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Committee on the Peaceful Uses of Outer Space

Report on the United Nations/Austria Symposium on Space for Climate Action

(Graz, Austria (online), 12–14 September 2023)

I. Introduction

1. The United Nations/Austria symposium is one of the long-standing activities of the Office for Outer Space Affairs of the Secretariat under the United Nations Programme on Space Applications. The symposium of 2023 was the twenty-ninth in the series.

2. The Office for Outer Space Affairs and the Government of Austria continued the theme of "Space for climate action", addressing experiences and best practices in mitigating and adapting to climate change and supporting sustainability on Earth. In 2020 and 2022, the symposium had considered the topic with a view to developing a dedicated long-term initiative to address the contribution of space solutions to climate action. The Space for Climate Action initiative was launched in 2022, and the symposium of 2023 provided additional input.

3. The symposium included two and a half days of presentations and discussions to show how space applications provided tools to address the climate crisis across many sectors of the global economy and how the space industry itself was starting to consider ways to reduce the greenhouse gas emissions created by its steady growth.

4. The symposium was held in a hybrid format, with a very limited number of participants attending in person in Graz, Austria, and all others attending online, from 12 to 14 September 2023. The event was co-organized by the Government of Austria and supported by Joanneum Research as the local organizer, in cooperation with Graz University of Technology. It was co-sponsored by the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, the Austrian Federal Ministry for European and International Affairs, the region of Styria, the city of Graz and Austrospace. The European Space Agency (ESA) provided additional support.

5. The present report describes the objectives of the symposium, provides attendance details and summarizes the activities carried out.

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II. Background and objectives

6. The Office for Outer Space Affairs disseminates knowledge regarding the added value of space applications in addressing societal issues, notably through events of the Programme on Space Applications held at the request of Member States and organized jointly.

7. Since 1994, the United Nations/Austria symposium has focused on innovative ways of responding to societal needs and has showcased the socioeconomic benefits of space applications in a wide range of areas. As in previous years, in 2023 the symposium had the following objectives:

(a) To promote the exchange of best practices to meet the demand and needs of developing countries with respect to mitigating and adapting to climate change;

(b) To demonstrate the ways in which initiatives based on space applications had been successfully developed and implemented in different countries;

(c) To share experiences and explore how space-based services could be used to comply with or support policies on climate action, according to national priorities, and how sustainability policies were being applied in the space sector;

(d) To present available toolboxes, through case studies or pilot projects at the country level, that had already been implemented to comply with regulations relating to climate action, with the aim of encouraging the adoption of tested tools and approaches;

(e) To raise awareness of relevant space-related activities, services and cooperation programmes among different user groups, in particular the United Nations and other international organizations, non-governmental organizations, government officials and the diplomatic community;

(f) To report to the Committee on the Peaceful Uses of Outer Space through the Scientific and Technical Subcommittee.

8. Technical sessions, “country case” sessions and panel discussions were interspersed with short presentations, called “project pitch” presentations, to avoid monotony. A chat function was provided on the online platform to enable attendees to ask questions and engage in some degree of exchange despite the lack of face-to-face interaction. All presentations were made available online in advance of the symposium, ensuring that time differences and limited Internet bandwidth would not hinder access to information.

III. Attendance

9. A total of 1,185 individuals, 62 per cent of whom were men, registered to attend the symposium and were granted access to the web-based communication platform. This represented an increase of 45 per cent compared with the symposium of 2022.

10. Owing to constraints of a logistical nature in Graz, only 50 persons could attend the symposium in person. This de facto limited those taking part in Graz to speakers, organizers and a few representatives of permanent missions to the United Nations in Vienna. With five exceptions, who delivered their presentations online, all speakers were present in Graz.

