Forum: Committee on the Peaceful uses of outer space

Issue: Regulations concerning the extraction of celestial bodies

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Introduction

The advent of advanced space technologies has opened the doors to the potential extraction of resources from celestial bodies, such as asteroids, the Moon, and other planets. This prospect raises significant legal, ethical, environmental, and technical challenges. At the heart of these challenges are the regulations that must govern such extraterrestrial activities. The United Nations, being the foremost international body, is crucial in the development of a framework that balances the interests of spacefaring nations and those of the international community, ensuring sustainable and peaceful use of outer space resources.

The United Nations has been playing an active role in space activities. Since the first human-made satellite was made in 1975 the satellite started orbiting the Earth, UN has been determined to keep any space activities on a peaceful scale.

After such developments in space in 1960 this research was followed by the exploration of space. Until 1961 when Yuri Gagarin became the first man to orbit Earth itself. The Cold War started rising, Member States grew concerned about what may become an outbreak. They were concerned that space activities may turn into a race between countries or space exploration might just be left to a limited number of countries with the proper research.

Soon after the first launch of the Artificial satellite in 1958, the 18 members of the committee came up with an agreement to increase international cooperation with the necessary framework and legal resources. The UN was aware that there might be problems that could arise shortly regarding the countries that might be involved in the research. In 1959 Copuos was a permanent body of the UN which had 24 members at that time. Since then the Committee on the Peaceful Uses of Outer Space (COPUOS) has been keeping close contact with governmental and non-governmental organizations.

The work of COPUOS has been assisted by two subcommittees which are the scientific and technical subcommittees followed by the legal committee.

Definition of Key Terms

Space Mining: The process of extracting valuable materials and minerals from asteroids, moons, and planets. It includes various techniques and technologies for mining operations beyond Earth's atmosphere, potentially for use in space missions or to be brought back to Earth.

Asteroid Mining: Specifically refers to the extraction of minerals and other resources from asteroids. Asteroids are considered valuable for their concentrations of precious metals like platinum, as well as for their water content, which could be used to support life support systems or produce rocket fuel.

Moon Agreement: Officially named the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, this treaty builds upon the OST to specifically address the Moon and other celestial bodies. Adopted in 1984, it introduces the concept of the Moon and its natural resources as the "common heritage of mankind" and proposes the establishment of an international regime to govern the exploitation of those resources. However, it has been ratified by only a limited number of states.

Non-Appropriation Principle: A foundational principle of space law, enshrined in the Outer Space Treaty, stating that outer space, including the Moon and other celestial bodies, cannot be claimed by any one nation through sovereignty, use, or occupation. This principle is intended to ensure that outer space remains accessible and available for exploration and use by all countries. However, this principle does not restrict resource extraction.

Space Resource Utilization: Refers to the process of extracting and using resources from celestial bodies, such as minerals, water, and metals, for scientific, commercial, or support purposes in space missions. It involves technologies and methods for locating, mining, and processing these resources in the challenging environment of space.

Common Heritage of Mankind: A principle suggesting that certain global commons (like the deep sea bed, Antarctica, and outer space) should be held in trust for future generations and protected from exploitation by individual nation-states or private entities. In the context of space, it implies that the benefits derived from outer space resources should be shared equitably among all humanity.

Satellites: Satellites are objects that revolve around planets or they circle around bigger objects. Today satellites are mostly known as artificial objects orbiting earth or other objects. These machines have a crucial role in the government, businesses, and societies around the globe. To add up most people don't even recognize the importance of a satellite these missions or satellites go unnoticed. To give an example from our daily lives a satellite is used to get longer and better TV communication for you to be able to watch a film or even the news.

General Overview

What does the extraction of celestial bodies mean?

An asteroid consists of vaporized minerals and other important chemicals in it. The extraction of asteroids means that we take out the minerals that are important parts of an asteroid. This extraction is also known as space resource mining which in simpler words means scientists are mining for valuable parts of celestial bodies. These resources could be crucial for future space exploration missions, colonization efforts, and even the sustainability of life on Earth.

