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SAUDI SPACE COMMISSION

G20
SAUDI ARABIA 2020

G20 Voices on the Future of the Space Economy

Space20
Space Economy Leaders Meeting
7 October 2020, Saudi Arabia

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Contents

Space20

> The G20 Secretariat realized how space can be part of developing new frontiers and maintaining a peaceful environment on earth and understands the role of new space activities in the broader economy. Therefore, for the first time in G20 history, space has been selected as one of the 22 priorities of the G20 2020 agenda, titled "Promoting Space Cooperation" under the goal "Shaping New Frontiers."

The first Space Economy Leaders Meeting – Space20 was held virtually on 7 October 2020. It was a high-profile meeting, organized by the Saudi Space Commission (SSC) and the G20 Saudi Secretariat as part of the International Conferences Program.

The meeting was initiated to increase awareness of the space economy, shape new frontiers in the global economy, and to contribute to the international efforts on the peaceful uses of space while maximizing its economic benefit.

The meeting brought together the heads of space agencies from the G20 countries as the leaders of the space economy ecosystem.

The gathering was opened by the Chairman of the SSC, His Royal Highness Prince Saltan bin Salman al Saud. Aside from the G20 countries, also the United Nations Office for Outer Space Affairs (UNOOSA) and the Organization for Economic Co-operation and Development (OECD) took part in the agenda and presented papers focused on leveraging space data to counter pandemics and on measuring the economic impact of the space industry.

The main agenda item of the Space20 meeting focused on exploring the views of the space agency heads on the role of the space economy in shaping new frontiers in the global economy. KPMG was selected to manage this agenda item and produce this report that summarizes and presents the discussion, G20 Voices on the Future of the Space Economy.

It is expected that the G20 countries will continue to host the Space20 meeting as part of the ongoing G20 agendas in the coming years.

Foreword

His Royal Highness
Sultan bin Salman Al Saud

We are very happy and honoured to host the G20 meetings for 2020, and for the first time have a focus on the Space Economy. King Salman and Saudi Arabia are not new to the space industry, though we are keen to make it a part of the agenda of the G20 meetings going forward.

I was honoured to participate in Saudi Arabia's first space mission in 1985 on the space Shuttle Discovery from the United States. The first phone call was made by King Fahd and King Salman, who is also my father, to me in the space shuttle. In that regard, you can say that although Saudi Arabia has the new Saudi Space Commission, established in 2018, we are not new to the space sector. Even before 1985, Saudi Arabia was a major investor in space and space technology through ArabSat and in 1985 we called for the establishment of a space program in Saudi. Since then we have made it our goal to make our own satellites and participate in international space missions. We are seeing today our region moving forward in the space economy, with examples including our neighbor, the Emirates, recently launching their very first space mission to Mars, and launching their Astronaut Hazza Al Mansouri to the International Space Station.

When I went on my mission in 1985, we had 30 Saudi scientists who participated in space experiments and since then we have heavily invested in building great universities, technological institutions and developing human capital. Today the innovation and technological advancement we see in Saudi and the thousands of engineers, doctors and scientists of all specialties is an investment which has taken many decades to be where we stand today.

I personally want to thank all of the heads of space agencies for participating in the Space 20 meeting. We welcomed of course Italy and India, beautiful countries that we look forward to going to for the next G20 meetings and we call on them to make space part of the standing agenda for the next G20 meetings.

We believe that we know how to build economic sectors in Saudi Arabia, and we've got to apply that knowledge to the space economy. We're going to be investing a lot, as your countries are in our relationships with G20 countries, we call for the G20 countries to invest in the future of this planet and not just the future of the economies of G20 nations. In that sense, when reflecting on the space station and my time in space with my colleagues from the United States and France, we all looked at Earth as we passed over it once every 90 minutes and saw 16 sunsets and 16 sunrises every day.

When I reflect on that, for the first day or two we were pointing to our countries, by the third day we were pointing to our continents, but truly by the fifth day we were pointing to one Earth and one planet. This fragile small planet is our home today and will be our home for a long time to come. The G20 economies are looked at by the rest of the world as countries that could lead the world to saving this planet not just in terms of the environment but resources through human interaction, settling human disputes and basically looking at Earth as a place that we all can come together and live together, in economic success and a clean environment.

