Committee on the Peaceful Uses of Outer Space
Legal Subcommittee

Report on the International Conference on Space Resources, including the results of the expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024

(International Conference, Vienna, 15 April 2024; and expert meeting, Luxembourg, 26 March 2024)

I. Introduction

1. The International Conference on Space Resources of the Working Group on Legal Aspects of Space Resource Activities of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space was held in Vienna on 15 April 2024, during the sixty-third session of the Legal Subcommittee, in accordance with the five-year workplan and methods of work of the Working Group, agreed at the sixty-first session of the Legal Subcommittee, in April 2022 (A/AC.105/1260, annex II, para. 6 and appendix), and in accordance with the terms of reference of the Working Group (A/76/20, annex III). The topics addressed at the International Conference and their scope were elaborated through inputs of States; the Conference was open to Governments and invited academic and other stakeholders.

2. At the sixty-sixth session of the Committee, in June 2023, the Working Group agreed that the International Conference would be conducted in an inclusive and transparent manner, within the scope and on the basis of the following topics:

   (a) Implications of the legal framework for space resource activities;

   (b) The role of information-sharing in supporting space resource activities;

   (c) The scope of future space resource activities;

   (d) Environmental and socioeconomic aspects of space resource activities;

   (e) International cooperation in scientific research and technological development for space resource activities (A/78/20, para. 234).

3. At the same session, the Working Group agreed that an event entitled “Expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024” would be held in Luxembourg during the Space Resources Week, and would be co-hosted by Belgium and Luxembourg and organized in cooperation with the United Nations (A/78/20, para. 232).
4. Also at the sixty-sixth session of the Committee, the Working Group agreed that the presenters of the expert meeting would be nominated by their respective national delegations and that the list of speakers would be, through close consultations between the Chair and Vice-Chair of the Working Group and States members of the Committee, prepared and finalized \((A/78/20, \text{para. 233})\).

5. In an invitation circular dated 28 June 2023, the Chair and Vice-Chair of the Working Group invited States members of the Committee to nominate panellists and presenters for both the expert meeting held in Luxembourg in 2024 and the International Conference on Space Resources held in Vienna during the sixty-third session of the Legal Subcommittee. In that circular, the Chair and Vice-Chair of the Working Group strongly encouraged the nomination of presenters from developing and emerging spacefaring countries for both the expert meeting and the International Conference.

6. The Chair and Vice-Chair of the Working Group convened four intersessional meetings of the Working Group to engage in consultations on the nominations by member States of presenters for both the expert meeting and the International Conference, and to discuss other practical and organizational matters relating to those events.

7. The programmes of the International Conference and the expert meeting were prepared and finalized in a series of intersessional meetings of the Working Group, on the basis of nominations received from Working Group members, taking care to incorporate diverse views and maintain a gender and geographical balance among panellists. Four intersessional meetings were held in virtual format, on 18 October, 22 November and 19 December 2023, and on 22 January 2024.

8. The International Conference and the expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024 collectively addressed five overarching topics relevant to the exploration, exploitation and utilization of space resources. The International Conference addressed the implications of the legal framework for space resource activities, and the role of governance, including information-sharing, in supporting space resource activities, while the expert meeting was aimed at gathering preliminary inputs on the scope of future space resource activities; environmental and socioeconomic aspects of space resource activities; and international cooperation in scientific research and technological development for space resource activities.

9. The International Conference and the expert meeting provided valuable contributions to the work of the Working Group in addressing the multifaceted nature of the exploration, exploitation and utilization of space resources and in assessing the benefits of further development of a framework for such activities, and also provided an opportunity to collect the views of experts who might not participate directly in the work of the Working Group.

10. The present report contains both information on the outcomes of the International Conference and the results of the expert meeting, in a single report, as agreed by the Working Group at the sixty-sixth session of the Committee, in June 2023 \((A/78/20, \text{para. 233})\).

11. The programmes of the International Conference and the expert meeting were made available on the website of the Office for Outer Space Affairs of the Secretariat \((www.unoosa.org)\). The International Conference was webcast on United Nations WebTV. The expert meeting was publicly webcast on a dedicated website established for the event by the co-hosts.

12. Furthermore, for consideration by the Legal Subcommittee at its sixty-third session, conference room papers containing information on the International Conference \((A/AC.105/C.2/2024/CRP.23)\) and the expert meeting \((A/AC.105/C.2/2024/CRP.15 \text{ and } A/AC.105/C.2/2024/CRP.31)\) were made available on the website of the Office for Outer Space Affairs.
II. Expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024

13. The event entitled “Expert meeting collecting preliminary inputs for consideration at the international conference in Vienna in 2024”, co-hosted by Belgium and Luxembourg and organized in cooperation with the United Nations, was held on 26 March 2024 at the European Convention Center in Luxembourg. It was aimed at gathering preliminary inputs on the scope of future space resource activities; environmental and socioeconomic aspects of space resource activities; and international cooperation in scientific research and technological development for space resource activities.