Benefits of extraction of celestial bodies:

Resource Availability: Space mining provides access to an almost infinite supply of resources, reducing the dependence on limited terrestrial reserves. This abundance can foster sustainable growth and development across industries.

Earth Preservation: By sourcing resources from space, we can minimize the environmental impact of traditional mining practices on Earth. Space mining offers a more sustainable approach to resource extraction, reducing pollution and habitat destruction.

Technological Advancements: The pursuit of space mining necessitates the development of cutting-edge technologies. This, in turn, drives innovation and encourages the creation of advanced mining techniques, robotics, and automation, which can be applied to other industries on Earth.

Economic Opportunities: Space mining has the potential to create a new economic sector. The extraction and utilization of space resources can stimulate job creation and drive economic growth, opening up new doors for investment and revenue generation.

Space Exploration: Space mining serves as a stepping stone for further space exploration. The ability to extract resources from celestial bodies can support long-duration space missions, and colonization efforts, and even serve as a refueling station for spacecraft.

Satellites

The first launch was in 1957 when the Soviet Union launched Sputnik 1. Soon after that followed America Explorer 1 America's first satellite launch. The multinational organization INTELSAT launched the first communication satellite in 1965. As of 2022 more than 100 countries have reached orbits around the Earth till the present.

The Future Of Space

According to NASA, a single asteroid measuring 1 km in diameter could contain more than 20 trillion worth of precious metals and resources. The global space economy was valued at 366 billion in 2020 and space mining is projected to play a significant role in its future growth. By 2025 experts estimate that the commercial space industry would be over 1 trillion. Space mining has shifted from science fiction to reality with various space agencies and private companies actively pursuing and exploring. The benefits of space mining include resource provision, fuel generation, economic

opportunities, and support for space colonization. Statistics and industry violations indicate the immense value and potential growth of space mining and sustainable space mining operations. However, challenges in technology regulation and environmental impact must be addressed to ensure responsible and sustainable space mining operations.

Historical Context:

The space race between the United States and the Soviet Union during the Cold War period had implications for space law, as each sought to ensure that outer space would not be used for military purposes. This rivalry resulted in incredible technological advancements, but it also highlighted the need for peaceful cooperation in space.

As the Cold War ended, and more countries and private entities became capable of space exploration, the focus shifted towards a collaborative approach to space utilization. The International Space Station is one such example of international cooperation.

However, with the increased interest in mining celestial bodies for resources like water, precious metals, and minerals, the existing legal framework is seen as inadequate. The Outer Space Treaty was not designed to address the commercial exploitation of space resources, leading to a gap that nations and companies are eager to fill.

The Outer Space Treaty, ratified by more than 100 countries, forms the basis of international space law. It articulates several key principles: Outer space shall be free for exploration and use by all countries, outer space is not subject to national appropriation by claim of sovereignty, use, or occupation, States shall avoid harmful contamination of space and celestial bodies, The Moon and other celestial bodies are to be used exclusively for peaceful purposes.

Subsequent treaties and agreements have built upon these principles, but none have explicitly detailed how resources extracted from celestial bodies should be managed. This has led to a legal ambiguity regarding the ownership and utilization of extraterrestrial resources.

Technological advancements have made the prospect of mining celestial bodies increasingly feasible. Missions such as NASA's OSIRIS-REx and Japan's Hayabusa to collect samples from asteroids demonstrate the growing capabilities in space robotics and remote resource extraction.

