

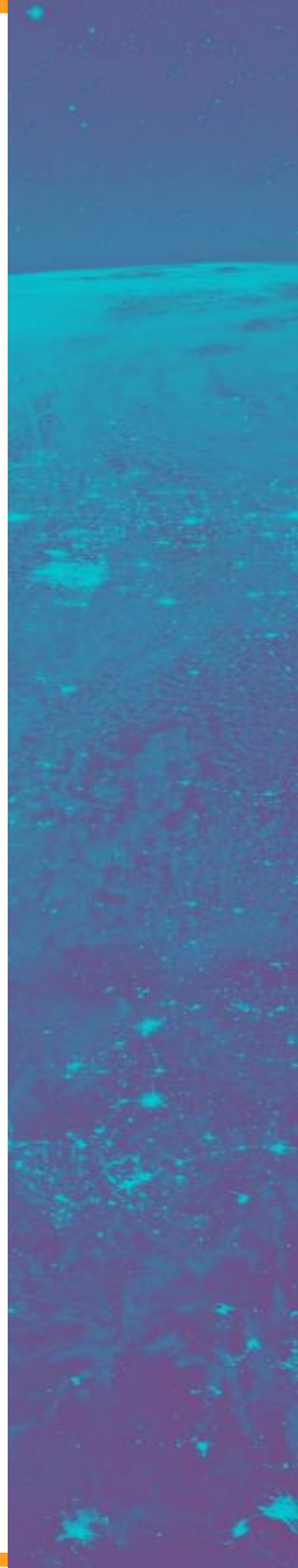
THE
SPACE ECONOMY
INITIATIVE

Using Space to Building
Back Better
Insights Report

September 23, 2020



UNITED NATIONS
Office for Outer Space Affairs



INTRODUCING THE **SPACE ECONOMY**

The level of 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.

THE 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 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 look at financing space activities, exploring success stories on how mixed public-private funding models are helping space economies thrive. The series touches upon the nexus between government, industry and academia, and how to leverage this nexus to maximise innovation and growth in the space economy. We 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 are 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 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.

INSIGHTS REPORT

BUILDING BACK BETTER - How a healthy space economy can support post-COVID-19 recoveries

This insights report captures the remarks and experiences shared during our seventh webinar session with space economy experts.

In this session, we heard from experts from Lift Me Off, SpaceBase, Hepta Analytics and NASA who delivered their perspectives on how a healthy space economy can help to mitigate the effects of Covid-19 so that space economic ventures could continue to thrive. The recording of the webinar is available on oosa.org and can be viewed [here](#).

SPEAKERS INSIGHTS

Space experts from across the international space sector were each given time for remarks on their personal experiences working in the field before switching into a moderated discussion to dig deeper into the topics and insights that had been shared.

- *Introductory remarks by **Simonetta di Pippo, UNOOSA Director***
- *Michel Pouchet, **Lift Me Off***
- *Emeline Paat-Dahlstrom and Eric Dahlstrom, **SpaceBase***
- *Sylvia Makario, **Hepta Analytics***
- *Patrick Besho, **NASA***

Introduction

Simonetta di Pippo

Director, United Nations Office for Outer Space Affairs

« The last decade has seen the global space sector taken to a new level. We have experienced many significant changes, from record political and economic investment to historic reductions in launch costs.

We have witnessed milestones for human spaceflight, robotic exploration and constant technology innovation. The global space economy is more open, more accessible and more relevant – than ever before. Space has never been closer.

These latest developments have not come out of the blue. Just ten years ago, we started witnessing great success for the commercial space sector. The International Space Station was re-supplied in a fully commercial mission, reusable rocket boosters are now a reality, companies were making progress in the launching industry and downstream applications of space information and data were already accelerating growth across almost every sector of the economy.

Today, private entities from both traditional and emerging spacefaring nations are launching more satellites than ever. Almost 10 thousand objects found their way to and in outer space since 1957 with about 30% of these objects being launched in the last 6 years alone. By July this year, we had already broken the annual record for the number of new satellites registered with UNOOSA.

The very value of the commercial sector is also breaking records. Currently representing around 80 per cent of the whole industry, private investment in the past three years reached highs both in size and number, dwarfing those done before 2015. Overall, the space industry is worth more \$400 billion, and several analysts expect further growth, seeing space becoming another trillion-dollar industry by 2050. The economic value of space has grown by about 60 per cent in the last ten years, as compared to 35% growth of the global GDP, underlining that space benefits extend notably to the wider economy.