14. The expert meeting focused on three of the five topics agreed by the Working Group, as referred to in paragraph 2 above. It comprised six panel discussions, with two panels dedicated to each of the three topics, as follows:

(a) Panels 1 and 4: the scope of future space resource activities;

(b) Panels 2 and 5: environmental and socioeconomic aspects of space resource activities;

(c) Panels 3 and 6: international cooperation in scientific research and technological development for space resource activities.

(a) The scope of future space resource activities

15. The first and fourth panels were moderated by Mahulena Hofmann, holder of the SES Chair in Satellite Communication and Media Law at the University of Luxembourg. The panels focused on the scope of future space resource activities.

16. The panellists of the first panel were Ernest Tan, member of the Space Exploration Strategic Planning team at the Canadian Space Agency; Liu Jizhong, Chief Designer of the Planetary Exploration Project Tianwen-3 mission of the Lunar Exploration and Space Program Center of the China National Space Administration; Alexis Paillet, Project Manager and Chief of the Moon and Mars Station, National Centre for Space Studies (CNES) of France; Philipp Reiss, Professor for Lunar and Planetary Exploration Technologies at the Technical University of Munich, Germany; and Bernhard Hufenbach, Commercialization and Innovation Team Leader at the European Space Agency (Luxembourg).

17. The panellists of the fourth panel were Arvid Bertheau Johannessen, Lead for Human Spaceflight and Exploration at the Norwegian Space Agency; Kevin Cannon, Assistant Professor at the Colorado School of Mines (United States of America); Kota Tanabe, Director of the Space Exploration System Technology Unit at the Japan Aerospace Exploration Agency Space Exploration Center; Marilena Amoroso, Head of the Infrastructure Office of the Robotic Exploration Unit at the Italian Space Agency; and Ayman Mahmoud Mohamed Ahmed, General Manager of the Space Imaging Department of the Egyptian Space Agency.

18. In the panel discussion on space resources, the critical role of space resources in sustainable and long-term space exploration was emphasized. Panellists discussed the need for clear guidelines on the use of space resources to create new knowledge and experiences that benefit society on Earth, highlighting global collaborative models facilitated by the exchange of information on achievements and joint planning, design and implementation efforts. Panellists stressed the importance of space resources for deep space exploration and the necessity of developing technology and legal frameworks concurrently to ensure that both were aligned and that they facilitated safe and sustainable operations. Panellists also stressed the need to carry out a thorough assessment of space resources and the lunar environment before establishing regulations, in order to better understand the impacts of human
activities in space. Overall, the panellists discussed the need for proactive multilateral coordination to support sustainable development both in space and on Earth.

19. Panellists also discussed the potential of space resources for accelerating space exploration and fostering a space economy, emphasizing the importance of regulatory frameworks and best practices to ensure equitable and sustainable space activities, as well as the need for proactive governance. However, the panellists also acknowledged the challenges of economic viability and technological limitations with regard to space resource extraction and suggested that a cautious approach should be taken. Participants were informed about initiatives focused on lunar exploration and resource identification that leveraged successful missions in order to advance future space activities. In addition, the panellists highlighted the role of CubeSats and remote sensing technology in assessing the resource potential of celestial bodies, underscoring the importance of international collaboration and capacity-building for developing countries in their space exploration endeavours. Overall, the panellists emphasized the need for collaborative efforts, regulatory frameworks and technological innovations to unlock the potential of space resources for scientific exploration and economic development.

(b) Environmental and socioeconomic aspects of space resource activities

20. The second and fifth panels, moderated by the Director of the Office for Outer Space Affairs, addressed the environmental and socioeconomic aspects of space resource activities.

21. The panellists of the second panel were Jean Robert Batana Pires Ferreira, General Coordinator of Strategic Technologies at the Ministry of Science, Technology and Innovation of Brazil; Du Hui, Research Fellow at the China Academy of Space Technology; Mr. Mardianis, Senior Researcher at the Directorate of Research and Innovation Policy Formulation of the National Research and Innovation Agency of Indonesia; Kathryn Hadler, Director of the European Space Resources Innovation Centre of the Luxembourg Institute of Science and Technology; and Vlada Stamenković, Senior Director of the Space Resources Program of Blue Origin (United States).

