policy issues that have an important bearing on the future evolution of the space sector.
- The OECD has *considerable experience with this type of platform*, notably in the form of the highly successful Global Science Forum which was created in 1992 and provides a unique venue for consultations among scientists and policymakers in basic scientific research.
- Finally, within the OECD, the International Futures Programme (IFP) has completed a major two-year project on the future of the space sector, *The Commercialisation of Space and the Development of Space Infrastructure: The Role of Public and Private Actors*. The policy recommendations were published in the spring of 2005 as the OECD publication: *Space 2030: Tackling Society's Challenges*.



BUILDING ON THE FINDINGS OF THE OECD / IFP SPACE PROJECT

The OECD / IFP Space Project

The “Space Project” was conducted with the active participation of a Steering Group composed of twenty-five high-ranking experts and decision-makers from the public sector (e.g. space agencies) and corporations in space and non-space sectors. The Project was enriched by an important consultation process, which led to discussions and comments from more than a hundred experts, international organisations, private actors and users of space applications.

The end-result of this work (published in June 2005) allows decision-makers to take stock of the opportunities and challenges facing the space sector, particularly civilian applications, with a view to reaching a better understanding of the issues at stake and of the solutions that could be applied thereto. The Project dealt with issues at both national and international levels -- in order to ensure that the sector might contribute fully to the development of the economy and society at large.

The added-value of the project comes from the non-space and broad socio-economic demand oriented approach that was used to assess the opportunities for developing and maintaining a sustainable space infrastructure, rather than a "technology push" perspective that has often prevailed in the past. Moreover the OECD has no vested interest in the space sector.

Main conclusions and recommendations of the Space Project

The main conclusion of the Space Project is that the space applications, due to their unique characteristics (e.g. global vision of the world, dissemination of information over broad areas) have considerable potential to contribute effectively and in a sustainable manner to several long term and enduring challenges of the 21st century such as the environment, the utilisation of natural resources, the management of natural and technological disasters, international mobility, and the move to the knowledge society. However the sector faces hurdles (technological, economic, legal, regulatory and institutional) that require policy-makers to act so as to make sure that space-based services fully meet public and private user needs; and are made available in a consistent, sustainable and cost-effective manner.

The recommendations drafted on the basis of these findings are intended to provide a long-term, future-oriented framework, i.e. an overall, consistent set of broad policy orientations that can offer a useful framework for policy formulation. The recommendations are made from a broadly societal non-space perspective and focus mainly on user-oriented space activities that may contribute to social and economic development in OECD countries and beyond. They are therefore addressed to governments in general, rather than to the space community as such. More specifically, they are intended for ministries that have main responsibility for overall economic and social policies – including policies that may have a bearing on the performance of private space actors – as well as for user departments that can take advantage of space-based solutions for delivering their services to the general public.

In order to help decision-makers improve the situation for the future, three main blocks of detailed recommendations have been formulated that aim to implement a sustainable user-oriented space infrastructure (Block I), encourage the public use of this infrastructure (Block II), and encourage private sector participation (Block III). At the heart of many of the recommendations of the OECD Space project is the clear recognition that economic considerations will be instrumental in charting a successful way forward for the space sector and its contribution to meeting many of the world's challenges (see Annex 2 for more details on the recommendations).



WHAT ARE THE AIMS OF THE OECD GLOBAL FORUM ON SPACE ECONOMICS?

General purpose of the Space Forum

The purpose of the Space Forum is to build on the recommendations that emerged from the major two-year OECD/IFP project on the future of the space sector, and establish a platform for international discussion and co-operation on a wide range of key economic issues affecting the future development of space infrastructure and space-based applications.

Hence, the Forum will review the implementation of and promote the key Space Project recommendations on:

1. How to develop a sustainable space infrastructure;
2. How to foster the public use of space tools;
3. And how to encourage private sector participation.

Moreover, the Forum will contribute to dialogue and research into the economic dimensions of space-related activities, in response to new developments in technology and changing social needs.

- By *promoting an exchange of ideas and identifying key lessons-learned* that could benefit the different actors.
- By *reviewing best practices* both in the space sector and in other economic sectors, it would promote the use of economic information and analysis in the development of best policy options.