With new downstream applications and services, the space sector is contributing more and more to the global GDP. Estimates from a variety of sources – including three recent studies from the European Union, Germany and the United Kingdom respectively – have demonstrated that more than 10% of GDP is dependent on the use of satellites, with indirect benefits contributing additional percentage points. Hence, while the value of global space economy as such, as mentioned already, is estimated at around \$400 billion - like the IT sector - it is the knock-on contributions of services derived from satellite data that is already contributing trillions to the global economy.

There are many signs that States are keeping up with this commercial growth with government space budgets also growing rapidly. Euroconsult expects around a 20 per cent increase in government spending by 2024. Expensive, high-risk and low-return missions, such as those to planets and moons of the Solar System, have generally been led by governments as it remains a challenge to define the business case for private investments in these endeavours. Indeed, State-run programmes continue to be extremely important for the success of the wider space sector, not just in exploration but also in the utilization of space.

Products and services developed in space programmes have in some cases eventually become commercially used. To make the example of what is happening in the US, the National Aeronautics and Space Administration (NASA) has documented more than 2,000 such technologies, called spin-offs, since 1976. All in all, it is estimated that for every single dollar spent on NASA the economic boost is between \$7-\$14. The Global Positioning System (GPS), which is the global navigation satellite system (GNSS) developed by the United States, is a great example of a government-funded project turning into one of the most important commercially productive assets. Developed initially for the use by the US military, it was later enabled for commercial purposes generating roughly \$1.35 trillion in economic benefits in the period 1984-2017.

When we started the Space Economy series, we asked ourselves, what can we – UNOOSA – do to level-up space economies responsibly and sustainably. Our answer is indeed this initiative: we are bringing the community together, to share experiences, insights and good practice and to leverage our own expertise in-house. The Space Economy initiative is a multi-stakeholder platform delivering real value for everyone in the space community - from the established to the emerging.

This is only the beginning. We close this opening series with a session on how space economies can continue to survive – and thrive – during the current global pandemic. But this is not the end of the journey. Looking ahead UNOOSA has plans to keep leading these engagement efforts on Space Economy issues so that we can continue to support strong, healthy and dynamic space economy growth that is delivering real benefits for everyone »

SPEAKERS

Michel Pouchet

Lift Me Off

Mr Michel Pouchet is the CEO and Director of Lift Me Off. Lift Me Off provides necessary technologies and services in the fields of Propulsion and Artificial Intelligence to ensure safe and sustainable growth of satellites sent into outer space.

Mr Pouchet spoke about the impact of COVID-19 on the company and the means through which the company has succeeded in ensuring business continuity. As the company is spread through different locations, using space infrastructure for communication has been crucial.

The role of space technology has been increasingly recognized around the world which translates into more engagement by different actors, including governments which invest to grow the space economy. Despite the difficult situation and the economic damage caused by COVID-19, investors have been reaching out exhibiting the growing understanding of the importance of space in the future.

Currently, there is enormous growth in the number of satellites launched but while in the past little attention was devoted to sustainability, in recent years risks have been much identified and some steps were taken to alleviate the situation such as the adoption of guidelines, policies and development of new technologies that could help with debris removal.

Lift Me Off works with the Governments of the UK and Luxembourg in ensuring that assets in space remain safe and that the current growth can continue to offer more economic benefits. The company is developing, in cooperation with governments, AI algorithms and sensors to actively spot objects in space and understand their behaviour. In this manner, active satellites can better avoid potential conjunctions. Another aspect is the development of techniques that would enable satellites to collaborate in space, with one satellite repairing another and alike. The same technology can be used into looking at how to recycle objects in space – recovery, repair, reuse and repurpose.

Mr Pouchet closed by saying that current times have shown that investments in space make sense and they are very important from an economic standpoint, but we must grow space safely.

Mr Pouchet's insights start at 00:04 in the recording [here](#).

Emeline Paat-Dahlstrom and Eric Dahlstrom

SpaceBase

Ms Emeline Paat-Dahlstrom and Mr Eric Dahlstrom are the Co-Founders of [SpaceBase](#). The missions of Spacebase is to democratize access to space by catalyzing space entrepreneurial ecosystems everywhere, especially in developing and emerging nations, starting in New Zealand. They are trying to create such ecosystems through education, entrepreneurship and community building.

SpaceBase has conducted dozens of activities in New Zealand and abroad and ran two national competitions to incentivize the creation of new projects and start-ups. The first virtual space incubator was also organized in the country with several start-ups coming out of it.