In that regard we would very much like to see space over the next few days, few months, few years to become part and parcel with the economy and to represent our region. We want to work very closely with our allies and colleagues of different countries to make sure that we are fully represented and participating. The team that met as part of the Space20 meeting is a great asset and have raised the important issues and recommendations in this report.

As part of the G20 meetings, Saudi Arabia have announced our strategic plan for space development and will be launching a space investment company as we go forward. This follows the launch of our major program for generations to come for Saudi Scientists from the ages of four onwards.

Key themes from the Space20 meeting

1. International collaboration and knowledge sharing are fundamental to space advancement

- International cooperation is widely considered as an imperative across the G20 community, and must continue to be a priority as the space sector continues to grow exponentially.
- As competition in the space economy increases, collaboration needs to be at the forefront of change in order to provide the depth of space knowledge and intelligence in a secure, safe and cooperative manner.
- The sharing of information across countries on space activity will ensure effective investment in resources and capabilities, fostering sustainable growth in the sector.

2. Space is an enabler of green economies and achieving our Sustainable Development Goals on Earth

- Many participants identified the socioeconomic benefit that is enabled by the Space sector, particularly in environmental sustainability, and in monitoring and achieving the UN's Sustainable Development Goals.
- Advances in satellite technology are projected to provide an even broader range of data in the future, enabling us to draw insights that will enhance our understanding of the science of earth and support efforts to mitigate the effects of climate change.

3. We need to protect the space domain to ensure longevity of our presence there

- The sustainability of the space domain itself was consistently identified as a strategic priority among the Space20 community, noting its importance as an enabler for continued growth a success of the space economy into the future.
- There has been a rapid increase in the number of spacecrafts in Earth's orbit over a short period and a record number of countries investing in space applications and research. When combined with the increasing volume of space debris, this poses a significant challenge for the safe and sustainable use of space.
- The sustainability of space also generates economic benefits within the space economy, as ensuring the safety and long-term viability of space infrastructure improves ROI within the space sector, and increases investor confidence in the industry.

4. Innovations in the space sector are improving productivity in traditional industries

- The Space economy continues to innovate, taking technologies previously developed and utilized for space exploration and commercializing them to provide unique solutions to traditional sectors including resources, medicine and agriculture.
- A variety of domains and industries have been identified as candidates to undergo significant change as a result of leveraging space sector technologies, including autonomous vehicles, communications and mobile services.

5. Entrepreneurship and technical expertise are still essential in the exponential growth of the sector

- As the space sector moves increasingly towards commercialization and the establishment of new business models, investment in entrepreneurship within the space sector is crucial for integrating cutting edge technologies into the space sector, including artificial intelligence, that will expand the market the global space economy can service.
- The Space20 community highlighted the importance of agency involvement in fostering and enabling entrepreneurship in the space sector, as economic priorities continue to shift in the fall out from the pandemic Innovation in the space sector is driving a number of trends, including less expensive launch services, lower costs of small satellites, and the use of commercial off the shelf solutions, all changing the price point of entry.

6. New nations and markets are becoming spacefaring and benefiting

- Many emerging markets are identifying the opportunities that investment in the space sector can provide for their economies, recognizing the benefits that it can provide in the wake of recovering from the pandemic.
- As competition within the space economy increases, new space-faring nations are looking to the Space20 community to support equitable and sustainable access to the domain.

7. Space is important to many nation's recovery from COVID-19 and its economic impact

- As the unprecedented economic ramifications of COVID-19 continue to play out on a global scale, the space sector will play an important role in stimulating economies and developing innovative solutions that improve productivity and efficiency. This has already been demonstrated in mass global digitisation as people have been required to work from home.
- Space infrastructure has played a key role in disaster management globally, enabling new ways to collect data, assess damages and efficiently communicate in times of emergency.

8. Connectivity is being enabled through space and has been particularly prominent during the pandemic

- The pandemic has necessitated the global need for virtual productivity across all industries, with society moving away from offices to working from home.
- Global Broadband is starting to connect individuals and communities who previously did not have the opportunity share knowledge and information, with the public and business benefiting from this development.

9. Space is helping develop the workforce of the future and inspiring how we connect and engage

- More than 80 countries and territories having operating satellites in orbit, generating new opportunities for global trade, the exchange of skills and collaboration across borders.
- There is an increasing focus across Space20 countries to inspire younger generations to develop an interest in the space sector to develop the level of expertise required in the sector.

