THE **SPACE ECONOMY** INITIATIVE

KICK-OFF WEBINAR **SUMMARY REPORT**

June 15, 2020

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INTRODUCING
SPACE ECONOMY

The level of global political and economic capital being invested in space is higher than ever. Estimates indicate the global space economy grew to $ 414,75 billion in 2018. Space and satellite technology are pillars of modern society. They provide policymakers with invaluable data and information, helping make effective fact-based decisions across a range of policy areas – from urbanisation to national crisis response, with the COVID-19 pandemic being the most recent example of 'space-enabled' policy decisions being made at scale.

Expanding the global space economy, responsibly and sustainably, is a fundamental driver behind efforts to bring the benefits of space to everyone, everywhere. Further, these developments can support countries in efforts to 'build back better' using space services to face policy challenges, while contributing to innovation, job and revenue creation.

Around the world, many space activities at the national level include a role for a publicly funded 'space agency' or similar institution. This central public entity is often also part of a much broader stakeholder ecosystem including both private and other public sector entities, all contributing to the national space sector. Moreover, to truly identify and realise the socio-economic benefits of a strong space sector, we must look beyond just the immediate context; from agriculture to finance, from education to transport, space is making tangible contributions across a huge range of fields.

At the United Nations Office for Outer Space Affairs (UNOOSA), 'Space Economy' is a concept that captures, in the broadest sense, the role space is playing to support sustainable socio-economic development. Unpacking such a complex picture is what we aim to achieve with the Space Economy Initiative. We seek to spotlight insights, success stories and experiences from across the international space community. We want to identify the key elements of growing healthy, prosperous space economies and then share such building blocks with all stakeholders pursuing responsible and sustainable space economy growth.

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SPACE ECONOMY
WEBINAR SERIES

To unpack how different countries are strengthening their respective space sectors UNOOSA has established a webinar 'space economy' series to bring together space economy experts from across the international space community.

The sessions are designed to tackle this complex subject by focussing on some of the more fundamental elements of a healthy space economy. For example, we will provide a platform to share insights from commercial space entities on how to go from the 'start-up' phase to being well-established. Further, we will look at financing space activities, exploring success stories on how mixed public-private funding models are helping space economies thrive. The series will touch upon the nexus between government, industry and academia, and how to leverage this nexus to maximise innovation and growth in the space economy. We will also look at what this all means outside the immediate domestic context and the link between growing space economies at the national level and supporting responsible and sustainable space activities at the international level.

All these considerations will be taken in the context of the current developments with regards to how space economy can play a key role in supporting socio-economic development, as countries build-back-better in response to the COVID-19 crisis.

The series is composed of topic-specific sessions, touching upon the elements below:

- **Introducing 'Space Economy'**
- **Making the Case for Space:** building the policy case, public support and initial investment.
- **Scaling-Up**: Success stories from the scale-up to established phase.
- **Access to finance:** building a sustainable financial system for space
- **International cooperation to grow responsible and sustainable space activities**: bringing the international normative framework into the domestic context.
- **Innovation and growth in the Space ecosystem:** the nexus between government, industry and universities.
- **Using space to building back better:** supporting countries post-COVID 19 recoveries.

During the series UNOOSA collates the experiences being shared by experts, to build insights of 'what works' with regards to building strong, responsible and sustainable space economies.

These success stories will play a key role towards publishing a set of 'building blocks' that can be used as a reference point in support of further growth in the global space economy and how this growth can help bring the benefits of space to everyone, everywhere. The following section includes the summary reports of each webinar, with "Introducing Space Economy" being the first one.

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SUMMARY REPORT
KICK OFF WEBINAR
June 15, 2020

This summary report captures the insights made during our first session with space economy experts. The key aims of the opening session were to establish the general tone of the Space Economy series as a dialogue with both private sector and public sector to provide a platform for success stories from both a commercial and public policy point of view. Further, the identification of key challenges of common interest across countries and markets will be a focus.

Finally, the kick-off session aimed to start breaking down the issue, including the definition of terms and signposting the issues to be included in deep-dive sessions that will form the rest of the webinar series.

More than 250 participants registered for the event and over 100 questions were submitted to the experts to help them tailor their remarks before the session. Areas of commonality emerging indicated a keen interest in understanding what elements are most important to keep in mind when starting space activities. Interest in exploring the role of universities and other educational institutes was also evident in these pre-registration questions.

The recording of the kick-off webinar is available on oosa.org and can be viewed here.