In early 2020, a plan of action was developed with focus limited to face to face, local events. In response to COVID-19, the reach has grown exponentially as the activities moved online ensuring global and inclusive reach. SpaceBase created a self-paced online [course](#) “Catalyzing space industry in your Region” providing an overview of opportunities in space and leveraging new technologies. Thanks to partners and various kinds of workshops, for example one at the International Space University, they were able to reach more diverse audiences and understand a wider range of regions in terms of their space capabilities.

Mr Dahlstrom described which areas suffered the most from COVID-19, focusing on the upstream sector especially manufacturing, assembly and test components, while downstream continues to provide, despite the pandemic, satellite services, data analysis and applications. He also focused on the immediate opportunities from the course, especially in adjacent industries such as sensor manufacturing or precision agriculture can use space-data.

Ms Paat-Dahlstrom’s and Mr Dahlstrom’s insights start at 07:30 in the recording [here](#).

Sylvia Makario

Hepta Analytics

Ms Makario is an Industry Innovation Lab Fellow at Carnegie Mellon University in Kigali, Rwanda. Ms Makario is the Co-Founder and Head of Marketing and Geospatial Technologies at Hepta Analytics. Hepta Analytics specializes in various practice areas under data science and analytics to transform raw data into information and insights that empower businesses to make informed decisions.

Ms Makario described the work of Hepta Analytics, focusing on the downstream side of space technology and supporting organizations in different applications where space data can be utilized including in agriculture and health. This helps the organizations in supporting their end users in an efficient way. She made the example of agriculture in remote locations in Africa where connectivity remains an issue. Hepta Analytics helps with the development of necessary infrastructures so that people in remote locations can use space tech and data without internet, or without the need for a smartphone.

In general, the company operated through in person meetings and only occasionally used digital tools to communicate with partners. Due to COVID-19, this has altered significantly as different actors now proactively express the wish to move online. While Hepta Analytics has been focused more on AI, machine learning or data mining, new services such as websites creation have been requested by clients to ensure that they can move their users online.

Ms Makario also explained that the company is based on remote work and was already prepared once the pandemic happened. This eventually helped them to take advantage of the existing practices. Governments and institutions are supporting their work through grants and experts which contributes significantly to the continuation of business delivery of the company.

Connectivity and related issues were less recognized before the pandemic but now, the disadvantage of being offline has become so apparent that governments are seeking to invest more in technologies that can contribute to addressing these issues. As an example, she mentioned that the Government of Rwanda is establishing a space technology agency to focus on these priorities.

Ms Makario's insights start at 16:50 in the recording [here](#).

Patrick Besha

NASA

Mr Besha is the Senior Policy Advisor in the Office of the Administrator at NASA Headquarters. He provides expert analysis and directs research studies focused on global space exploration, economic and policy evaluations of major civil and commercial space initiatives, national security space issues and international relations.

Mr Besha started by recognizing the criticality of space and highlighted that many of human activities depend on the use of satellites. NASA itself focuses on various missions and the priority rests in space exploration and human spaceflight. This includes a variety of projects including, but not limited to: the return to the Moon, Mars exploration, operating of the International Space Station and building the James Webb Space Telescope.

Mr Besha explained that different companies and partners who are participating in these missions experienced a range of setbacks resulting from the COVID-19 pandemic. Given the fact that over 90 percent of companies with R&D as their primary line of business are small enterprises - they have faced considerable problems including limited access to new contracts, loans or other financial lifelines. In the US, however, recent legislation seeks to provide broad economic relief through unemployment benefits to workers, low-cost loans and other measures which are helpful to stabilize these companies. A survey of the industrial base is still on-going to understand what weaknesses might exist.

He continued to inform that larger companies, also described as prime contractors, generally fared slightly better thanks to stable, long-term government contracts with revenues more certain. But as the space sector is a complex ecosystem with a network of suppliers with supply chains spanning through multiple companies and countries, weakness in one component of the chain can cause trouble for the rest.

To further assess and mitigate any impacts, NASA will continue supporting new and emerging industries including commercial remote sensing, payload services, lunar services space tech development, LEO manufacturing or tourism. It is now the role of the industry to work towards building non-government demand for space services and other products as diversity of customers can bring stability to companies in uncertain times and grow the space economy at large. NASA long-term strategy can provide new business opportunities and visibility to companies.

To conclude, he explained the logic behind the planned 'space industrial base supply chain' survey which will help in understanding the health of the space sector - where and how severe the impacts of COVID-19 are and how to help through government and public sector to mitigate them.

Mr Besha's insights start at 24:46 in the recording [here](#).

QUESTIONS and ANSWERS

How is government and private support helping to get things done during the COVID-19 pandemic?

