
ANNUAL REPORT 2018



UNITED NATIONS

On the right: Original cover image
Cover: Greenland ice. Credit: ESA

ST/SPACE/76



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UNITED NATIONS OFFICE
FOR OUTER SPACE AFFAIRS

2018

ANNUAL
REPORT



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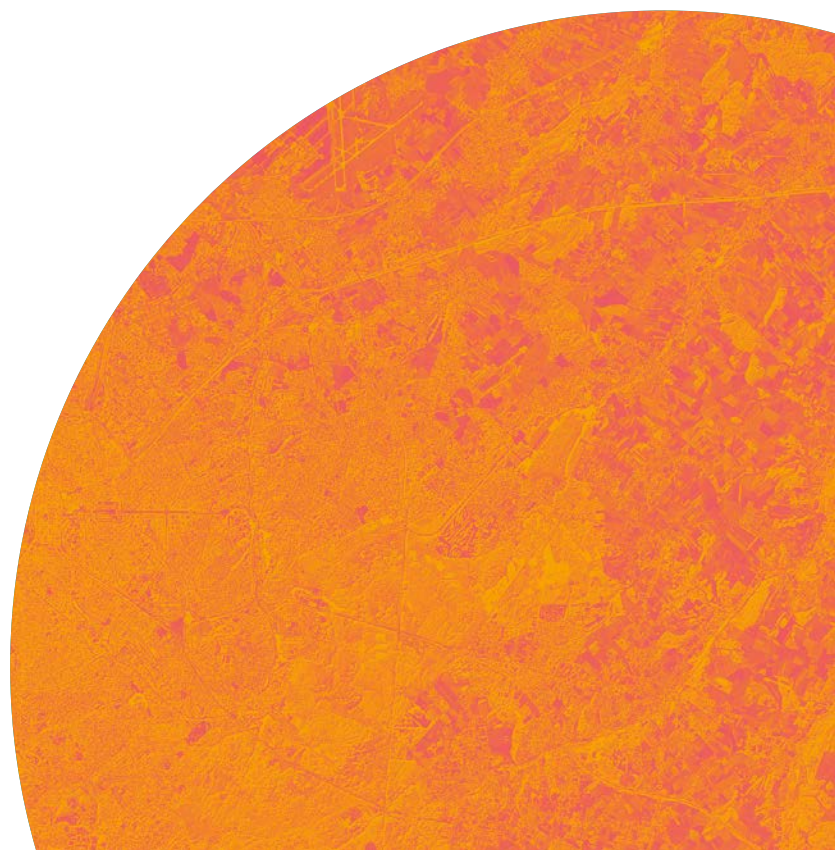
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UNOOSA Director
Simonetta Di Pippo.
Credit: UNIS

FOREWORD

The year 2018 was an outstanding period for the Office for Outer Space Affairs (UNOOSA), with UNISPACE+50 being one of many highlights among a number of exciting developments.

Under the Access to Space 4 All initiative, launched at the High-level Forum in November 2018, we are enabling communities from all over the world to use and benefit from space technologies and applications. Building on the partnerships that we have established over the years, projects covering everything from microgravity, basic space science and data, disaster risk reduction, space law to even orbital opportunities have been introduced.

In 2018, through our cooperation with the Japanese Aerospace Exploration Agency (JAXA) on the KiboCube project, we have taken these capacity-building efforts to another level by breaking records through the launch of the first cube satellite under the auspices of the United Nations to make Kenya an emerging space nation, while additionally sparking the creation of Kenya's own national space agency.

This bridging function of UNOOSA has been a great success and offering the full package of access to space to countries and their citizens from all corners of the globe ultimately benefits the whole of humanity. We will be further expanding this initiative in the coming years.

Furthermore, as highlighted in the 2018 UNOOSA/European Global Navigation Satellite Systems Agency (GSA) pioneering report, the use of space applications delivers direct benefits to almost 40 per cent of the 169 targets of the Sustainable Development Goals (SDGs). Consequently, the Office is working on a broad set of initiatives and projects and is constantly expanding its

portfolio to support SDG implementation through the unique angle space can provide.

With more than 800 participants, over 30 space agencies present and over 100 delegations and Member States, including representatives at ministerial and vice-ministerial level and numerous high-level delegates and observers, as well as over 40 exhibitors attending the celebration of the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space, UNISPACE+50 truly exemplified the unique role of UNOOSA as a convener of the international space community. Being able to welcome such a diverse and extensive group of participants to Vienna can be considered as one of the highlights of the activities of the Office for Outer Space Affairs in 2018.


With numerous panel discussions, side-events and receptions, during June 2018 the Vienna International Centre indeed became the hub of international space activity and I would like to thank all delegations, participants, contributors and sponsors for their great support in making UNISPACE+50 a unique and exceptional event.

Through our innovative partnerships, and capacity-building, awareness-raising and outreach efforts, all highlighted in this annual report, we are confident that our work can make a real difference to the future of peaceful uses of outer space. We are living in exciting, ground-breaking times in the outer space arena, and the Office, together with its stakeholders and partners, will do its best to keep bringing the benefits of space to everyone, everywhere.

Ms. Simonetta Di Pippo

Director, Office for Outer Space Affairs





UNOOSA group
picture. Credit: UNIS

This chapter introduces the mandate and main responsibilities and programmatic activities of UNOOSA, from helping Member States leverage space technologies to achieve the SDGs, to maintaining the United Nations Register of Objects Launched into Space.

1

UNOOSA: ROLES AND RESPONSIBILITIES

1 | UNOOSA: ROLES AND RESPONSIBILITIES

UNOOSA is the only United Nations Office entirely dedicated to outer space activities.

The UNOOSA Programme on Space Applications (PSA) helps countries strengthen their capacity to leverage the potential of space for achieving the SDGs. UNOOSA provides capacity-building, education and research opportunities and technical advisory services to Member States on topics including space science, technology and human space technology.

Through the United Nations Platform for Disaster Management and Emergency Response (UN-SPIDER), present in Beijing, Bonn, and Vienna, UNOOSA helps countries use space technologies – in particular satellites – to prevent and manage disasters. The programme of UN-SPIDER is implemented through the generous financial support of the Governments of China and Germany.

UNOOSA serves as the Secretariat for the only committee of the General Assembly dealing with international



cooperation in space: the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). The Committee has two subsidiary bodies: the Scientific and Technical Subcommittee (STSC), and the Legal Subcommittee (LSC), both established in 1961. COPUOS reports to the Fourth Committee of the General Assembly, which adopts an annual resolution on international cooperation in the peaceful uses of outer space.

The Office supports all Member States in establishing legal and regulatory frameworks to govern space activities, which is increasingly important in the context of fast-growing space sectors worldwide.

Outer space can bring many benefits to humanity, chiefly through technology and innovation. It is important that these benefits reach beyond those countries that have the means to explore space. Under the Access to Space 4 All initiative, UNOOSA works with a variety of partners to increase opportunities for more Member States, in particular developing countries, to access space.


UNOOSA is the Executive Secretariat of the International Committee on GNSS (ICG), that brings together all global navigation satellite system (GNSS) providers and is a role model for international cooperation.

UNOOSA is also Secretariat to the

Space Mission Planning Advisory Group (SMPAG), which works with space agencies on planetary defence. The ICG Programme is being successfully implemented thanks to the generous financial contributions of the Government of the United States of America and the European Commission towards supporting the capacity-building and technical advisory services provided by UNOOSA.

UNOOSA discharges the Secretary-General's responsibilities under international space law, including maintaining the United Nations Register of Objects Launched into Outer Space, created in 1961 at the request of United Nations Member States. The Register is the only existing treaty-based transparency and confidence building measure in outer space activities: it establishes a jurisdictional link between a State and a space object, building trust among countries. UNOOSA also serves the session of the United Nations Inter-Agency Meeting on Outer Space Activities (UN-Space).

Through the breadth of its activities, UNOOSA addresses all stages and aspects of space research, exploration and applications, helping all countries leverage the benefits of space for sustainable development.

A satellite in space with Earth in the background. The satellite's solar panels and various instruments are visible against the bright, curved horizon of the Earth.

Earth from space.
Credit: ESA

From the deployment of the first Kenyan satellite in space to the inclusion of space technologies in the new disaster risk reduction policy in Nepal, this chapter presents the main highlights for UNOOSA in 2018.

2 HIGHLIGHTS OF 2018

2 | HIGHLIGHTS OF 2018

UNISPACE+50

In June 2018, the space community celebrated the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE I), held in Vienna in 1968. To mark the occasion, UNOOSA organized UNISPACE+50, with a two-day symposium followed by the UNISPACE+50 high-level segment of COPUOS.

Over 400 representatives from Governments, the private sector, civil society, academia and space agencies participated in the UNISPACE+50 Symposium, aiming at engaging the international space community to consider current and future space-related challenges and opportunities. The symposium featured keynote statements by UNOOSA Director Simonetta Di Pippo and by the United Nations Champion for Space, former National Aeronautics and Space Administration (NASA) astronaut Scott Kelly.

It also featured side events and panel discussions on the past, present and future of outer space activities; space and industries; space and civil society; space and youth; and space for women.

Throughout the symposium, experts from the entire spectrum of the space sector addressed the role of space science and technology in fostering global development and cooperation from various perspectives.

The symposium concluded with a historic gathering of the heads of nearly 30 space agencies from all over the world, who delivered statements

and underscored the broad global interest in contributing to the Space2030 agenda.

UNISPACE+50 included a space-related show comprised of 43 exhibitors, one of the largest ever hosted at the Vienna International Centre (VIC). The exhibition was opened to the public on Saturday 23 June in an effort to engage the general public in global space activities.

Former NASA astronaut Scott Kelly, United Nations Champion for Space, delivering a keynote address at UNISPACE+50. Credit: UNIS





UNOOSA Director
Simonetta Di Pippo
with heads of
space agencies at
UNISPACE+50.
Credit: UNIS

UNISPACE
+50

The exhibition at
UNISPACE+50.
Credit: UNOOSA

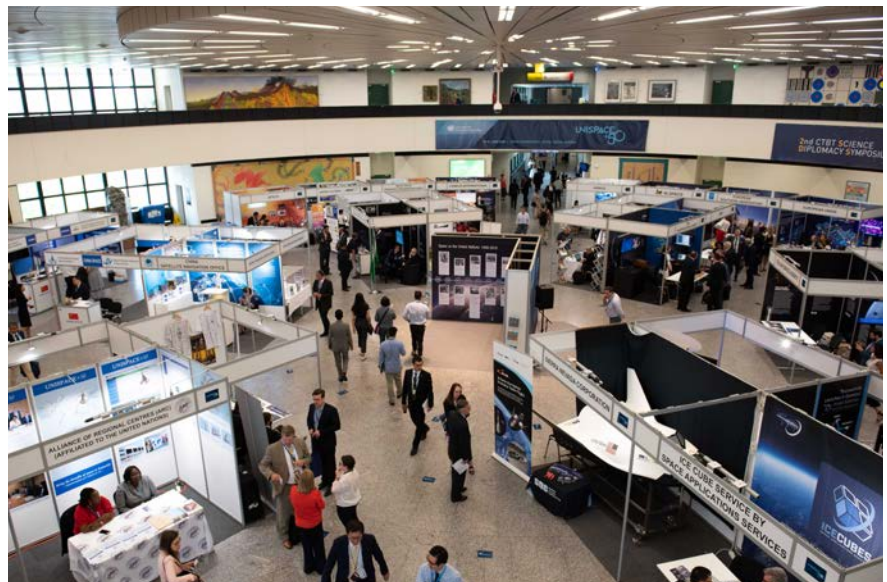


Photo of deployment of 1KUNS-PF (Kenya) and Irazu (Costa Rica) (deployed at the same time) from the ISS. Credit: JAXA

Kenya deployed its first satellite through the KiboCUBE programme

The first CubeSat developed under the KiboCube programme was deployed from the International Space Station (ISS) on 11 May 2018. Named “1KUNS-PF”, or the “First Kenyan University Nano Satellite-Precursor Flight”, it was developed by a team at the University of Nairobi after they were selected for the first round of KiboCUBE in 2016. 1KUNS-PF is Kenya’s first satellite, as well as the first satellite ever developed and deployed under the auspices of the United Nations. The University of Nairobi team is using its CubeSat to test technologies for the future launch of a larger Earth observation satellite. The team also hopes to apply data acquired from its CubeSat to the monitoring of agriculture and coastal areas.

The experience with KiboCUBE will increase Kenya’s capacity in space technology, science and exploration, helping the country leverage their benefits for sustainable development.



European Global Navigation Satellite System and Copernicus: Supporting the SDGs

This joint study by UNOOSA and GSA finds that the use of the European Global Navigation Satellite System (EGNSS) and Copernicus applications delivers direct benefits to almost 40 per cent of SDG targets, either through monitoring the status of achievement or actively contributing to their fulfilment.

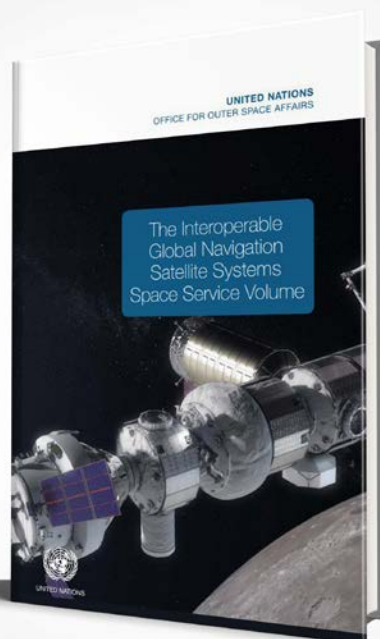
The report shows that the combined use of EGNSS and Copernicus unleashes an array of synergies that can support the achievement of all SDGs. While EGNSS determines a precise position anytime, anywhere on the globe, Earth observation from

Copernicus provides information on the Earth’s surface, its atmosphere and marine systems. From providing the maps needed to find the best locations for renewable energy to outlining the most fuel-efficient flight paths, optimizing road transportation routes and infrastructure monitoring, applications using both EGNSS and Copernicus are essential for sustainable development. UNOOSA is facilitating knowledge exchanges and providing capacity-building for countries to fully leverage their potential.

The Interoperable GNSS Space Service Volume

UNOOSA published this resource, produced by Working Group B of the ICG, with the objectives of defining, establishing and promoting an interoperable GNSS Space Service Volume (SSV) for the benefit of GNSS space users and GNSS space receiver manufacturers. The publication brings together in one resource the characteristics provided by every GNSS as their contribution to an interoperable GNSS SSV. Through the ICG, all providers have agreed on the

information presented in this booklet, and on several recommendations to continue developing the multi-GNSS SSV concept. This publication shows the significant value of GNSS SSV for the future of space exploration activities for countries all over the world: GNSS SSV and its potential augmentations can enable ambitious future space missions and activities going beyond low-Earth orbit to the Moon, Mars and other celestial bodies.



The cover of the report

Brochure on near-Earth objects and planetary defence

UNOOSA is Secretariat to the SMPAG and works with the International Asteroid Warning Network (IAWN), both established in 2014 through a series of recommendations for an international response to the threat of near-Earth object (NEO) impact, endorsed by COPUOS.

In 2018, UNOOSA, together with SMPAG and IAWN, published a brochure on NEOs and planetary defence to further raise awareness and promote global cooperation on NEOs. Through IAWN and SMPAG, UNOOSA helps communities build resilience to NEO hazards and enhance planetary defence to protect humankind. This work is also linked to some of the most pressing challenges of the twenty-first century – building resilient societies and SDG 11 on Sustainable Cities and Communities.

The cover of the brochure on near-Earth objects and planetary defence

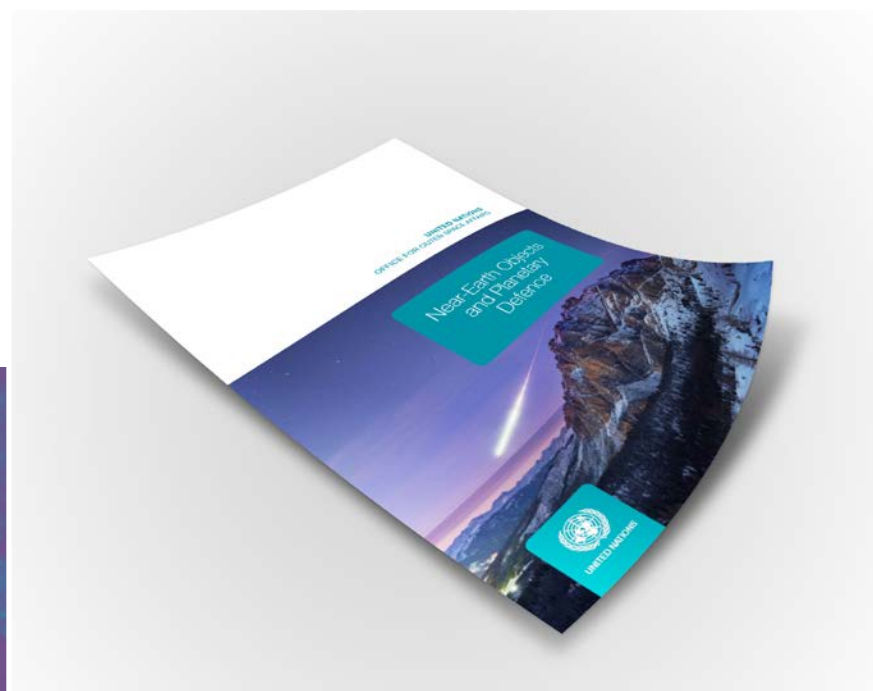
Launch of the Space4Water portal

Building on the agreement signed in 2016 between UNOOSA and the Prince Sultan Bin Abdulaziz International Prize for Water (PSIPW) to collaborate on promoting the use of space-based technology for increased access to water, the two organizations co-launched the Space4Water portal in 2018.

The portal supports capacity-building and policymaking that leverage the potential of space for SDG 6, Clean Water and Sanitation, and SDG 14, Life Below Water. It provides information on projects, initiatives, community

portals, training material, conferences and publications in the space and water sectors and on their linkages. The information is categorized and shared publicly in a user-friendly format, and readers are invited to submit guest articles.

The portal is a one-stop shop that enables developing countries in particular to expand and better leverage their range of space-related tools to support the management of water resources. The portal has been established through the generous financial support of PSIPW.



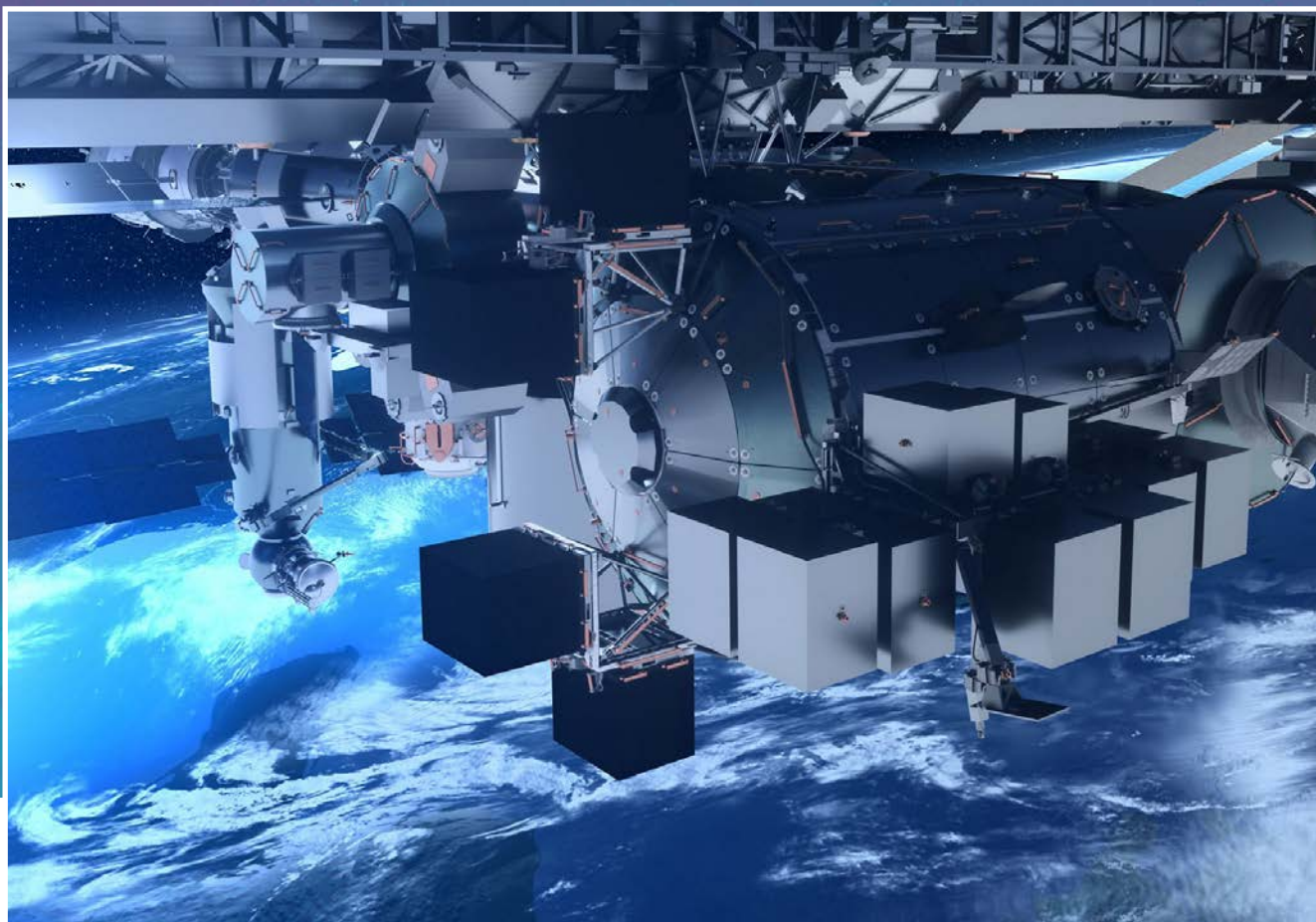


Nepal includes space technologies in 2018 Disaster Risk Reduction Policy

In 2017, UN-SPIDER experts conducted a technical advisory mission to Nepal to evaluate the current and potential use of space-derived information in all aspects of disaster management, and to offer recommendations to increase its role. Through interaction with UN-SPIDER and the report provided by the programme following the mission, stakeholders in Nepal strengthened their understanding of how space technologies can contribute to disaster risk reduction and emergency response. In 2018, UN-SPIDER conducted a follow-up mission to continue these capacity-building efforts.