SPEAKERS

Space Economy experts from across the international space sector were divided into two speakers' groups. The first gave remarks in the context of a 'space economy overview', with the second group shifting to a more 'space economy in practice' focus.

- *Mr Naser Al Rashedi,* ***United Arab Emirates Space Agency***
- *Mr Andrea Sommariva,* ***SDA Bocconi School of Management, Milan, Italy***
- *Ms. Nathalie Ricard,* ***UNOOSA, Space Applications Section***

- *Mr Chris Blackerby,* ***Astroscale***
- *Mr Damrongrit Niammuad,* ***Geo-Informatics & Space Technology Development Agency, Thailand***
- *Mr Luigi Scatteia,* ***PricewaterhouseCoopers, Space Practice***

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INSIGHTS

Director Simonetta Di Pippo

United Nations Office for Outer Space Affairs

The kick-off webinar opened with remarks from Ms Simonetta Di Pippo, Director of UNOOSA. Director Di Pippo noted that many countries have at the centre of their space ecosystem a publically-funded space agency as well as stakeholders such as companies and universities. Understanding the space economy is a two-way street: how can the space sector help the wider social-economic sectors, and how can those sectors support the space economy itself?

Further remarks noted that space activities were previously only carried out by governments because they were risky and expensive, but the pendulum is now swinging to public and private players and academia who are contributing to the space economy.

The global space economy is also growing substantially. Public and private investors have been funding space start-ups at an increasing rate. Half of the satellites launched in 2017 were non-governmental. This simple fact underlines that a multi-stakeholder approach is required to have a healthy and sustainable space economy. This is key to unlocking the potential of space to support socio-economic development across the board. With 40% of the targets underpinning the SDGs benefiting from space technologies, this is a clear indication of how important a healthy, dynamic space sector is.

Finally, it was underlined that, in the post-covid-19 phase, we need to look ahead to build back better, moving away from harmful practices for health, agriculture, the environment, and to use space technologies to their maximum potential.

UNOOSA's Space Economy initiative, with support from the international community, aims to be the accelerator to supporting countries grow healthy and sustainable space economies that can play a key role in global efforts to build back better.

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'Space Economy Overview' Expert Group

Mr Naser Al Rashedi

United Arab Emirates Space Agency

Naser Al Rashedi is Director of Space Policy and Regulations at the UAE Space Agency. This role His current role includes developing and maintaining national policy, strategy and regulations for the UAE space sector. He represents the UAE at the UN Committee of the Peaceful Uses of Outer Space, in Vienna and has extensive experience working in the international space sector, including roles representing the UAE at ITU meetings. Naser holds B.S. Degree in Electrical Engineering from the University of Southern California, as well as postgraduate Executive Master's degree in international Negotiation and Policy-Making from the Geneva Institute for Graduate Studies.

The term "space economy" is an umbrella concept that covers not only tech industries, but all industries which have a link to space economy. In the United Arab Emirates (UAE) context, national space strategies are founded on concepts of "sustainability" and "partnerships".

The UAE space agency looks at the term sustainability as being divided into three dimensions:

- Sustainability of Earth – primarily related to the SDGs;
- Sustainability of Space – debris, space traffic management;
- Sustainability of the space program itself – how can we ensure that the UAE space economy continues to grow.

Mr Al Rashedi explains the UAE approach towards a sustainable Space Economy. Many elements were outlined as part of the UAE space strategy: UAE space agency, 52 entities working on space economy, including areas related to space law, strategy, policy; an astronaut program and many space projects; three universities providing space education and specialised research centres. These are only a few of the components surrounding the UAE's space sector.

The national space strategy of the UAE has a clear vision between now and 2030 to become one of the most pioneering and advanced countries in the field of space. The space strategy includes 6 goals: competitive space services, advance R&D, inspire exploration missions as well as fostering space culture, create partnerships and enabling infrastructures.

The clear interest from the private sector was highlighted. Space investment around the world indicates that 534 venture capital funds have invested in space since 2009. The number has increased sharply since 2016-2017. Private investment has occurred in more than 412 space companies between 2009-2018 representing more than $18 billion.

Recently, the UAE space agency surveyed to assess the impact of space policy on UAE space sector. The survey found that almost 84% of the expenditure on space in the UAE comes from the private sector;

and more than 50 entities in UAE work on space economy with 17 sectors benefitting from UAE space products.

Looking ahead, the UAE Space Investment Promotion Plan includes 2 pillars. The first focusing on how to create an attractive environment. The second, how to create an investment vehicle and the needed supported entities to foster entrepreneurship the Agency has developed incubation and acceleration programmes, which have seen already several start-ups being graduated.