10. Space is becoming commercialized, with reliance on government spending reducing

- Historically, investment in many countries' space industries were synonymous with public spending. Now we see the private sector as a leading player in the domain, a change welcomed by the G20 community as an opportunity for the market to develop efficient and sustainable solutions to a variety of global challenges.
- The shift toward private investment in the space economy is widely considered one of the key proponents of change within the industry, both in emerging and established markets, with industry being able to provide new and innovative ideas to the market.

G20 heads of space agencies summary

Hiroshi Yamakawa
President
Japan | Japan Aerospace Exploration Agency (JAXA)

"The world is facing various challenges caused by the coronavirus pandemic, as we work on building a resilient social structure for our future, technologies such as digitization and automation which we have refined through space development in Low Earth Orbit and space exploration to the moon and asteroids havecan makede a significant contribution to the stable delivery of new services on earth.

For example, by combining space-based data with various ground-based data and analyzing them with AI, it is expected that many different problems can be solved efficiently. This is an area where the private sector is expected to create new businesses.

Promoting private sector engagement in new space businesses will lead to reach efficient and sustainable solutions to global challenges such as energy, food and public health, as well as the achievement of the United Nation's SDGs."

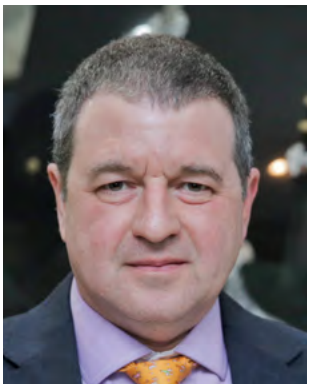
Dr. Abdulaziz Al Sheikh
CEO
Kingdom of Saudi Arabia |
Saudi Space Commission (SSC)

As we are now entering a new era of space, called space 4.0 we can see the interaction between governments, private sectors, society, and politics. This has resulted in space activities expanding globally with a record number of countries and companies investing in space applications and research.

In fact, the space economy is now sized at over four hundred billion dollars (including government and private sector). The government sector is now only sized at 25% compared to 80% of government spending 20 years ago. In my opinion, this new change will have a significant impact on the future of all aspects of space and of course will positively affect the space economy."

Giorgio Saccoccia
President
Italy | Agenzia Spaziale Italiana
(ASI)

The use of space data affects almost every aspect of our daily lives and represents relevant support to the achievement of several SDGs of the UN agenda 2030 and to emergency situations like the one we are experiencing today." The bulk of investment still comes from public institutions and governments play a major role in guiding the development of space activities. We are currently implementing a process aimed at helping our governments to cooperate together towards the common objective of promoting space economy as part of the global economy. Italy will host the next G20 and the Italian Space Agency is ready to organize the second Space Economy Leaders Meeting in 2021, with the final goal of leading to the insertion of the Space item in the G20 agenda in the future."



Raúl Kulichevsky
Director General
Argentina | Comisión Nacional de Actividades Espaciales (CONAE)

Argentina today counts on information from the two Argentine Satellites which are part of the SAOCOM constellation, in partnership with the Italian Space Agency and this information is shared with numerous friendly space agencies." This information is vital to many sectors of our country. A lot of critical issues arising from the pandemic, make it necessary to redouble our efforts to continue to work in an international manner. This cooperation will allow us to grow through these difficult times in the best way. The space economy is going to play a fundamental role in the world's recovery, and we are committed to continue making our contribution to the economic recovery and sustainable development."

Anthony Murfett
Deputy-Head
Australia | Australian Space Agency (ASI)

"The Australian government recognizes that space technologies are playing an increasingly important role in driving societal and economic transformation and is an industry that will play a very important role in the future. As we look forward to the new frontiers and the role of space, we see some important aspects playing out. Firstly, like this forum, international collaboration and cooperation of space activities will be a key element, and this is highlighted in our Australian civil space strategy which sets out a 10-year path to grow our Australian space industry. We also recognize that as we face the challenges associated with COVID-19 that space can play a very important role in economic recovery and industry will play an important role as it brings new innovative solutions to the table.

The reason for that is that space is used every day and the technologies can be used in all areas of the economy, from helping disaster management, to supporting the efficient use of food production and assisting monitoring the environment. As we go forward miniaturization and lower cost means that new solutions and new innovations will come forward and importantly, they can also support many of the Sustainable Development Goals. We also talk about how space can inspire so that we can connect and engage with the community, with parents, with our kids and inspire them into the jobs of the future."