When drafting the 2018 National Disaster Risk Reduction Policy, Nepalese policymakers took into consideration the benefits that the use of space-based information holds for disaster management and included text on leveraging remote sensing, geographic information systems (GIS) and Earth observation tools in the new policy document. The development of national and local disaster risk reduction strategies is one of the seven targets of the Sendai Framework for Disaster Risk Reduction 2015-2030.

UN-SPIDER mission to Nepal in 2018.
Credit: UNOOSA



Orbital opportunity with Airbus

In 2018, UNOOSA signed a memorandum of understanding with Airbus to jointly build in-orbit capabilities in developed and developing countries, as well as expand know-how on the use of Earth observation data and their related benefits.

As part of their joint work, in 2018 UNOOSA and Airbus announced a Call for Interest (CFI) for institutions from United Nations Member States to apply for the opportunity to accommodate a payload on the Airbus Bartolomeo external platform

on the ISS. This opportunity is part of UNOOSA's Access to Space 4 All initiative, described in the following chapter of this report.

The purpose of this CFI was to provide a summary of the opportunity and to solicit information from Member States' entities interested in providing payloads. The CFI was also aimed at gathering information on the interested countries so that UNOOSA may better understand the demand for this type of opportunity.

The Bartolomeo platform on the ISS.
Credit: Airbus

Space solutions for the Pacific

Launched in 2018, this project helps Pacific Island States leverage space technologies to achieve the SDGs, in particular those most relevant for the region, such as fighting climate change (SDG 13) and illegal fishing (under SDG 14), enhancing telecommunications (under SDG 9), enhancing global health (SDG 3) and reducing disaster risk (under SDG 11). The services provided by UNOOSA range from technical advisory missions to increase capacity to access and use space-based information, to institutional strengthening missions to help domestic institutions make space-informed policy decisions. Furthermore, UNOOSA – in partnership with the Pacific Community and the United Nations Development Programme (UNDP) – can connect

Pacific Island States with third-party providers of space technology and applications from the commercial sector, national space agencies and other United Nations entities in the region.

In November 2018, UNOOSA engaged with representatives from Pacific Island countries working in space science and technology to survey their current activities and identify areas where enhanced access to space science and technology can support sustainable development in the various national contexts. This information gathering process will go on to inform and tailor the future activities of UNOOSA in the region.

This project is being delivered through the generous support of the Government of New Zealand.



A view of Fiji from space. Credit: ESA

UNOOSA partnership with the Ministry of Science, Technology and Higher Education of Portugal and the AD-Air Centre

In November 2018, UNOOSA signed a memorandum of understanding with the Ministry of Science, Technology and Higher Education of Portugal and the Association for the Development of the Atlantic International Research Centre (AD-Air Centre). The three institutions will identify user needs that may be addressed by space data, applications and technology and work on capacity-building activities to help countries leverage space to achieve the SDGs. The institutions will also explore possibilities for sponsoring research and capacity-building activities in the space sector.

The signature of the agreement took place during the fourth High Level Industry-Science-Government Dialogue, a meeting to foster scientific diplomacy, with the participation of Ministers from Nigeria, Portugal and Spain, and the Secretary of State from Angola, among other high-level officials from different countries.

"My planet, my future: space for the Sustainable Development Goals" exhibition at United Nations Headquarters in New York

The exhibition "My Planet, My Future: Space for the Sustainable Development Goals", displayed at United Nations Headquarters in New York from 10 July to 5 September 2018, was the first-ever focused on how space can support the achievement of the SDGs since the launch of the 2030 Agenda. Organized by UNOOSA and the non-profit organization CANEUS International, it exhibited case studies from around the world on leveraging space for the SDGs.

United Nations Deputy Secretary-General Amina Mohammed delivered the opening speech for the exhibition. She highlighted the need to harness all

tools available and focus on data-driven, evidence-based policymaking to achieve the SDGs by 2030. She underlined that space science and technology play a critical role in this effort, by enabling us to monitor water quality, track diseases, respond to natural disasters, survey crops and natural resources, and much more, in real time and in high resolution.

Ms. Mohammed also emphasized how essential it is for countries around the world to have equitable access to such technologies and that she is encouraged by the work of UNOOSA in bridging the space divide.



From left to right: António Sarmiento, Chair of the Steering Committee AD-AIR Centre, Simonetta Di Pippo, Director of UNOOSA and H.E. Manuel Heitor, Portuguese Minister for Science, Technology, and Higher Education, signing the agreement. Credit: UNOOSA



Opening of the Exhibition. From left to right: Pierre Delsaux, Deputy Director General at Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (GROW); Amina Mohammed, Deputy Secretary-General of the United Nations; Simonetta Di Pippo, UNOOSA Director; Carlo Des Dorides, Executive Director of the European GNSS Agency (GSA); Milind Pimprikar, CANEUS International founder and chairman. Credit: CANEUS International

United Nations/Germany High-level Forum

The United Nations/Germany High-level Forum (HLF): “The way forward after UNISPACE+50 and on Space2030”, held in Bonn, Germany, in November 2018, provided updates and recommendations on how space innovations can address emerging sustainable development challenges, and allowed participants to exchange views on the ever-changing space sector.

Recommendations from participants included the need to strengthen international cooperation and

public-private partnerships, and to increase access to space and space data and technology for all countries to achieve the SDGs.

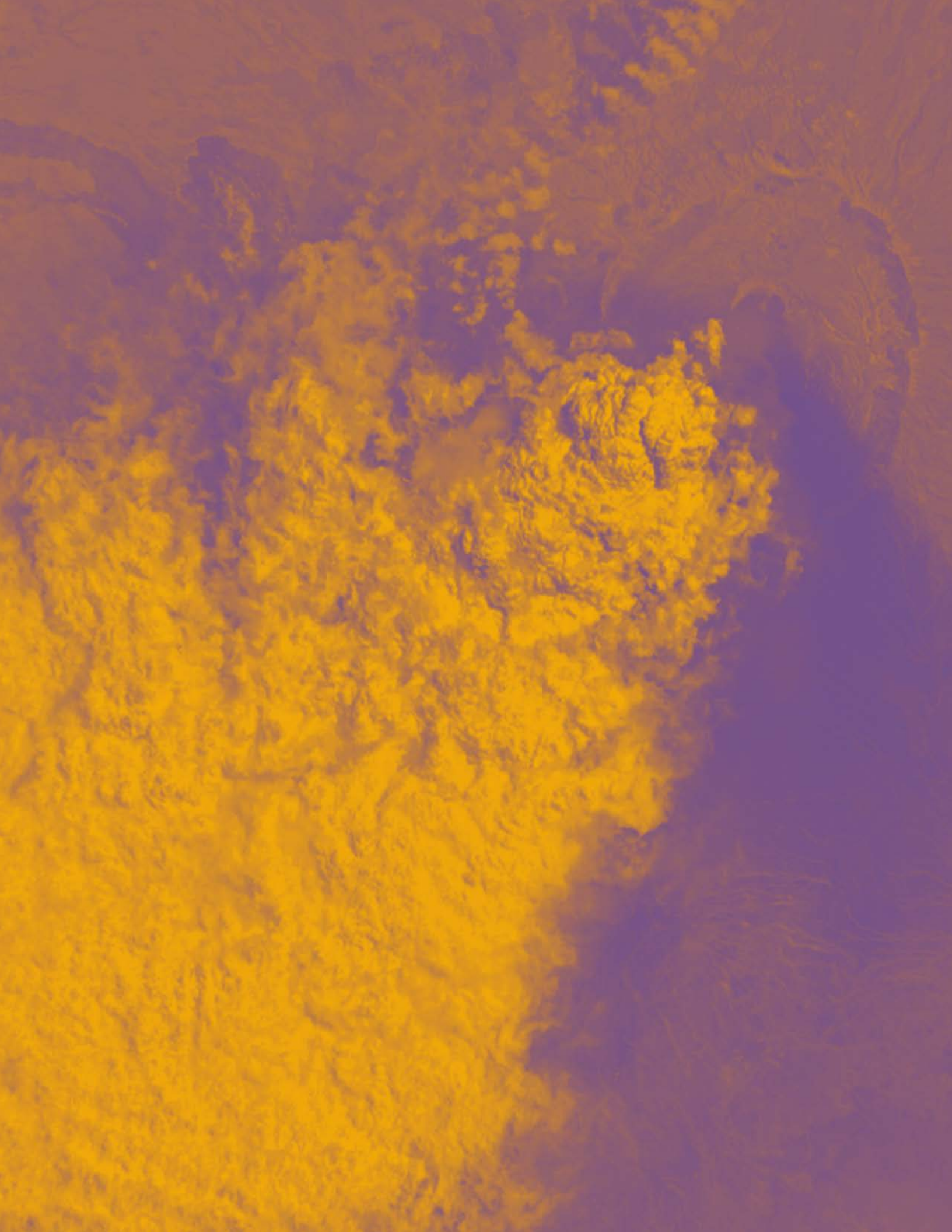
Organized by UNOOSA in cooperation with the German Aerospace Centre (DLR), the HLF was attended by over 300 participants from 58 countries.


At the HLF 2018, UNOOSA announced the Access to Space 4 All initiative to stakeholders.

The 2019 HLF will be held in Vienna.

An aerial photo of HLF 2018. Credit: DLR







Nabro volcano
erupting, Eritrea.
Credit: NASA

This chapter introduces the Access to Space 4 All initiative, launched in 2018 to help all countries, in particular those who do not yet have or with limited space capabilities, access the benefits of space research and technology.

3

FOCUS: ACCESS TO SPACE 4 ALL

3 | FOCUS: ACCESS TO SPACE 4 ALL

The UNOOSA Access to Space 4 All initiative enables communities from all over the world, with special focus on non-spacefaring and emerging spacefaring nations, to use and benefit from space technologies and applications. The initiative offers a wide range of opportunities in micro-gravity research, satellite development and deployment, in-orbit research and access to laboratories in low Earth orbit, such as the ISS and the future China Space Station.

The initiative is a great example of triangular cooperation between established space actors, the United Nations, and non-spacefaring or emerging space entities, working together through UNOOSA to unlock access to space-based benefits. The initiative partners the United Nations with a diverse group of stakeholders such as governments, space agencies, private space entities, civil society and

academia. Such partnerships are key to supporting the achievement of the three global United Nations frameworks – the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction 2015-2030 and the Paris Agreement.

Access to Space 4 All portfolio

The Access to Space 4 All initiative represents a holistic, modern and strategic approach to capacity-building. The initiative focuses on developing the capacity of Member States to access the benefits of space. It comprises research opportunities to develop the technologies needed to send hardware into space, orbital opportunities and a project to increase access to space data.

Research opportunities

Fellowship programme for Drop Tower Experiment Series (DropTES)

Through this fellowship programme, which started in 2013 and is open to all Member States, UNOOSA promotes space education and research in microgravity, particularly in developing countries.

The teams of students selected for the programme can carry out experiments on microgravity science at the Bremen Drop Tower in Germany. These experiments, which consist of four drops or catapult launches, can build capacity for both hardware and human space missions.

The team selected for the fifth cycle of the DropTES in 2018, from the National Institute for Laser, Plasma and Radiation Physics of Romania, produced a potential solution to the increasing drug resistance of pathogenic infections for long-lasting space missions in the future. In 2018, the sixth cycle of the fellowship opened for applications.

The programme is run by UNOOSA in collaboration with the Centre of Applied Space Technology and Microgravity (ZARM) and the German Aerospace Centre (DLR).

Cooperation with the European Space Agency to help developing countries access space technologies

UNOOSA and the European Space Agency (ESA) laid the ground for a future cooperation agreement to provide capacity-building to developing countries for accessing and using space-based technologies to plan, measure and monitor their actions under Agenda 2030. A joint statement declaring mutual interest was signed in 2018, and the agreement is expected to be signed in 2019.

Orbital opportunities

KiboCube programme for deploying cube satellite from the ISS

UNOOSA and JAXA are continuing their collaboration to offer the opportunity for institutions from developing countries to develop a Cube Satellite to be deployed from the ISS Japanese Experiment Module (Kibo), KiboCUBE.

Besides the launch of the first satellite developed under the programme, presented in this year's highlights, KiboCUBE saw further exciting developments in 2018.

Two winners were selected for the third round of the programme: a team from the Mauritius Research Council and one from Surya University in Indonesia. They joined the Universidad del Valle de Guatemala and the University of Nairobi as distinguished winners of the programme.

The team from Mauritius aims to deploy the first Mauritian satellite "MIR-SAT1". The satellite will include a camera that will allow it to collect thermal infrared images of Mauritius and its surrounding areas. The team also aims to test the onboard communication capabilities of the CubeSat by studying the satellite's capacity to transfer information via satellite radio wave frequency.

The Indonesian satellite – Surya Satellite 1 (SS-1) – will be equipped with an automatic package reporting system (APRS) that works on amateur radio frequencies. This will enable the CubeSat to transmit APRS messages to ground stations. Furthermore, SS-1 will be designed for two-way communication use for educational and disaster mitigation purposes, which

can be carried out by anyone with a valid amateur radio call sign.

In October 2018, UNOOSA and JAXA announced the fourth round of the programme, for which applications were accepted until 28 February 2019. We look forward to reporting on the further achievements of this extraordinary collaboration!

(continued)

CubeSats Irazu (Costa Rica) and 1KUNS-PF (Kenya) deployed from the ISS. Credit: JAXA



Orbital opportunities *(continued)*

Space experiments on board the China Space Station

UNOOSA and the China Manned Space Agency (CMSA) launched their collaboration to provide institutions from Member States, in particular countries with limited or no space capabilities, with the opportunity to conduct space experiments on board the China Space Station, which is expected to be operational by 2022.

The collaboration aims to build the capacity to use human space flight technologies, including facilities and resources from China's human space-flight programme, and promote awareness of the benefits of utilizing human space technology and its applications.

The year 2018 saw the first announcement of opportunity, for which 42 applications for space experiments on board the China Space Station were received. These are now being evaluated by experts from UNOOSA, CMSA and the international space community for final selection. We look forward to announcing the winners in 2019 and following the implementation of their exciting projects!



Rendering of the China Space Station in low Earth orbit. Credit: CMSA

The Airbus Bartolomeo platform

In 2018, UNOOSA and Airbus announced a CFI for institutions from United Nations Member States to apply to participate in an orbital space opportunity utilizing the Airbus Bartolomeo external platform attached to the European Columbus Module of the ISS. Responses were received between 6 December 2018 and 31 January 2019.

The opportunity would be to accommodate and operate a payload on the platform, with application areas that include Earth observation, robotics, material science and astrophysics. The opportunity aims to contribute to the 17 SDGs by building capacity and knowledge in space technologies at the national level. It will also promote international cooperation across nations in the peaceful uses of outer space.

Orbital space mission using the Sierra Nevada Corporation's Dream Chaser

Back in 2017, UNOOSA and the Sierra Nevada Corporation (SNC) issued a CFI for a proposed orbital space mission using SNC Dream Chaser® space vehicle.

The mission will allow Member States to provide payloads or experiments to be flown in low-Earth orbit, on the condition that they contribute to the attainment of one or more of the SDGs.

The CFI, which was to ascertain the level of interest in this initiative, received more than 150 responses from 75 countries, addressing all 17 SDGs. A briefing on the technical capabilities of the Dream Chaser was held on 10 January 2018 at the UNOOSA office in Vienna. As a next step, UNOOSA and SNC are working on the announcement of opportunity to select payloads.



Top: A depiction of the Dream Chaser.
Credit: Sierra Nevada Corporation

Bottom: The International Space Station (ISS).
Credit: NASA





Musa Bay, Islamic
Republic of Iran.
Credit: ESA

Space technology is essential for all stages of disaster management and to increase the resilience of communities all over the world to disasters. This chapter presents the work of UNOOSA in this area through the UN-SPIDER programme.

4

LEVERAGING SPACE FOR DISASTER RISK REDUCTION AND MANAGEMENT

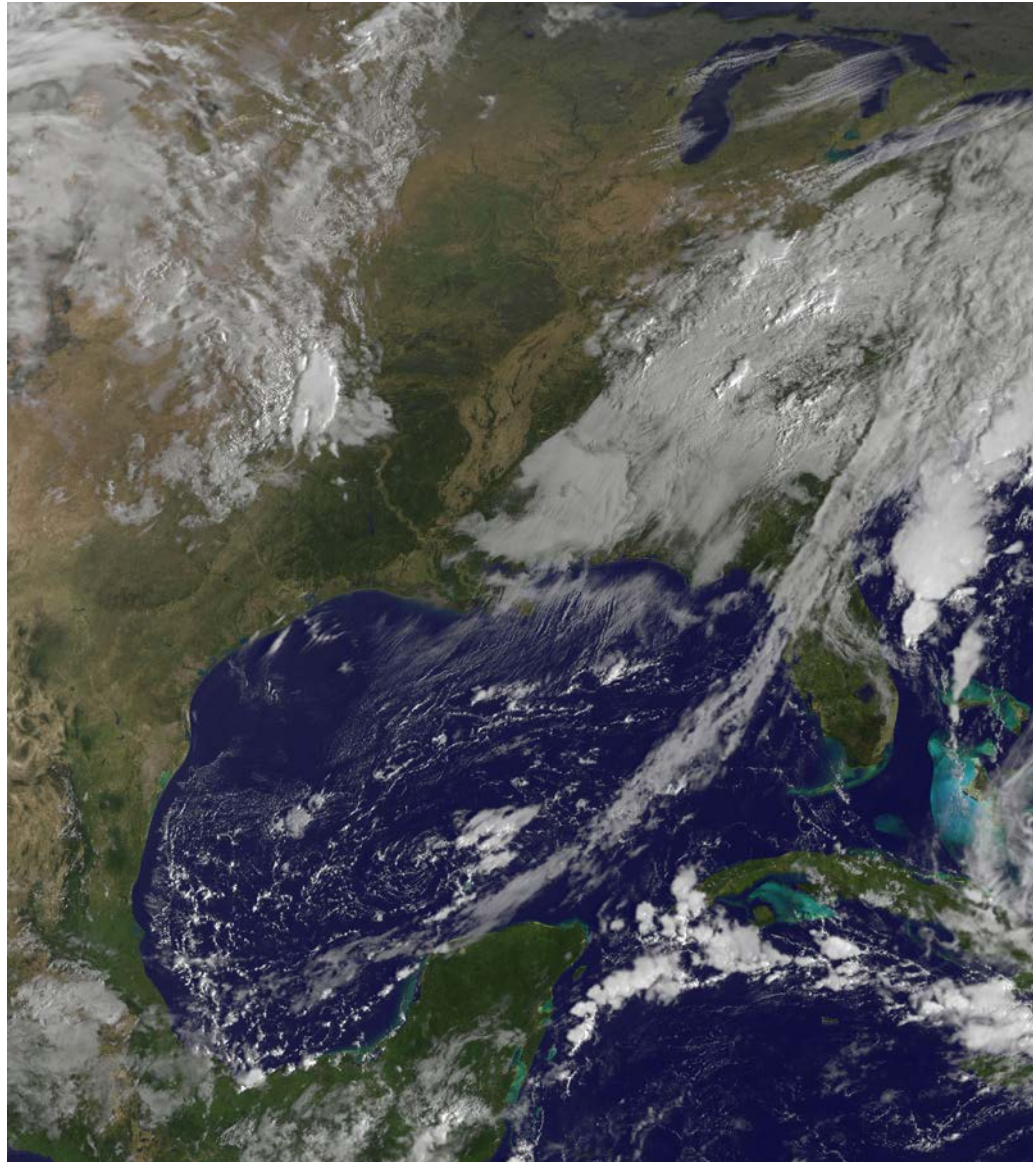
4 | LEVERAGING SPACE FOR DISASTER RISK REDUCTION AND MANAGEMENT

What is UN-SPIDER?