Finally, as part of its efforts to step up space activities, the UAE adopted a robust and comprehensive national space law and launched an Arab Space Cooperation Group that include 11 countries and aims at exchanging knowledge and working on joint practices while boosting the Arab space industry.

Slides used during remarks can be found here.

Mr Andrea Sommariva

SDA Bocconi School of Management, Milan, Italy

Andrea Sommariva is Associate Professor of Practice and director of the multidisciplinary research laboratory on the evolution of the space economy (SEE Lab) at the SDA Bocconi School of Management. He is an international economist specializing in international finance, the markets for oil and raw materials, renewable energy, and the development of the space economy. He is a member of the study group "Space Mineral Resources - Challenges and Opportunities" of the International Academy of Astronautics.

The space economy definition from OECD speaks to "the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilizing space"[1]. SDA Bocconi starts the economic analysis of the space economy from two pillars of modern economic science:

- Higher living standards are reached and productivity increases. Knowledge and technical innovation are fundamental elements for this to happen.
- Technology advances if scientific institutions are involved.

Knowledge sharing and management are fundamental for innovation and SDA Bocconi highlights the different phases of economic development. Governments have a central role through funding research and facilitating academic collaboration with research centres, industry and financial entities. This allows the identification of valuable commercial opportunities, and in the end, venture capital funds and business angels play a key role to bring the products and companies to the market.

SDA Bocconi further underlines the importance of a transition toward sustainability and how space technologies play a role in sustainable development. They are conducting a research in this area on the

[1] OECD 2018 report

effects of the use of satellite services (Earth observation, navigation, meteorology) in agriculture, transportation and logistics, energy, and other private sectors, with precision farming's research being quite advanced. The use of space technologies to look at optimized use of fertilizer, irrigation, etc. has shown an increase in the quality of products. Moving forward, SDA Bocconi will extend its analysis to other sectors such as energy, transport and logistics, banking and insurance.

SDA Bocconi finally noted that national and international space governance is important to maintain a sustainable space economy and need to be up to speed with the evolution of the sector.

Slides used during remarks can be found here.

Ms Nathalie Ricard,

UNOOSA, Space Applications Section

Nathalie joined the United Nations Office for Outer Space Affairs in January 2020, after working on satellite telecommunication and navigation services since 1999. She notably designed and developed services for aviation safety, first as Iris programme manager at the European Space Agency then as a service engineering manager for EGNOS at the European GNSS Agency. She is a French aerospace engineer with a degree in business engineering and extensive experience in market studies of satellite communications.

Ms Nathalie Ricard's remarks focused on satellite communications, satellite navigation and Earth Observation. Looking at the development of the space economy of the past decades historically, satellite telecommunication has been the main market for most civil applications of the space industry – specifically TV, and later internet access.

Back in the 1990s, the satellite industry started to look at the provision of internet access via satellite constellations. Some efforts were made, but they were difficult endeavours to pursue and were not successful. The second wave of satellite constellations only became possible once new space actors emerged about 10 years ago, secured the availability of funding and developed technology for smaller satellites and user terminals. Ms Ricard highlighted that some of the key factors underpinning this uptick in the successful realization of space economy growth include public-private partnerships and reduced costs of launches.

Secondly, it was explained how satellite navigation started as government projects, with GPS and GLONASS, and other regions of the world developing their constellation or their regional system. The space infrastructure has remained government-funded whereas the downstream markets for user receivers and applications have been private (e.g. navigation application that we are using daily). Attempts at Public-Private Partnership have been tried for a Global Navigation Satellite Systems (GNSS) infrastructure, but this has proven a challenging area and efforts came back to an institutional initiative. Four core constellations, plus several regional systems and augmentation systems are now available.

Last, the focus shifted to Earth Observations (EO), which have been historically dominated by institutional programs with large satellites owned by government space agencies. Development of new technologies for smaller satellites, coupled with a strong demand for satellite imagery and lower cost of launchers, motivated a strong growth in the sector in the last 15 years and emergence of private actors. A recent example of the importance and growth of this area is the increasing demand for satellite imagery to assess the impact of the Covid-19 crisis on the economy in real-time.

Growth in the global downstream market for the three main space application markets has been fuelled by the shift from just providing data to developing user-centred value-added services. This has enabled the emergence of a wide range of private sector-led, commercial services.

Slides used during remarks can be found here.