11. A number of participants, both in person and online, were members of the diplomatic community. Also present were representatives of space agencies, including the Algerian Space Agency, the National Space Programme Management Office of Angola, the National Commission for Space Activities of Argentina (CONAE), the State Space Agency of Azerbaijan (Azercosmos), the National Space Science Agency of Bahrain, the Belgian Science Policy Office, the Bolivarian Agency for Space Activities, the National Institute for Space Research of Brazil

(INPE) and the Brazilian Space Agency, the Canadian Space Agency (CSA), the Centre for Research and Military Studies of the Chilean Army, the Colombian Air Force, the Egyptian Space Agency, the Ethiopian Space Science and Technology Institute, ESA, the European Union Agency for the Space Programme (EUSPA), the National Centre for Space Studies (CNES) of France, the Gabonese Agency for Space Studies and Observation, the German Aerospace Center (DLR), the Indian Space Research Organization (ISRO), the Iranian Space Research Centre, the Kenya Space Agency, the Mexican Space Agency, the Royal Centre for Remote Sensing of Morocco, the National Space Research and Development Agency of Nigeria, the Netherlands Space Office, the Pakistan Space and Upper Atmosphere Research Commission, the Paraguay Space Agency, the Rwanda Space Agency, the Saudi Space Commission, the Swedish National Space Agency, the Turkish Space Agency, the United Arab Emirates Space Agency, the National Aeronautics and Space Administration of the United States of America (NASA), the Centre for Space Monitoring and Geoinformation Technologies and the Space Technology and Research Agency of Uzbekistan and the Zimbabwe National Geospatial and Space Agency.

12. The following 119 countries were represented: Afghanistan, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bolivia (Plurinational State of), Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chile, China, Colombia, Comoros, Democratic Republic of the Congo, Côte d'Ivoire, Croatia, Czechia, Dominican Republic, Ecuador, Egypt, Ethiopia, France, Gabon, Gambia, Germany, Ghana, Greece, Guatemala, Guinea, Haiti, Honduras, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Japan, Jordan, Kenya, Kyrgyzstan, Lao People's Democratic Republic, Liberia, Libya, Luxembourg, Malaysia, Malawi, Maldives, Mali, Mexico, Mongolia, Morocco, Myanmar, Namibia, Nepal, Netherlands (Kingdom of the), New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Saint Lucia, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Somalia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Tunisia, Türkiye, Uganda, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia and Zimbabwe.

13. In comparison with previous years, the geographical distribution of attendees was more balanced between world regions, with an increased representation of Latin American and Caribbean States, 31 per cent of attendees from African States, 32 per cent from Asian or Pacific States and a lower percentage of attendees from Europe, demonstrating that the marketing campaign before the symposium had been effective at attracting a worldwide audience. Seventy-four per cent of registrations came from persons from developing countries.

14. The number of attendees online varied throughout the symposium, with a maximum of 143 attendees connected simultaneously.

IV. Programme

15. As in previous years, the programme was structured according to four types of intervention:

(a) Keynote speeches;

(b) Panel discussions;

(c) Presentation sessions with four or five successive speakers, followed by a question-and-answer period;

(d) Succinct "project pitch" presentations, each lasting five minutes.

16. Continuing with the successful format of previous symposiums, to deepen the discussions on climate action policies and the use of space applications at the national level, three “country case” sessions were held, focusing on Brazil, Slovenia and South Africa. Each country case presented a comprehensive overview of the challenges posed by climate change in the country and of national policies and space-related projects, and showcased applications of space activities for end users, with success stories, future plans and lessons learned.

17. The use of the “project pitch” format, a talk limited to five minutes, made it possible to increase the number of initiatives presented and to provide opportunities for less experienced speakers to give presentations.

18. Online attendees were encouraged to submit questions to speakers in writing using the online communication platform throughout the event, while the moderators used that function to highlight relevant initiatives. Questions to speakers conveyed via the communication platform were read aloud by the moderator at the end of each session and panel discussion to provide some level of interaction.

19. In total, the event lasted for 13 hours; it included 42 speakers, comprising 23 women and 19 men. Half of the speakers came from developing countries.