22. The panellists of the fifth panel included Philip de Man, Research Manager at the Leuven Centre for Global Governance Studies (Belgium); Laércio Massaru Namikawa, Senior Technologist at the National Institute for Space Research of Brazil; Thao Nguyen, Director of Mission Engineering for Off-Planet Systems at ICON Technology (United States); Simone Pirrotta, Head of the Robotic Exploration Office at the Programmes Directorate of the Italian Space Agency; and Jesús Roberto Romero Ruiz, Deputy Director of Space Security at the Mexican Space Agency.

23. Panellists observed that developing technologies for sustainable space exploration not only enabled living and working in space, but also fostered benefits for Earth by reducing costs, providing clean energy solutions and promoting global access to space resources, thereby driving equity and sustainability initiatives worldwide. The application of the joint principles of universal service obligation and an emphasis on factors such as availability, affordability and accessibility should guide the exploration and exploitation of space resources, while taking into consideration the economic, environmental and equitability implications. Panellists encouraged developing countries to pursue and participate in space programmes and promote benefit-sharing. They highlighted the need to rethink resource utilization in space, including by considering complex systems, the scale of operations and potential economic benefits, and emphasized the importance of minimizing environmental impacts and facilitating technology transfer to benefit Earth. Panellists advocated for a cautious and exploratory approach to mitigating environmental impacts while advancing space resource utilization, suggesting that the Working Group on Legal Aspects of Space Resource Activities was the platform for addressing those complex issues.
24. Panellists also explored the multifaceted aspects of space resources and considered legal frameworks, private sector involvement, knowledge-sharing and international cooperation. Discussions centred on the interpretation and application of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and the need for inclusive regulations to guide space resource utilization. The panellists highlighted the importance of equitable access to space resources, emphasizing the potential benefits for both scientific research and economic development. Private sector engagement was identified as a driving force for advancing space resource activities, and suggestions for promoting knowledge-sharing and collaboration among businesses were given. In addition, panellists emphasized the significance of expanding the definition of benefits beyond material gains to include opportunities for emerging countries and broader scientific advancement. International cooperation and capacity-building initiatives were recognized as essential for ensuring inclusive participation in space exploration and resource utilization efforts. Overall, the panellists underscored the need for a collaborative and comprehensive approach to address the complex challenges and opportunities associated with space resources.

(c) International cooperation in scientific research and technological development for space resource activities

25. The third and sixth panels focused on international cooperation in scientific research and technological development for space resource activities. The panels were moderated by Jean François Mayence, Legal Advisor of the Belgian Federal Office for Science Policy.

26. The panellists of the third panel were Carolina Eugenia Catani, in charge of space law affairs at the National Commission on Space Activities (CONAE) of Argentina; Petra Rettberg, Head of the research group entitled “Astrobiology” at the German Aerospace Center (DLR); Setsuko Aoki, Professor of Law at Keio University, Japan; and Jeremiasz Merkel, Specialist in Research and Innovation, Polish Space Agency.

27. The panellists of the sixth panel were Thales Sehn Körting, Researcher at the National Institute for Space Research of Brazil; Guo Linli, Vice-Chief Engineer at the China Academy of Space Technology; Julien-Alexandre Lamamy, Chief Executive Officer of ispace Europe (Luxembourg); Kesniel Humberto Bravo Carpio (Mexico); and Wilawan Pipatjirattikal, Senior Specialist and Strategist at the Geo-Informatics and Space Technology Development Agency of Thailand.

28. Panellists discussed the importance of cooperation in science and space exploration, emphasizing the need for multilateral inclusion and collaboration among States. They highlighted the significance of adhering to international principles, such as those outlined in the Outer Space Treaty, in order to ensure the responsible exploration and exploitation of space resources while minimizing environmental impacts. Moreover, they stressed the need for forward and backward planetary protection measures to safeguard against contamination and preserve the integrity of celestial bodies. The panellists also discussed the challenge of accessing scientific data and the development of beneficial and acceptable rules for all stakeholders in that regard. In addition, they underscored the role of education, public communication and international cooperation in addressing global challenges and advancing space exploration efforts. Lastly, the panellists emphasized the importance of shared values and prioritizing cooperation to overcome challenges and achieve sustainable space exploration goals.

29. Panellists highlighted the importance of international collaboration, acknowledging the vital role of private entities in advancing lunar exploration and exploitation. They noted that challenges such as financial constraints and technological complexities had historically hindered progress, but that commercial entities were now driving an increase in accessibility with respect to the Moon. Panellists also noted that collaboration frameworks demonstrated the potential for supporting
scientific advancement, and that developing countries aspired to leverage space technology for sustainable development, and emphasized the importance of international cooperation and operational coordination in space endeavours. Despite obstacles related to data-sharing policies and technological standards, a collective commitment to peaceful space exploration remained paramount.