Preliminary themes for the Space Forum

Encompassed in the larger observation and research missions of the Forum, specific themes chosen by the participants will be addressed, in order to provide concrete outputs from the discussions. Based on comments received through the consultation process and including the Founders' Meeting held on October 27-28, 2005 at OECD Headquarters, and the 1st Meeting of the Steering Group on 16-17 February 2006, there are six modules that could be addressed in the framework of the Space Forum:

Module 1- Statistics

Module 2- Benefits

Module 3- Economic indicators

Module 4- Economic and business models

Module 5- Governance

Module 6- Legal/regulatory frameworks



➤ *Module 1 – Statistics*

Measurement and conceptual barriers remain when trying to assess the role of the space sector in the economy. Several national or regional organisations publish official statistics on space activities, while a number of consulting firms compile industry data. However, country comparisons are often difficult and industry definitions differ between organisations and between countries (i.e. most of the industrial classifications used by national statistical offices provide no breakdown for the space industry). The first step, in cooperation with the Forum members, would be to identify and analyse the specific needs of decision-makers in terms of statistical information about the space sector. A second step would focus on the determination of variables and the type of measurement scales that may be developed in order to manipulate the sets of different variables. In the final third step, the IFP team and the Forum members would discuss specific recommendations on the identified needs for statistical data and the measurement options.

➤ *Module 2 – Benefits*

Credible cost/benefit analyses in the space economy are not easy to make. It is very difficult to trace the economic benefits due directly to the utilization of space systems (e.g. ‘value’ of lives saved or property spared thanks to the timely availability of space data in cases of disaster, societal gains in remote areas that are attributable only to satellite communications). Space assets – although their role is essential at times – often represent only a small component of the entire socio-economic value chain of a product or a service.

Different methods have been used to assess the economic benefits of high tech activities. None has been recognized as providing the appropriate answers. Benefits can only be approached through a multi-faceted process including examination of direct and indirect benefits, spill-over-spin offs, economic and social returns, cluster effects, short and long term impacts, etc.

The Steering and Working Groups would aim at improving the understanding and knowledge of the potential and actual benefits of space based applications. This will require developing a sound methodological basis (for instance by taking stock of other similar OECD exercises) which can ultimately serve as a “template”. In the shorter term, identification and analysis of benefits will be an integral path of the case studies that the Steering and Working Groups will choose to review.

➤ *Module 3 – Economic and other kinds of indicators:*

The Space Forum could investigate the feasibility of developing a set of official and comparable statistics on the space sector and its contribution to economic activity. This would constitute a rather long process, involving broad cooperation with different OECD directorates and external public and private organisations, and it could notably build on the current efforts concerning the 2007 revision of the United Nations International Standard Industrial Classification (ISIC).

In the short and medium term, the economic indicators would be developed on a case study basis in order to both validate the methodological process and obtain some practical results quickly. Participants in the October 27-28, 2005 meeting expressed the need for a dynamic approach which would include sensitivity or impact analysis in case of disruptive technologies, important change in the cost of access to space, or wild cards.

The participants in the Steering and Working Groups may also wish to track the implementation of the OECD IFP Space 2030 report. Ultimately this process could take the form of indicators and in the medium term, with the help of participants, an update and review in selected OECD countries.



➤ **Module 4 - Economic and business models in selected space applications:**

The work conducted during the Space Project on specific space applications (e.g. risk and disaster management, space adventure and tourism) provided identification of main actors, system maps, prospects for the future and consideration of business and economic models.

Under the umbrella of the Forum, other promising applications out of the 14 which were initially identified could be reviewed with the same procedure.

Further analysis could also be envisaged to assess different contexts such as the case of stronger terrestrial competition, disruptive technologies, breakdowns of the value chain caused by innovations, or different types of interactions between public and private actors.

In particular, the impacts of public private partnerships (PPP) in the commercial space sector have not yet been fully analysed. PPPs might represent a useful tool to increase private involvement and investment in the development of space systems. Diverse approaches have been adopted in different OECD countries for major infrastructure projects in such areas as transport, energy and water. They could be analysed with a view to drawing pertinent lessons and identifying best practices for future partnerships in the space sector.