Carlos Augusto Teixeira de Moura
President
Brazil | Agencia Espacial Brasileira (AEB)

The space sector offers many applications and solutions and creates new markets and products. For example, major modifications in our daily lives in Brazil enabled by online commercial services, including tele-education, tele-medicine and the home office are strategies adopted by private and public sectors. Increases in private sector participation has dramatically changed the space domain. Governments are responsible for creating a friendly and supportive environment for the development of space activity, while the private sector creates new markets, new products and new needs. Governments will still be required to finance some large-scale space projects. But business vision and the private sector's pursuit of profits aim to reach product values in the billion-dollar range. Finally, the space industry has pushed forward the relationship between all countries. Brazil has a major role in that economic sector, the same way we believe the space economy can contribute to a more integrated and cooperative world."

Lisa Campbell
President
Canada | Canadian Space Agency, Agence spatiale Canadienne (CSA, ASC)

Space also plays a role in bringing innovation to traditional sectors, improving productivity and economic growth. It's important to acknowledge that the space sector is undergoing significant shifts, specifically, less expensive launch services, lower costs of small satellites, and the use of commercial off the shelf solutions has changed price point of entry. Satellite systems such as Canada's radar satellites are capturing, analyzing and disseminating vast quantities of data. These are projected to provide an even broader range of data in the future, unlocking new products and services, enabling cutting edge science, enhancing our understanding of the science of earth, and supporting efforts to meet our sustainable development goals."

Xu Hongliang
Secretary-General
China | China National Space Administration (CNSA)

Development of space technology, communications, navigation and Earth observation play an important role in our daily lives, promoting social progress and achieving our way of livelihood. Space technology has become a pivotal part of the world economy and it will help our future economic development." China has always been conforming to the peaceful use and exploration of outer space, with openness and the concept of consultation and contribution to promote indefinite collaboration. We expect many benefits of space technology for all mankind and promote the global economic development."

Dr. Jean-Yves Le Gall
President
France | Centre National D'Études Spatiales (CNES)

For every business to become a space business, for space data to become fully commoditized and for the space economy to be sustainable, considerable efforts are still necessary. Uptake of space-based products and services still needs to be accompanied, the potential of space data is still underexploited and, I must say, behavioral barriers on the side of potential end users are still hindering both of them. Therefore, I would like to make a few recommendations. The first one is about innovation. We must tap into creativity, by interacting with and investing in new ideas and promote opportunities provided by competitive space solutions to new non-space users and customers. Secondly, public investment. For space programs and space R&D, investment must be sustained, and industry and international cooperation is needed. Thirdly, sustainability. We should promote initiatives that move to ensure the sustainability of space, the environment and our planet. We have to connect our initiatives to our earth, and we need to ensure that the space sector is a driver for a greener economy."

Dr. Walther Pelzer
Head of the DLR Space Administration
Germany | Deutsches Zentrum für
Luft-und Raumfahrt

The global space sector is under considerable change. With this, our role as national agencies is in the process of transition too. This is to be seen as a chance with regard to the implementation of our statutory tasks.

There is already a strong bond between the role of the space economy and the overall global economy, where space-derived products and services constitute a critical part within all our nations' cross-linked economies.

The space sector is determined to move increasingly towards commercialization and the establishment of new business models, which gives impetus to the flourishing start-up scene, to innovation and entrepreneurship. All of this is contributing to new economic activities, often far removed from investments in space infrastructure. In our role as agencies redefined we have the opportunity to support this overall spirit of entrepreneurialism and the emergence of new economic actors in particular.

The space sector is transforming. The more this transition progresses and new paths will be forged effectively, the greater the impact on the global economy will be."

Dr. K. Sivan
Chairman
India | Indian Space Research
Organization (ISRO)

Space products and services have become part of everybody's everyday life. Space economy is growing further, globally, with the renewed interest of the private sector and diversified applications including space resource utilization and space tourism. Until recently, India's space program was synonymous with government spending. With the emergence of technology advances and the data revolution, India is also witnessing the new business spirit and this is going to shape the new space economy in India. To meet the challenges and to proactively build a conducive atmosphere, India has announced space sector reforms recently. The new enabling mechanisms, IN-SPACe will facilitate the Indian private industry to become productive and competitive in global space market. Today, we are looking at Space, with new opportunities, that could unveil new businesses and drive global growth. For this to happen, space must be safe, secure and easily and readily accessible. India is at the forefront of these reforms, handholding, promoting and enabling to build a sustainable space sector, closely connected with national development and the global economy. India is supportive of this initiative, in this exciting and challenging new era."