20. All presentations were made available on the website of the Office for Outer Space Affairs before the start of the event to enable attendees who might have limited bandwidth during the event to download the content in advance. Presentations remain available on the website.[1]

21. The symposium began with a welcome ceremony, with live music from an award-winning Austrian accordion player to add a measure of local culture.

22. During the welcome ceremony, Austrian authorities, co-organizers and sponsors emphasized the importance of climate action. The Managing Director of Joanneum Research and the Managing Director of the association of Austrian space industries and research industries, Austrospace, welcomed the focus of the symposium on Sustainable Development Goal 17. They explained how Austria was at the forefront of technical developments in the area of space applications that provided tools to address the climate crisis and to achieve other Sustainable Development Goals. As the Managing Director of Austrospace noted, the space sector would also need to adapt its own practices and reduce its carbon emissions.

23. The representatives of the region of Styria and of the city of Graz explained how initiatives such as the European Green Deal were instrumental for the region, and highlighted how local research and development activities were being adapted to the changing climate and to reduce the impact on the environment. Austria was not immune to climate change and was experiencing extreme weather events. The representative of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology of Austria explained how space-based infrastructure served as an essential monitoring tool to identify changes and prepare mitigation actions; the country had developed a strategy for sustainability on Earth and in space. Space applications and technologies were vital adaptation and mitigation tools, and deserved to be better known, especially in less developed countries. The Permanent Representative of Austria to the United Nations noted that, since the symposiums had first started focusing on climate action in 2020, some progress had been achieved in relation to the “Space 2030” Agenda,[2] notably the coordination of capacity-building activities, the involvement of the private sector in initiatives of the Office for Outer Space Affairs and the wider participation of women in the symposium.

24. In his welcome address, the Acting Director of the Office for Outer Space Affairs said that the Office aimed to facilitate international cooperation and enable the wider use of space-based technologies to implement data-informed climate

[1] www.unoosa.org/oosa/en/ourwork/psa/schedule/2023/un-austria-symposium-2023.html.
[2] General Assembly resolution 76/3.

change mitigation, adaptation and resilience initiatives. Various capacity-building and awareness-raising activities were being implemented, including the Space for Climate Action initiative, through which a dedicated website, developed with support from Austria, was providing information on the use of various space technologies and applications for climate action. He also highlighted that, in view of the very high demand seen last year, the Office would again be providing, together with partners, an extensive number of online training activities in the weeks following the symposium; he encouraged attendees to take advantage of those opportunities.

25. In a keynote speech, the Director of the ESA Earth Observation Programmes presented the Agency's space technology for climate action initiative. She discussed future scenarios for climate evolution and the many technical climate variables that the Earth Observation Programmes were monitoring, contributing data to the climate modelling user group and engaging in strong international collaboration. To better observe the Earth, the Agency had 15 satellites in operation, providing data products focusing on land, ocean, ice and the atmosphere, and scientific missions supporting very specific objectives. It was striking to note that the ice lost from polar ice sheets between 1992 and 2020 was equivalent to an ice cube measuring 20 kilometres on each side. Forty satellites were currently under development, including for a new mission to monitor anthropogenic carbon dioxide emissions for the Copernicus programme of the European Union, as well as a biomass mission to investigate forest growth, loss and degradation in order to better understand the link with climate change and environmental challenges.

26. Session 1 began with the presentation of a range of initiatives in which space applications were being used to monitor water-related challenges and adapt to or mitigate them. The representative of the Regional Organization for the Protection of the Marine Environment, based in Kuwait, presented the Organization's data sets and ways in which it monitored the Red Sea region. Obtaining in situ measurements to complement satellite imagery presented specific challenges locally. Similarly, the representative of the Egyptian Space Agency explained how the Agency used satellite imagery to adapt agricultural practices to climate change and to support the new delta project that would enable agriculture to be practised in a desert area. Satellite imagery was also used to improve water supply, and Egypt had been partnering with Chinese and German satellite manufacturers to develop two spacecraft to monitor climate change. The representative of the Kenya Space Agency explained that in Kenya, the Agency had been using open-source satellite imagery for flood mapping, developing vulnerability maps and a flood hazard impact catalogue with the ultimate goal of developing adaptive strategies.

