LUXEMBOURG SPACE AGENCY

LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère des Affaires étrangères
et européennes

Contribution of the Grand Duchy of Luxembourg

on the Mandate and Purpose of the Working Group on Legal Aspects of Space Resource Activities

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INTRODUCTION

At the 60th session of the Legal Subcommittee, in 2021, UN COPUOS Member States agreed to establish a Working Group on the Legal Aspects of Space Resource Activities (Working Group). The five-year workplan and methods of work of the Working Group require for initial tasks to be undertaken in 2022, including information collection through submissions by stakeholders. Luxembourg is responding to the invitation by the Chair and Vice-Chair, the Grand Duchy of Luxembourg and is sharing information about its current national activities in the legal, technological, research and education, industrial domains.

1. Luxembourg National Activities in Space Resources Exploration, Exploitation and Utilization

Having understood and realized early the potential of the space sector, the Luxembourg government launched the very innovative SpaceResources.lu initiative in 2016 with an open and transparent approach. Luxembourg has the vision to contribute to the peaceful exploration and the sustainable utilization of space resources for the benefit of humankind. Access to space resources in outer space is essential for the sustainability of outer space exploration and may provide commodities essential to life. The Grand Duchy is thus subscribing to the wider United Nations' goals of outer space, its legal framework, policies and activities as well as to the UN global sustainable development goals.

Luxembourg encourages discussions on space resources exploration and utilization in all relevant international fora, most importantly in the Legal Subcommittee of the UN COPUOS. As an active member of the Hague International Space Resources Governance Working Group between 2016 and 2019, Luxembourg is committed to advance discussions at bilateral and multilateral levels. Luxembourg is contributing to the work of these international bodies. In addition, national initiatives such as the Space Resources Week hosted yearly by Luxembourg provide an open, collaborative international platform to discuss all issues related to space resources. The overall objective is to progress together with other nations on shaping the future international framework for space resources utilization.

Led by the Luxembourg Space Agency (LSA), Luxembourg's SpaceResources.lu initiative aims to position the country as a pioneer in the exploration and utilization of space resources.

The initiative builds on 5 pillars:

- Political support: ensure national political support and promote international cooperation
- Legal framework: build a clear legal framework and engage internationally
- Research and education: provide long-term public support and workforce engagement
- Innovation, R&D: provide dedicated support for industrial R&D activities
- Funding instruments: develop long-term funding instruments

1.1. Political support and international cooperation

Luxembourg engages actively in international discussions on space resources in fora such as the European Space Agency, the European Union and the UN, but also in bilateral settings. The country signed government-level agreements with the USA, Japan, Belgium, Poland, the Czech Republic, Portugal, Australia/New South Wales as well as agreements on space agency level with NASA (USA), the DLR (DE), CNES (FR), ASI (IT), CNSA (China), the UAE Space Agency, CSA (Canada) and ISRO (India). Moreover, Luxembourg is member of the International Astronautical Federation since 2019 and of the International Space Exploration Coordination Group (ISECG) since 2020.

On the national level, Luxembourg established in 2017 a high-level Advisory Board on Space Resources as part of the implementation of the SpaceResources.lu initiative. The Board's objective is to support the government on topics related to the exploration and use of resources available in space. Moreover, several events such as the "Mining Space Summit" or the annual "Space Resources Week" organized by Luxembourg aim to encourage discussions on space resources gathering stakeholders from different sectors, such as mining, space, finance, governments. The first edition of the "Mining Space Summit" was organized in September 2018. The 2019 edition gathered more than 180 experts from 24 countries and aimed at understanding the technical and economic challenges facing the future space resources industry.

1.2. Contribution to Current Framework

Luxembourg contributes actively to the clarification of the legal and regulatory framework in different ways. In 2017, the country was the second worldwide to adopt a Law on the Exploration and Use of Space Resources[1]. It also adopted a general space law in 2020[2] (for further details, see part 3.2 below).