The potential for vast wealth from space resources has not gone unnoticed. Certain celestial bodies are believed to contain a plethora of valuable materials, such as rare metals and water ice (which can be converted to rocket fuel). This prospect has piqued the interest of both governments and private companies

In response to the growing interest in space resource extraction, some countries have begun to pass national legislation. For instance, the United States enacted the U.S. Commercial Space Launch Competitiveness Act (H.R. 2262) in 2015, which allows U.S. citizens to engage in the commercial exploration and exploitation of space resources (asteroids and other celestial bodies) which has sparked international debate regarding its compatibility with the Outer Space Treaty.

Advantages and Drawbacks

The space mining industry has the potential to create new job opportunities and stimulate economic growth similar to how traditional mining is done on earth. The availability of resources from space could support future colonization efforts allowing humans to establish a sustainable presence beyond Earth. The word colony or colonization on space means that humans will have the opportunity to live in space which is also known as human activity in space. To add no permanent space settlement has been established till today.

A key advantage of mining is that it could give Earth significant resources such as water as that could become scarce. However, Earth's resources are limited, and their continued use on Earth is limited which is why mining is crucial. Mining is often destructive, the distribution of rare materials will not be divided sufficiently which can cause restrictions due to geopolitical and environmental circumstances. A new solution to these concerns lies in space resource utilization (SRU), which involves accessing key resources and reserves on extra-terrestrial bodies such as asteroids or the Moon. The extraction and utilization of resources from space could enable the production of fuel for spacecraft reducing dependency on earth-based resources.

Challenges to overcome

The non-appropriation principle of the Outer Space Treaty contrasts with the interest of entities in owning and profiting from extraterrestrial resources. Balancing these interests with the treaty's ideals requires nuanced legal frameworks and international cooperation. Ensuring that resource extraction does not irreversibly harm celestial environments is crucial. Developing sustainable mining practices and environmental protection guidelines is a significant challenge. The high cost of space missions and uncertainty about the economic return on investments in space resource extraction pose risks to the development of this sector. As multiple countries and private entities aim to exploit space resources, fostering cooperation while managing competition and conflict of interest is essential.

Timeline of Events

October 4, 1957	The launch of Sputnik, the first artificial space satellite launched by Moscow.
April 12, 1961	Yuri Gagarin becomes the first man to orbit the Earth in 108 minutes.

January 27, 1967	The Outer Space Treaty was established and signed.
December 7, 1972	Apollo 17 mission is launched and collects samples of lunar material highlighting the possibility of extracting resources from celestial bodies.
December 18, 1979	The Moon Treaty is signed by some of the States.
April 28, 2001	Italian millionaire becomes the first space tourist.
September 29, 2008	Spacex is the first private venture to launch a rocket successfully.
May 21, 2015	U.S. Space Act of 2015 was passed, explicitly allowing US citizens exploitation of space resources.
August 1, 2017	Luxembourg's Space Resources Act was passed which enabled private companies to own space resources

Major Parties Involved and Their Views

NASA

The National Aeronautics and Space Administration has been actively exploring the concept of space mining and has conducted initial research and studies to assess feasibility. NASA has also conducted research to understand the depths of space exploration.NASA has done the groundwork to experiment and get a better knowledge of what asteroids are made of. so in the near future, they can start mining for valuable minerals. NASA has also had numerous missions for Space Exploration.

SpaceX

Elon Musk SpaceX has expressed interest in space mining and has plans to send missions to asteroids in the future. SpaceX was the first private company to successfully launch and return a spacecraft from Earth's Orbit. SpaceX will launch not one but up to two spaceships in order to start space mining; the first launch will be in April.

PLANETARY RESOURCES

This private American company develops and deploys technologies for asteroid prospecting and mining. The company's stated goal was to ‘‘Expand Earth's natural resource base ’’. Despite the fact the company's hardware-software was auctioned off, the company is actively persistent regarding the mining of asteroids and is launching and planning missions.

United States Of America

The Government of the USA has a wide budget regarding the activity on space. This is why the USA has established many companies such as NASA to conduct and explore space. The USA is also making it clear that in a 50-year time estimate, they are hoping for space Tourism to play an important role. The USA has also given funds to help conduct research throughout the years. The USA's estimated budget for space exploration is $ 27.2 billion.