Space Economy in Practice' Expert Group

Mr Chris Blackerby,

Astroscale

Chris is Astroscale's Chief Operating Officer and Director, Japan office. Chris joined Astroscale in August 2017 having previously served as the NASA Attaché for Asia, the senior space policy official in the US. Embassy Tokyo, from 2012-2017. In that capacity he identified multiple opportunities for cooperation in the region; served as strategic space advisor to the US Ambassador to Japan and senior US Government officials; acted as an official intermediary between NASA and its partners in Asia in negotiating agreements and resolving disputes, and participated in numerous outreach events highlighting NASA activities.

Astroscale is a start-up focused on the sustainability of the orbital environment. Since 2013, the company has established locations in Singapore, Japan, UK, US and Israel. The company focuses on on-orbit servicing and sustainability across orbits. The company was originally focused on Lower Earth Orbit (LEO) but has expanded to Geostationary Orbit as well. They provide end-of-life service for satellites, active debris removal, in-situ Space Situational Awareness and life extension services.

Three main aspects have been central to achieving the objectives of Astroscale: develop the technology, identify a robust business case, and finally inform international and domestic policies to support growth. These elements must go hand in hand.

As space 'start-up' several reflections can be drawn from Astroscale's experience in the process of transitioning from start-up to established entity. In simple terms these experiences can break down into the following areas:

- **Secure financing** is the first essential step. A creative and diverse approach is needed to access finance (sponsorships, grants, loans, etc.)
- **Pursue an inspirational mission** to build a strong team and attract talent to the company.
- **Actively engage in public outreach**. Global citizens need to understand how they are impacted every day by space and companies need to craft their messages to convey information.
- **Connect with domestic stakeholders** (governments, agencies) **and local investors**. Space is not truly a commercial market yet. Government investment and support is a necessary ingredient for success as well as identifying priority areas for stakeholders.
- **Develop an international presence**. Space policies and standards are inherently international, and business is global.
- **Articulate a clear business case.** The technology is essential but economic, finance and strategic business expertise are needed to develop a good business case.
- **Prioritize internal processes and management of the team**. It is important to maintain strong internal communication and implement global standards while also allow for regional autonomy.

Slides used during remarks can be found here.

Mr Damrongrit Niammuad,

Geo-Informatics and Space Technology Development Agency, (GISTDA), Thailand

As an Executive at the policy level, Damrongrit is responsible for innovation development consisting of human resource development in technological science at GISTDA. Research and innovation development among international scholar networks, space technology infrastructure and planning of a platform for technological linkage with society, environment and economy to respond to national and international policies. Damrongrit, as a director of Space Krenovation Park in Chon Buri Province, adds value to products in related businesses such as aerospace industry, and development and awareness of potential geoinformatics and space technology under the Association of Southeast Asian Nations (ASEAN). Promoting capacity building via ARTSA centre as the current executive officer, the academic activities include training courses, workshops, short courses, degree programs and exchange programs, enhancing academic connectivity all over the ASEAN region and the world.

GISTDA is the Thai government agency dealing with space technology and how space technology will be used across the public sector. During his remarks, Mr Niammuad outlined that one of the main objectives of GISTDA is to explore how space economies can be grown and used in Thailand and across Southeast Asia.

It was noted that the space industry in Thailand is balanced towards the downstream space economy rather than the upstream or manufacturing-based economy. Research from 2018 has been undertaken to measure the size of the Thai space industry. This research looked at attaching a figure to both the economic and societal impact of space on Thailand, with results putting a total value of this impact at around $1B (USD).

The aerospace industry ecosystem in Thailand centres around two main sectors – manufacturing and services. The government focus on supporting space economic growth tends to swing towards policy, standard-setting, R&D, and international collaborations. This is complemented by a private-sector emphasis that tends to cover aerospace manufacturing, aerospace applications such as EO and GNSS, and development processes such as training and standardization. Together, these two emphases of the public and private sides of the space economy work in collaboration to drive forward a dynamic and healthy space economy.

Slides used during remarks can be found here

Mr Luigi Scatteia,

PricewaterhouseCoopers, Space Practice

Luigi, Partner at PwC's Space Practice with 18+ years of industry experience leading a unique specialised strategy and policy team dedicated to the Space sector, with business, high-level technical and legal functional reach.

The Space Practice team has a reach into space downstream through an internal PwC Data Analytics team for additional technical support, with an expanding focus towards the impact of spatial data in the overall wider space economy, and towards emerging business models in data analytics and data fusion. The team serves as core global hub for the PwC Space Practice.

PricewaterhouseCoopers (PwC) through its dedicated Space Practice, serves both the commercial and institutional international space markets. The Space Practice team works through assignments to support space economic growth for public and private entities. The range of clients is large, having supported for example the European Commission, the European GSA agenda, and ESA in economics, policy, strategy and regulation.