27. Session 1 continued with analyses of drought occurrence in Mozambique. While most tools focused on rainfall, soil moisture and evaporation must also be considered in drought prediction. Measurements from space would only measure moisture within the first few centimetres of soil, but remote sensing still provided crucial data, for instance, for entities providing disaster relief to predict which areas would need support. The representative of the Space for Climate Observatory (SCO) explained that the Observatory provided studies and operational tools to help decision makers adapt to climate change. The Observatory's portfolio had grown to 71 projects for 42 members worldwide. To be selected, projects needed to address the needs of end users, propose operational and practical solutions, such as software that used satellite data, and have the potential to be extended to several geographical areas. Providing examples of monitoring of the hydrological system in French Guiana, the speaker encouraged the audience to answer the open call for projects published at spaceclimateobservatory.org, in order to join the Observatory's portfolio.

28. A "project pitch" presentation gave an overview of the Earth Observation Training, Education and Capacity Development Network (EOTEC DevNet), which provided capacity-building in the area of Earth observation education and data and comprised thematic working groups (www.eotecdev.net). The Network was keen to

discover as many additional tools as possible and invited the audience to join the Network. A second “project pitch” presentation focused on the role of marine litter in the context of climate change. Besides polluting water, marine litter was a vector for transporting non-local species to other areas. Two “project pitch” presentations addressed urban heat, mapping such heat in the United Republic of Tanzania, where the Government had planned to counteract the issue by planting trees. In Austria, a spin-off initiative of the University of Salzburg now involved 90 persons and provided high-resolution thermal imagery for energy and urban heat applications with a spatial resolution of 2 metres.

29. At session 2, presentations were given on the use of space applications to address forestry- and agriculture-related challenges. The representative of the World Wide Fund for Nature International explained that the rate of deforestation of the Atlantic Forest in Paraguay had decreased by 90 per cent in two years thanks to a new policy and the monitoring put in place using satellite imagery. The drivers of deforestation in Paraguay were livestock farming, mechanized agriculture and the illicit cultivation of cannabis hidden in the forest. All stakeholders, from municipalities to schools, had been informed of the new policy against deforestation, and Paraguay had launched a reforestation plan with Argentina and Brazil. The representative of the National Space Science Agency of Bahrain explained that the Government of Bahrain planned to achieve net-zero emissions by 2060 and had launched an initiative to enhance food security. Research to develop indices to assess soil moisture and salinity showed that 76 per cent of the soil in Bahrain was dry or extremely dry, and only 12 per cent of the soil had low salinity, with only 1 per cent having very low salinity. The Government had realized that the situation was alarming and that it needed to act.

30. Session 2 continued with an overview of the monitoring of forest cover in India. The remote sensing activities of ISRO underpinned laws and policies with scientific evidence in instances where India needed to reduce emissions from deforestation. The company Planet presented a concrete example of public-private partnership: it offered mosaics of visual data and analysis-ready surface reflectance data, produced monthly since 2020 and available for use with a non-commercial licence. A total of 97 countries benefited from that data, with more than 9,000 users registered, to, for instance, track deforestation, forest fires or environmental crime. The impact of the public-private partnership programme was mostly limited by the lack of connectivity, making it difficult for some local actors to access data, and by challenges in empowering those actors in decision-making processes.

31. The first panel discussion brought together four speakers, who discussed the challenges of detecting emissions from the energy sector from space. Three speakers used space applications to monitor and reduce greenhouse gases, while one speaker used remote sensing data to optimize the production and use of sustainable energy. The provision of better information on the forecasted availability of solar power would reduce discrepancies between solar energy production curves and consumption curves. Besides improving management of the energy network, better information would also support smart energy management systems such as heat pumps and charging stations and increase the efficiency of energy communities.