Thomas Djamaluddin
Chairman
Indonesia | Lembaga Penerbangan dan Antariksa Nasional (LAPAN)

"The space economy is one of the contributors to the economic growth in G20 countries. For Indonesia, as part of an archipelago country, the commercial space activities have been in the development of industrial revolution 4.0 and the improvement of public services." The future activities in the space sector will range from R&D to the production of goods and services, which will have a big impact on economic growth. The second development is currently encouraging the commercialization of space by formulating regulation in the country. Indonesia is supporting the growing space economy activities, with the aim of sustainability and equitable access."

Dr. Cheol Ho Lim
President
South Korea | Korea Aerospace Research Institute

"We all know space is now beyond a scientific sector, and has become domain of the economy, which can be a new growth engine of future society. Each country is putting in effort to create new jobs and high value products, in the fields of broadband, space communications, space data applications and space services, exploration etc." However, the space sector, similar to the aviation sector, has a high barrier to entry, and it takes time to realize a return on investment. It cannot be solely boosted by market forces, and therefore nations should echo participation of their private companies and provide as much support as they can. Korea is currently moving forward with policies to further support the private sector so they can lead the way in space development."

Salvador Landeros Ayala
Director-General
Mexico | Agencia Espacial Mexicana (AEM)

"In Mexico, there are many satellite ground stations in different geographic locations and we partner with other ground stations around the world. Missions to the Moon and Mars will signify a $20.8b of spending on space and exploration. AEM is about to sign an MOU with several other space agencies to participate in the Artemis accords with NASA. Emerging Space Agencies like ours will spend about $4b developing new national public space programs. AEM is also actively working with other space agencies in the development of the National multi-agency projects and contributing to the Mexican space economy with two new regional space centres. Mexico is working actively in the development of the new Space Development National Plan, to align with the 2020-30 UN development plan of reducing poverty. This will focus on the main areas of telecommunications, Earth Observation and Space exploration."

Dmitry Rogozin
Director-General
Russia | Russian State Corporation
for Space Activities – ROSCOSMOS

"In Russia we are trying to keep up with the current trends, by developing a new program called Sphere, which is aimed at integrated development of Russian communications, navigation, and Earth observation space services by 2030. We are planning to develop existing assets and to deploy new orbital constellations. Steadily increasing investment in space activities ensures significant growth, that the global space services market does not rest on the orbital assets. But the rapid increase in the number of active spacecraft and the growing amount of space debris increases the chance of emergency situations and the resulting risk of losing money invested in the development of space constellations. We believe that due consideration should be given to fostering the cooperation between the G20 space agencies to provide information support for the safety of space activities. This goal can be attained by creating a new open service information platform to collect information from various sources and disseminate it to the interested users. Considering the fact that 12 G20 space agencies are members of the Inter-Agency Space Debris Coordination Committee, we think that this proposal is relevant and might interest the G20 space community. I hope that we will be able to discuss existing problems and threats and ways to solve and mitigate in this extremely well-chosen format of space community meetings."

Dr. Valanathan Munsami
CEO
South Africa | South African National Space Agency (SANSA)

Space sciences and technologies are recognized as an important enabler in enabler in responding to the continents pressing priorities through the implementation of the science and technology innovation strategy and the African Union agenda 2063. The long-term agenda 2063 specifically identifies an African Space Program aimed at strengthening Africa's use of Outer Space resources to support its socioeconomic environmental development and the need for Africa to merge among the global players, whilst remaining a responsible user of space. The effective exploitation of space science and technology requires regional, continental and international governments, agencies and institutions to cooperate and collaborate in this Domain. South Africa played a leading role in these developments."