➤ **Module 5 – Governance: Provide key lessons learned in institutional mechanisms**

The OECD has specific competences in analysing institutional mechanisms in OECD and non-OECD governments and in different sectors. In that context, the Space Forum could provide the venue for some particularly innovative studies concerning the relations between a range of space and non-space actors.

Evaluation of institutional best practices: Illustrations could be chosen in different countries to reflect the types of institutional and organisational relations between users and providers of space infrastructure for each case study under review (e.g. using space assets in the case of flood management under different institutional arrangements). Based on the research conducted, an evolving matrix could be ultimately created to help identify the key features of such cooperation.

Thematic studies on space commercialisation: Several specific themes could be addressed with regards to commercialisation of the space sector. One theme could focus on the trends of privatisation of public space organisations and the lessons learned so far (e.g. 1980s and 1990s privatisations in the telecommunications sector) in comparison with other economic high tech and sensitive sectors. Another theme could focus on the study of the possible impacts of a high concentration of the space manufacturing and production industries.

Developing models of international cooperation: the Working Group could investigate international models of cooperation inside and outside the space sector and provide governance perspective on future large space cooperation ventures. Several existing models developed within the OECD or OECD family agencies could be usefully tested to see if they could help resolving some of space sector's specific difficulties (e.g. the OECD peer review process, the International Energy Agency mechanisms on strategic oil reserves, the Nuclear Energy Agency practices on safety issues, the Export Credit Arrangement hosted by OECD etc...).



➤ *Module 6 – Legal and regulatory frameworks*

The legal and regulatory framework determines the rules of the game according to which space actors operate. Some important work is already being conducted in different forums with regards to space law (e.g. UN COPUOS). However although a number of basic components of the legal framework are now in place at the international level and in some cases at the national level, many gaps remain. As a result, existing regimes are currently not very predictable or supportive of commercial space activities. In that context, the Space Forum could address, from an economic standpoint, specific legal and regulatory aspects that increasingly structure the development of space activities.

Three areas of interest were originally identified: exploring the economic implications of national space laws as a framework for commercial space activities, particularly where the most advanced space-faring nations would welcome transitional regulations that encourage innovation; investigating the economic significance of property rights in space for the same kind of innovations; assessing the possible harmonisation of some space related contractual arrangements. As a priority, the Forum's Working Group could look at issues at the crossroads between legal/regulatory issues on the one hand and other modules such as governance and international cooperation on the other. In this respect, the impact of general laws on the economic development of space activities could also be reviewed within the case study process.

CASE STUDIES

For the sake of practicability (optimisation of time and human capital, financial resources), it was deemed useful to start the Forum work by a review of a selection of case studies, which would then be assessed along the lines of all or some of the six modules mentioned above.

The objective of case studies is to test methodologies, transmit the findings to decision-makers, and have the outputs feed selectively and progressively into a possible future "OECD Space Economy in Figures" publication.

Five case studies had been put forward for discussion after the Forum's Founders Meeting:

- Disaster management (floods)
- Meteorology
- Supply chain security (tracking containers)
- Efficient land use (urban planning)
- Space exploration

During the first meeting of the Steering Group of the Space Forum, on February 16-17, 2006, an agreement emerged that the first case study would be "disaster management: flood", in the overall context of water management. In addition to earth observation issues, telecommunications and navigation will be included. Other case studies will be considered for work subsequently, and Steering Group and Working Group members will be able to propose new ones if they wish (potential participants have for e.g. mentioned commercial space access ventures and solar power satellites).