32. Reviewing the main obstacle to a wider use of what was already on offer, the speakers underscored a lack of awareness. For instance, once producers of oil and gas were made aware of leakages of methane from pipelines, they were eager to act in order to remedy a situation that, besides causing environmental damage, generated unnecessary costs. With increasing public awareness of the contribution by the energy sector to the climate crisis, satellite monitoring of carbon dioxide and methane emissions, with associated regulations and fines, such as those Nigeria had been implementing, could become more prevalent. In practice, although the role of regulators was to enforce the law, the approach of solving issues privately between producers of greenhouse gases and governmental agencies might be more effective than publicly shaming offenders, otherwise they might deliberately call the trustworthiness of remote sensing data into question. Providing transparency in

relation to that data and the measurement process would enable such monitoring processes to be more easily accepted and support accountability. Data were readily available, sometimes even at no cost, and tools already existed, but policymakers needed to be more aware of what was achievable.

33. Although space-based infrastructure with the capability to detect anthropogenic greenhouse gases from orbit had been gradually deployed, and the detection of methane leaks had become feasible, one speaker explained that only about 1.5 per cent of what had been detected had been mitigated so far. Reaching the stakeholders in the energy sector who were able to push for change was a slow process, and sometimes there was little interest in modifying long-established industrial practices. The technical performance of existing satellite technology was already sufficient to provide actionable information, and an increasing number of countries were interested in receiving the data. There had been an uptake of satellite technology; however, the development and enforcement of environmental policies remained essential to incentivize changes. Collaboration with government research agencies and with space agencies was a necessary step to provide assurances that the technology was suitable for Governments' own objectives of developing effective monitoring policies and regulatory schemes.

34. Attendees participating in person were invited by the Mayor of Graz to a reception at Graz City Hall to mark the end of the first day of the symposium.

35. The first "country case" session of the second day focused on South Africa. The speakers from the Water Research Commission, the Agricultural Research Council and the National Department of Forestry, Fisheries and the Environment explained how South Africa was using space applications in innovative projects. The South African National Space Agency (SANSA) had provided written input giving an overview of how space applications supported policy development against climate change. Presentations were followed by a discussion between the speakers and the audience.

36. The Water Research Commission oversaw the management of water bodies. Wetlands and estuaries had shown vulnerabilities to drought and floods, and South Africa had been using satellite data to conduct risk assessments in order to prepare for floods and plan in a proactive manner by, for instance, mapping vulnerable areas, developing local adaptive capacity and making adaptations on a local scale. The Agricultural Research Council used an archive of satellite imagery from various providers, maintained on a regular basis. The Council's "Umlindi newsletter" (from a Zulu word for "watchman"), which combined remote sensing data and in situ weather data, was disseminated on a monthly basis to about 400 users, including government officials, policymakers, farmers and private organizations. Feedback from end users was sought through local seminars, as well as meetings with agricultural and farmers' committees. The newsletter could incorporate other satellite data sets, such as microwave or radar, and incorporate other indicators such as soil moisture, when they were provided through collaboration with other entities. The Council also collaborated with the National Disaster Management Centre and provided drought-related indicators.

37. When climate change had caused severe floods in KwaZulu-Natal Province in 2022, the national response had used Earth observation data for planning, and a "let's respond" toolkit had been developed to integrate climate change risks and opportunities into training at the local municipal level. A wide range of initiatives had been established, including a community of practice and climate services to enable early warning systems, with the goal of mainstreaming climate change into the planning systems, down to the local government level. Sectorial policies had been defined, with emission targets for each significant economy sector, limits for industry emissions and economic measures to drive mitigation. The South Africa low-emission development strategy was one of the key instruments. SANSA Earth observation technology made it possible to monitor freshwater bodies in near real time, and SANSA reports on settlement growth were used in combination to plan

disaster response. During the ensuing discussion, the speakers emphasized the clearly defined, coherent and strategic coordination among agencies and across sectors as being key to the implementation by South Africa of its national climate change and development policy.