UN-SPIDER was established by the General Assembly in 2006 and is implemented by UNOOSA. The programme supports all countries in accessing and using all types of space-based science and information for the full disaster management cycle – from disaster risk reduction to emergency response.

UN-SPIDER has a network of regional support offices (RSO). An RSO is a regional or national centre of excellence in the use of space technology in disaster management that supports the implementation of UN-SPIDER activities in its sphere of operation. An RSO can be hosted by a space agency, a research centre, a university or a disaster management institution, to name but a few examples. These offices communicate and coordinate with UN-SPIDER on a regular basis, engaging in outreach and capacity-building, as well as horizontal cooperation and technical advisory support.

In 2018, Delta State University in Cleveland, Mississippi, United States, joined the UN-SPIDER network of RSOs, bringing their total number to 23 and adding an important North American location to the network.



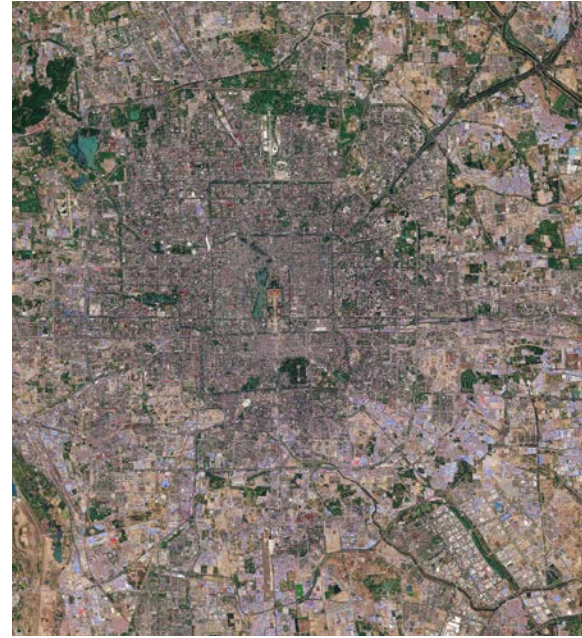
Hurricane Joaquin. Credit: NASA

UN-SPIDER Knowledge Portal

Knowledge management is at the core of UN-SPIDER activities – offline and online. The Knowledge Portal, a cornerstone of UN-SPIDER, hosts information on all activities conducted by the programme and provides easy

digital access to resources related to the use of space technologies in disaster management. Interest in the latter increased visibly in 2018, as did traffic on the Knowledge Portal, which reached half a million users, more than 40 per cent higher than in 2017.

In May 2018, UNOOSA became a data provider in the Group on Earth Observations System of Systems (GEOSS) platform. Under the arrangement, selected content from the UN-SPIDER Knowledge Portal, such as data sources, is made available through the GEOSS platform.



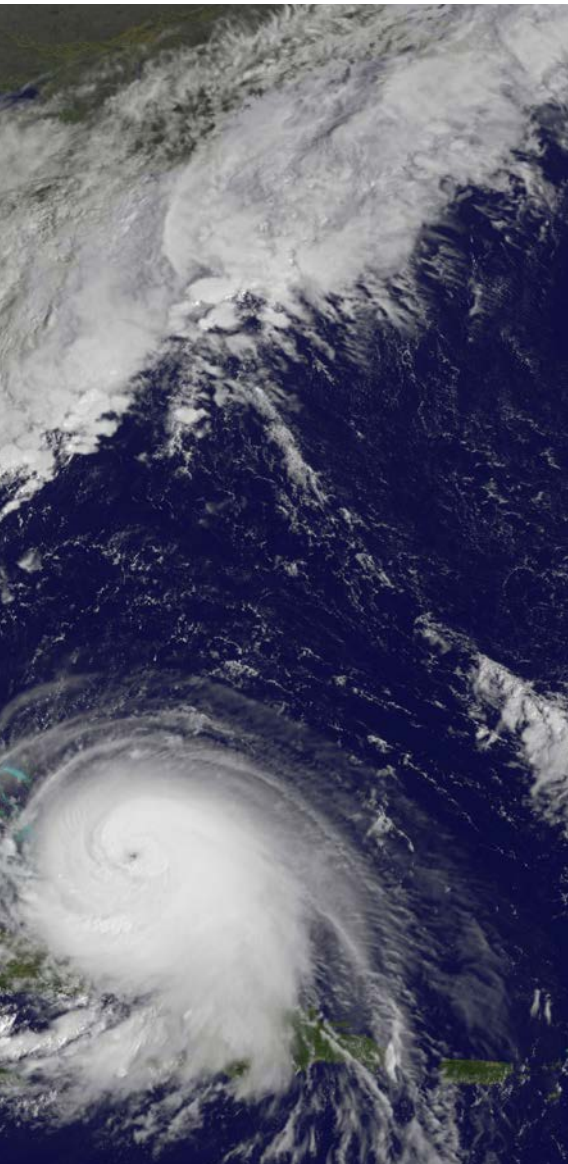
Beijing viewed from space. Credit: ESA

Activations of the International Charter “Space and Major Disasters”

In 2018, UNOOSA requested the activation of the International Charter “Space and Major Disasters” – a worldwide collaboration through which satellite data are made available for disaster relief efforts – three times:

- On behalf of the Ministry of Science and Technology and the Department of Disaster Management and Climate of the Lao People’s Democratic Republic, in response to the floods that hit the country in July.
- On behalf of the Viet Nam Disaster Management Authority (VDM) when typhoon Bebinca caused floods and landslides in Viet Nam in August.
- On behalf of the National Institute of Aeronautics and Space of Indonesia, when a tsunami hit the country in late 2018.

UNOOSA also helped the National Coordinating Agency for Disaster Reduction of Guatemala activate the Charter following a large eruption of the Fuego volcano on 3 June 2018.



Technical assistance to Member States

In 2018, UNOOSA, through UN-SPIDER, provided the following technical advisory services and technical assistance to Member States to help them leverage space technologies for disaster risk reduction and management.

Sri Lanka

**27 February to 1 March
and 22 to 28 March**

Building on the outcomes of previous missions to Sri Lanka, in 2018 UN-SPIDER carried out two technical advisory missions to the country to address long-term capacity-building needs and discuss joint activities. UN-SPIDER followed up with the Disaster Management Centre of Sri Lanka regarding the technical inter-institutional team for rapid mapping in case of disasters that is being established at the suggestion of UN-SPIDER and discussed plans to support the implementation of the Sendai Framework in the country with senior officials. UN-SPIDER also joined forces with two of its RSOs – the Asian Disaster Preparedness Centre and the International Water Management Institute (IWMI) – to conduct a training session on disaster risk assessment for development planning and emergency response, which attracted 41 participants from the Disaster Management Centre, the National Building Research Organization, the Ministry of Disaster Management, the National Disaster Relief Services Centre and other institutions.

Guatemala

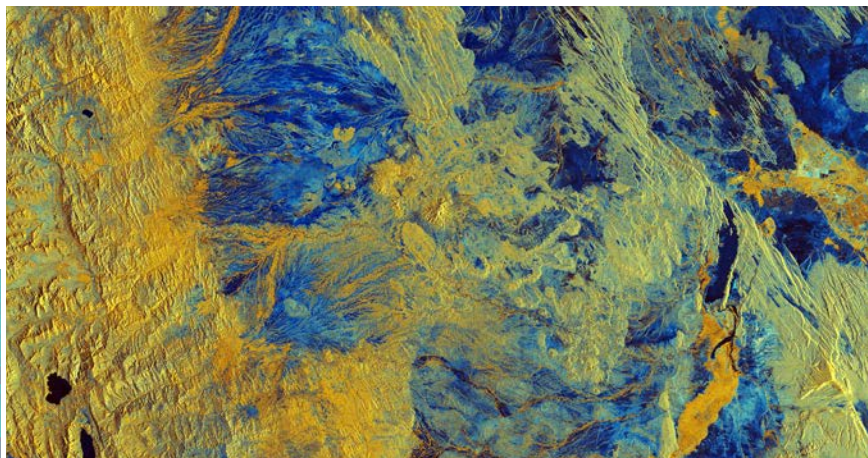
**23 to 31 July and 29 October
to 2 November**

Building on the outcomes of previous missions to Guatemala between 2010 and 2017, UN-SPIDER conducted two expert missions to the country in July and November 2018. The missions included exchanges with the National Institute for Seismology, Volcanology, Meteorology and Hydrology, the Executive Secretariat of the National Coordinating Agency for Disaster Reduction and other government agencies, as well as joint seminars with the National Secretariat for Science and Technology of Guatemala. In 2018, UN-SPIDER also facilitated Guatemala's access to satellite imagery donated by DigitalGlobe, a provider of Earth observation data, with which UNOOSA has a memorandum of understanding, to support emergency response efforts and damage assessments.

Viet Nam

13 to 17 August

UN-SPIDER carried out an institutional strengthening mission upon invitation of the VDMA, to follow up on recommendations made after its 2013 technical advisory mission to the country. The mission included an expert meeting to define the long-term engagement of UN-SPIDER in Viet Nam and discuss steps for the Disaster Management Policy and Technology Centre to become an authorized user of the International Charter "Space and Major Disasters". UN-SPIDER also ran a three-day hands-on training programme on "Unmanned aerial vehicles and space technology for disaster management" for key stakeholder organizations, attended by 15 government officials.



Viet Nam Mekong
Delta. Credit: ESA

Ghana

15 to 19 October

The institutional strengthening mission was conducted by UN-SPIDER at the request of the National Disaster Management Organization (NADMO) of the country. The mission consisted of a seminar with representatives of government agencies and universities, including the Ghana Space Science and Technology Centre, as well as a four-day training course on UN-SPIDER recommended practices for dealing with floods and droughts. The course was attended by over 30 participants from various institutions. The course initiated the establishment of a technical inter-institutional team focused on generating geospatial information from space and in situ data to contribute to disaster management efforts. UN-SPIDER also helped NADMO apply to become an authorized user of the International Charter "Space and Major Disasters".

Cambodia

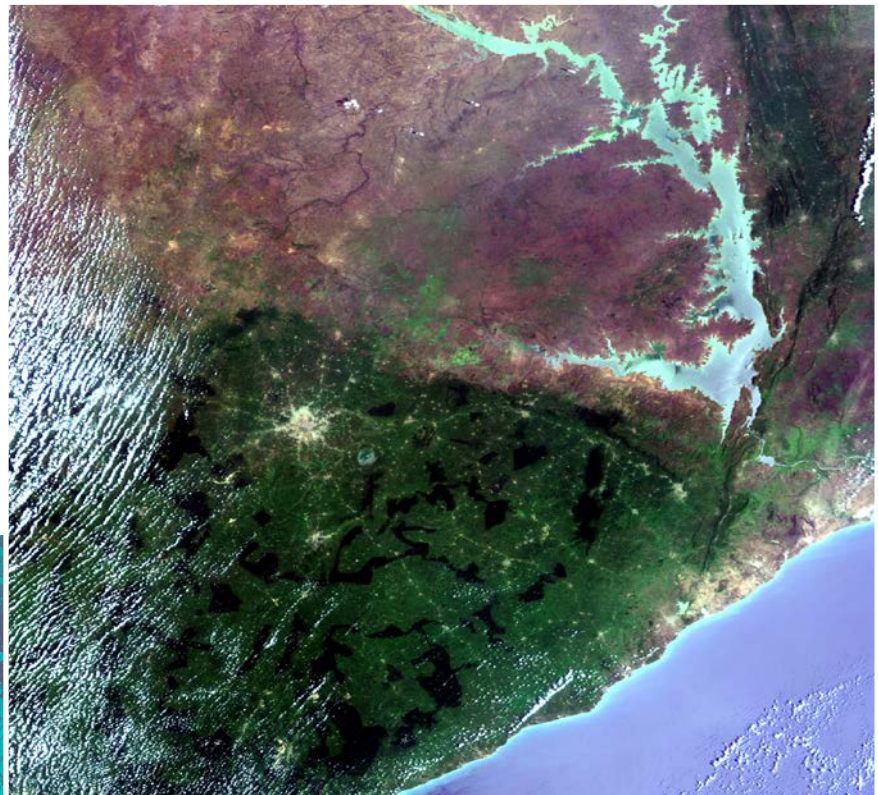
29 October to 1 November

UN-SPIDER and World Vision organized a training course and simulation exercise for emergency response to typhoons in Phnom Penh. The objective was to build the capacity of the Humanitarian Response Forum, a mechanism for coordination on emergency preparedness and humanitarian response in Cambodia between the United Nations, non-governmental organizations (NGOs) and international organizations, created in 2011. Participants simulated the immediate, initial response phase to a typhoon disaster.

Zimbabwe

19 to 23 November

UN-SPIDER conducted a technical advisory mission to evaluate the current use of space-derived information for disaster management and provide recommendations for leveraging their potential further.



Lake Volta in Ghana.
Credit: ESA



The Regional Workshop and Training Programme in Ahmedabad, India. Credit: UNOOSA



The Imja glacier, Himalayas, Nepal. Credit: ESA



Peruvian landscape from space. Credit: ESA

India

4 to 8 December

The South Asian Association for Regional Cooperation (SAARC) Disaster Management Centre, based at Ahmedabad, India, hosted the Regional Workshop and Capacity-building Programme for Utilization of Space-based and Geospatial Information for Achieving the Targets of the Sendai Framework for Disaster Risk Reduction. Experts from UN-SPIDER, the UN-SPIDER Regional Support Office, IWMI as well as from the Centre for Space Science and Technology Education in Asia Pacific contributed to the training programme.

Nepal

17 to 21 December

UN-SPIDER undertook an institutional strengthening mission to assist Nepal in improving the utilization of space-based and geospatial information in all stages of disaster management and help stakeholders implement the recommendations from the 2017 UN-SPIDER mission to the country. UN-SPIDER also organized a capacity-building programme on the use of space technology for floods, droughts, landslides and earthquakes for 25 officials from various government agencies. An expert from DigitalGlobe also joined the 2018 mission to raise awareness about the use of high-resolution images in building resilience.

Maps of drought indicators for Bolivia (Plurinational State of), Ecuador, El Salvador, Guatemala, Nigeria and Peru

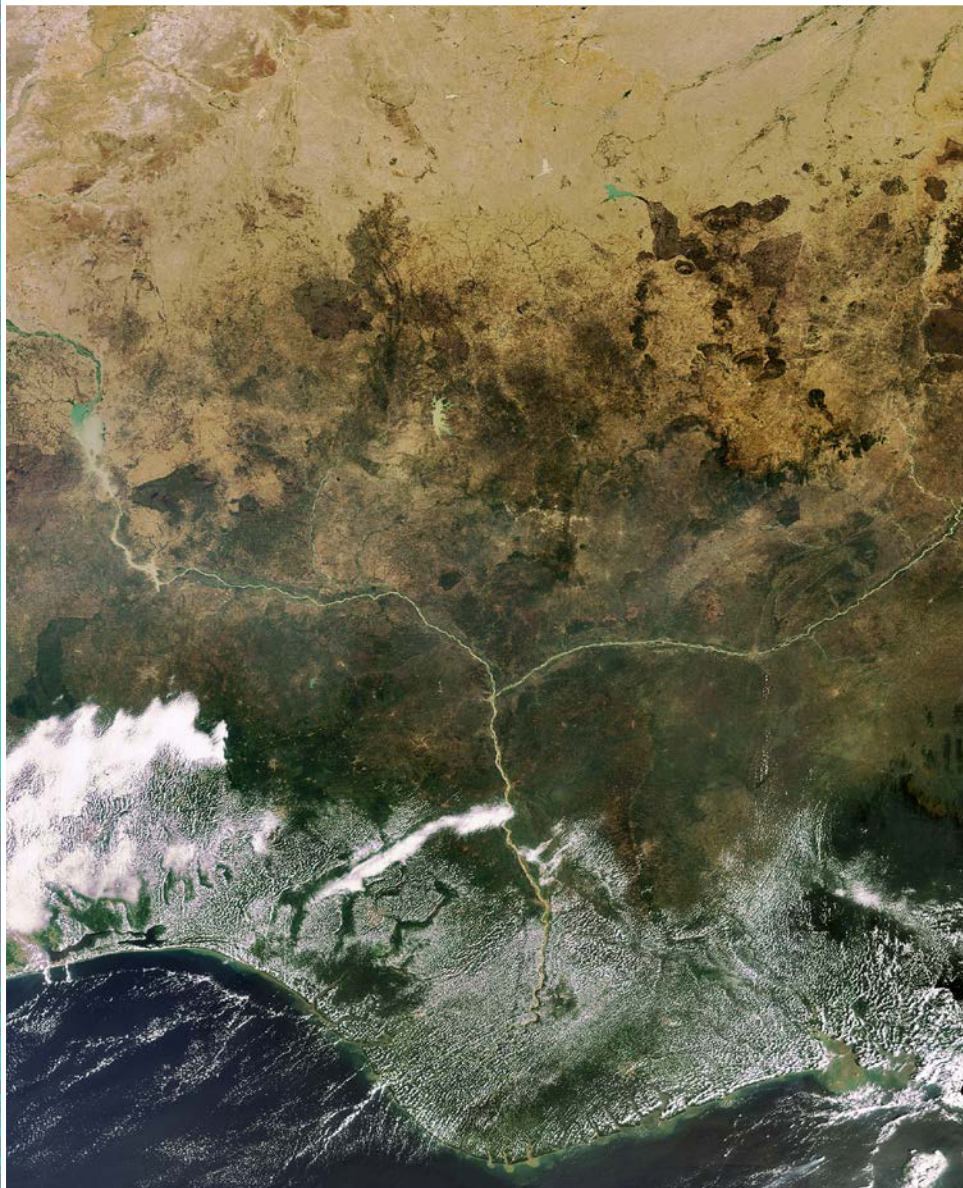
Using free-access satellite data, UN-SPIDER prepared and provided maps of drought indicators to Bolivia (Plurinational State of), Ecuador, El Salvador, Guatemala, Nigeria and Peru, through institutional partners. As an example of drought early warning practices, these maps were used to encourage continuous monitoring efforts. In the case of El Salvador and Guatemala, these maps contributed to raising awareness about the longer-than-usual reduction in rainfall in July and August 2018, which triggered drought conditions in the two countries.

Satellite image for flood in Afghanistan

In July 2018, Airbus and UN-SPIDER also worked together to provide Afghanistan with a satellite image of the area affected by a glacial lake outburst flood. The International Centre for Integrated Mountain Development (ICIMOD), a UN-SPIDER RSO, used the image to create a flood map of the area, which was shared with authorities.

Flood mapping and drought early warning support for Nigeria

UN-SPIDER supported the National Space Research and Development Agency (NASRDA) of Nigeria, a UN-SPIDER RSO, with information regarding the geographical extent of the Benue river floods that took place in September 2018. Based on its recommended practices for flood mapping and using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) Terra, as well as Sentinel-1 radar imagery, UN-SPIDER created and shared maps of flooded areas. It also trained NASRDA staff in generating drought maps for Katsina State.