FORUM DELIVERABLES AND DISSEMINATION OF RESULTS

DOCUMENTS:

- Internal to the Forum

- Interim reports on progress of work in the different modules, as prioritised during the first Steering Group meeting in February 2006 (i.e. indicators, benefits, statistics)
- Interim reports on case studies
- Visualisation tools

- Publicly available

- Selective update of the main space project recommendations
- Inputs towards updated data and statistics on civil space based applications in OECD publications
- Dedicated OECD publications and small brochures (i.e. inspired by *OECD Scoreboard* and *OECD in Figures* booklets) reflecting ongoing work and results in the different modules (e.g. snapshots of space indicators)
- OECD publications reflecting findings from the case studies, once several case studies have been completed
- Policy Brief(s)

MEDIA:

- Presentation / Events to spread the Forum messages:

- Presentation of results by OECD IFP Secretariat in OECD Committees
- Presentation in international conferences, fora, intergovernmental organisations
- Dedicated event such as an OECD Forum for the Future conference
- Visit in capitals at the request of participants

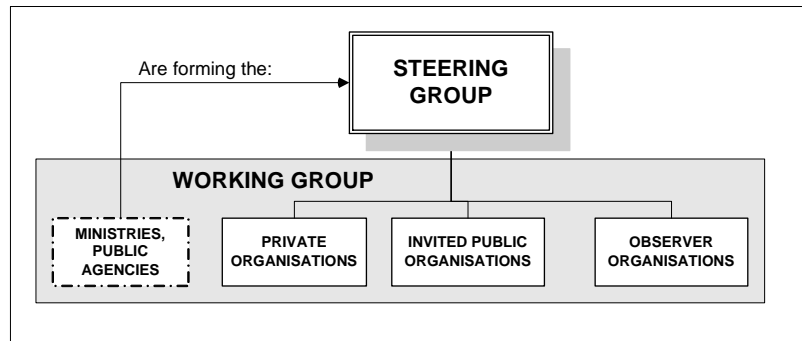
- Website

- On-line facilities on which Forum members can work

HOW DOES THE OECD GLOBAL FORUM ON SPACE ECONOMICS OPERATE?

The Global Forum on Space Economics (GFSE) is based on several successful OECD structures, whereas both public and private actors can actively participate in the activities.

Structure of the OECD Forum on Space Economics



The Steering Group: The Global Forum on Space Economics Steering Group provides advice to the OECD Secretariat and is composed of public actors, in line with the intergovernmental nature of OECD Forums.

- The Steering Group is made up of representatives of major public stakeholders, in particular space agencies, ministries of economy, departments which are users of space applications, organisations responsible for regulating space activities, and experts from space and non-space sectors in the OECD area.
- The main tasks of the Steering Group are to propose guidelines with respect to membership of the Steering Group and the Working Group, especially as concerns non-OECD economies. NGOs and IGOs, advise on the orientation for the work of the Forum, and consult with the Working Group on workplan, dates of meetings, budget and resources. It can also help give stronger exposure to WG's recommendations and liaise with other bodies.
- The Steering group would meet twice a year in plenary sessions.

Steering Group Members of the OECD Forum on Space Economics (February 2006)

The initial founders of the Forum are the British National Space Center, Canadian Space Agency, Centre National d'Etudes Spatiales, European Space Agency, National Oceanic and Atmospheric Administration, Norway Space Center, and the U.S. Geological Survey.

The Working Group:

- The Working Group is made up of participants from the public and the private sectors, who have agreed to actively participate in the activities and to share the funding of the Forum.
- The Working Group is expected to make proposals on priorities, work with the Project team on substantive matters, make suggestions to invite IGO's, NGO's and non-Member economies in compliance with the proposals of the Steering Group, produce working papers, guidelines, maps or roadmaps, and discuss recommendations.
- Participants in the Working Group may contribute proactively, e.g. by sending research or position papers to the IFP Project team, suggesting names of in-house experts able to deliver state of the art substantive or methodological contributions, and/or leading a focus group of the Working Group in



order to accomplish specific tasks or address particular problem-sets. One could also envisage nominating “lead” advisors on modules or part of the modules as well as on case studies.

- The Working Group will address: (1) statistics, (2) benefits; (2) economic indicators, (4) economic and business models, (5) governance (including international cooperation), and (6) legal / regulatory issues.
- The Working Group will meet twice a year in plenary sessions, back-to-back with the Steering Group Meeting.