Moreover, Luxembourg contributed actively to the "Building blocks for the development of an international framework on space resource activities" as a member of the "Hague International Space Resources Governance Working Group" from 2016 to 2019. Luxembourg is also a member of the Global Expert Group on Sustainable Lunar Activities (GEGSLA) of the Moon Village Association, an international platform dealing with space resources with the goal of de-risking future lunar missions and increasing global cooperation for lunar exploration and settlement.

[1] https://legilux.public.lu/eli/etat/leg/loi/2017/07/20/a674/jo
[2] https://legilux.public.lu/eli/etat/leg/loi/2020/12/15/a1086/jo

Luxembourg counts also among the 8 founding signatories of the Artemis Accords setting principles for cooperation in the civil exploration and use of the Moon, Mars, comets, and asteroids for peaceful purposes signed in October 2020. The Artemis Accords establish fundamental principles based on the Outer Space Treaty of 1967. The Artemis Accords essentially reaffirm the main provisions of the 1967 Outer Space Treaty, but also state that the extraction of space resources is not contrary to the principle of non-appropriation applicable to celestial bodies.

Luxembourg considers that the Artemis Accords, as well as the Building Blocks of the Hague Working Group, constitute a valuable contribution to the discussions in international fora, especially the UN COPUOS. Our aim is to help shape an international framework which is responsive to the highly innovative space sector and its technologies.

Luxembourg would like to underline the nature of the Artemis Agreements, which is a political declaration between partner countries willing to work with the United States on a project of common interest. In addition, section 10.4 of the Artemis Accords states the intention of the signatories to use the experience gained under in this frame to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and use of space resources, including through the ongoing efforts in the COPUOS.

Finally, Luxembourg is strongly engaged in the COPUOS and supported the creation of the Working Group on Legal Aspects of Space Resource Activities.

1.3. Research and education

Over the past years, Luxembourg substantially increased its research activities on space resources and provides various training opportunities. In addition to the Space Resources professional development course given in cooperation with the International Space University, ESA and the Colorado School of Mines on a yearly basis during the Space Resources Week, the "Interdisciplinary Space Master" was created in 2019 at the University of Luxembourg with the support of the LSA. The Interdisciplinary Space Master is a 2-year master programme covering various technology aspects of the space value chain, from system engineering to different space applications. The programme also includes classes on space resources and teaches the fundamentals of business, finance as well as entrepreneurship.

Moreover, the LSA and the Luxembourg Institute of Science and Technology (LIST) established in August 2020 the European Space Resources Innovation Centre (ESRIC)[3]. The European Space Agency became a strategic partner of ESRIC in November 2020 and currently implements a joint research programme at ESRIC in the field of space resources, with a **specific focus on the sustainability** of space resources utilization. The centre aims to become the internationally recognised centre of expertise for scientific, technical, business, and economic aspects related to the use of space resources for human and robotic exploration, as well as for a future in-space economy. ESRIC connects world-leading technical, academic and entrepreneurial talents in the field of space resource utilisation.

[3] https://www.esric.lu/

1.4. Innovation, R&D

Luxembourg puts a strong emphasis on commercial partnerships and economic development through R&D, for instance through its participation to ESA's exploration programme and its Space Resources Strategy[4]. On the national level, several agreements have been passed with various companies, addressing existing and near-term markets while developing long-term goals in space resources utilisation. Competitions are organised regularly, such as the Space Exploration Masters, an international competition aiming to identify and reward technology-transfer business successes and business innovation ideas for space exploration, and the ESRIC-ESA space resources Challenge[5] in 2021-2022, where teams from all over Europe were competing to find resources on a lunar analogue terrain by remotely operating their rovers.

Luxembourg has developed a vibrant and highly innovative start-up ecosystem in the last couple of years, including in the space sector. Thus, Luxembourg supports companies active in the space resources sector through its Fit4Start programme, as well as the ESRIC Start-up support programme called ESRIC SSP. Fit4Start provides entrepreneurs with intensive coaching, attractive pre-seed funding and access to key network that help them succeed with launching their business venture and scaling it on the European market. The ESRIC SSP aims at supporting European early-stage ventures and start-ups designing novel technologies for space resources applications in refining their business plan, attracting customers, and securing their first investments. SMEs can apply twice a year to calls allowing them to join the first incubation programme exclusively dedicated to space resources utilisation projects. The first ESRIC call closed in March 2022 and the second call closed in September 2022.