The Niger Delta in Nigeria. Credit: ESA

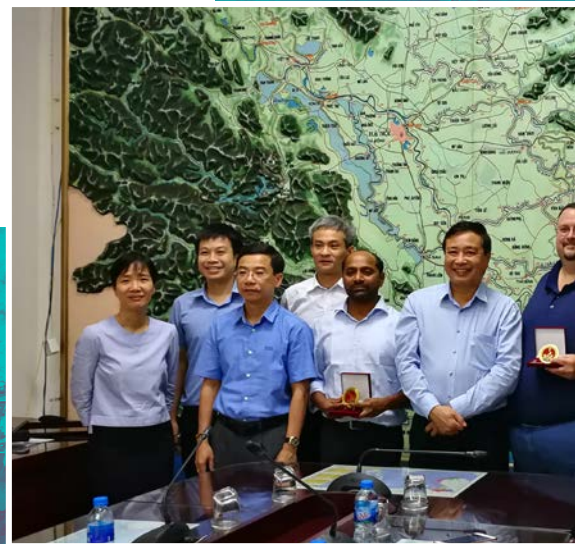
Mapping support for floods in Ghana and Viet Nam

In response to requests from the VDMA and NADMO for flood monitoring support in September and October 2018, UN-SPIDER processed free access satellite imagery to

generate and provide maps of flooded areas. UN-SPIDER also supported the VDMA in obtaining satellite data for the Mangkhut super typhoon on 14 September.



UN-SPIDER mission to Sri Lanka, 2018. Credit: UNOOSA



UN-SPIDER mission to Ghana in 2018. Credit: UNOOSA

Other activities on space for disaster management

United Nations International Conference on Space-based Technologies for Disaster Risk Reduction

About 100 participants from 34 countries attended the eighth annual United Nations international conference on Space-based Technologies for Disaster Risk Reduction held in Beijing from 24 to 26 October.

Under the theme “Enhancing Disaster Preparedness for Effective Emergency Response”, the conference provided a platform to exchange information on uses of space-based technologies for disaster management and emergency response.

UN-SPIDER International Expert Meeting “Towards Big (Space) Data in Support of Disaster Risk Reduction and Emergency Response in Africa”

Conducted at the United Nations campus in Bonn, Germany, on 12 November 2018, the meeting brought together around 45 experts from space agencies, civil protection authorities, international organizations, technical relief and humanitarian aid providers, national ministries and the private sector. Participants identified ways to strengthen the capacity of African countries in using big data and satellite technologies, as well as assessing technical needs on the continent.



UN-SPIDER training programme in Viet Nam, 2018.
Credit: UNOOSA



UN-SPIDER training in Ghana, 2018.
Credit: UNOOSA

EvIDENz project

The Earth Observation-based Information Products for Drought Risk at the National Level (EvIDENz) carries out drought impact monitoring with space-based sensors in combination with socioeconomic data for the case study areas of Eastern Cape Province in South Africa and the Kiev region (oblast) in Ukraine. In particular, EvIDENz considers agricultural economic loss due to yield changes caused by drought in Kiev, and the estimated number of people affected by drought hazards in the agricultural sector (livestock and crops) in South Africa. The project also helps measure drought indicators to track progress in implementing the Sendai Framework for Disaster Risk Reduction 2015–2030.

The project is carried out by a consortium that includes the Centre for Remote Sensing of Land Surfaces of the University of Bonn (ZLF), the Institute for Environment and Human Security of the United Nations University (UNU-EHS), and UN-SPIDER.

In 2018, EvIDENz held workshops in South Africa and Ukraine to update decision makers and technical staff on the workflows developed.

The project is being carried out thanks to the generous financial support of the University of Bonn.



Antenna at dawn.
Credit: Devostock

Space technology provides unique images, data and navigation services, among other applications, that are essential for achieving and monitoring progress towards all the SDGs. This chapter presents the main activities of UNOOSA in helping countries leverage space technologies for the SDGs.

5

SPACE4SDGs

5 | SPACE4SDGs

Space technologies and data are fundamental for achieving the SDGs: they provide real-time, homogenous information from any location, including remote areas, upon which strategic policymaking decisions can be based; and they are essential for monitoring progress against the SDGs.

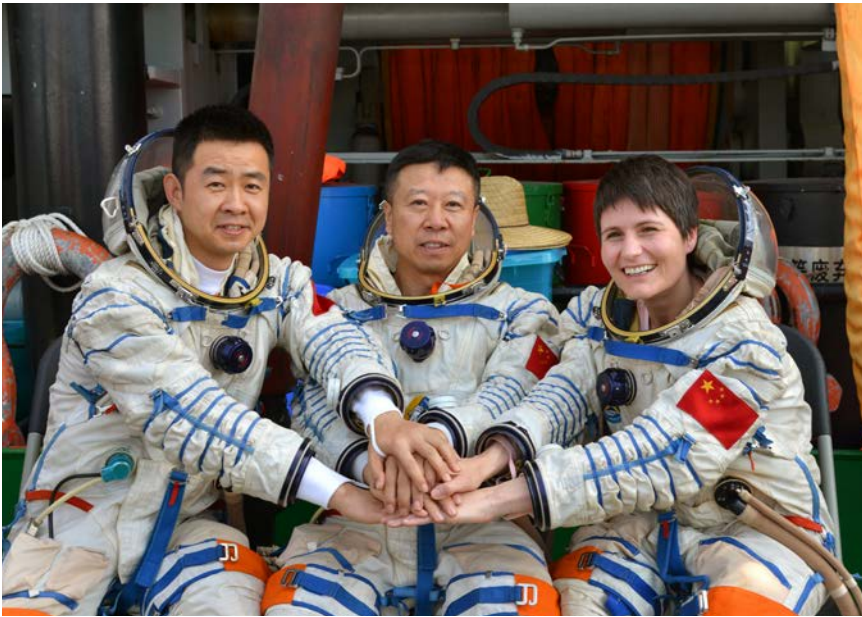
Just to provide a few examples, through space technologies, countries can improve resilience to disasters; increase agricultural output and profitability; fight the spread of diseases; foster innovation, education and research in science, technology, engineering and mathematics (STEM) fields, and expand opportunities for women in these fields; promote industrialization, productivity improvements through innovation and economic growth; achieve better water management; support clean energy transition; promote sustainable infrastructure and cities; analyse natural resources and ecosystems for sustainable consumption and production; monitor and devise strategic responses to climate change and the risks to life and biodiversity under water and on land; combat illegal trade and other criminal activities, foster peace and justice; and promote international cooperation and partnerships across nations.

To capture the importance of space technologies for the SDGs, UNOOSA introduced the Space4SDGs logo:



SPACE 4SDGS

In what follows we provide some highlights of the work of UNOOSA towards the achievement of the SDGs in 2018. Other UNOOSA projects that directly support the SDGs are featured throughout this report, for example in the chapters related to Space Education, International Cooperation and Disaster Risk Reduction.



Italian female astronaut
Samantha Cristoforetti
at a Chinese training
centre. Credit: CMSA



Women astronauts
aboard STS-131, a
NASA Space Shuttle
mission to the
ISS. Credit: NASA

Space4Women

Leveraging the talent of women and girls all over the world is essential for humanity to seize the benefits of space and reach unprecedented frontiers in space technology and exploration.

UNOOSA supports these objectives through the Space4Women project, which helps communicate and facilitate access to opportunities in the space sector, and in STEM sectors more widely, for girls and women. In particular, the project promotes a global “Space4Women Champions” network, linking young women with positive female role models who can advise and guide them throughout their career journey from education to occupation in STEM sectors. This project contributes directly to SDG 4 (quality education) and SDG 5 (gender equality).

The Space4 Women platform will also be the central hub for global initiatives and for research on various aspects of women’s involvement in STEM and the space sector, under the umbrella of the United Nations.

Through Space4Women, UNOOSA will also provide data, research and evidence-based policy advice to institutions and Governments to increase opportunities for women in the STEM and space sectors, and for recognizing the contributions of women to these fields.

The Space4Women project is being carried out thanks to generous contributions from the Government of Israel, the European Space Agency and Women in Aerospace Europe.

Space4Water

UNOOSA works to promote the use of space technologies and applications for better water management, supporting SDG6. Besides the launch of the Space4Water portal, in this year's highlights, UNOOSA's portfolio on Space4Water saw other exciting developments in 2018.

In February, UNOOSA and PSIPW organized the United Nations/Pakistan/PSIPW fourth International Conference on the Use of Space Technology for Water Management in Islamabad. The conference attracted over 100 decision makers and experts from around the world to consider how space technology can help manage water resources.

At the conference opening, the Pakistan Federal Minister for the Interior and Federal Minister for Planning Development and Reform Ahsan Iqbal underlined how the application of space technology has proven to be cost-effective, accurate and worthwhile for water management. He also highlighted the importance of raising awareness among policymakers of the advantages of employing space technology in water-related and other fields.



The Amazon river seen from space. Credit: ESA

Space economy for SDG 8 and 9

The space economy is expanding enormously, with predictions from Morgan Stanley and Bank of America that it could generate revenues of US\$ 1.1-2.7 trillion or more by 2040, up from US\$ 383.5 billion currently, as estimated by the Space Foundation. The sector is seeing the participation of an ever-increasing number of actors, including private firms, and exponential growth in the launch of objects into space. Innovation from space technologies is opening doors to other sectors: for example, companies operating in robotics, artificial intelligence and the "neural network" are looking at the development opportunities that space can offer for their products and services.

Given these trends, the space sector will increasingly contribute to economic growth, industrialization, innovation and job creation, in line with SDG 8 and 9. The space economy is also one of the four pillars of the Space2030 Agenda, which outlines the contribution of space to the SDGs.

To shed light on the potential of the space economy for sustainable development through research and education, on 8 November 2018 UNOOSA signed a memorandum of understanding with Bocconi University through the Space Economy Evolution Lab (SEE) of the SDA Bocconi School of Management, managed by Prof. Andrea Sommariva. This collaboration will include academic courses for training public employees, particularly those in developing countries, on topics related to the space economy. The courses will be provided by SDA Bocconi with the support of UNOOSA. UNOOSA will ensure that the managerial, strategic, economic and financial knowledge of SDA Bocconi reaches the emerging countries interested in entering the space sector. The cooperation will pay attention to integrating space technologies with emerging new technologies, in line with the New Technologies Strategy of the Secretary-General.

SDG17: new partnerships

In 2018, UNOOSA launched new partnerships to leverage the potential of space for achieving the SDGs, with the following entities:

- **Ministry of Science, Technology and Higher Education of Portugal and the Association for the Development of the Atlantic International Research Centre (AD-Air Centre):** memorandum of understanding to identify user needs that may be addressed by space data, applications and technology and work on capacity-building activities to help countries leverage space for the SDGs.
- **Italian Space Agency (ASI):** memorandum of understanding to strengthen international cooperation on newly emerging issues in space science and exploration, satellite navigation and communication, education, Earth observation and natural disaster management.
- **China National Space Administration (CNSA):** a declaration of intent to cooperate on the Belt and Road Space Information Corridor to help countries along the Belt and Road, as well as developing countries, achieve the SDGs through the utilization of space technology.
- **German Aerospace Centre:** memorandum of understanding to promote the discovery, access and use of space technology in the field of space technology applications for sustainable economic and social development, disaster management and climate change.
- **Asteroid Foundation:** memorandum of understanding to promote International Asteroid Day, celebrated on 30 June each year, and increase public awareness on the work and cooperation taking place around the world on the topic of asteroids.
- **Committee on Space Research (COSPAR):** memorandum of understanding to strengthen collaboration on strategic objectives including quality of life, food security, global health and disasters, satellite communications, environment and climate change, planetary protection and space exploration, and space weather.
- **CANEUS International:** memorandum of understanding to promote the SDGs through cooperation in building a network of partners from various sectors and to organize events and exhibitions relevant to the work of UNOOSA and on the use of space for the benefit of humankind, in line with the SDGs.
- **Geo-Informatics and Space Technology Development Agency (GISTDA) of Thailand:** memorandum of understanding to make the technical capacity, physical facilities and services of GISTDA accessible to space actors in South-East Asia, to help develop a strong space sector in the region, and to encourage the interest of local youth in pursuing studies in space science and applications.
- **Ministry of Science and ICT of the Republic of Korea, and the Korea Aerospace Research Institute:** a declaration on cooperation highlighting the mutual interest in capacity-building and the intention to cooperate for enhancing knowledge of space and promoting more opportunities and open access to space technologies, systems and space-derived information and data.
- **Airbus:** memorandum of understanding to jointly build in-orbit capabilities in developed and developing countries, as well as to expand know-how on the use of Earth observation data and their related benefits.
- **World Space Week Association:** memorandum of understanding to jointly promote the benefits of space to humankind and space as a tool to support the SDGs.
- **Space Trust:** memorandum of understanding to jointly promote the use of space science and technology. UNOOSA and Space Trust organized a space panel during the General Assembly meeting in New York in September 2018, focused on strengthening international cooperation in the peaceful uses of outer space.
- **Bocconi University:** memorandum of understanding with the Space Economy Evolution Lab (SEE) of the SDA Bocconi School of Management to develop research and academic courses for public employees, particularly those in developing countries, on topics related to space economy.
- **Delta State University** in Cleveland, Mississippi, United States, joined the UN-SPIDER network of RSOs, bringing their total number to 23 and adding an important North American location to the network.

Other Space4SDGs activities

United Nations/Holy See Seminar on Exploration and Development of Space Resources, Opportunities and Issues in the Context of the Sustainable Development Goals

Held in March, the seminar brought together 30 experts to discuss how space science and technology can foster sustainable development. Participants identified recommendations to support the efforts of UNOOSA to engage the broader space community, including on the importance of raising awareness of space-related issues, on building capacity in STEM and for youth, and on facilitating open access to space and space-based data.

At the sidelines of the seminar, UNOOSA Director Simonetta Di Pippo met with Pope Francis during a *baciamento speciale* to discuss the importance of bringing the benefits of space activities to humankind.



UNOOSA Director Simonetta Di Pippo with His Holiness Pope Francis. Credit: EURISY

"Keep Running" challenge on the SDGs

UNOOSA contributed to the special Austrian edition of the number one Chinese reality show "Keep Running", which is based on the concept of Chinese celebrities accomplishing special challenges. The UNOOSA Director was featured in the show and informed the participants, seven leading Chinese celebrities including actors, singers, film directors, a fashion model and a racing driver, about their challenge to put together a presentation on the United Nations SDGs and deliver it in English at a Youth Forum in the Vienna City Hall. Later in the evening, the celebrities delivered their speeches at the City Hall in front of an audience of more than 500 people. They were joined by six speakers from different Vienna-based United Nations organizations who spoke about their work in achieving the Goals.

This episode of the show, aired in April, was watched by millions of people. UNOOSA also contributed to the Youth Forum by making a presentation on the importance of space for achieving the SDGs.



New York from space.
Credit: ESA

High-level Political Forum on Sustainable Development

UNOOSA Director Simonetta Di Pippo spoke at the High-level Political Forum, held in July in New York, in a panel on "Building the enabling system to maximize partnership in driving sustainable and resilient societies". She highlighted concrete examples of the innovative, twenty-first century approach that UNOOSA has adopted towards partnerships with public and private sector entities, which create new opportunities in space for the benefit of all stakeholders and in support of all 17 SDGs.

United Nations/Austria Symposium on Space for the Sustainable Development Goals

Held in Graz, Austria, from 17 to 19 September 2018, the symposium attracted approximately 80 participants from national statistics institutes, space agencies, United Nations entities and the industry.

In addition to traditional presentations, the symposium featured interactive working groups that resulted in concrete recommendations. Specifically, according to the participants, communication between space users and providers should be greatly enhanced. Intermediate layers of users between providers and end

users should play an important role in defining user needs. Furthermore, the establishment of a database to showcase space systems (e.g., GNSS and Satellite Telecommunication Systems) was proposed. Participants also stressed the urgent need to develop a directory of activities, providers, experts and contact points, including a taxonomy of space-related initiatives. It was agreed that UNOOSA should manage such a directory to capitalize on the linkages between the Office and COPUOS Member States, other United Nations bodies and private entities.



Austria from space.
Credit: ESA

International Astronautical Federation (IAF) Workshop on Space Technology for Socio-Economic Benefits: Industry, Innovation and Infrastructure for Development (3Is4D)

The twenty-sixth IAF Workshop took place in Bremen, Germany, on 28–30 September 2018. The event provided a forum to discuss space science, technologies and applications in support of economic, social and environmental development, with a focus on the role of industry as a key player in fostering innovation and the infrastructure essential for sustainable development, supporting SDG 9 (Industry, Innovation and Infrastructure) and SDG 17 (Partnerships for the Goals).

The workshop was attended by 80 participants from 25 different countries. Participants discussed the importance of free and open access to space data, to be increased through cloud services, open data cubes and international and national policy.

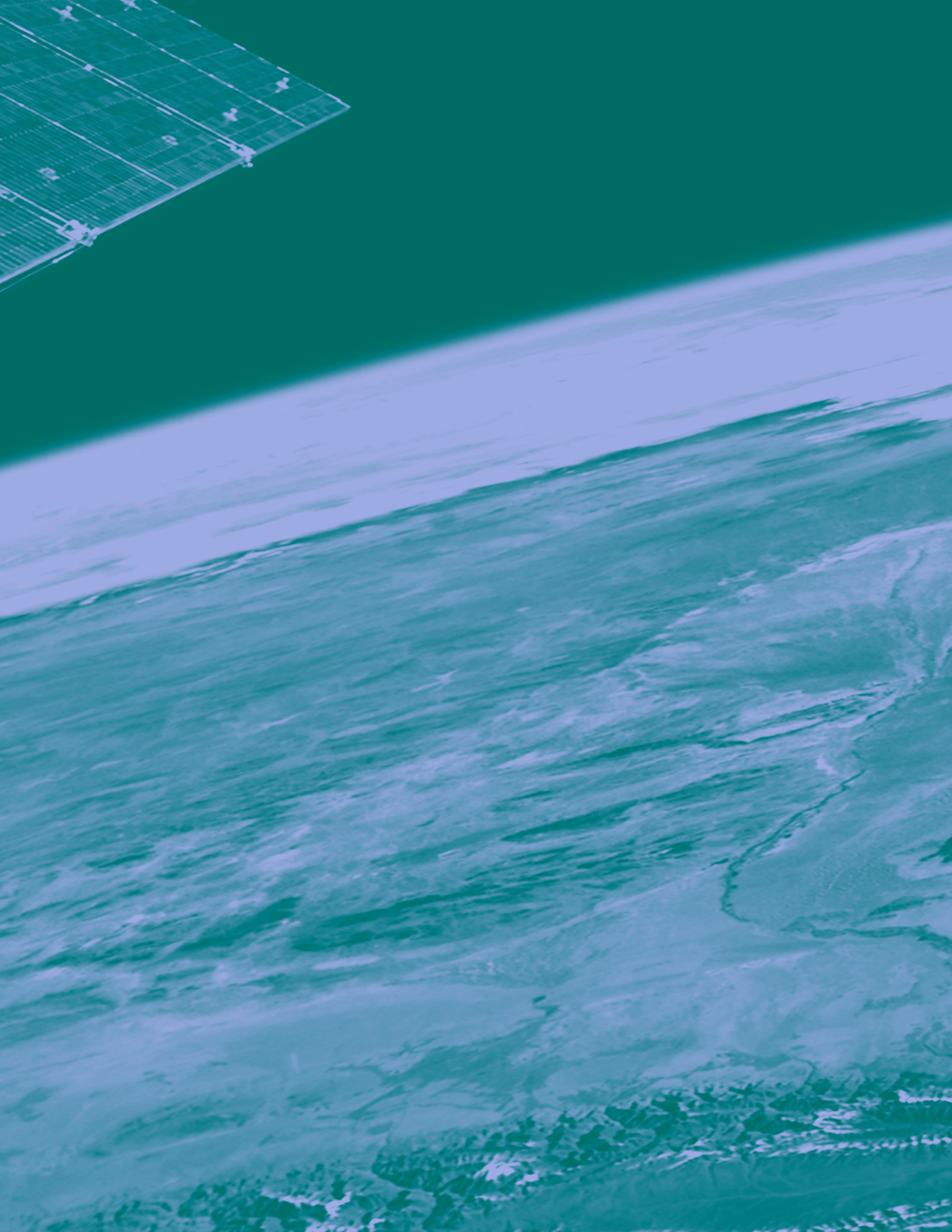
Participants stressed the importance of promoting space technologies to support the SDGs, and of the role of UNOOSA in increasing awareness of these technologies and providing technical advisory services for Member States to leverage them. Participants also highlighted the role of Governments in fostering enabling environments for the development of the space industry.