China

The Chinese Government had already launched its first spaceship in April 2021 showing that the spacecraft would be suitable to explore space in depth. The spacecraft, named NEO-1 was dedicated to mining space resources from asteroids to lunar surfaces. China currently holds a rare earth element (REE) extracting and processing up to 90% of 17 minerals. The current Chinese budget for Space exploration is an estimate of $ 12 billion in 2022.

Japan

Japan is aiming to double its scale by the end of 2030 to a minimum of 10 million Yen regarding the start of the program and missions. In recent years Japan has been investing in more space startups including Tokyo's i-space, which aims to develop lunar resources; the space debris cleaning company Astroscale which is based in Singapore but with Japanese owners; and iQPS, a mini-satellite manufacturer. Although, there have been fewer than 20 candidates, and each has generally received just billions or hundreds of millions of yen, leaving Japan trailing NewSpace competitors such as the United States.

UN Involvement

Working group on the "space2030" Agenda (2018-2021)

The working group was established by the Committee on the Peaceful Uses of Outer Space after the fifteenth anniversary of the committee the statement called upon 'to continue to develop based on UNISPACE+50 process, a 'space2030' agenda and implementation plan to provide General Assembly with the work for consdieratıon by the assembly'. After that, the committee added a new item in 2018 listed as space2030, and agreed to establish it under that timeline. The space2030's purpose is to reaffirm and strengthen the contribution of space activities and space tools to the agenda.

Working group on the use of nuclear power sources in outer space

The working group on the uses of nuclear power sources in outer space has a long record of productive work under consideration. In 2009 the working group came together with the International Atomic Energy Agency (IAEA).

Working group on the long-term sustainability of outer space activities

The working group was established in 2010 under the scientific and technical subcommittee to identify areas of long-term sustainability of outer space activities. Proposal measures that would enhance sustainability and produce voluntary guidelines to reduce the risk of the long-term sustainability of outer space development on Earth. At the fifty-ninth session of the scientific and technical subcommittee in February 2022 the working group agreed on and adopted its terms of reference methods of work and work plan, and the actions were endorsed by the subcommittees.

Legal Subcommittee

Working group on the definition and delimitation of outer space

This working group considers information on legislation and practice relating to the definition and delimitation of outer space and reviews responses of states and international organizations to questionnaires on issues relating to the definition and delimıttaion of outer space.

Working group on legal aspects of space resource activities

This working group was established under the legal subcommittee agenda item ‘general exchange of views on potential legal models for activities in the exploration, exploitation, and utilization of space resources.

Treaties and Events

The Outer Space Treaty

“The Outer Space Treaty was considered by the Legal Subcommittee in 1966 and agreement was reached in the General Assembly in the same year (resolution 2222 (XXI)). The Treaty was largely based on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, which had been adopted by the General Assembly in its resolution 1962 (XVIII) in 1963, but added a few new provisions. The Treaty was opened for signature by the three depository Governments (the Russian Federation, the United Kingdom, and the United States of America) in January 1967, and it entered into force in October 1967. The Outer Space Treaty provides the basic framework on international space law, including the following principles:the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind;outer space shall be free for exploration and use by all States;outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means;States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner;the Moon and other celestial bodies shall be used exclusively for peaceful purposes;astronauts shall be regarded as the envoys of mankind;States shall be responsible for national space activities whether carried out by governmental or non-governmental entities;States shall be liable for damage caused by

their space objects; and states shall avoid harmful contamination of space and celestial bodies.''

The Rescue Agreement

"The Rescue Agreement was considered and negotiated by the Legal Subcommittee from 1962 to 1967. A consensus agreement was reached in the General Assembly in 1967 (resolution 2345 (XXII)), and the Agreement entered into force in December 1968. The Agreement, elaborating on elements of articles 5 and 8 of the Outer Space Treaty, provides that States shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State and that States shall, upon request, provide assistance to launching States in recovering space objects that return to Earth outside the territory of the Launching State.''