1.5. Funding instruments

Dedicated funding instruments foster the sustainable and on-going growth and development of the country's space capabilities. Luxembourg engages in various partnerships to provide long-term financial support to companies, such as the funding of research, development and innovation (RDI), mainly through ESA and the national R&D programme LuxIMPULSE. The R&D funding aims to encourage companies to carry out R&D and innovation activities.

Luxembourg also supports space companies via agreements with the European Investment Bank and equity investment through the Luxembourg Future Fund and the national investment bank (SNCI). Luxembourg has also established close relationships with various ventures capital funds. As mentioned above, SMEs can benefit from the ESRIC start-up support programme in partnership with Technoport, Luxembourg's technology business incubator.

[4] https://sci.esa.int/documents/34161/35992/1567260390250-ESA_Space_Resources_Strategy.pdf
[5] https://www.spaceresourceschallenge.esa.int/

2. Definition of Space Resources from Luxembourg National Perspective

In 2017, Luxembourg put in place a legal and regulatory framework with a dedicated space law on space resources that ensures Luxembourg's compliance with the Outer Space Treaty, specifically Art VI referring to the authorization and supervision of activities of non-governmental actors.

According to the Luxembourg legislator, space resources are now commonly defined as abiotic resources that are in situ in outer space and can be extracted. This notion includes, for example, mineral resources and water, but not orbital positions or frequencies.

In the Building Blocks for the Development of an International Framework on Space Resource Activities, space resource is defined as an extractable and/or recoverable abiotic resource in situ in outer space6. According to the understanding of the Hague International Space Resources Governance Working Group, this includes mineral and volatile materials, including water, but excludes (a) satellite orbits; (b) radio spectrum; and (c) energy from the sun except when collected from unique and scarce locations.

3. Current International and National Framework

3.1. International Framework

International space law consists of five international treaties:

- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty or OST) of 1967;
- Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement) of 1968;
- Convention on International Liability for Damage Caused by Space Objects (Liability Convention) of 1972;
- Convention on Registration of Objects Launched into Outer Space (Registration Convention) of 1975;
- Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement) of 1979.

In addition to the international treaties, the international legal framework also includes other non-binding instruments, such as Resolutions of the UNGA, state practices and customary international law.

Luxembourg ratified the Outer Space Treaty, the Liability Convention and the Registration Convention and is in the process of accessing the Rescue Agreement.

Luxembourg has not signed the Moon Agreement

The international space treaties have not yet been tested with regard to the rights over resources found in space. Most of carried missions have taken place for scientific purposes. However, for the sustainability

[6] Ref to BB, BB1

of future deep space exploration, for commercial space projects and space mining to be viable, future explorers and investors will need certainty regarding their rights to the materials they find.

3.2. Luxembourg National Legislation

Luxembourg is the first European country, and the second worldwide, to adopt a specific law on the exploration and utilization of space resources.

The Luxembourg Law of 20 July 2017 on the Exploration and Utilization of Space Resources was passed by the Chamber of Deputies on 13 July 2017 and went into effect on 1 August 2017[7].

The Law on the Exploration and Utilization of Space Resources sets out the following:

- space resources are capable of being owned;
- the requirement to obtain an authorization to execute a mission in order to explore or use space resources. The law sets the rules and conditions according to which the mission is authorized and supervised by the competent authority;
- a full liability of operator for caused damages;
- sanctions in case of the Law infringement.