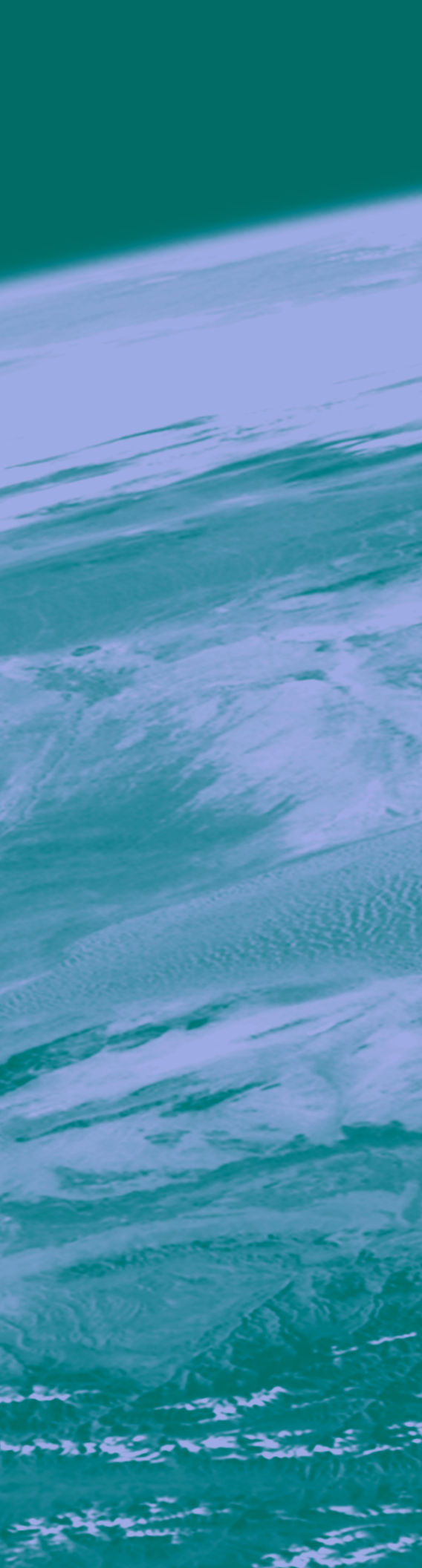
Copernicus Hackathon

In October, UNOOSA participated in the Copernicus Hackathon on the SDGs, organized by the European Institute for Technological Development in Venice, Italy. At the Hackathon, different teams challenged each other to provide applications based on the Copernicus Earth observation programme. UNOOSA gave a presentation on how Earth observation technologies contribute to the SDGs, thus raising awareness of the benefits of space and space technologies for achieving the 2030 Agenda.



Venice, Italy.
Credit: ESA





The Taklamakan Desert,
photographed from
space by Chinese
astronaut Fei Junlong.
Credit: CMSA

The work of UNOOSA on space education, presented in this chapter, ranges from providing unique research opportunities on nano-satellite technologies to delivering workshops on space weather and fostering education in space science and technology through its Regional Centres.

6

SPACE EDUCATION

6 | SPACE EDUCATION

UNOOSA works to increase access to education and research opportunities on space science and technology, in line with SDG 4, quality education. In particular, UNOOSA offers fellowships on space-related topics; provides advisory services to space agencies and research institutions in developing countries to expand their knowledge of space applications; organizes international conferences and workshops on space technologies; and provides online educational resources and directories of educational opportunities on space topics.

UNOOSA also regularly opens its doors to and engages with young people at its offices in Beijing, Bonn and Vienna. In 2018, UNOOSA gave lectures and presentations to over 160 participants in its Vienna office, including groups of students of a wide range of ages, who had the chance to ask questions about our work, the potential of space for development, global space law and policy.

Selected educational initiatives and their news in 2018 are presented below.



Regional Centres for Space Science and Technology Education

In order to foster education and research on space science and technology, UNOOSA established the Regional Centres for Space Science and Technology Education, affiliated with the United Nations and hosted at existing research and higher education institutions around the world. The centres, six so far, are in Brazil, China, India, Jordan, Mexico, Morocco and Nigeria.

The principal goal of each Regional Centre is to develop the skills and knowledge of university educators and scientists, through rigorous theory, research, applications, field exercises and pilot projects in aspects of space science and technology that can contribute to sustainable development in each country.

To ensure a common standard of teaching at the centres, UNOOSA developed education curricula in all major fields of space applications: satellite meteorology and global climate, satellite communications, space and atmospheric science, remote sensing and geographic information systems, and GNSS. The curricula have been used at the Regional Centres and are available for other educational institutions and training initiatives across the world.

Left page: Young students from the English International School of Bratislava visited UNOOSA in October 2018, where the UNOOSA Director talked to them about space exploration. Credit: UNOOSA

The activities of the Regional Centres in 2018 are presented below:

- The Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) in Dehradun, India, held the twenty-second Remote Sensing and GIS Course (2017–18) from July 2017 to March 2018. This was attended by 22 participants from 11 countries. The twenty-third Remote Sensing and GIS Course (2018–19) ran from July 2018 to March 2019.
- The African Regional Centre for Space Science and Technology Education – in French CRASTE-LF – in Rabat held nine-month postgraduate courses on GNSS, remote sensing and GIS and satellite meteorology and global climate, from September 2017 to July 2018. This was attended by 16 participants from eight countries.
- In September 2018, CRASTE-LF again held nine-month postgraduate courses on GNSS, remote sensing and GIS and satellite meteorology and global climate that are ongoing until June 2019.
- The African Regional Centre for Space Science and Technology Education – in English ARCSSTE-E – in Ile-Ife, Nigeria, held nine-month postgraduate courses on remote sensing and GIS, satellite communications, GNSS and/or basic space science from January to November 2018. These were attended by eight participants from six countries.
- The Regional Centre for Space Science and Technology Education for Latin America and the Caribbean (CRECTEALC) at the Mexico Campus in Tonantzintla, Mexico, held the twelfth postgraduate course on remote sensing and GIS from September 2017 to September 2018. This was attended by four participants from one country. The thirteenth postgraduate course on remote sensing and GIS started in December 2018 and is ongoing until September 2019.
- In 2018, the Regional Centre for Space Science Technology Education in Asia and the Pacific (RCSSTEAP), hosted by the Beihang University of Beijing, held four master's programmes (GNSS, remote sensing and GIS, micro-satellite technology and space law and policy) that were attended by 45 participants from 13 countries. It held one doctoral programme (space technology applications) attended by 11 participants from six countries, and six short training programmes (GNSS, space cooperation for global health, BeiDou/GNSS, satellite technology and space-based technology for emergency response) attended by 342 participants from 36 countries.
- RCSSTEAP, with the support and contribution of Delta State University (a UN-SPIDER RSO), the International Water Management Institute (Sri Lanka) and the National Disaster Reduction Centre of China (NDRCC), hosted an international training course on "Space-based Technologies for Emergency Response" from 28 October to 1 November 2018, which was attended by 24 participants.

Research and training opportunities

United Nations/Japan Long-term Fellowship Programme for Postgraduate study on Nano-Satellite Technologies

In 2012, UNOOSA and the Government of Japan, in cooperation with the Kyushu Institute of Technology (Kyutech), established a fellowship programme on Nano-Satellite Technologies (PNST) for nationals of developing countries or non-spacefaring nations. The Programme provides selected master's and doctorate students with extensive research opportunities using the nano-satellite development and testing facilities at Kyutech. The 2018 round of applications for the PNST launched in January.

The purpose of this fellowship is to equip students with knowledge of space science and technology to help their country access the space sector and its benefits. Selected candidates each receive a grant from the Japanese Government for the duration of their fellowship.

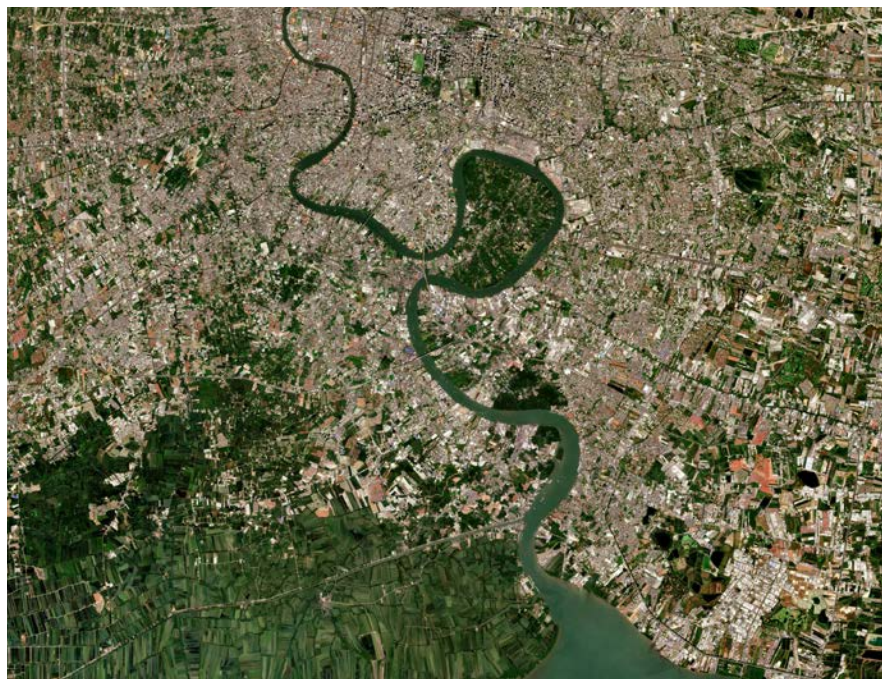
Master in Navigation and Related Applications Programme

In 2018, as it has done since 2005, UNOOSA helped organize the Second Level Specializing Master on Navigation and Related Applications, a joint initiative of the Politecnico di Torino and the Istituto Superiore Mario Boella with the collaboration of the Istituto Nazionale di Ricerca Meteorologica.

The 12-month master programme provides young graduates with high-quality training, professional knowledge and skills to meet labour market demands for high-level technicians in navigation/localization. UNOOSA also contributed funding to support the travel expenses of selected participants from developing countries.

Training Programme on Global Navigation Satellite Systems

On 23–26 January 2018, UNOOSA participated in this training course on GNSS in Bangkok. Organized by ICG, of which UNOOSA is Executive Secretariat, the Geoinformatics Centre of the Asian Institute of Technology and the Centre for Spatial Information Science at the University of Tokyo, the course is aimed at increasing awareness of GNSS and its applications in Asia and the Pacific region.



Space view of Bangkok.
Credit: ESA



Buenos Aires from space. Credit: ESA

United Nations/Argentina Workshop on the applications of GNSS

In March 2018, this workshop, organized by UNOOSA in cooperation with the National Space Activities Commission (CONAE) of Argentina, featured technical sessions on GNSS operations and development.

As a concrete outcome, participants formulated a common plan of action for the Latin American region, with several recommendations, such as improving GNSS training and education, strengthening regional GNSS networks and partnerships, and enhancing capacity-building on geo-referencing.

These recommendations provided guidance for institutions on working together through regional partnerships. With the support of UNOOSA, these partnerships will result in the sharing and transfer of GNSS-related knowledge and in the development of joint activities and project proposals.

Workshop on the space weather effects on GNSS operations at low latitudes

Held in Trieste, Italy, in May 2018, this workshop was the tenth in a series carried out since 2009, both in Italy and Africa. It featured a presentation on the ICG programme on GNSS applications and the impact of its training activities in developing countries. Experts from Argentina, Côte d'Ivoire, Ethiopia, Malaysia and Nigeria made presentations on research projects and academic achievements in their countries that were facilitated by the joint training activities. With the participation of 65 experts from 29 countries, the workshop enabled the exchange of scientific knowledge, technical experience and capacity-building on GNSS technologies. The workshop was co-organized by UNOOSA in cooperation with the Abdus Salam International Centre for Theoretical Physics, the Institute for Scientific Research of Boston College and the ICG.

UN-SPIDER/SENACYT Seminar: Science and technology, its applications in disaster preparedness and response in case of disasters in Guatemala

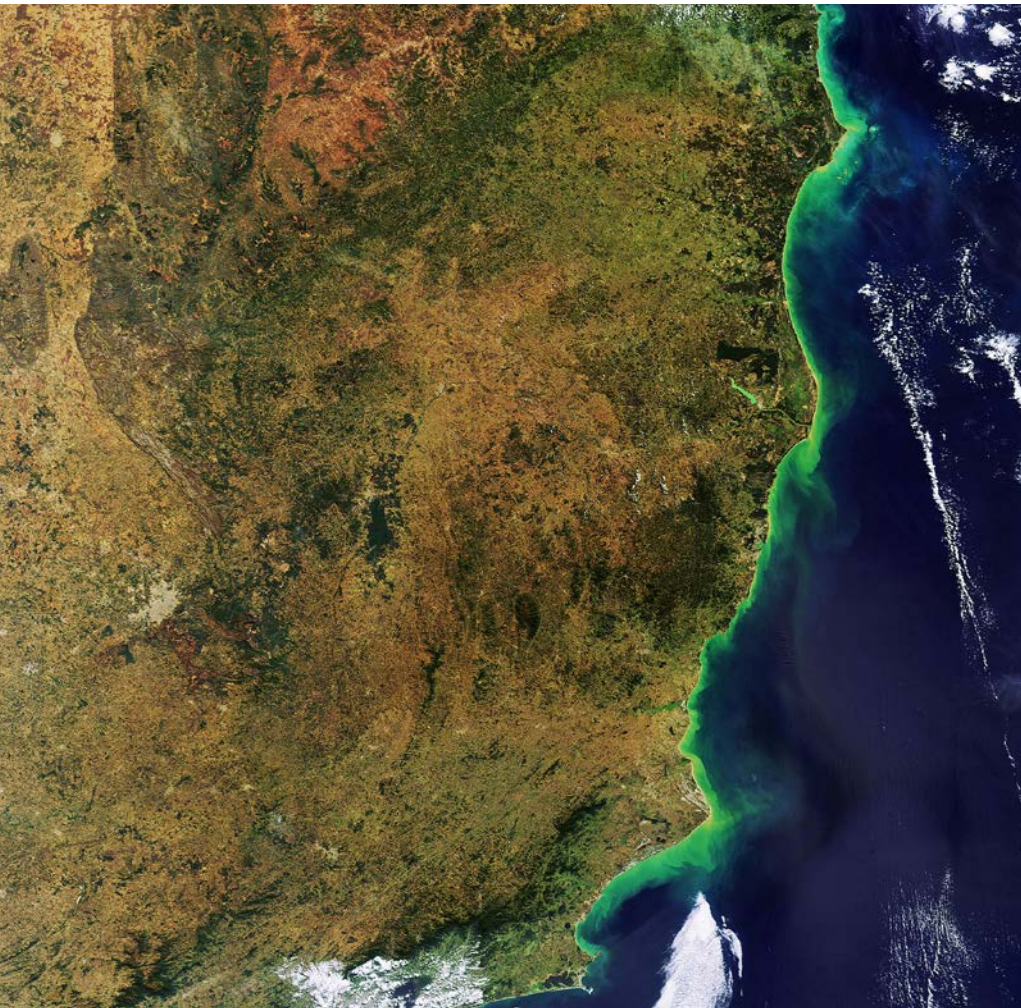
The seminar focused on the use of science, technology and innovation in disaster risk reduction and response efforts in Guatemala with an emphasis on geological hazards. Held on 24 July 2018 in Guatemala City, it brought together more than 40 participants. It was co-organized by UN-SPIDER and the National Secretariat of Science and Technology of Guatemala.

UN/Brazil Symposium on Basic Space technology "Creating Novel Opportunities with Small Satellite Space Missions"

Held on 11–14 September 2018, the symposium was part of a continuing series organized by UNOOSA since 2012 across the different United Nations regions. The focus of this fifth symposium in the series was capacity-building in space technology development, in particular for small satellite activities, in Latin America and the Caribbean; opportunities for regional and international cooperation; and legal and regulatory issues of space technology development.

In the days preceding the symposium, UNOOSA took part in a hands-on workshop on nanosatellite mission design and testing provided by trainers from INPE at the Brazilian Space Agency facilities.

The Symposium was co-organized by UNOOSA with the Government of Brazil.



The Brazilian coast from space. Credit: ESA

The International Space Weather Initiative (ISWI) School on Space weather and GNSS

Held in October 2018 in Baku, the School, which was sponsored by UNOOSA, included a comprehensive series of lectures, with 53 experts from 24 countries, as well as technical tours to provide hands-on insight into ongoing work in the field. It provided a unique opportunity for scientists, engineers and graduate students from Africa, Asia and Eastern Europe to gain knowledge and experience on topics related to solar physics, space science and engineering, and their effects on GNSS and other infrastructure.

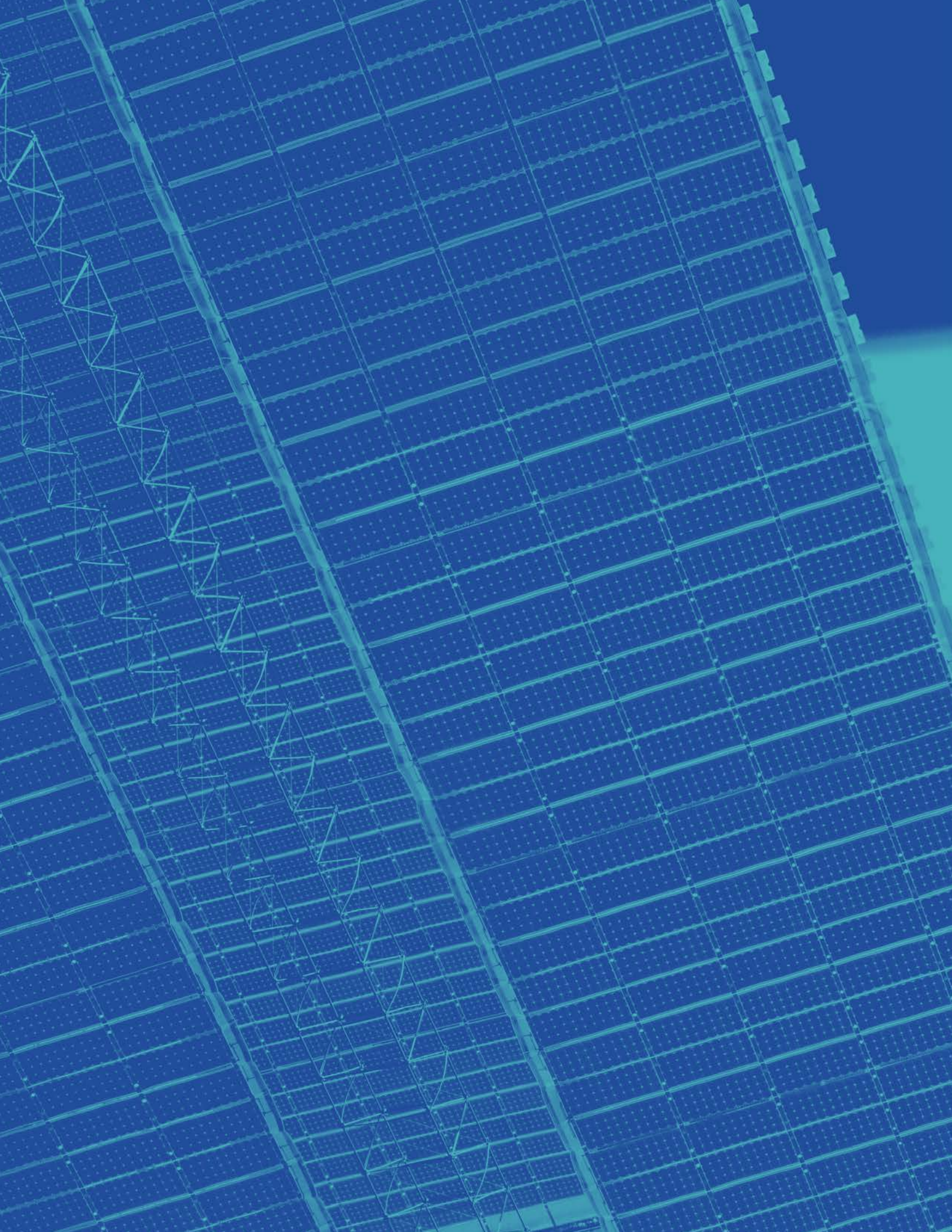
United Nations Expert Meeting on Human Space Technology "Providing Access to Space"


Held on 4–6 December 2018 in Vienna, the Expert Meeting brought together senior experts from space-related organizations to exchange information on how to leverage international cooperation to create more opportunities for all countries to become involved in human space exploration-related activities, space technology and its applications. The meeting was aligned with the objectives of UNOOSA Access to Space 4 All initiative to help more countries access the benefits of space.

The meeting was organized and hosted by UNOOSA with the support of CMSA and JAXA.