The OECD IFP Project Team: The OECD team, as host to the Forum, supports the Steering Group and the Working Group with its technical analyses and studies. It pilots the work on the modules, in close cooperation with the participants. It may be supported by experts when necessary, from OECD (e.g. statisticians) or from outside OECD (e.g. economists from different sectors), for specific tasks.

Funding: The Space Forum is financed through voluntary contributions from government departments and agencies and through grants from the private sector. A difference in the scale/size of the financial contributions can be introduced (in the case of governments differentiating between G7 and non G7 countries for instance and in case of grants from the private sector depending upon the sales revenues).

Sunset clause: The Global Forum on Space Economics has been created for an initial period of three years under the umbrella of the OECD/IFP, after which its mandate will be reviewed.

WHAT ARE THE NEXT STEPS?

- 2 June 2006: 1st Meeting of the Working Group
- 29 September 2006: 2nd Meeting of the Working Group
- 22-23 March 2007: 2nd Meeting of the Steering Group and 3rd of the Working Group

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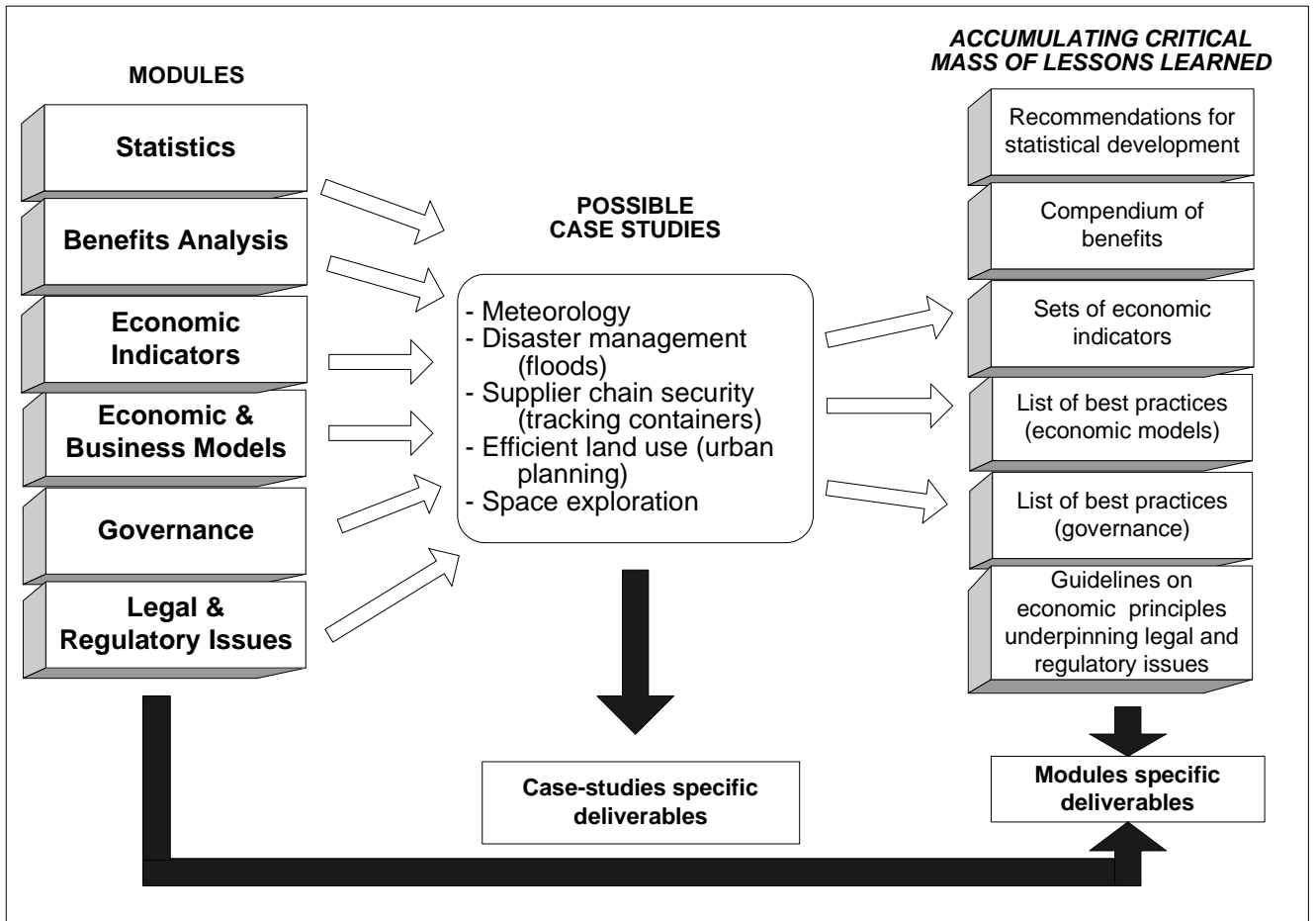
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**ANNEX 1
RELATIONS BETWEEN MODULES AND CASE STUDIES**