The commentary of the draft law stated that, although the legal status of the territories of celestial bodies themselves is defined by the Outer Space Treaty, namely the Article II stating that they are not subject to national appropriation , it does not further address the status of the resources nor even touches upon it. The article 1 of the Law of 20 July 2017 on the Exploration and Utilization of Space Resources only applies to space resources. Asteroids, comets and celestial bodies per se remain outside the scope of the Law. The Law does not have the objective, aim or effect of paving the way for any national appropriation of outer space, including the Moon and other celestial bodies themselves. There is a difference between resources and celestial bodies themselves. The Law clarifies Luxembourg's national position on the status of resources that can be extracted from these celestial bodies and in outer space, in general.

In December 2020, two new laws reinforcing Luxembourg's legal framework for the authorization and supervision of space activities were adopted. On the one hand, the Law on Luxembourg's Accession to the Convention on the Registration of Objects Launched into Outer Space and, on the other hand, the Law on Space Activities. These legislative acts respond to a growth and diversification of activities carried out by space actors.

The Law on Space Activities provides a clear legal framework for the authorization and supervision of space activities, allowing the management of risks related to space activities and the responsibility of different actors. It creates a national register of space objects, listing all space objects for which Luxembourg assumes a registration obligation.

It should be noted that the Law on Space Activities of 2020 does not apply to missions for the exploration and use of space resources covered by the Law of 20 July 2017 on the Exploration and Utilization of Space Resources.

[7] http://legilux.public.lu/eli/etat/leg/loi/2017/07/20/a674/jo

4. **Relevant Factors to be Considered in the Development of a set of Principles on Space Resources Activities**

The question of international cooperation and governance has become more acute in recent years. The emergence of new space actors creates important challenges, particularly of security and of legal nature. It is therefore crucial that the international framework governing the space resources activities is strengthened and respected by as many States and actors as possible.

Luxembourg believes that the exploration, exploitation and use of space resources must take place within an international, responsible yet permissive framework. It is driven by an approach that does not prohibit the deployment of increasingly sophisticated and innovative technologies, which may derive important applications in non-space fields, but that sets a clear, transparent, legible and predictable framework so that all actors, public and private, who wish to invest in this sector are bound by the same rules. The framework should also be able to evolve, in order to take into account both the current state of operations and future evolutions.

It is essential that all actors have equal and fair access to the resources of space, without discrimination, within an internationally agreed framework.

Current international legal framework might not be sufficient to assure a peaceful and sustainable exploration, exploitation and utilization of space resources. Some specific aspects can only be defined in cooperation with other countries and within COPUOS, such as environmental issues, respect of noninterference principle, and assistance to developing countries.

It seems essential that the Working Group, especially when formulating the set of initial recommended principles, is driven by adaptive governance principle and focuses on the most pressing issues. The highest priority is the recognition of individual rights over space resources, mechanisms for avoiding harmful interference and for the establishment of safety zones. As much as possible, the Working Group shall take into account and integrate into its work elements identified in other fora, whether the United Nations or otherwise. Luxembourg is convinced that the Artemis Agreements, together with initiatives such as the Hague Working Group, will lead to a valuable sharing of knowledge and a better technical understanding of key issues, which in turn will advance discussions and progress at the UN.

5. Format, agenda, topics and other details of the dedicated conference scheduled for 2024

Luxembourg has been organizing events which gathered the space community involving scientific and industry representatives and created synergies with other domains outside space. Luxembourg contributed significantly to building a favorable environment for inclusive and far-reaching exchanges.

One of such examples is the "Space Resources Week". Organized in Luxembourg by the European Space Resources Innovation Centre (ESRIC), in collaboration with the European Space Agency (ESA) and the LSA over 3 days, the "Space Resources Week"[8] became an annual event since 2019, with close to 1000 participants in the 2022 edition. The event connects leaders from the terrestrial mining sector, aerospace industry, financial institutions, investors community, research institutes and academia. These events are key to Luxembourg's strategy to raise awareness and share knowledge on space resources.

Luxembourg sees a great potential and benefit of bringing together the Space Resources Week and the international conference, which shall take place in 2024, as a part of the five-year work plan and methods of work for the Working Group on Legal Aspects for Space Resource Activities.

[8] https://www.spaceresourcesweek.lu/