Participants at the United Nations Expert Meeting on Human Space Technology.
Credit: UNIS







1U CubeSats Irazu
(Costa Rica) and
1KUNS-PF (Kenya)
deployed from the JEM
Small Satellite Orbital
Deployer (J-SSOD).
Credit: JAXA/NASA

UNOOSA is the Secretariat of the Committee on the Peaceful Uses of Outer Space (COPUOS), the main global forum for countries to discuss the scientific and legal aspects of outer space activities. This chapter presents the work of UNOOSA in fostering international cooperation in outer space.

7

INTERNATIONAL COOPERATION IN OUTER SPACE

7 | INTERNATIONAL COOPERATION IN OUTER SPACE

UNISPACE+50

UNISPACE+50

In June 2018, the space community celebrated the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE I), held in Vienna in 1968. To mark the occasion, UNOOSA organized UNISPACE+50, a two-day symposium followed by the UNISPACE+50 high-level segment of COPUOS from 20 to 21 June. UNISPACE+50 was supported by the generous contribution of the Government of Austria, which, among other things, held three receptions during UNISPACE+50, hosted respectively by the City of Vienna, the Austrian Ministry for Transport, Innovation and Technology and the Ministry for Europe, Integration and Foreign Affairs.

The high-level segment of the Committee saw the participation of over 800 representatives from 92 countries, including representatives at the ministerial and vice-ministerial levels, heads of space agencies, astronauts and other dignitaries.

The opening ceremony of the high-level segment included interventions by many special guests.

United Nations Secretary-General António Guterres participated with a video message in which he underlined the importance of international cooperation in outer space and of ensuring that everyone can benefit from the frontier technologies developed by the space sector.

He was followed by Yuri Fedotov, Director-General of the United Nations Office in Vienna and UNOOSA Director Simonetta Di Pippo, who also gave opening addresses.

The ceremony of the UNISPACE+50 high-level segment included the donation by ESA astronaut Paolo Nespoli and ESA Director General, Johann-Dietrich Wörner of a United Nations SDG flag that had been flown on the ISS. Mr. Nespoli presented the flag to UNOOSA Director Simonetta Di Pippo.



From left to right: Ambassador Christine Stix-Hackl, Permanent Representative of Austria to the United Nations (Vienna), UNOOSA Director Simonetta Di Pippo, the President of Austria, Alexander Van Der Bellen, Scott Kelly and Director-General of the United Nations Office in Vienna Yuri Fedotov at UNISPACE+50. Credit: UNIS



Some of the stamps created by UNPA for UNISPACE+50

As part of the ceremony, Scott Kelly unveiled the UNISPACE+50 stamps, which had been created for the occasion by the United Nations Postal Administration (UNPA) in different languages.

Participants at the high-level segment were also treated to a live in-flight call with the crew of the ISS. Astronauts Serena Auñón-Chancellor, Richard Arnold, Andrew Feustel from NASA; Oleg Artemyev and Sergey Prokopyev from Roscosmos; and Alexander Gerst from the European Space Agency (ESA) participated in the call. The discussion was moderated by the Chief Scientist of NASA, Jim Green, and by UNOOSA Director Simonetta Di Pippo.

The UN-Space High-Level Panel “United Nations: Reinforcing synergies for UNISPACE+50 and beyond”, was held on 21 June 2018 in Vienna, at the level of heads of agencies. During the panel discussion, moderated by the Director of UNOOSA, representatives presented current and potential activities by their respective organizations, shared best practices and showcased bilateral relations in space-related activities within the United Nations system.

The high-level segment included the endorsement by United Nations Member States of a draft UNISPACE+50 resolution that called for strengthened international cooperation in the peaceful use of outer space and the global governance of outer space activities, and encouraged coordination to ensure that space science, technology and applications serve the Sustainable Development Goals.

In a follow-up to the panel discussion, UN-Space issued a joint statement highlighting the common aspiration of participating United Nations entities to strengthen the capacities of Member States for sustainable development, which could be achieved through the increased integration of space science, technology and their applications, as well as space law and policy, in national development strategies.

The UNISPACE+50 process concluded in October 2018, with the adoption of a dedicated General Assembly resolution: “Space as a driver of sustainable development”. The resolution mandated COPUOS with developing a “Space2030” agenda and an implementation plan by 2020. The “Space2030 Agenda” will aim to strengthen international cooperation in the peaceful uses of outer space and outline a comprehensive and inclusive long-term vision for space.



ESA astronaut Paolo Nespoli presents the United Nations SDG flag to UNOOSA Director Simonetta Di Pippo at UNISPACE+50. Credit: UNIS

The live in-flight call with the ISS crew at UNISPACE+50. Credit: UNIS



UN-Space

What is UN-Space?

From the earliest days of space exploration, the United Nations recognized the important role that space-related technologies can play in improving the human condition all over the world. To this end, UN-Space, the United Nations inter-agency mechanism for coordination on space-related matters, convenes annual sessions to discuss current and future activities, emerging technologies of interest and other related matters. For consultations with broader stakeholders, UN-Space also organizes sessions open to Member States, the private sector, non-governmental institutions and academia.

Thirty-eighth session of UN-Space

The thirty-eighth session of UN-Space, organized by UNOOSA as the Secretariat of UN-Space and co-hosted by the United Nations Office for Partnerships (UNOP), was held on 29 October 2018 at United Nations Headquarters in New York.

Participants discussed experiences in building partnerships with stakeholders outside the United Nations system and shared practices to overcome challenges in forming successful partnerships.

UN-Space special reports are produced on a biennial basis. Noting the wealth of discussion and experiences

within the United Nations system on cooperation with the private sector, UN-Space agreed that its special report to be presented in 2019 would focus on promoting partnerships in the use of space science, technology and applications for economic growth and the attainment of the SDGs.

COPUOS

What is COPUOS?

COPUOS was set up as a permanent committee by the General Assembly in 1959 to address the exploration and use of outer space for the benefit of all humanity.

Owing to rapid advances in space science and technology, the space agenda is constantly evolving. The Committee provides a unique multilateral platform to monitor and discuss these developments.

The Committee is comprised of both well-established spacefaring nations and nations with emerging space programmes. Its work is also supported by many permanent observer

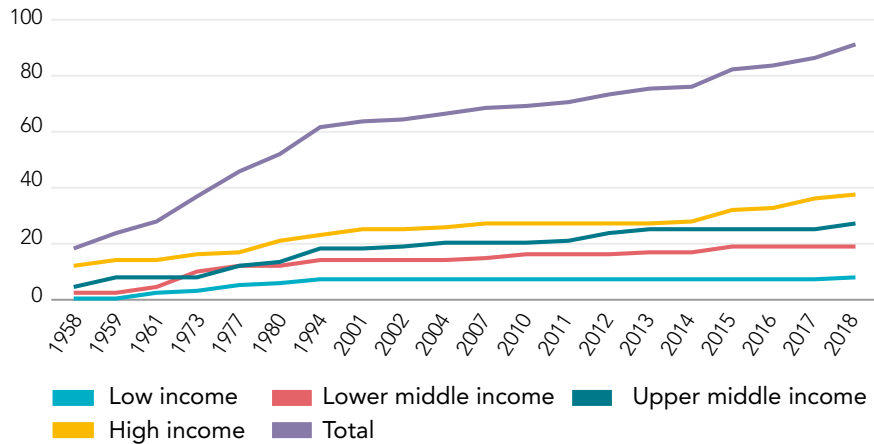
organizations. As the benefits of space technologies become increasingly interconnected with everyday life on Earth, there is growing interest in, and value placed on, Committee membership. In fact, COPUOS is one of the fastest-growing committees in the United Nations system: starting with 18 Member States in 1959, its membership has more than quadrupled over the years and now includes 92 countries and 41 observers. In 2018, by decision of the General Assembly, the following five new Member States were admitted: Cyprus, Ethiopia, Finland, Mauritius and Paraguay. Four new permanent observers were also admitted to the Committee in 2018: the European Union, International

Organization for Standardization, Organization on Space Technologies for Societal Applications (Canada-Europe-United States-Asia-Africa) and For All Moonkind.

As shown in the table below, the number of low-income and lower middle-income countries that are members of COPUOS increased from 2 in 1958 to 27 in 2018, while that of upper middle-income countries went from 4 to 27.¹ The total number of members increased more than five times over the period.

¹ As per the World Bank income classification in 2018.

Growth in COPUOS membership over time by World Bank income level



COPUOS membership* by World Bank income level

High income	38
Upper middle income	27
Lower middle income	20
Low income	7
Total	92

* COPUOS membership as of January 2019

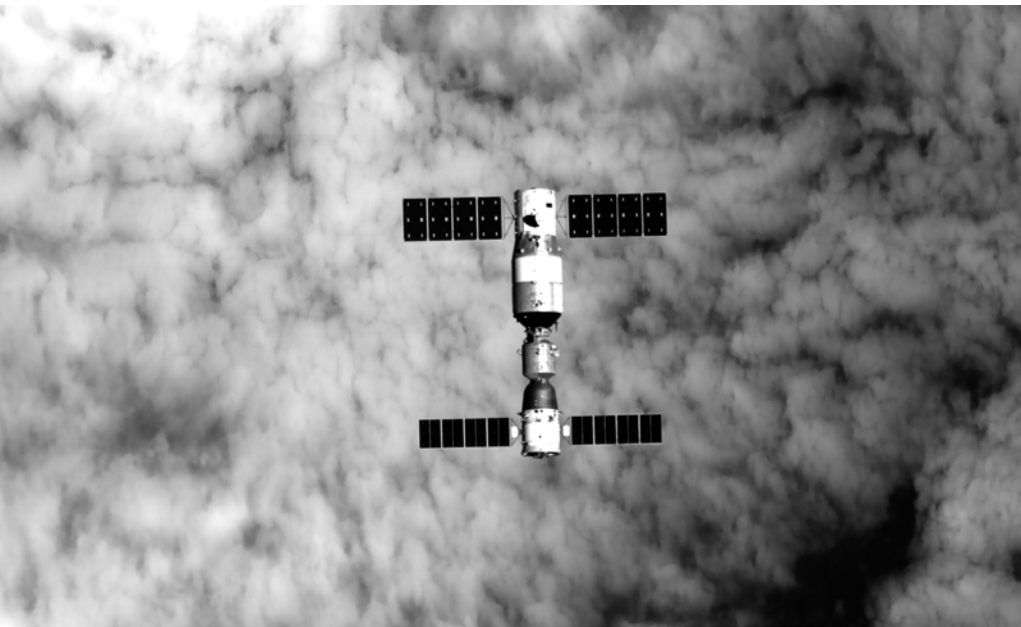
COPUOS members

Albania	China	Iran (Islamic Republic of)	Niger	Spain
Algeria	Colombia	Iraq	Nigeria	Sri Lanka
Argentina	Costa Rica	Israel	Norway	Sudan
Armenia	Cuba	Italy	Oman	Sweden
Australia	Cyprus	Japan	Pakistan	Switzerland
Austria	Czechia	Jordan	Paraguay	Syrian Arab Republic
Azerbaijan	Denmark	Kazakhstan	Peru	Thailand
Bahrain	Ecuador	Kenya	Philippines	Tunisia
Belgium	Egypt	Lebanon	Poland	Turkey
Belarus	El Salvador	Libya	Portugal	United Arab Emirates
Benin	Ethiopia	Luxembourg	Qatar	United Kingdom of Great Britain and Northern Ireland
Bolivia (Plurinational State of)	Finland	Malaysia	Republic of Korea	United States of America
Brazil	France	Mauritius	Romania	Ukraine
Bulgaria	Germany	Mexico	Russian Federation	Uruguay
Burkina Faso	Ghana	Mongolia	Saudi Arabia	Venezuela (Bolivarian Republic of)
Cameroon	Greece	Morocco	Senegal	Viet Nam
Canada	Hungary	Netherlands	Sierra Leone	
Chad	India	New Zealand	Slovakia	
Chile	Indonesia	Nicaragua	South Africa	

COPUOS sessions in 2018

The Committee meets annually in Vienna, as do its subsidiary bodies, the STSC and the LSC. The fifty-fifth STSC was held from 29 January to 9 February 2018 and the fifty-seventh session of the LSC from 9 to 20 April 2018. The subcommittees considered items ranging from

space-system-based disaster management support and space weather to the legal aspects of space traffic management and the exploration, exploitation and utilization of space resources. The sessions were also enriched by many technical presentations.



Tiangong 2 docked with Shenzhou 11, captured by the BanXing-2 satellite.
Credit: CMSA



Delegates in discussion at the Legal Subcommittee of COPUOS 2018.
Credit: UNOOSA

Other 2018 COPUOS highlights

Conclusion of the Working Group on the Long-term Sustainability of Outer Space Activities

The Working Group on the Long-term Sustainability of Outer Space Activities was established under the STSC in 2010. It was tasked with identifying areas of concern and agreeing on voluntary guidelines to increase the long-term sustainability of outer space activities.

During its mandate, which concluded in June 2018, the group was supported by UNOOSA and deliberated on topics including the safety of space operations; policy and regulatory frameworks for space activities; and scientific and technical research and development. As of June 2018, the group reached consensus on a substantive preamble and 21 guidelines. States and international inter-governmental organizations were encouraged to implement guidelines for the long-term sustainability of outer space activities on a voluntary basis.

As the group had not been able to conclude its consideration of all related proposals within its mandate, States will continue to consider various aspects of the long-term sustainability of outer space activities, including under the STSC agenda item.



Astronaut Alexander Gerst conducting medical experiments on board the ISS.
Credit: ESA

International cooperation to leverage space for global health

The interconnections between space and global health have been known for decades. Already in 1968, at UNISPACE I, a thematic session was dedicated to biology and medicine. Strengthened space cooperation for global health was one of the seven thematic priorities of UNISPACE+50. The major outcome of the work under the thematic priority was the introduction of a new item “Space and global health” on the STSC agenda, and the establishment of the Working Group on Space and Global Health with Antoine Geissbühler of Switzerland as Chair. The Group commenced its work in February 2019.

Compendium of space debris mitigation standards

COPUOS pays particular attention to the increasingly important need for preventing and minimizing space debris. Every year, at the STSC and the LSC, Member States and space-related organizations exchange information on scientific research and national and international legal aspects related to space debris mitigation. One important result of these discussions has been the Compendium of Space Debris Mitigation Standards, adopted by States and international organizations, developed in 2014. The compendium, maintained on the UNOOSA website, collects the current instruments and measures implemented by States and international organizations. As of 31 December 2018, the compendium featured 27 national and six international mechanisms on space debris mitigation, with four new entries added in 2018.

Special Political and Decolonization Committee (Fourth Committee) and its Working Group considered item 53 “International cooperation in the peaceful uses of outer space”

The Fourth Committee of the General Assembly, which assembled on 23–25 October 2018, adopted the annual resolution on international cooperation in the peaceful uses of outer space, A/RES/73/91, as well as a separate decision on increasing the membership of COPUOS.

Among other things, the resolution urges States to become parties to the

international treaties governing the uses of outer space; urges States to contribute actively to the goal of preventing an arms race in outer space; urges UN-Space to continue to examine how space science and technology and their applications could contribute to the 2030 Agenda; and agrees that UNOOSA should pursue greater engagement with industry and private sector entities.



General Assembly considered item 20 “Space as a driver of sustainable development”

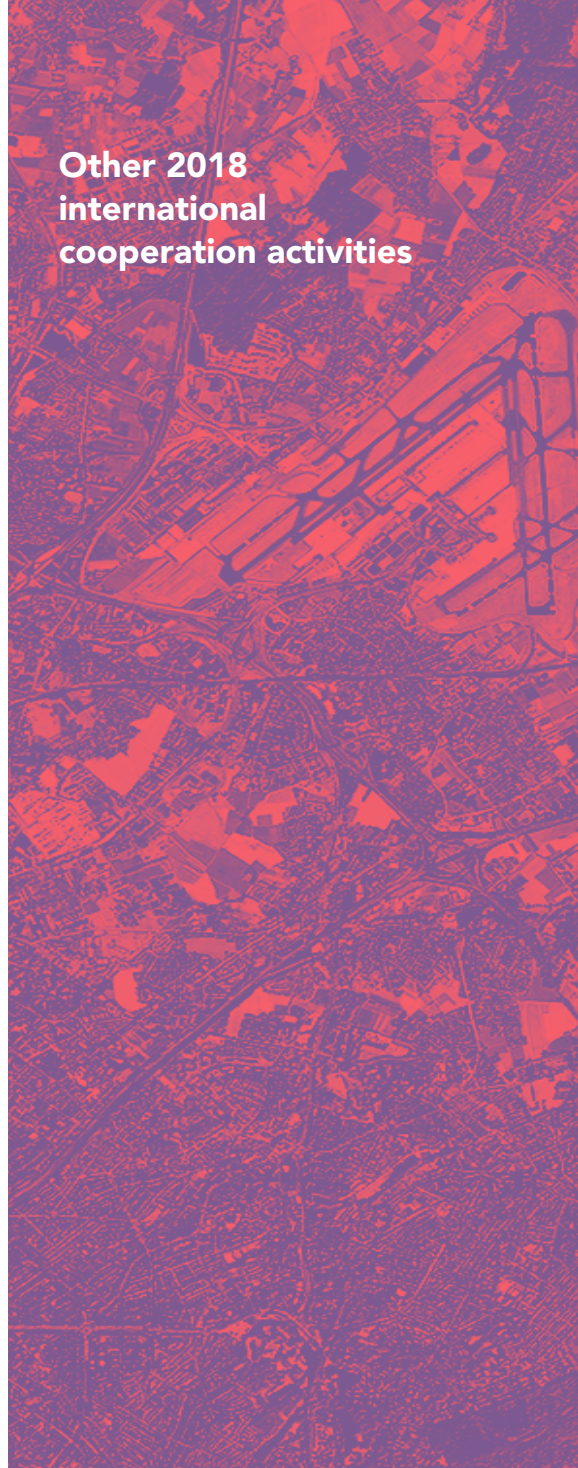
On 26 October 2018, the General Assembly adopted the resolution on the “Fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space: space as a driver of sustainable development” in plenary. This resolution marks the way forward on establishing a “Space2030” agenda and implementation plan.

The General Assembly of the United Nations.
Credit: UN Photo

UNOOSA Director Simonetta Di Pippo briefs the press outside the United Nations conference on Space Law and Policy.
Credit: UNOOSA



Other 2018 international cooperation activities



First United Nations Conference on Space Law and Policy

In 2018, the Office launched a new series of United Nations conferences dedicated to space law and policy. The first Conference under this series, held in Moscow from 11 to 13 September 2018, focused on the progressive development of international space law. Interactive discussions covered such timely topics as space traffic management, space debris mitigation and remediation, and the exploration, exploitation and utilization of space resources. The Conference increased public awareness of existing and

potential challenges and threats in outer space activities. It also promoted international cooperation in space-related areas in line with the 2030 Agenda for Sustainable Development.

The conference was co-organized by UNOOSA and the Government of the Russian Federation, and sponsored by the State Space Corporation “Roscosmos”, the Ministry of Foreign Affairs of the Russian Federation and the Roscosmos Academy.

International Astronautical Congress 2018

UNOOSA participated in the sixty-ninth International Astronautical Congress (IAC) in Bremen, Germany, which attracted more than 6,500 participants from 82 countries. During the IAC, UNOOSA held a special session entitled “A Global Space Partnership Towards 2030: Addressing the Needs of Member States of the United Nations to Achieve the Sustainable Development Goals”. The special session featured UNOOSA Director Simonetta Di Pippo and high-level speakers from the National Centre for Space Studies of France (CNES), Kenya Space Agency, United Nations Department of Economic and Social Affairs (UNDESA) and China Academy of Space Technology, who shared their visions for a global partnership to identify user needs and propose long-term space solutions towards

2030. These discussions supported the “Space2030” agenda and its implementation plan.

At the IAC, UNOOSA organized a dedicated booth, promoting the work of the Office and highlighting the disaster management role of UN-SPIDER. At the booth, UNOOSA held a press briefing on the KiboCUBE Project and on the UNOOSA-CMSA cooperation on the utilization of the China Space Station.

The UNOOSA Director also gave a presentation on the Space4Women project at the IAF Diversity Breakfast, and on the importance of leveraging space for the SDGs at the IAC Game Changers event. The Director was the first woman to receive the 2018 Eurisy “Hubert Curien Award”, which recognizes outstanding efforts to help societies benefit from space.