Mr. Serdar Hüseyin Yıldırım
President
Turkey | Turkish Space Agency (TUA)

Space related developments have multiple effects on the economy as a whole. It has the potential to exponentially grow the global economy. In order to fulfil this potential, international collaboration in frame of the peaceful use of space is vital. The world has already entered an era of capturing the economic benefits of the space sector." While most space economy activities originate from space faring countries, emerging space fairing nations do not benefit as much as they could from this area. I believe that the G20 space community is capable of developing more support for emerging space faring nations to take part in the global space economy. The Turkish Space Agency (TUA) is planning to make sustainable investments in space related technologies, and in this regard, we are trying to strengthen cooperation with capable institutions and countries. We have full faith that the peace maker function of space led initiatives, and the leadership of G20."

Dr. Graham Turnock
CEO
United Kingdom | United Kingdom Space Agency (UKSA)

Space has a critical role to play in helping us shape the future direction of the UK and global economy as we recover from the COVID 19 pandemic and look forward to a decade of growth. If this year has taught us anything, it is the importance of virtual productivity to people all over the world, who moved away from offices to working from home and relied on applications like Zoom to stay in touch. Global Broadband has been a dream for a long time, but it may be finally within reach thanks to mega-constellations like OneWeb, connecting the unconnected for the first time. Space services will also generate giant leaps in new technologies such as autonomous transport, leading to new commercial opportunities, reducing carbon emissions and changing how people live their lives. Globally, satellite data helps us monitor and mitigate the impacts of climate change, which remains one of the biggest risks to the future.

More than 80 countries have now operated satellites, this opens up new opportunities for global trade, the exchange of skills and collaboration across borders. The UK has recently launched an international space program, which I hope will promote opportunities for collaboration with those in attendance today. The next decade will see fundamental shifts in the global economy, by working together we can ensure that space plays a positive role in shaping it."

Jim Bridenstine
Administrator
United States | National
Aeronautics and Space Administration (NASA)

When we think about Space exploration and the economy they are intertwined. Think about how we communicate, how we navigate, how we produce food and energy cleanly, how we predict weather and understand the climate. All of these things were based around space exploration, and in fact, now these activities have been commercialized." Think about what we are doing right now with human activity in Low Earth Orbit; the ability to compound pharmaceuticals and create immunisations, we use adult stem cells to print human organs in 3D. But it's not just about medicine, it's also about advanced materials, creating an artificial retina for the human eyeball so people who have macular degeneration, don't have to lose their eyesight; creating very pristine fibre optics that will be transformational for connectivity here on Earth.

When we think about the things that are going on right now, and of course the things in the past, you want to know what's even more exciting, what's going to happen in the future with the Artemis program, we are going to the moon, this time sustainably, with commercial and international partners. We're building the broadest coalition of international partners for not just a sustainable return to the moon, but also missions to Mars. So when we think about the future of space and the economy here's what we know – the more we explore and develop space, the better it is for the economy."

Matthias Petschke
Director of Space Policy
Galileo and Copernicus Units
European Union | European Commission

With Galileo and Copernicus, we are now delivering world-class services with global reach, and our ambitions will not rest there. With our current COVID crisis, our satellites have made a contribution, notably through Earth observation and satellite navigation, offering free data and information for the benefit of our member states to mitigate the impact of the crisis. Going forward, we chose to actively support the political priorities set out by the European Union, ensuring we are fit for the digital age and building the resilience of Europe by way of ensuring Europe's autonomy over its security and its critical structures. One of the focus areas where space technologies have a clear role to play in our efforts will be channelled accordingly. Our President has announced that we are now going to target emission reduction of 55 percent by 2030. Only if others follow our lead can the world keep warming below 1.5 degrees. Certainly, our space program Galileo and Copernicus especially Copernicus CO2 mission will make progress in this context. It is our position that international cooperation on all matters related to space, should not be lost going forward as the sector continues to grow exponentially."

Recommendations

Develop a Space20 Collaboration Strategy for regional, continental and international governments, space agencies and institutions that enables the international space community to deliver its strategic objectives. This includes developing an ongoing Space20 working group to progress collaboration and recommendations between meetings.

Develop a comprehensive understanding of the breadth and depth of international space activity to identify opportunities for global trade and the exchange of skills.

Promote initiatives that help ensure the sustainability of space and the planet, connecting initiatives to ensure that the space sector is a driver for a green economy.

Investigate opportunities for space agencies to enable entrepreneurship within the space sector, es economic priorities continue to shift in the fall out from the pandemic.

Promote private sector engagement in new space business to develop efficient and sustainable solutions to global challenges such as energy, food and public health, as well as the achievement of the United Nation's SDGs.

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