III. International Conference on Space Resources

30. The International Conference on Space Resources, held in Vienna on 15 April 2024, during the sixty-third session of the Legal Subcommittee, focused on two of the five topics agreed by the Working Group, as referred to in paragraph 2 above. It comprised two panel discussions, on the following topics:

(a) Panel 1: implications of the legal framework for space resource activities;

(b) Panel 2: the role of governance, including information-sharing, in supporting space resource activities.

(a) Implications of the legal framework for space resource activities

31. The panel discussion on the implications of the legal framework for space resource activities was moderated by Andrzej Misztal, Chair of the Working Group on Legal Aspects of Space Resource Activities. The panellists were Gao Guozhu, Professor of International Law at Beihang University, China (panellist nominated by China); Sergio Marchisio, Professor of Space Law at the Sapienza University of Rome, Italy (panellist nominated by Italy); Christopher Johnson, Director of Legal Affairs and Space Law at the Secure World Foundation (panellist nominated by the United States); El Bachir Zantou, Researcher at the Royal Centre for Space Studies and Research of Morocco (panellist nominated by Morocco); Rosa María Ramírez de Arellano y Haro, General Coordinator of International Affairs and Space Security at the Mexican Space Agency (panellist nominated by Mexico); Rocío Germania Narváez Benalcázar, Chief of Geographical Production at the Military Geographical Institute of Ecuador (panellist nominated by Ecuador); Georgios Kyriakopoulos, Associate Professor of International Law at the National and Kapodistrian University of Athens, Greece (panellist nominated by Greece); Marcus Schladebach, Professor of Public Law, Media Law, and Air and Space Law at the University of Potsdam, Germany (panellist nominated by Germany); and Vasily Gudnov, Head of the Multilateral Division of the International Cooperation Department of the State Space Corporation “Roscosmos” of the Russian Federation (panellist nominated by the Russian Federation).

32. In his introductory remarks, the moderator emphasized that the International Conference on Space Resources, conducted under the five-year workplan of the Working Group on Legal Aspects of Space Resource Activities, by bringing together experts, nominated by States, in the field of space resource exploration, exploitation and utilization, as well as experts in the areas of international legal regimes of a related nature, offered an important opportunity to discuss existing legal provisions that could serve as a basis for a potential legal framework for such activities, and would support the work of the Working Group towards achieving its mandated goal of developing a set of initial recommended principles for space resource activities.

33. Panelists considered several implications of a potential legal framework for space resource activities, with a view to assessing the benefits of developing an internationally agreed legal framework for such activities. The implications ranged from the need for compliance with existing rights and obligations enshrined in international space law, to the clarification of the scope of those rights and obligations in the light of balancing freedoms and related limitations under the Outer Space Treaty and other relevant principles. Such a framework could provide a pathway towards the progressive development of law on space resource activities, which in turn could contribute to avoiding conflicts and concurrent claims related to such activities.
34. Panellists discussed opportunities and challenges related to an integrated legal framework for space resource activities, and the need to enhance transparency and confidence-building, prevent conflicts and anchor such activities to the principle of the peaceful uses of outer space. It was noted that it was important to develop a common understanding of space resource utilization, one that was based on the principles of peaceful use and non-appropriation enshrined in the Outer Space Treaty. In that context, several panellists recalled the pivotal role of the Committee on the Peaceful Uses of Outer Space. In addition, several panellists emphasized that principles or recommendations to be developed in that area should align with existing international law, including the Outer Space Treaty, and should focus on ensuring the sustainable and predictable use of outer space, and on ensuring legal conformity, and that it was also important to determine what constituted “space resources” when developing such principles. In the discussion, the importance of ensuring equitable access to outer space and the sharing of benefits was noted. It was also noted that comprehensive multinational cooperation was imperative in achieving equitable access to and the sustainable use of outer space.

35. The panellists highlighted the importance of adaptive governance models that considered current technological advances and foresaw future developments. Emphasis was also placed on examining the application of existing models, such as the International Telecommunication Union framework for radio frequencies, when developing frameworks aimed at governing space resource activities.

36. Panellists highlighted the importance of ensuring that space activities benefited all of humanity by adhering to the principles of the Outer Space Treaty. The discussion revolved around how those principles guided the sharing of benefits, not only through legal frameworks, but also through the fostering of international cooperation and technology transfer, and around a recommendation for an integrated approach that included legal, regulatory and commercial strategies to advance the sustainable exploration and use of space resources.