38. In three "project pitch" presentations, speakers briefly presented initiatives to evaluate or reduce the impact of space activities on the environment, notably in relation to pollution of the atmosphere.

39. Speakers in the second panel discussion discussed how to modify space engineering practices using greener technologies, and what incentives could be proposed for their adoption with a view to reaching a net-zero objective. While the cost of access to space has decreased significantly, making it more affordable and driving demand, that growth has come with its own environmental costs that had not been at the core of considerations so far. Initiatives such as space tourism did raise questions in the media and among the general public about environmental sustainability.

40. The speaker from ESA provided an overview of contributions made by space projects to the sustainable development of society and explained what was being done to manage the space sector in a more socially and environmentally responsible manner. Institutional initiatives by space agencies were required to develop new standards and hardware, with the involvement of the space industry itself to ensure that sustainability would not only remain a matter of goodwill and environmental responsibility but also a commercial priority. Three speakers addressed propellants and how to transition to greener technology or to provide new propulsion to spacecraft already in space in order to prolong their use and then ensure their appropriate demise. Two of those speakers were entrepreneurs who were developing and testing technical solutions that were envisaged to be available commercially in two to three years' time. The development of new space technology was a slow process, notably because of the numerous and expensive tests required during the development process to ensure that engineered products were qualified for space and ready for commercialization. Financial support from public entities such as space agencies during those early phases, as well as the provision of technical advice from their experts, were essential for new innovative companies to scale up. Innovations were risky and could not depend on any customer-driven development, as demand was not yet sufficient.

41. Specific policies in Europe to ban toxic chemicals and transition towards a greener economy, combined with economic incentives to develop products, had led to a limited number of private sector initiatives and entrepreneurship, with, for instance, the creation of companies as spin-offs of university students' activities in Austria. Financial drivers could be identified; for example, the use of less toxic chemicals for propulsion was financially attractive, as there was no need for costly health and safety protective measures, but substitute products needed to be made widely available first. Save for in a few niche areas and in a very limited number of countries, the topic of greening technologies in the space industry was in its infancy. As opposed to other industry sectors, there was no "greenwashing" issue in the space industry because those responsible for creating pollution did not yet feel pressure to change their industrial processes. The speakers were nonetheless convinced that the need to reduce the impact of the space industry on the environment would grow steadily in the years to come, and that job opportunities would appear in that area. Young people who were seeking opportunities in the space sector and were keen to make the world more sustainable were encouraged to consider a career in that domain.

42. The final two "project pitch" presentations showed how satellite applications could motivate young people in Botswana to work in agriculture, and how the YouthMappers initiative was providing satellite data products to support sustainability.

43. The “country case” session on Brazil brought together speakers from the Ministry of Science, Technology and Innovation, INPE and the Federal University of Alagoas. While two State institutions were dedicated to space in Brazil, the Brazilian Space Agency and INPE, the Ministry had the objectives of expanding the use of space applications and generating and disseminating knowledge and technologies to mitigate and adapt to the effects of climate change. The national space activities programme aimed to establish space infrastructure that met national priorities, including new remote sensing satellites. The country had been particularly prone to extremely heavy rainfall in 2023, with numerous casualties and landslides. Brazil was using two platforms, called TerraMA2 and AdaptaBrasil, to address its unique environmental challenges, mitigate natural disasters and inform the public. One speaker stressed the need to involve multiple stakeholders, because, once issued, alarms had to effectively reach vulnerable populations, then warnings needed to be understood and acted upon by those at risk.