ANNEX 2 OVERVIEW OF THE SPACE PROJECT RECOMMENDATIONS

LESSONS-LEARNED DURING THE SPACE PROJECT

A number of important lessons have been learned throughout the OECD IFP Space Project, and it is upon those findings that recommendations have been formulated. Some of the main lessons are briefly presented below:

LESSON 1: Space assets contribute - thanks to their unique characteristics – in tackling major societal challenges – Based on the demand-oriented analysis conducted during the Space project, the first lesson learned is that space can indeed help decision-makers cope with a number of major societal challenges that will confront humankind in coming decades. These range from serious threats to the physical environment (climate change, growing pollution, depletion of natural resources and the impact of intensive agricultural practices) to major social challenges (evolution towards the knowledge society, increased mobility and rising concerns about security). For each of these challenges, it was found that space can make a useful contribution for both OECD and non-OECD countries.

LESSON 2: Space activities could face a rather promising future – The scenario-based analysis conducted during the Space Project provides rather encouraging prospects for the future of space activities in OECD and non-OECD countries. The longer-term future of the space sector seems promising over a broad range of global scenarios, when all main segments of the space sector (*i.e.* military space, civil space and commercial space) are taken into account. Depending on changing geopolitical contexts and policy orientations of governments, military and civil applications are pursued more or less significantly.

LESSON 3: Short- and medium-term fluctuations do impact space actors and limit the space infrastructure's effectiveness – This rather possible bright future is somewhat tempered by the third lesson which suggests that severe short- and medium-term fluctuations are likely to affect space actors, given the capital-intensive nature of space activities, the long lead times required for the development of space assets, the high risks of space ventures and the heavy involvement of the state in space activities. A clear distinction should be made between the upstream segment of the sector (space asset manufacturing and launching services) and the downstream segment (space applications). Typically, the downstream segment offers better prospects over the longer term than the upstream segment which suffers from a situation of chronic oversupply resulting largely from the desire of governments of space-faring nations to establish and maintain – for strategic and national sovereignty reasons – independent (if not guaranteed) access to space. However, while the downstream sector offers the best prospects overall, not all applications are equally promising over the long period considered. On the one hand, information-intensive applications such as satellite-based telecommunications, Earth observation and navigation have a bright future. On the other, the prospects of transport and space manufacturing-related applications are more uncertain, given the cost of access to space, which is unlikely to decline drastically over the next decades, and the complex technical problems of working in space.

LESSON 4: Public authorities have a key role in shaping the institutional, legal and regulatory regime for space activities – A fourth lesson deals with the key role of public authorities and framework conditions (*i.e.* the existing institutional, legal and regulatory regime) they set up for the space sector. While it was found that the role of government is essential for the development of space activities, the conditions under which public authority is exercised today is far from ideal.

- First, there are a number of uncertainties on the institutional front in many OECD countries regarding how the different public and private space actors are positioned to discharge their responsibilities, the relationships that obtain among them and the incentives in place that shape their behaviour.