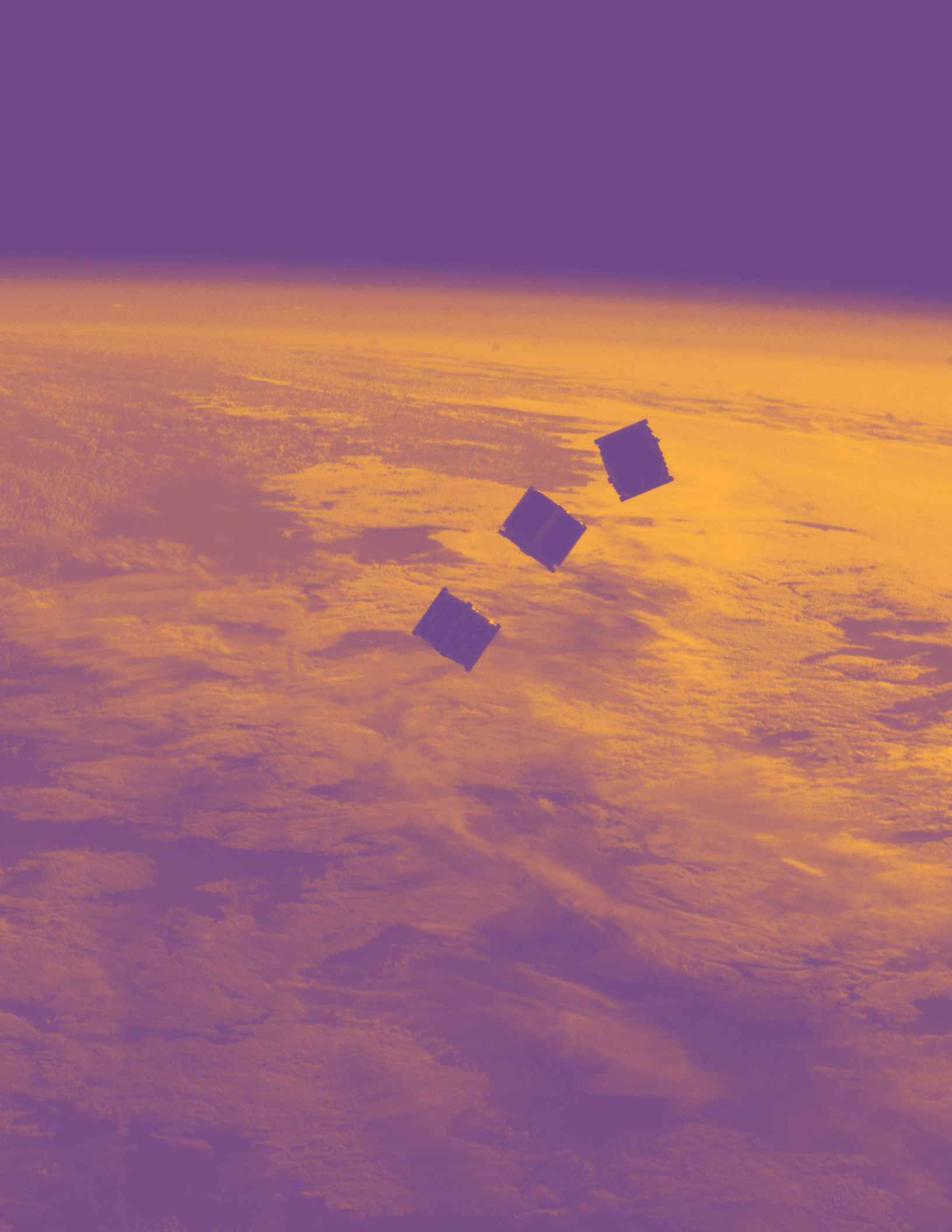
Group of Friends

In December 2017, the UNOOSA Group of Friends was created as an initiative of the Permanent Representatives of Austria and Zambia to the United Nations (New York) to raise awareness of the Office and its work among the United Nations New York community. In March 2018, a meeting of the Group was held in New York to provide Member States with updates on the activities of UNOOSA. The meeting discussed the use of space for socioeconomic development and increased awareness on the use of “space solutions” for the benefit of Member States.

Committee on Space Research

The Committee on Space Research (COSPAR) was created in 1958 to exchange results, information and opinions on space research. Its forty-second Assembly, which also marked its sixtieth anniversary, was held in 2018 and its forty-third Assembly will take place in 2020.

UNOOSA serves as a Vice-Chair of the Panel on Planetary Protection and was also assigned as a Vice-Chair to the Panel on Space Weather.





Three small satellites
photographed from the ISS.
Credit: NASA

UNOOSA maintains the United Nations Register of Objects Launched into Outer Space, an important transparency and confidence-building mechanism designed to increase trust among countries in outer space activities, particularly in light of the rapidly increasing number of launches globally. In 2018, 330 functional and non-functional space objects were registered with the Secretary-General.

8

SPACE OBJECTS REGISTRATION

8 | SPACE OBJECTS REGISTRATION

Since the entry into force of the Convention on Registration of Objects Launched into Outer Space in 1976, States and organizations that agree to abide by the Convention are required to establish their own national registries and provide information on their space objects to the Secretary-General for inclusion in the United Nations Register of Objects Launched into Outer Space.

This unique Register, maintained by UNOOSA, is available on its website in all six official languages of the United Nations. In addition to maintaining the Register, UNOOSA also provides technical assistance to Member States and international organizations in applying the Convention and implementing registration.

The Register is an important transparency and confidence-building mechanism among countries, as it identifies which State bears international responsibility and liability for each object. With the number of satellites launched rising rapidly in recent years, and with more private firms progressively developing the capacity to conduct space activities, fostering such transparency and accountability in outer space is increasingly important.

The Register also helps countries better understand what is happening in outer space, enabling more productive discussions through COPUOS. Finally, the Register raises global awareness and transparency on objects in space.

In 2018, 452 functional space objects were launched or deployed into Earth orbit or beyond, including the touchdown of probes on the Moon, Mars and the asteroid Ryugu. To give an idea of the increase in the number of satellites launched, this figure is more than four times that of 10 years ago, when 108 satellites were launched in 2008.

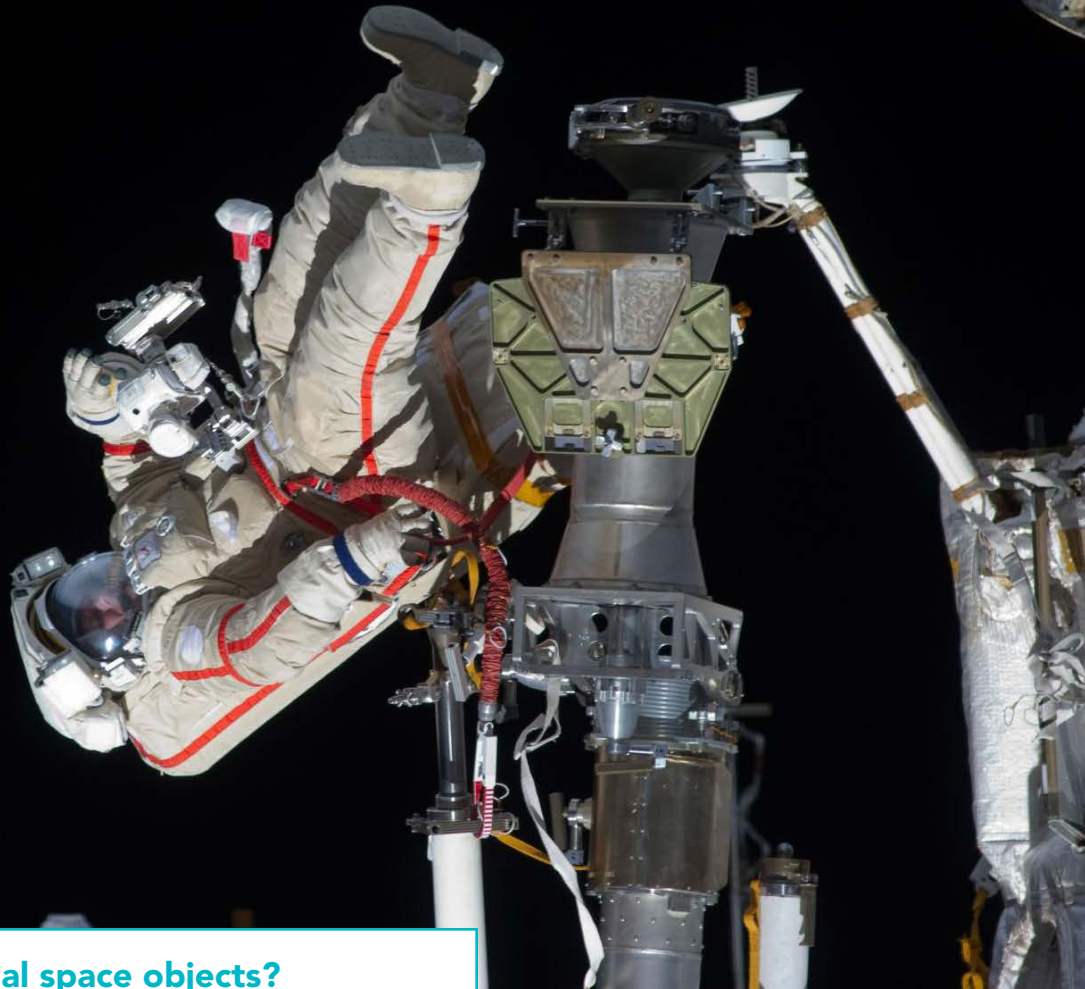
Not all States register their space objects immediately after launch. As per the table below, in 2018, 229 functional space objects and 101 non-functional space objects, a total of 330, were registered with the Secretary-General. At the time this report went to print, an additional 222 objects launched in 2018 had been registered in the first half of 2019, which are not reported in the table below. It is expected that more registrations for objects launched in 2018 will be reported in the remaining months of 2019.



The crew of the Shenzhou in orbit.
Credit: CMSA

Space objects registration in 2018

Space objects registered in 2018				Notifications received in 2018 related to space objects previously registered	
State/Organization	Functional	Non- functional	Total	Re-entries	Change in status
Argentina	1				
Algeria	1				
Australia	3				
Belgium	0	0		1	
Brazil	2				
Chile	1				
China	47				
Denmark	2				
Finland	2				1
France	2	14		3	2
Germany	6				
Indonesia	2				1
Italy	2				
Japan	23	77		2	
Lao People's Democratic Republic	1				
Luxembourg	2			1	11
New Zealand	1	2		1	
Pakistan	2				
Republic of Korea	6				
Russian Federation	12			12	
Spain	1				
United Kingdom	7				2
United Arab Emirates	0	0			1
United States	99	8		12	
Uruguay	3				
Eumetsat	1				
Functional	229				
Non-functional		101			
Total number of space objects registered in 2018			330		
Number of space objects' re-entry reported to the Secretary-General				32	
Number of space objects' change in status (decommissioning, change of orbital parameters, including GSO position, etc.) reported to the Secretary-General					18



What are non-functional space objects?

Non-functional space objects refer to rocket boosters, upper stages, payload adapters, shrouds and other launcher elements that are no longer in use, as well as to space debris caused by satellite collisions, destructions and other events.

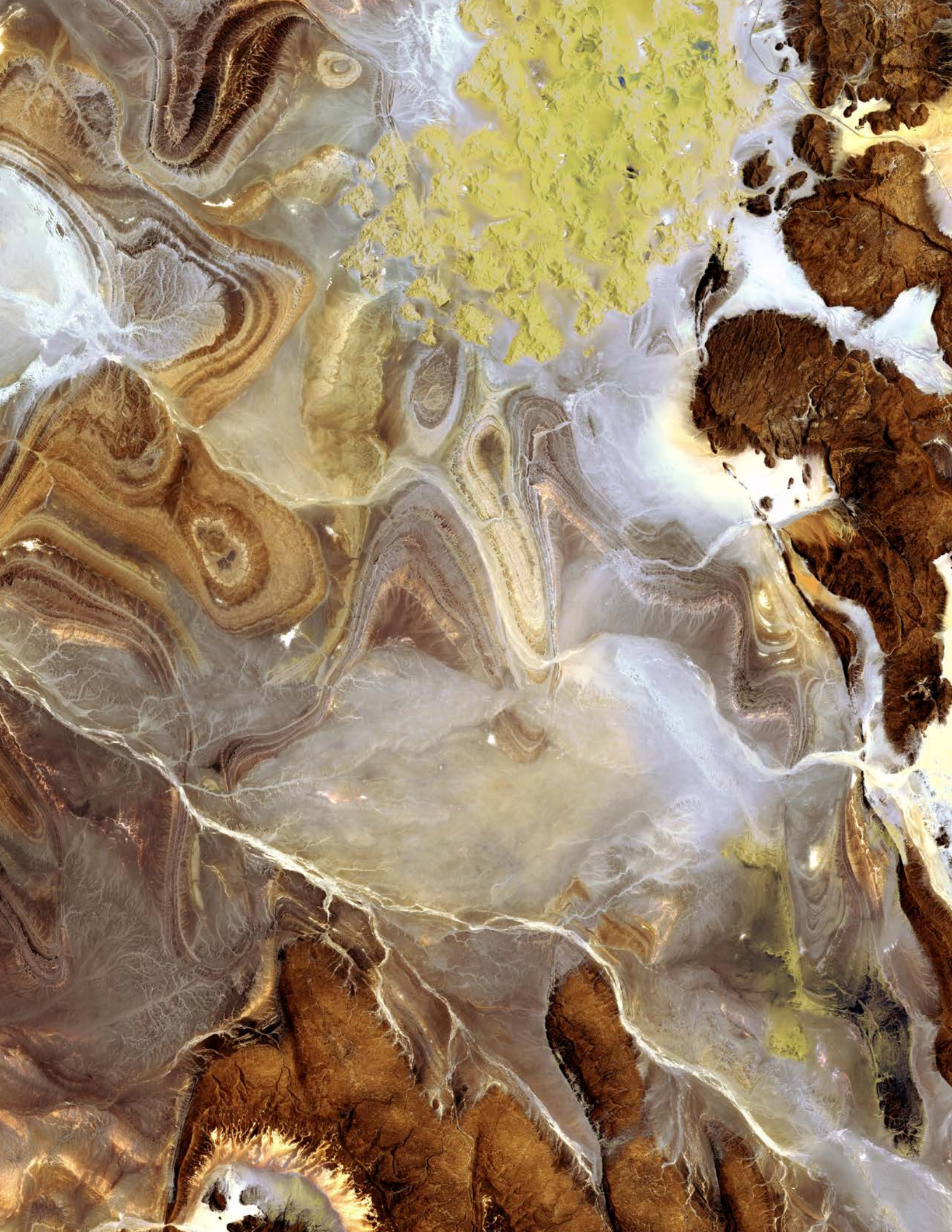
Space debris poses risk both in orbit, for example through collision with operational spacecraft such as satellites, and in re-entry, when a space object re-enters Earth's atmosphere, often falling into the oceans that cover over 71 per cent of the Earth's surface. More information on the work of COPUOS in preventing and

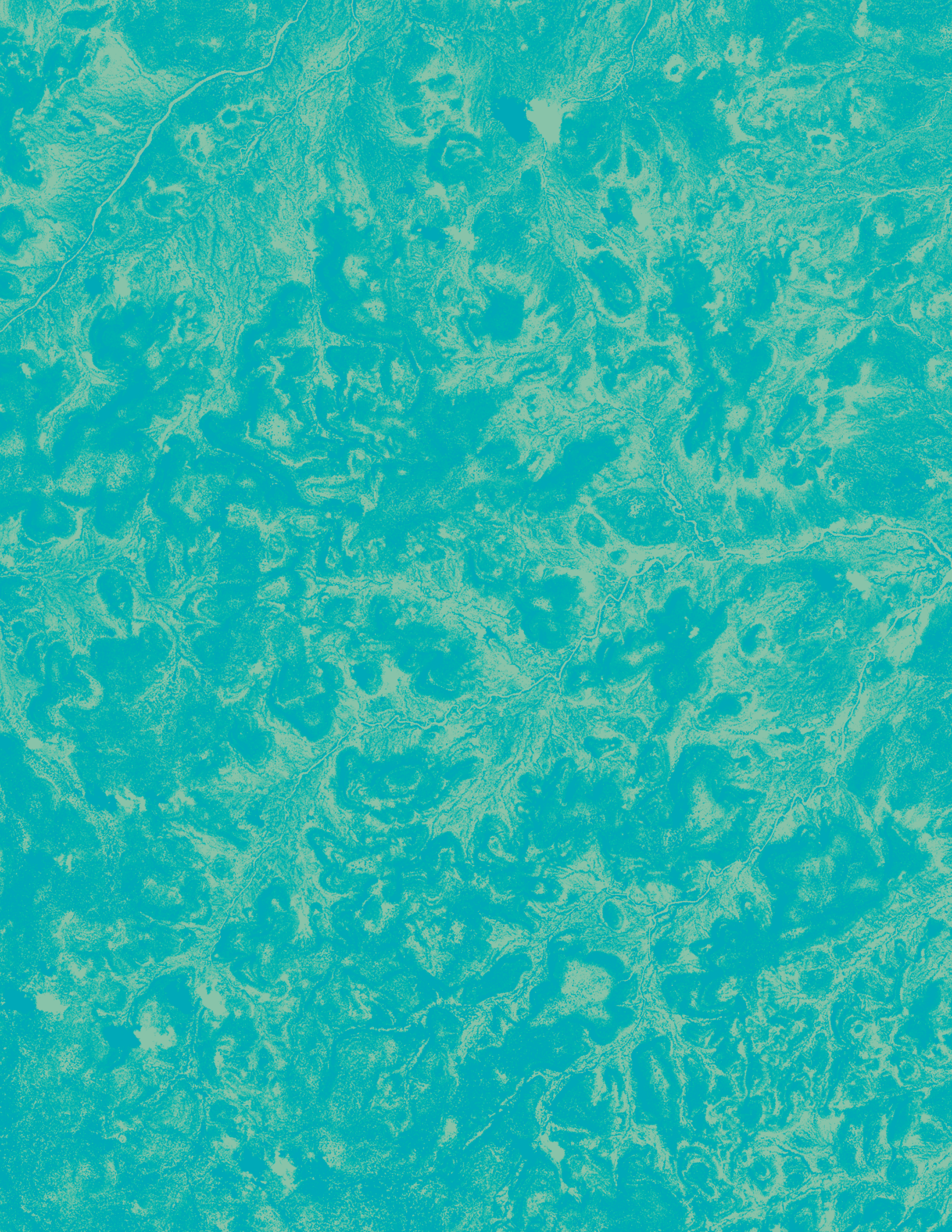
minimizing space debris can be found in the International Cooperation section of this report.

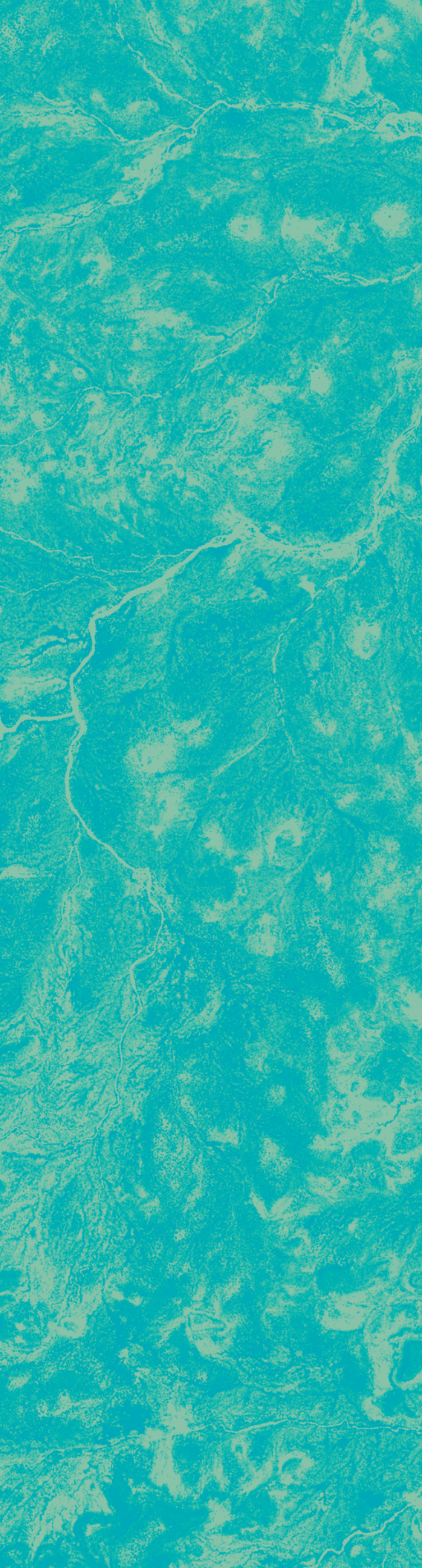
Of the approximately 80 States and international intergovernmental organizations conducting space activities, fewer than 20 are considered to "own" space debris. France, India, Japan, the United States and the ESA routinely register non-functional space objects such as rocket stages and inter-satellite structures with the Secretary-General.

