

Event Report

2024 International Workshop on Space Resources:

PERSPECTIVES FOR FUTURE ECOSYSTEMS

Event Date November 21-22, 2024

Report Date February 2025

Co-organized by the **Brazilian Space Agency** and
the **Secure World Foundation**



MINISTRY OF
SCIENCE, TECHNOLOGY
AND INNOVATION





Secure World Foundation and the **Brazilian Space Agency** (AEB) partnered to organize the **2024 International Workshop on Space Resources: Perspectives for Future Ecosystems** at the São José dos Campos Technology Park, in the State of São Paulo, Brazil. Discussion at the event focused on regional perspectives on the ways space resource activities will contribute to the future development of the space sector and its benefits. The workshop aimed to broaden exchange on the role of space resources in the long-term future of space activities on to promote international cooperation and dialogue on the benefits that in situ space resources can offer to humanity. The event featured keynote speakers from the US, presenting the Artemis program, and from China, discussing the International Lunar Research Station (ILRS) program, as well as contributions from speakers from government, academic, and private sector organizations. The event was attended by 124 participants representing organizations in Argentina, Brazil, China, Chile, Italy, South Africa, South Korea, the United States, and Uruguay. This workshop was a thematic follow-on to the **2023 International Workshop on Space Resources Perspectives of Emerging Space Programs**, which was organized by SWF and several Korean research institutes in November 2023. The event included panel discussions, keynote presentation, and interactive roundtable sessions.

This report summarizes the key discussion themes and questions raised by the workshop; the agenda for the event is included as an appendix. The views expressed in this summary report do not necessarily reflect those of Secure World Foundation, the Brazilian Space Agency or of the individuals in attendance or their respective institutions, organizations, or governments.

Keynote Presentations and Agency Briefings

During the Workshop keynote presentations were delivered providing updates on two flagship lunar exploration initiatives being led by the United States and China. The U.S. State Department presented a talk on the goals of the Artemis Program, including an emphasis on the continued development of the Artemis Accords, which is a related initiative to develop international principles for peaceful lunar exploration. The China National Space Administration (CNSA) presented an overview of the International Lunar Research Station project, including information on planned development timelines as well as cooperation principles. Both presentations provided an update on the network of international partners engage in each of the respective initiatives, and noted that participation in one does not prevent participation in the other. Both keynotes also briefly introduced the role of space resources in the context of the broader lunar exploration goal being pursued.

The workshop also included a session in which five space agencies or government space-related organizations presented plans and interests related to space resources. These presentations represented Argentina, Brazil, the Republic of Korea, South Africa, and Uruguay. These presentations introduced national missions and activities, as well as activities being conducted in partnership or participation with both ILRS and Artemis programs. Presentations discussed the necessity of ensuring tangible outcomes from space exploration related programs, given the challenges of resources in new entrant programs. They also highlight the benefit of partnerships and collaboration. Several of these presentations noted that is possible for space resources and space exploration related projects to have synergy with other areas of national interest/investment.

Key Topics from Panel Session Presentations

During the course of the workshop four panel sessions were held, covering scientific, policy and legal, commercial and benefit aspects of space resources activities. These panels were interdisciplinary in nature, highlighting connections between different fields and sectors in pursuing space resources development, with an emphasis on presentations from stakeholders involved in space resources related activities in the Latin America region.

The first panel session, covering “Scientific Knowledge and Interest in Space Resources,” provided the audience with an general introduction to the state of knowledge of space resources, with an emphasis on lunar resources. It also discussed the relationship between lunar exploration, space resources, and astrobiology. Panelists also introduced Brazil’s planned SelenITA mission, a CubeSat mission which seeks to conduct dust, plasma, and magnetic field measurements from lunar orbit; and AEB-funded research related to space farming, a potential use case for lunar resources. During this session panelists also discussed the important of educational initiatives related to space exploration, including in early childhood and high-school as well as at the university level, in order to build both support for this activities and the human resources to conduct them.

The second panel session, covering “Future Use Cases for Space Resources”, discussed opportunities for space resources to contribute to innovative and disruptive activities in non-space sectors, such as agriculture and mining, as well as the participation of Latin American organizations in these activities. This session include introduction of a joint AEB-Embrapa study focused on space agriculture and the production of food in space. Speakers also considered the role of space exploration and space resources in the context of broader space technology development, discussing the need for investments in space exploration to be considered and scaled appropriately to other activities in the context of smaller agency budgets while emphasizing that specific niches can be identified where contributions and projects may be most effective.

The third panel session, covering “Policy and Legal Considerations for Space Resources Activities, shared insights into the current legal and policy questions related to enabling space resources activities in the context of the Outer Space Treaty; and to the efforts on the multilateral and national levels to address these questions. Panelists discussed national initiatives to both develop domestic law related to enabling space resources activities as well as the reasons national governments might be interested in supporting space resources development. Panellists also emphasized the importance of multilateral coordination to ensure there is some coordination and info-sharing in the execution of lunar activities (including space resources) as well as shared legal principles supporting these activities.

The fourth panel session, covering “Commercial Space Resources Activities”, discussed – from the perspectives of several early-stage companies as well as an industry association – current areas of private sector activities related to space resources, the different roles commercial companies might occupy in the space resources value chain, and the technical, market and policy challenges companies face. This session also included a special presentation on space food and the potential use of in-situ resources to support production of food in space as an enabler for human presence. Companies in this panel emphasized both the importance of industry collaboration to advance development in a emerging technology area and the need for sustained government programs in space exploration to provide strategic direction and overall stability.