The importance of quantifying the role of space is also crucial. Accordingly, the Space Practice has developed a 'Data Lab' that uses space data to generate reports and frame insights to guide decision-makers.

Through PwC's experience working with the global space sector, it is clear that the sector is diverse and is driven by many dynamics that go beyond traditional market forces. The global space sector can be broken down into multiple domains. Each domain has a unique set of different trends and specificities. Further specific characteristics of working in the space economy include a need to recognise the impact of an evolving regulatory and policy environment at national, regional and international levels. The significant reach space has into other industrial sectors, compounded by a considerably wide societal and economic impacts of space, all add to the complexity of the situation.

For example, societal and economic impacts of space are vast and far-reaching for many space domains, hence the importance of developing a healthy space economy. Indeed, the value that investing in space can bring to the wider socio-economic domain is huge.

Mr Scatteia noted how recent trends in space have lowered the barriers to entry for new countries to develop a space economy. In general terms these global trends driving down entry costs can be broken down into three areas; moving away from a government-owned sector to commercialization; shifting from prolonged project development from specific countries towards access to space for all, and finally towards the democratization of access to space data.

PwC underlined how having worked with a wide range of clients, several common elements are emerging that can prove fundamental to creating a healthy and prosperous space economy. These include the need for a well-established national space strategy and a clear road-map to support its implementation over the long-term. Next, a governance framework of policies, regulations and legislation that is fit for purpose to support growth. Typically, such a framework is reinforced by a strong and open relationship between government and industry. Further, awareness-raising and outreach on the space economy and the value represented by a healthy space sector. Finally, enhancing the capacity to engage in space economic activities through capacity building and involvement of stakeholders is also crucial.

Slides used during remarks can be found here

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CONCLUSION and **NEXT STEPS**

The kick-off webinar beings an exploration of the core of the Space Economy. It showed us the variety of realities, trends and elements that surround this concept. From theory to practice, the kick-off session brought together the insights of governmental agencies, academic institutions, the private sector and the United Nations.

Sustainability, partnerships, knowledge-sharing and socio-economic development over the long-term emerged as keywords. The need for clear visions for growth was also made readily apparent. Firm stakeholders committed to supporting space economy growth is fundamental; building a healthy, dynamic space economy that can deliver wider socio-benefits takes time.

Ensuring that citizens are well informed on how space affects and improves their everyday life is also a crucial element in the foundation of a strong space economy. Engaging in public outreach is thus necessary to ensure support to continue developing space activities, both public and commercial. Understanding how to identify, measure, track and present the economic impact of space growth, both for the immediate space sector and wider non-space sectors is also pivotal.

All this takes place in a unique sector, one that has not yet matured into a true commercial market remains intimately connected to trends in technology innovation and policy developments. In this context, successful partnerships between governments, industry and academia at both the national and international level remain a pivotal factor for healthy, responsible and sustainable space economies. UNOOSA, with its unique convening power, brings these actors together for a more solid, productive and long-lasting collaboration for the benefit of everyone, everywhere.

Sustainability, partnerships, knowledge-sharing and socio-economic development: over the long-term.

Delivering on these key points through the rest of the Space Economy webinar series, and beyond, neatly captures how UNOOSA will approach this initiative. For the next session, we will shift from the general to start breaking down this complex concept block by block. We will, therefore, focus on how to 'Make the Case for Space'. We will gather another group of space economy experts for a deep dive on this subject, to share experiences and lessons learnt about generating public support for space and securing initial investment in getting a space economy up and running.

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THANK YOU

The Kick-Off Space Economy webinar was made possible with time, support and expertise of our speakers; Mr Naser Al Rashedi, Mr Andrea Sommariva, Ms Nathalie Ricard, Mr Chris Blackerby, Mr Damrongrit Niammuad and Mr Luigi Scatteia.

Thank you to Ms Simonetta Di Pippo, Director of UNOOSA, for opening the webinar series. Heartfelt appreciation also to all UNOOSA colleagues who supported the launch of this initiative, including Julia Milton for her assistance in drafting this summary report.

Moving forward, the Space Economy Initiative aims to support healthy space economies in both theory and practice. For an initiative funded entirely by voluntary contributions, donor support is crucial to realising this vision. Should you be interested in contributing to this work to build responsible and dynamic space economies that accelerate sustainable socio-economic development, please get in touch with Ian Freeman at ian.freeman@un.org or Veronica Cesco at veronica.cesco@un.org.