- A second set of issues relates to the rules of the game (*i.e.* legal and regulatory framework) that space actors have to abide by. Some limitations facing space actors result from (1) the lack of national laws in a number of space-faring countries; (2) the fact that some existing space-related laws are not business-friendly; (3) the fact that in many applications, success or failure depends on the application of laws beyond space laws (*e.g.* liability, copyright); (4) the fact that the international space law regime is not very well-suited to business, with a limited application of World Trade Organisation discipline to trade in space goods and services; and (5) some regulatory issues raised by the allocation of geostationary orbit and frequencies.
- Finally, it was noted that although some space ventures have attracted a lot of public interest, there is a lack of awareness in the general population of the concrete contribution that space can make to society at large, with adverse consequences for the political decision process. As a result, decisions regarding space are not always taken with a full understanding of the issues at hand. Moreover, the lack of attractiveness of space-related careers is a source of concern for the future of the sector. There is a danger that the knowledge and expertise accumulated over decades may be lost in the coming years if too few students are attracted to careers in the space sector.

THE SPACE PROJECT RECOMMENDATIONS

The recommendations drafted on the basis of these findings are intended to provide an overall, consistent set of broad policy orientations that can offer a useful framework for policy formulation. The recommendations take the perspective of society in general rather than that of the space sector. Hence, they address governments rather than the space community as such. More specifically, they are intended for ministries with responsibility for overall economic and social policies that may bear on the performance of private space actors, as well as for user departments that might take advantage of space-based solutions for delivering their services to the general public.

The actions are proposed for the short to medium term, even though the project has looked at the space sector from a long-term perspective throughout. Essentially, the Space Project provides recommendations that decision-makers are advised to consider in order to take advantage of space infrastructure's societal benefits and derived economic growth. The policy measures concern (1) the provision of a sustainable space infrastructure, (2) the need to foster public use of space tools, and (3) the encouragement of private sector participation.

Block 1: Implement a sustainable space infrastructure – The existence of an efficient, robust and sustainable infrastructure is essential for the smooth operation of modern economies. As eloquently illustrated when major failures occur, the world depends on the discreet, but ubiquitous, presence of such infrastructures as communication or electricity networks, as well as on their seamless and almost invisible – but essential – operation. The same is true of space. This means that developing such an infrastructure should be a major objective of public policy. The term “space infrastructure” is defined here as encompassing all space systems, whether public or private, that can be used to deliver space-based services. These include space segments as well as ground segments. Two sets regrouping specific recommendations to foster the development of a sustainable space infrastructure are presented:

- The first set focuses on that part of the space infrastructure that is directly “user-oriented”, *i.e.* designed to provide services to society at large; these currently include communications, navigation and Earth observation services.
- A second set provides measures to strengthen the underlying critical space transport and servicing infrastructure, which encompasses not only the facilities needed for launching payloads into space, and for eventually bringing them back to Earth, but also support functions, such as in-orbit servicing and the management of space debris.



Block 2: Encourage public use – Typically, governments are major users of infrastructure, whether they use public infrastructure to deliver services to citizens or whether they use private infrastructure as an input in their activities. In most cases, public services are financed by general taxes on the population at large and are provided free of charge or at marginal cost. Space infrastructures offer very attractive opportunities for pursuing a broad range of public missions in a cost-effective manner. In particular, space assets can help to provide solutions for long-term societal needs (*e.g.* environment, disaster relief, remedying the digital divide). Unfortunately, such opportunities may not be fully exploited for a variety of reasons, ranging from lack of information to technical problems, or the existence of bureaucratic rules that prevent the effective use of the infrastructures. Hence, a systematic approach to foster public use is needed that fully takes into account all major impediments. Two sets of recommendations are presented.

- The first set focuses on actions that governments can take at national level. The main thrust is on measures designed to strengthen co-operation between user ministries and space agencies to foster the effective generation and use of space-based data and to facilitate transactions between suppliers and public users of space-based services.
- The second set addresses actions that governments can take at international level to take better advantage of the ubiquity that space-based services offer. These recommendations include a broad grouping of public initiatives, ranging from risk prevention, emergency support and assistance to developing countries in the management of their resources, to the monitoring of the effective application of international treaties.