The Liability Convention

"The Liability Convention was considered and negotiated by the Legal subcommittee from 1963 to 1972. Agreement was reached in the General Assembly in 1971 (resolution 2777 (XXVI)), and the Convention entered into force in September 1972. Elaborating on Article 7 of the Outer Space Treaty, the Liability Convention provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space. The Convention also provides for procedures for the settlement of claims for damages.''

The Registration Convention

"The Registration Convention was considered and negotiated by the Legal Subcommittee in 1962. It was adopted by the General Assembly in 1974 (General Assembly resolution 3235 (XXIX)), opened for signature on 14 January 1975, and entered into force on 15 September 1976.

Building upon the desire expressed by States in the Outer Space Treaty, the Rescue Agreement, and the Liability Convention to make provision for a mechanism that provided States with a means to assist in the identification of space objects, the Registration Convention expanded the scope of the United Nations Register of Objects Launched into Outer Space that had been established by resolution 1721B (XVI) of December 1961 and addressed issues relating to States Parties responsibilities concerning their space objects. The Secretary-General was, once again, requested to maintain the Register and ensure full and open access to the information provided by States and international intergovernmental organizations.''

The Moon Agreement

"The Moon Agreement was considered and elaborated by the Legal Subcommittee from 1972 to 1979. The Agreement was adopted by the General Assembly in 1979 in resolution 34/68. It was not until June 1984, however, that the fifth country, Austria, ratified the Agreement, allowing it to enter into force in July 1984. The Agreement reaffirms and elaborates on many of the provisions of the Outer

Space Treaty as applied to the Moon and other celestial bodies, providing that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, that the United Nations should be informed of the location and purpose of any station established on those bodies. In addition, the Agreement provides that the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible.''

Evaluation of Previous Attempts to Resolve the Issue

The United Nations has signed a treaty and has considered the safety of humans and the impact celestial bodies might have on humans. The UN has signed 5 treaties regarding celestial bodies that extraction will be done carefully. These 5 treaties remain crucial regarding space activity and space exploration.

Possible Solutions

An updated or new international agreement specifically addressing space resource extraction is needed to clarify legal uncertainties and provide a stable environment for both public and private sector activities. This framework should detail rights to resource extraction, ownership, and sale, as well as obligations to protect space environments and share benefits. Guidelines and standards for environmentally responsible space mining practices should be developed and enforced. These could include protocols for minimal impact exploration, waste management, and the avoidance of contamination. The establishment of protected zones around areas of scientific interest or historical significance on celestial bodies could also be considered. Strengthening international cooperation in space exploration and resource utilization can accelerate technological development, reduce costs, and ensure that the benefits of space resources are shared more equitably. Joint missions, research programs, and shared infrastructure could serve as models for collaborative resource extraction projects. Governments and private entities should engage in open dialogue with the public and stakeholders about space resource activities. Transparency regarding plans, technologies, and the intended use of resources can help build trust and foster international support for sustainable space development.

Notes from the Chair

All delegates are encouraged to look through these websites and reports:

https://www.vedantu.com/physics/celestial-bodies
https://press.un.org/en/2023/gaspd788.doc.htm

https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/rescueagreement.html
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/registration-convention.html
https://worldpopulationreview.com/country-rankings/countries-with-space-programs
https://business.esa.int/news/esa-competition-to-boost-advanced-mining-solutions-for-earth-and-space
https://www.tomorrow.bio/post/the-future-of-resource-extraction-space-mining-2023-06-4603049094-space

Bibliography

"Asteroids: Facts - NASA Science." *NASA Science*, https://science.nasa.gov/solar-system/asteroids/facts/. Accessed 20 Jan. 2024.