WORKSHOP AGENDA

The program for this event was developed with the advice of the following Program Committee Members:

- **Dr. Angel Abbud-Madrid**, Director of the Center for Space Resources, Colorado School of Mines
- **Mr. Ian Christensen**, Senior Director, Private Sector Programs, Secure World Foundation
- **Ms. Soyung Chung**, Senior Researcher, Korea Aerospace Research Institute (KARI)
- **Dr. Alessandra Pereira Fávero**, Brazilian Agricultural Research Corporation (EMBRAPA)
- **Dr. Rodrigo Leonardi**, Brazilian Space Agency (AEB)
- **Ms. Asanda Sangoni**, Space & Stakeholder Liaison Specialist, South African National Space Agency (SANSA)
- **Mr. Carlos Roberto de Jesús Duarte Muñoz**, AEM (Mexican Space Agency)

[Day 1] Thursday, November 21st

TIME	SESSION / SPEAKERS
08:15-09:00	Registration
09:00-09:30	<p>Opening Remarks (Master of ceremonies Mônica Rocha, AEB)</p> <p>Welcome from PIT <i>Jeferson Cheriegate, PIT President</i></p> <p>Opening Remarks from AEB <i>Rodrigo Leonardi, AEB Director</i></p> <p>Opening Remarks from SWF <i>Ian Christensen, SWF Director</i></p>
09:30-09:45	<p>Host Nation Presentation Rodrigo Leonardi, AEB</p>
09:45-10:15	<p>Keynote 1: Major Exploration and Space Resources Drivers, Artemis</p> <ul style="list-style-type: none"> • David Reinecke, United States, Department of State
10:15-10:45	Coffee Break
10:45-11:45	<p>Panel 1: Scientific Knowledge and Interest in Space Resources <i>Moderator: Angel Abbud-Madrid</i></p> <ul style="list-style-type: none"> • Angel Abbud-Madrid, Colorado School of Mines • Gustavo Porto de Mello, Brazilian Society for Astrobiology • Luis Loures, ITA Brazil • Rebeca Gonçalves, United Nations Development Programme Consultant

TIME	SESSION / SPEAKERS
11:45-12:00	<p>International Resources Prospecting Campaign <i>Clive Neal, University of Notre-Dame [via recording]</i></p>
12:00-13:15	<p>Lunch Break</p>
13:15-13:45	<p>Keynote 2: Major Exploration and Space Resources Drivers: ILRS</p> <ul style="list-style-type: none"> • Wei WANG, China National Space Administration (CNSA)
13:45-14:45	<p>Panel 2: Future Use Cases for Space Resources <i>Moderator: Rodrigo Leonardi, AEB</i></p> <ul style="list-style-type: none"> • Alessandra Favero, Embrapa • Marco Muñoz, Redminera • Wagner Vendrame, University of Florida • Hadler Egydio Da Silva, INPE
14:45-16:00	<p>Agency Presentation Session <i>Presentations from invited regional and other space agencies on their interests/activities</i></p> <ul style="list-style-type: none"> • Argentina: Marcelo Colazo, CONAE • Brazil: Paolo Gessini, AEB • South Africa: Asanda Sangoni, SANSA • Uruguay: Daniel Gonzalez, Uruguayan Air Force • Republic of Korea: Young Rew, KASA [via recording]
16:00-16:30	<p>Coffee Break <i>Hosted by Chef Jefferson Rueda (Casa do Porco) and Space Farming Brazil.</i></p>
16:30-17:30	<p>Panel 3: Policy and Legal Considerations for Space Resources Activities <i>Moderator: Antonino Salmeri, Lunar Policy Platform</i></p> <ul style="list-style-type: none"> • Rodrigo Vesule Fernandes, Moon Village Association • David Reinecke, US Department of State • Soyoung Chung, Korea Aerospace Research Institute (KARI) • Jean Robert Batana Pires Ferreira, Brazilian Ministry of Science
17:30	<p>Day 1 Concludes <i>Reflections from Marco Antonio Chamon, AEB President</i></p>

[Day 2] Friday, Nov 22nd

TIME	SESSION / SPEAKERS
09:30-10:30	<p>Panel 4: Commercial Space Resources Activities <i>Moderator: Ian Christensen, SWF</i></p> <ul style="list-style-type: none"> • Marchel Holle, Ispace U.S. • Himilcon Carvalho, Visionia • Sara Rocci, EAT Freedom • Celso Merege, Merege Consulting & Commercial Representative Services • Lucas Fonseca, Airvantis <p>Remarks from Domenico Fornara Console Generale d'Italia a San Paolo & Video from ASI</p>
10:30-11:00	<p>Coffee Break <i>With a space food experience offered by the Embassy of Italy in Brazil</i></p>
11:00-12:30	<p>Roundtable Sessions <i>Interactive group discussion to focus on outcomes and summary. Discussion of role, benefit, and types of space resources activities in future space ecosystems and to build partnerships.</i></p>
12:30	<p>Conclusion</p>

On-site logistics and arrangements for the workshop were supported by a local organizing committee with the following members:

- **Alexandre Macedo de Oliveira**, AEB
- **Brenda Ribeiro Barbosa**, AEB
- **Mônica Elizabeth Rocha de Oliveira**, AEB
- **Rebeca Gonçalves**, AEB
- **Márcia Alvarenga dos Santos**, AEB