44. Initiatives to address drought risks were deployed in the north-east region of Brazil, using a combination of in situ measurements and remote sensing. The Brazilian Drought Observatory used open-access data from Earth observation satellites and other products obtained via the EUMETCast Lapis system to analyse historical extreme events, to provide information about present drought events and to forecast future drought events and prepare risk management plans with local communities. To assist the Brazilian federal environmental authority (IBAMA) in organizing the law enforcement plan against illegal deforestation in the Amazon rainforest, INPE was leading two main projects: one called PRODES, which provided an annual estimate of shallow deforestation, and one called DETER, which gave an early warning of the deforestation process. Since 2010, those projects had been complemented by a capacity-building project called Capacitree to monitor forests by satellite.

45. During the ensuing discussion between panellists and the audience, there was agreement on the need to bridge the “technical divide” between scientists and policymakers, so that they all understood the data. In the past, INPE had developed products that end users did not use because they did not understand them. To remedy the situation, the Institute had worked more closely with users and brought all stakeholders together. It was essential to understand the context in which users lived and the many differences in their ways of using information in order to produce appropriate products. It was also vital to obtain feedback from civil society to feed the policy development process that could reinforce actions.

46. In an overview of the eight free online courses to be provided following the symposium, the Office for Outer Space Affairs and the seven organizations offering the training explained what the courses would cover and who the target audience for them was. The courses were a joint initiative of the Office in collaboration with EUSPA, CSA and SANSA, as well as, in a renewal of their previous collaboration with the European Centre for Medium-Range Weather Forecasts (ECMWF), ESA, ISRO and NASA. As in previous years, the courses explained how to use space-based data for climate action, provided information on high-accuracy positioning with global navigation satellite system services and offered advice for budding entrepreneurs in the space sector.

47. Attendees present in Graz were offered a guided walking tour of the old city to mark the end of the second day, prior to a reception from the region of Styria in the historical Orangerie building of Graz castle.

48. The last “country case” session focused on Slovenia. The representative of the Ministry of the Economy, Tourism and Sport began by providing an overview of the country’s space activities; Slovenia had been an associated member of ESA since 2016 and joined the Committee on the Peaceful Uses of Outer Space in 2021. Within Slovenia, there was a diverse space ecosystem, with entities active at most levels of the space value chain. Through its dynamic industry, lively start-up community and increasing investments in space within the national framework,

Slovenia was poised to engage in greater international collaboration. Climate change would require more sector-oriented information in order for government policies to drive adaptation in urban areas and agriculture, while also addressing the need for climate risk and vulnerability assessments.

49. Two representatives of the Slovenian Centre of Excellence for Space Sciences and Technologies (SPACE-SI) introduced the NEMO HD satellite mission, the first Slovenian microsatellite for low latency remote sensing, offering sharp multispectral images and high-definition videos from space. The mission was unique in that it provided the ability to cover areas of interest wider than the satellite swath with a single microsatellite by using different attitude modes of the spacecraft, whereby sensors would point and acquire data, for instance, with curve tracking to follow a river basin. In addition, transportable ground stations could be deployed to provide near real-time acquisition of the satellite data for processing.

50. The Geological Survey of Slovenia had assessed the changes in seasonal rainfall that caused landslide occurrences in Slovenia up until the end of the twenty-first century and had revealed several key points of interest for early warning systems and disaster preparedness. The number of landslides was expected to increase significantly in summer and autumn by the mid-century to the end of the century in the eastern part of Slovenia, and shallow landslides would have a greater impact on the landscape than complex landslides. A Slovenian company specialized in sustainable agriculture had developed a commercial application that offered high-resolution geo-information with detailed time series and disaggregated data to provide solutions for efficient crop farming and monitoring.

51. In the ensuing discussion, the speakers agreed that continuous interaction and communication between key stakeholders such as policymakers and technology partners were essential to ensure that the needs of institutions were understood, and to help industry develop applicable solutions that would better suit those needs.

V. Recommendations for future activities

52. To review and summarize what should be proposed, the Office for Outer Space Affairs co-chaired a panel discussion with the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology. The panel discussion involved a representative of the European Union Agency for the Space Programme and a representative of the Ministry of Science, Technology and Innovation of Brazil.