"Comets | NASA Space Place – NASA Science for Kids." *Home | NASA Space Place – NASA Science for Kids*, https://spaceplace.nasa.gov/menu/comets/. Accessed 20 Jan. 2024.

"COPUOS." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/index.html. Accessed 20 Jan. 2024.

"---." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/index.html. Accessed 20 Jan. 2024.

"COPUOS, STSC, LSC Past Sessions." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/past-sessions.html. Accessed 20 Jan. 2024.

Dobrijevic, Daisy, and Charles Q. Choi. "Comets: Everything You Need to Know | Space." *Space.Com*, Space, 22 Sept. 2021, https://www.space.com/comets.html#:~:text=Comets%20are%20defined%20as%20icy,thousands%20of%20years%20to%20complete.

"Documents and Resolutions." *UNOOSA*, https://www.unoosa.org/oosa/documents-and-resolutions/search.jspx?&view=resolutions. Accessed 20 Jan. 2024.

"Galaxies - NASA Science." *NASA Science*, https://science.nasa.gov/universe/galaxies/. Accessed 20 Jan. 2024.

"Galaxy." *Encyclopædia Britannica*, Encyclopædia Britannica, https://www.britannica.com/science/galaxy. Accessed 20 Jan. 2024.

Greshko, Michael. "Galaxies—Facts and Information." *Science*, National Geographic, 17 Apr. 2019, https://www.nationalgeographic.com/science/article/galaxies.

Lea, Robert. "What Are Asteroids? | Space." *Space.Com*, Space, 22 Nov. 2021, https://www.space.com/51-asteroids-formation-discovery-and-exploration.html.

"Meteors and Meteorites - NASA Science." *NASA Science*, https://science.nasa.gov/solar-system/meteors-meteorites/. Accessed 20 Jan. 2024.

"Space Exploration | National Archives." *National Archives*, 15 Aug. 2016, https://www.archives.gov/research/alic/reference/space-timeline.html.

"Space Law: Resolutions." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/spacelaw/resolutions.html. Accessed 20 Jan. 2024.

"---." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/spacelaw/resolutions.html. Accessed 20 Jan. 2024.

"The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier? | Wilson Center." *Wilson Center*, https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier. Accessed 20 Jan. 2024.

"The Space Review: Will a Five-Year Mission by COPUOS Produce a New International Governance Instrument for Outer Space Resources?" *The Space Review: Essays and Commentary about the Final Frontier*, https://www.thespacereview.com/article/4534/1. Accessed 20 Jan. 2024.

"View of Commercial Mining of Celestial Bodies: A Legal Framework for Mining Temporarily-Captured Orbiters Regarding the Notion of 'Patria Economicus' | Acta Universitatis Danubius. Juridica." *Danubius Journals*, https://dj.univ-danubius.ro/index.php/AUDJ/article/view/945/1438. Accessed 20 Jan. 2024.

"What Is a Comet? | Cool Cosmos." *Cool Cosmos*, https://coolcosmos.ipac.caltech.edu/ask/178-What-is-a-comet-#:~:text=Comets%20are%20basically%20dusty%20snowballs,dust%20(called%20the%20coma). Accessed 20 Jan. 2024.

"What Is an Asteroid? | Ask An Earth and Space Scientist." *Ask An Earth and Space Scientist*, https://askanearthspacescientist.asu.edu/asteroids. Accessed 20 Jan. 2024.

"Working Group on Space Resources." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/space-resources/index.html. Accessed 20 Jan. 2024.

"---." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/space-resources/index.html. Accessed 20 Jan. 2024.

"Working Groups of the Committee and Its Subcommittees." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/working-groups.html. Accessed 20 Jan. 2024.

"---." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/working-groups.html. Accessed 20 Jan. 2024.

"COPUOS History." *UNOOSA*, https://www.unoosa.org/oosa/en/ourwork/copuos/history.html. Accessed 21 Jan. 2024.