An astronaut in space.
Credit: NASA

Right page:
Algerian Sahara.
Credit: NASA







The Gedo region in
Somalia from space.
Credit: ESA

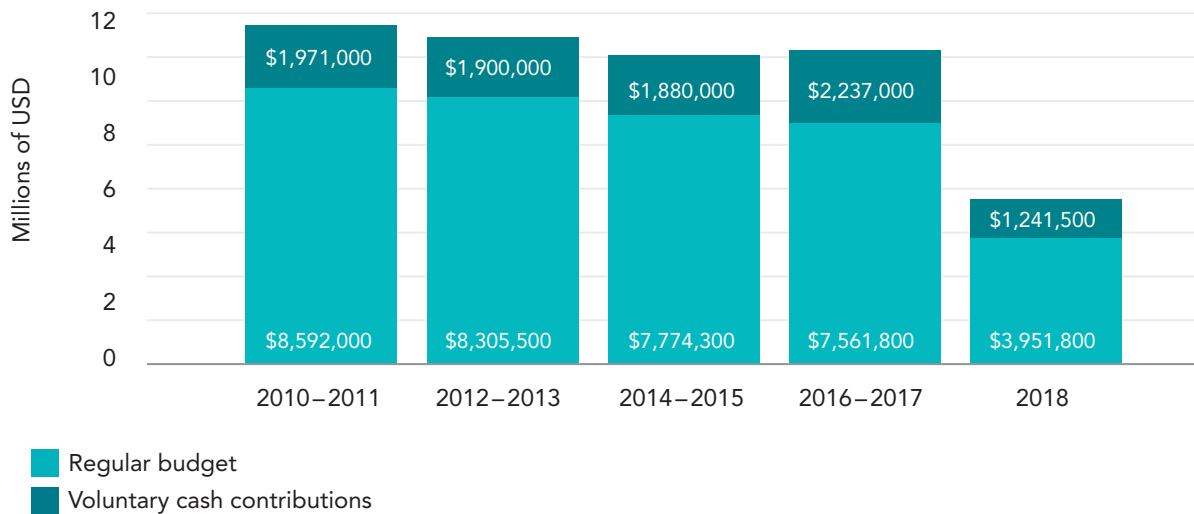
The following provides an overview of
the UNOOSA budget, expenditure,
voluntary contributions and staff
numbers in 2018.

9

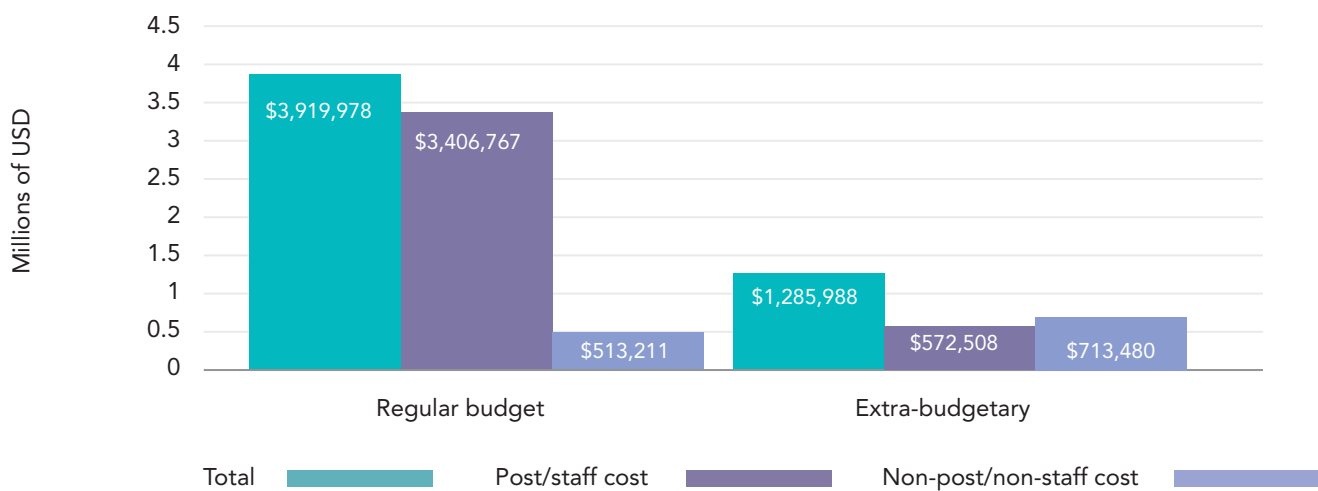
UNOOSA IN NUMBERS

9 | UNOOSA IN NUMBERS

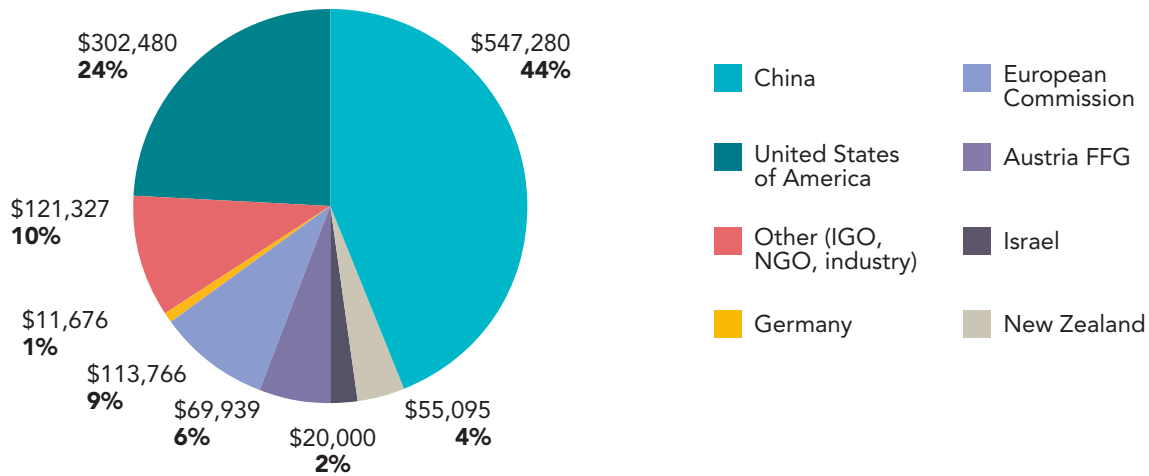
Budget overview



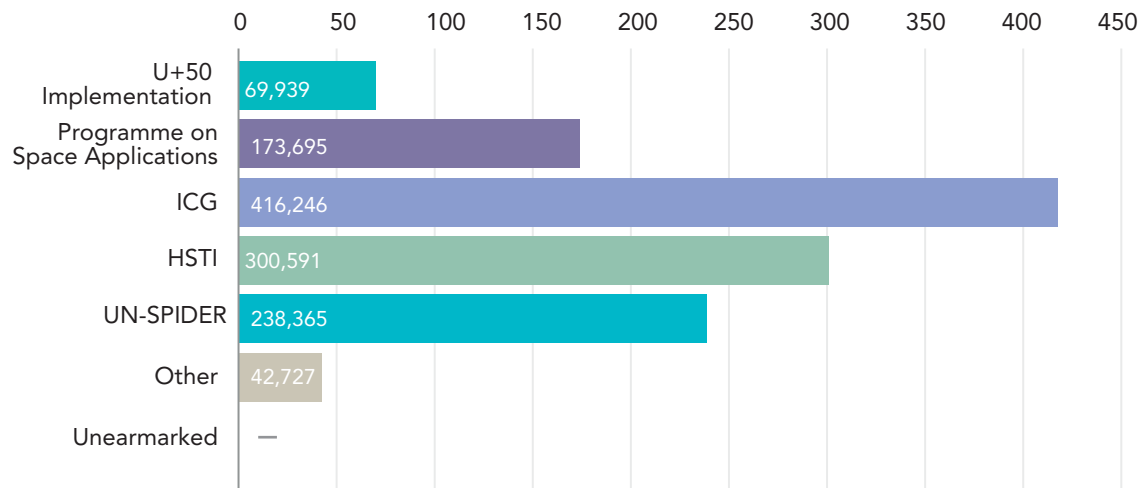
2018 expenditure



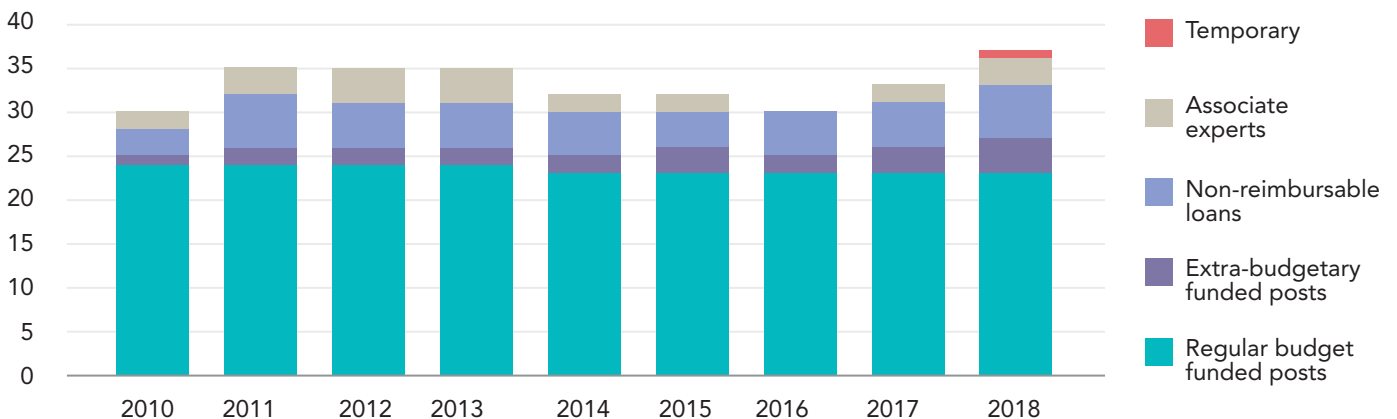
Voluntary cash contributions, 2018 – donors



Voluntary cash contributions, 2018 – main areas supported



Staff



INTERVIEW WITH SCOTT KELLY, UNITED NATIONS CHAMPION FOR SPACE



Scott Kelly in his astronaut suit.
Credit: NASA

UNOOSA appointed Scott Kelly as United Nations Champion for Space in 2016. A former NASA astronaut and Commander of the ISS, Mr. Kelly is also known for his “year in space”, during which he and NASA partnered with UNOOSA on the #whyspacematters campaign to draw attention to the role space-based science technology and its applications can play for sustainable development. In this interview, conducted by UNOOSA, Mr. Kelly reflects on his experience as an astronaut in relation to sustainable development.

Your first space flight was in 1999, and your latest one-year-long mission concluded in 2016. From the vantage point of space, how much has the Earth changed in this time? To what extent can you see the effects of human activities such as pollution and climate change on our planet?

SK: That’s an interesting question. My flights got progressively longer, so I had more time to look out of the window to view the Earth and consider the impact of human activities on our planet. It seems to me that, over the course of the four times I travelled to space over the last 17 years, when I looked out of that window on the ISS, I noticed more pollution, more fires, more storms and a rain forest in South America that looked like more fields and burning vegetation than forest.

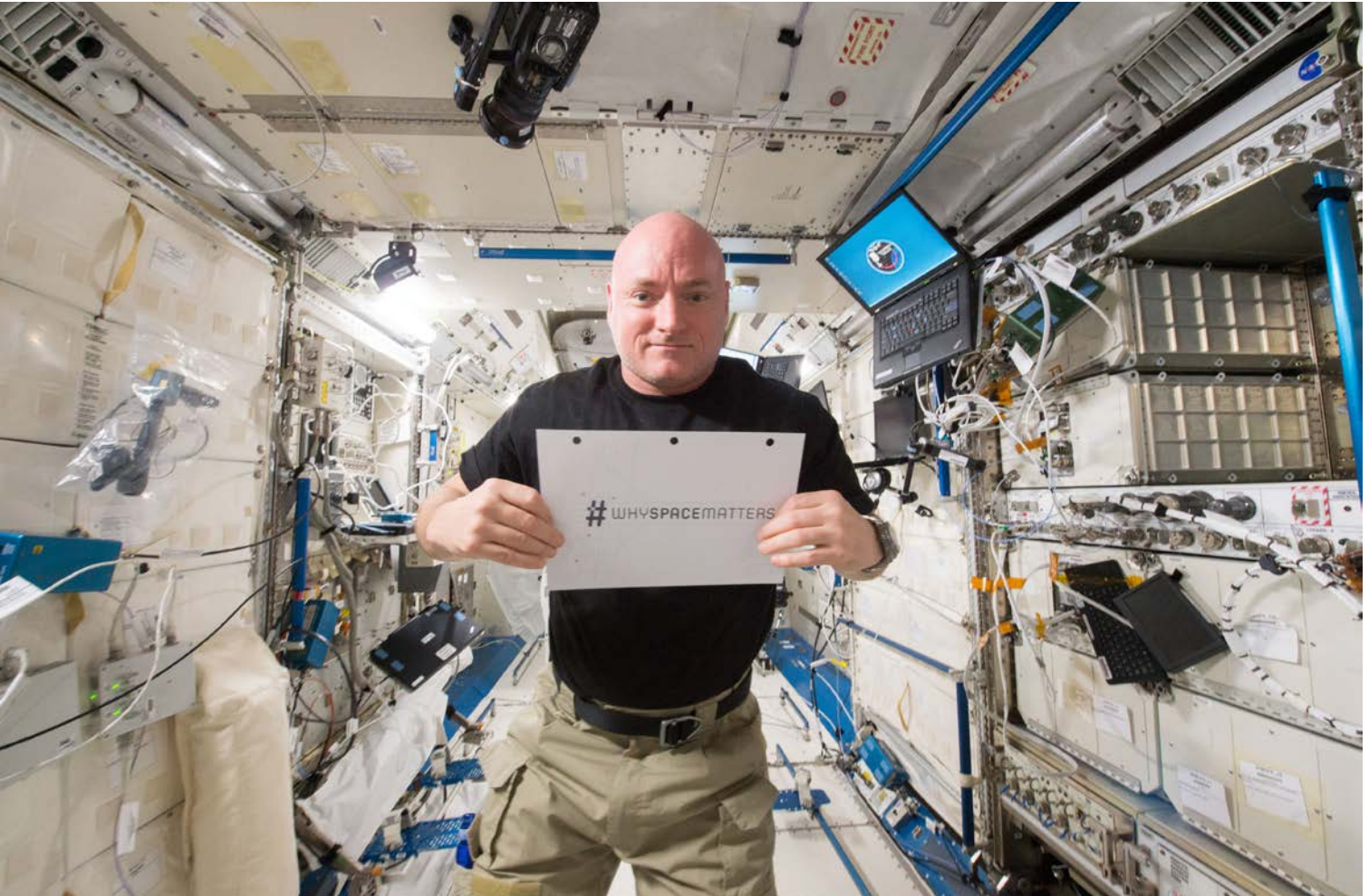
You worked with some cutting-edge space technology onboard the ISS, and, in your role as the United Nations Champion for Space, you are bringing attention to the important role that space can play in sustainable development. In your opinion, what are some of the most interesting ways that space and space technology can support the SDGs?

SK: The ISS is a great example of a renewable energy system. Energy from the sun is used to power all the systems onboard. One of them takes our urine and turns it into drinkable water. Our water recycling efficiency on the ISS is at 70 per cent, which means we must supply only 30 per cent of the water that is required to support life. These examples can be used on Earth to support the SDGs.

In your career as an astronaut, you have witnessed what international cooperation in space can achieve. What lessons can we on Earth learn from our collective success in space exploration?

SK: Cooperation in space is a great example of how nations, some of which have not always been friendly to one another, can come together to work towards our common goals. It’s an example of what we can do if we put our differences aside and work together as a team.

2019 will mark the fiftieth anniversary of the Apollo 11 Moon landing. What is the next frontier in space exploration? Where do you see humanity going in the next 50 years?



Scott Kelly during his year in space aboard the ISS. Credit: NASA

SK: We have unlimited potential. Landing on the Moon 50 years ago is a prime example. Our future in space can take us back to the Moon, permanently, to Mars or wherever else we decide. We need commitment and the willingness to continue to work together in a cooperative way.

Space has always inspired curiosity, especially among young people. As someone who has been in the space sector for almost 20 years and as a father, what more can be done to support young people, particularly girls and youth from developing

countries, to access opportunities in space and more broadly in STEM?

SK: I came from a humble background and wasn't a particularly good student when I was younger. I'm an example of hard work and perseverance paying off. Of course, I was lucky I was born in a country that had a space programme, but times are changing. Developing nations are continuing to advance and get involved in the space industry and there will be more and more opportunities for those that are committed to studying in the STEM fields. Girls in developing nations, and

even in the United States, are unfortunately under-represented in these fields. That needs to change, as we are missing the opportunity to utilize their skills and imagination. I think one thing everyone can do is to continue to encourage young girls and women that there is a place for them in space. They represent half of the team and we need them.

List of abbreviations and acronyms

AD-AIR Centre	Association for the Development of the Atlantic International Research Centre
ASI	Italian Space Agency
CFI	Call for Interest
CMSA	China Manned Space Agency
CNES	National Centre for Space Studies of France
CONAE	National Space Activities Commission (Argentina)
COPUOS	Committee on the Peaceful Uses of Outer Space
COSPAR	Committee on Space Research
CTBTO Preparatory Commission	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
DLR	German Aerospace Centre
DropTES	Drop Tower Experiment Series
EGNSS	European Global Navigation Satellite System
ESA	European Space Agency
EvIDENz	Earth Observation-based Information Products for Drought Risk Reduction at the National Level
GEOSS	Global Earth Observation System of Systems
GIS	Geographic Information System
GISTDA	Geo-Informatics and Space Technology Development Agency (Thailand)
GNSS	Global Navigation Satellite System
HLF	High-Level Forum
HLPF	High-Level Political Forum
HSTI	Human Space Technology Initiative
IAC	International Astronautical Congress
IAF	International Astronautical Federation
IAWN	International Asteroid Warning Network
ICG	International Committee on Global Navigation Satellite Systems
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information Communication Technology
INFLPR	National Institute for Laser, Plasma and Radiation Physics (Romania)
INPE	National Institute of Space Research (Brazil)
ISS	International Space Station
ISWI	International Space Weather Initiative
IWMI	International Water Management Institute (Sri Lanka)
JAXA	Japanese Aerospace and Exploration Agency
Kyutech	Kyushu Institute of Technology (Japan)
LSC	Legal Subcommittee (of COPUOS)
MODIS	Moderate Resolution Imaging Spectroradiometer
NADMO	National Disaster Management Organization (Ghana)

NASA	National Aeronautics and Space Administration (United States of America)
NASDRA	Nigerian Space Research and Development Agency
NDRCC	National Disaster Reduction Centre of China
NEO	Near-Earth Object
NGO	Non-governmental organization
OLA	Office of Legal Affairs of the United Nations Secretariat
PNST	Post-graduate study on Nano-Satellite Technologies
PSIPW	Prince Sultan bin Abdulaziz International Prize for Water
RCSSTEAP	Regional Centre for Space Science Technology Education in Asia and the Pacific, China, affiliated to the United Nations
Roscosmos	State Space Corporation (Russian Federation)
RSO	Regional Support Office (of UN-SPIDER)
SAARC	South Asian Association for Regional Cooperation
STSC	Scientific and Technical Subcommittee (of COPUOS)
SDGs	Sustainable Development Goals
SEE	Space Economy Evolution Lab
SMPAG	Space Mission Planning Advisory Group
SNC	Sierra Nevada Corporation
STEM	Science, Technology Engineering and Mathematics
SSV	Space Service Volume
UNDP	United Nations Development Programme
UNDPI	United Nations Department of Public Information
UNDESA	United Nations Department of Economic and Social Affairs
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNIDO	United Nations Industrial Development Organization
UNIS	United Nations Information Service
UNPA	United Nations Postal Administration
UNODC	United Nations Office on Drugs and Crime
UNOOSA	United Nations Office for Outer Space Affairs
UNOP	United Nations Office for Partnerships
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
UNU-EHS	United Nations University (UNU) Institute for Environment and Human Security (UNU-EHS)
VDMA	Viet Nam Disaster Management Authority
WG	Working Group
ZARM	Centre of Applied Space Technology and Microgravity of the University of Bremen (Germany)
ZLF	Centre for Remote Sensing of Land Surfaces of the University of Bonn (Germany)



SPACE4SDGS

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