Block 3. Encourage private sector participation – While space activities were essentially public at the beginning of the space age, the role of private actors has been on the rise. They have been able to exploit successfully, in some markets, technologies that were originally developed in co-operation with or for the public sector, as in the case of telecommunication satellites. Moreover, the end of the cold war created an environment more conducive to the commercial exploitation of space. In a more open world, space firms have been able to restructure and form new alliances, and the opening of markets has benefited important segments of the industry. These commercial developments have often opened the door for more cost-effective ways to address important societal issues using space technologies (*e.g.* telecommunications networks in remote areas, Earth observation high-resolution data for disaster management). Despite such progress, the development of commercial space remains fragile. The upstream segment of the industry (*i.e.* space asset manufacturing and launching services) continues to face high costs and remains very dependent on governments, while the development of the downstream segment (*i.e.* space applications such as satellite communications services, Earth observation services and satellite-based navigation services) is uneven. To overcome some of these weaknesses, governments need to take action so as to ensure that private actors are in an optimal position to develop innovative applications that contribute fully to the economy and society at large. Moreover, governments should take full advantage of the expertise and resources of private space actors for the development and operation of space infrastructure. In this regard, three sets of recommendations are presented:

- The first set provides measures for creating a more supportive legal and regulatory environment.
- The second gives recommendations for strengthening the private provision of space goods and services.
- The third one gives leads for the development of a more supportive international business environment.



‘SPACE PROJECT’ List of Recommendations

BLOCK I - IMPLEMENT A SUSTAINABLE SPACE INFRASTRUCTURE

Pillar 1: Implement a sustainable user-oriented space infrastructure

- Recommendation 1.1 – Foster the development of a more effective Earth Observation infrastructure that allows for greater participation by both public and private actors
- Recommendation 1.2 – Foster the development of an effective and sustainable satellite navigation infrastructure, fully suitable for public and commercial applications
- Recommendation 1.3 – Encourage the further development of communications satellite infrastructure, suitable for meeting effectively both public and private needs

Pillar 2: Develop and maintain cost-efficient space transport and servicing infrastructure

- Recommendation 2.1 – Encourage long term R&D targeted to reducing the cost of access to space
- Recommendation 2.2 – **Special Focus** Encourage international cooperation for conducting pre-competitive R&D work to reduce the cost of access to space
- Recommendation 2.3 – Review ‘access to space’ policy to reduce redundancy
- Recommendation 2.4 **Special Focus** – Encourage long-term efforts in developing a sustainable in-orbit servicing infrastructure

BLOCK II - ENCOURAGE PUBLIC USE

Pillar 3: Encourage public use at national level

- Recommendation 3.1 – Create mechanisms for the effective generation and use of space-based data
- Recommendation 3.2 **Special Focus** – Strengthen cooperation between user ministries and space agencies

Pillar 4: Encourage public use at international level

- Recommendation 4.1 – Encourage the use of space applications for global disaster prevention and emergency management purposes
- Recommendation 4.2 – Encourage the use of space applications for monitoring international treaties
- Recommendation 4.3 **Special Focus** Encourage the use of space applications to foster social and economic development in low-income countries

BLOCK III - ENCOURAGE PRIVATE SECTOR PARTICIPATION

Pillar 5: Create a supportive legal and regulatory environment for commercial activities

- Recommendation 5.1 – Develop national space laws when none exists, or complement existing ones
- Recommendation 5.2 – Make existing domestic space laws and regulations more business-friendly
- Recommendation 5.3 – Adapt international space laws to business needs
- Recommendation 5.4 **Special Focus** – Review the application of general laws and their impacts on the development of space applications

Pillar 6: Strengthen private provision of space goods and services

- Recommendation 6.1 – Foster public procurement from the private sector
- Recommendation 6.2 – Privatise commercially viable business-oriented government activities
- Recommendation 6.3 **Special Focus** – Encourage entrepreneurship and innovation

Pillar 7: Foster a more supportive international business and finance environment

- Recommendation 7.1 – Extend free trade discipline to open up markets
- Recommendation 7.2 – Encourage international standards
- Recommendation 7.3 – Improve the allocation of spectrum and orbital positions
- Recommendation 7.4 – Encourage the private financing of space activities