37. In addressing the legal challenges of space resource activities, discussions also explored the possibility of developing an enabling and equitable legal framework that could facilitate the integration of emerging space countries into the space resources economy and promote sustainable and inclusive global cooperation in space exploration and resource utilization, and that could be developed within the framework of the Committee on the Peaceful Uses of Outer Space, thereby ensuring broad cooperation and effective participation. The importance of taking a collaborative, multidisciplinary approach to space resource governance, after a careful examination of the purposes for which space resources are extracted and utilized, was noted.

(b) The role of governance, including information-sharing, in supporting space resource activities

38. The panel discussion on the role of governance, including information-sharing, in supporting space resource activities was moderated by Steven Freeland, Vice-Chair of the Working Group on Legal Aspects of Space Resource Activities. The panellists were Su Jinyuan, Professor at the Institute of International Law of Wuhan University, China (panellist nominated by China); Tanja Masson-Zwaan, Assistant Professor and Deputy Director of the International Institute of Air and Space Law at Leiden University, Kingdom of the Netherlands, President Emeritus of the International Institute of Space Law and Co-founder of the Hague International Space Resources Governance Working Group (panellist nominated by the Kingdom of Netherlands); Konrad Jan Marciniak, Judge of the International Tribunal for the Law of the Sea (panellist nominated by Poland); Yury Razoumny, Chairman of the Technical Committee for International Scientific Cooperation of the Space Council of the Russian Academy of Sciences and Director of the Academy of Engineering of the Peoples’ Friendship University of Russia (RUDN University) (panellist nominated by the Russian Federation); Ian Grosner, Federal Attorney and Head of the Legal Department at the Brazilian Space Agency and Chair of the Working Group on the Definition and Delimitation of Outer Space of the Legal Subcommittee (panellist
nominated by Brazil); Mathias Link, Deputy Chief Executive Officer at the Luxembourg Space Agency (panellist nominated by Luxembourg); and Ryosuke Murayama, Director at the Cabinet Office of the National Space Policy Secretariat of Japan (panellist nominated by Japan).

39. Panellists underscored the importance of information-sharing and international cooperation in the area of space resource activities in order to ensure the safe, secure and sustainable use of outer space. That was particularly important as the range of space activities expanded, including on the Moon and other celestial bodies. The function of article IX of the Outer Space Treaty was noted, in particular the principle of cooperation and mutual assistance, which included giving due regard to the corresponding interests of other States parties through international consultations and the sharing of information. The necessity of the existing instruments and provisions addressing registration and information-sharing, including article XI of the Outer Space Treaty, was stressed.

40. Several legal concepts, including the notion of “safety zones”, that had been elaborated by mechanisms such as the building blocks for the development of an international framework on space resource activities developed by the Hague International Space Resources Governance Working Group, and other collaborative mechanisms, such as the Artemis Accords on the Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes, were discussed.

41. Panellists highlighted developments and considerations regarding the governance of resources in areas beyond national jurisdiction, making reference to the United Nations Convention on the Law of the Sea and the Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction. Those included a mandatory public database for registering and sharing detailed information on marine genetic resources, aimed at enhancing transparency and international cooperation in marine resource management; the importance of defining pre-emptive and standing rules for exploration; managing the interface between law, diplomacy and science; considering environmental impacts; and evaluating the legal, political and fairness aspects of the concept of the “common heritage of humankind”, including in relation to innovative monetary and non-monetary benefit-sharing mechanisms, all of which contributed to ensuring transparency and cooperation and to giving due regard to possible environmental impacts. Examples of national legislative initiatives, including domestic laws related to space resource activities, were also given.

42. The discussions pertaining to governance in support of space resource activities also addressed aspects of ownership and extraction rights; the creation of regulatory bodies to oversee and manage space resource activities; aspects of balancing technological advancement with environmental protection, including the consideration of an environmental impact assessment mechanism; and the promotion of sustainable practices and the fostering of international cooperation to facilitate equitable and peaceful space resource utilization while ensuring that space exploration benefits all of humanity.

43. The International Conference and the expert meeting provided valuable contributions to the work of the Working Group on Legal Aspects of Space Resource Activities under its five-year workplan by addressing the complexity of space resource activities and the necessity for collaborative systems. The key takeaways were the following elements for further consideration: the importance of cooperation, collaboration and coordination; the role of multilateral processes; the significance of information-sharing; the importance of considering the interests of all stakeholders; the relevance of data handling; the importance of taking into account environmental and socioeconomic aspects; the importance of ethics and the sharing of benefits; the interaction between the private and public sectors; and the centrality of the existing legal framework.