53. The discussion covered the need to better communicate the benefits of space applications to those who could use them at the local level and factors preventing the wider use of satellite-based data. It was regrettable that the space sector remained somewhat self-centred and was not yet able to widely explain the practical value of space programmes to achieve the Sustainable Development Goals. While many technical solutions did exist and were already being implemented, they were often deployed within projects; guaranteeing the continuity of such solutions through resources and funding required the institutionalization of strategic projects into policies, aligning them with governmental plans to ensure the long-term sustainability of these initiatives. The panel also discussed ways and means of scaling up efforts to raise awareness of the benefits of space solutions for climate action, including working with networks and multipliers.

54. With regard to the activities of the new Space For Climate Action initiative of the Office so far, the speakers discussed how to involve the private sector and benefit from the communication and level of investment that it could bring to new initiatives. Public entities should make more effort to communicate what technology existed, and what type of support – including funding and financing – might be available to support private initiatives to implement solutions.

55. At the international level, the Office was able to act as a bridge between information provided by experts and at meetings at the intergovernmental level, notably within the United Nations system. Furthermore, the Office was in a unique position to advocate for the use of space applications to mitigate the impact of climate change at the international level. Space was to be a topic of interest at the twenty-eighth meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change, and was gradually being perceived as a way to support socioeconomic development, including that of non-space-faring nations.

56. Capacity-building activities remained essential to appeal to non-space-faring countries. Such countries would not necessarily need to develop their own space programme with capabilities to design, develop and launch spacecraft, but could cooperate with others who were already able to do so. Alternatively, in order to develop applications, they could obtain, process and use data from third parties, including open-source remote sensing data sets that were already available at no cost. Both SCO and the Space4ClimateAction website would continue to share information about projects, make data available and encourage collaboration at the international level.

57. The panellists concluded that all parties, especially institutions and States, needed to engage with users and user communities to better understand their needs, explain more clearly and practically what kind of benefits users could obtain from space applications, and clarify jointly how space applications could support them in meeting their goals. In the context of the climate crisis, the activities of the Office to advocate for space applications as enabling solutions should be reinforced. Moreover, capacity-building activities, particularly those tailored to the needs of developing countries, should continue to be held on a regular basis.

VI. Conclusions and lessons learned

58. The Office for Outer Space Affairs and the Austrian co-organizers concluded the symposium by providing an overview of the respective roles of those involved in preparing the event, both in Graz and for online attendees.

59. The symposium had shown how space applications provided tools to address the climate crisis across many sectors of the global economy and how the space industry itself was starting to consider ways to reduce the greenhouse gas emissions created by its steady growth. Three countries cases from Africa, Europe and South America had showcased concrete policies at national level, existing services and successful projects that could be replicated by others.

60. Participants were encouraged to provide written feedback using a dedicated online form, and the feedback received was overwhelmingly positive: on average, participants rated the event 4.50 out of a maximum rating of 5, and those who attended in person rated the event 4.73 out of 5. Words of appreciation were received from speakers and attendees, who had appreciated the interdisciplinary nature of the discussions. They had particularly valued the panel discussions and the country cases, because they provided concrete information on successful initiatives and strategies being undertaken by various countries. Those who had participated in person had found the event very valuable for meeting like-minded individuals and discussing opportunities to collaborate.

61. Two thirds of the attendees who provided feedback had registered to attend at least one of the eight post-symposium technical courses provided by the Office for Outer Space Affairs in collaboration with CSA, EUSPA, ECMWF, ESA, ISRO, NASA and SANSA. This very high level of interest in the courses confirmed that initiatives of the Office to offer capacity-building on the topic of climate action should be reinforced.

62. All the presentations of the symposium and relevant materials from the post-symposium online training courses would remain available at unoosa.org.

63. As in previous symposiums since 2020, remote attendance had provided an opportunity for a much larger number of participants than would have been possible for a physical event in Graz. Use of the hybrid format with an online platform would continue to be considered for symposiums in the future.