Mr Pouchet: Luxembourg and the UK, where the company is located, have very proactive ways of looking at innovation. Delegates from respective space agencies are open for discussion on how a particular innovation can bring benefit to the wider economy. Having a business plan aligned with government's and national priorities can unlock access to public grants which complement private funding. The key is to explain what the outcome of such an investment in economic terms is. The way in which governments approach investments into the space industry has become quite entrepreneurial as they understand the benefit of investing into small companies and also consider the associated risks. Mr Pouchet also mentioned the example of a company that has been through difficult financial times, however, joint investment from the UK government and another partner provided the necessary injection for the company to carry on.

Which are the top priorities in terms of education capacity building to encourage space economic growth?

Mr Dahlstrom: There is a need for expansion beyond the traditional space industry. Educating stakeholders and people in related industries to see the opportunities in space and application of space technology in addressing their problems enables them to acquire a different perspective and that is how the real growth can happen. It is important to build new customers and users of space.

Mr Basha: Education is at the core of what space agencies do and NASA recognizes its national function in supporting STEM education. This can be done through various courses across the full portfolio of studies from elementary school to university, scholarships or grants to researchers, scholars or PHD students to really ensure involvement of pupils and students who are interested in space. The main aspiration is logically to develop the new aerospace workforce, either for the benefit of NASA itself or for new start-ups, economic opportunities and innovation. The missions of NASA aim to have the educational component that complements the production of scientific knowledge to ensure that this knowledge is widely disseminated not just to professionals in the field but to students as well. This is done both domestically, and internationally with projects in over 100 countries where NASA seeks to provide educational resources to interested students such as the Globe Program.

How does NASA work with foreign companies?

Mr Basha: In its missions, NASA works with a number of companies, generally through agreements with national space agencies, or with institutions such as the Ministry of

Technology or Ministry of Education if a country does not have a dedicated space agency. These institutions can then make deals with domestic companies to deliver the necessary products. Additionally, foreign companies use NASA facilities to test research & development work under certain arrangements.

How can countries/entities not participating in space benefit economically?

Ms Makario: Space technology is about data and how it is used (e.g. air quality, population, land, packaged in different ways). Having the knowledge to analyse data is necessary to understand how stakeholders can apply them to various aspects of their activities and create actionable insights (e.g. through data you could understand whether there is lack of schools in a specific area and act based on the need to increase the number of schools). African countries and the African Union are increasingly pushing for cooperation and for developing their own capabilities, to reduce the dependency on other space stakeholders.

CONCLUSIONS and NEXT STEPS

The speakers discussed how the Covid-19 pandemic is affecting their efforts to grow and expand their space economy activities. We got an overall impression that Covid-19 has tested all space actors in several ways. Learning from and adapting to the new environment, therefore, is crucial, while continuing to focus on delivering the core aims and values of the space entity.

A common experience across the speakers presented during the webinar was that there is clear governmental willingness to invest in the space economy. Such a tendency, in many jurisdictions, appears to have been even greater since the appearance of the Covid-19 pandemic. Governments are realizing that citizens are increasingly dependent on space technologies, therefore investments in space applications, – besides directly benefiting the society – may also positively affect a country's overall economy, diversifying economic structures to ensure they can build back better. Nonetheless, not only the public sector plays a key role in the advancement and assistance of the space sector, but private investors do as well. It was touched upon during the webinar that diversity of customers and demands of non-governmental organizations not only help to grow the size of the space economy but also encourage continuous innovation. This view was confirmed by several speakers, stating that they have been able to mitigate their current challenges through combined private and public investments and that besides the commercial actors, governmental agencies are also keener to take risks as space “entrepreneurs”.

The speakers also emphasized, along with the financial incentives, the necessity of space education and transparency. Such factors were characterized as pivotal in bringing space applications closer to people and inspire them, while reaching a mind shift of various stakeholders on the accessibility of the capabilities that the space sector offers them. Even though Covid-19 has affected face-to-face meetings in spreading knowledge locally, it enabled space companies to communicate their message to a wider audience globally.

Overall, the webinar discussion showed that the negative effects of the pandemic give an enhanced chance to space entities to draw the attention of decision-makers and investors to the enormous potential of space technologies. Above all, transparent, accessible business models remain crucial in strengthening the space economy together and in a sustainable manner, both during and after this COVID-19 pandemic.

THANK YOU

The webinar was made possible with time, support and expertise of our speakers; Michel Pouchet, Emeline Paat-Dahlstrom, Eric Dahlstrom, Sylvia Makario and Patrick Besha.

Thanks to all UNOOSA colleagues who supported the webinar's delivery, including Martin Stasko and Annie Kazarjan for the assistance in drafting this 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.