Luxembourg aims to contribute to the peaceful exploration and sustainable utilization of space resources for the benefit of humankind.
Realizing the Potential Benefits of Space Resource Utilization Remains Challenging & Requires Global Partnerships

**Key Challenges**

<table>
<thead>
<tr>
<th>TECHNICAL</th>
<th>Capabilities necessary to prospect and utilize resources from space still must be developed, tested, and matured</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGULATORY</td>
<td>International &amp; domestic legal frameworks need to be established to protect entrepreneurs, assure investors, and ensure responsible activities</td>
</tr>
<tr>
<td>FINANCIAL</td>
<td>Significant investment with long-time horizons must be available to enable private firms to develop and deploy critical systems</td>
</tr>
<tr>
<td>BUSINESS</td>
<td>Identification of capabilities needed for space mining with near-term business potential is required to ensure incremental growth as the market today is nascent</td>
</tr>
</tbody>
</table>
Luxembourg is Implementing a Comprehensive Strategy to Realize Its Space Resources Vision

**Five Strategic Pillars**

1. Ensure national political support and promote international cooperation
2. Build clear legal framework and engage internationally
3. Promote long-term public support and workforce engagement through education and R&D
4. Provide dedicated support for industrial research and development activities
5. Develop investment instruments focussed on commercial space
Why is the Luxembourg Government Supporting and Promoting Commercial Space Resource Utilization?

**Space Resources Are Available and Valuable**
Large quantities of high-value resources, such as water and metals, exist in the Solar System and could enable Earth-independent system architectures.

**Space Resources Will Create the Future Space Economy**
Utilization of space resources could play a foundational role in future in-space economies.

**Space Resources Will Enable Deeper Space Exploration**
Incorporation of space resources into exploration architectures could reduce costs and improve the viability of future missions beyond LEO.

**Space Resource Tech Has Near-Term, Commercial Value**
Technologies developed for space resources utilization could have multi-sector, near-term applicability in terrestrial markets.
THE STUDY WAS ARTICULATED AROUND 5 MAIN DELIVERABLES, 4 AT GLOBAL SCALE AND 1 STAND ALONE ON SPECIFIC OPPORTUNITIES FOR LUXEMBOURG

- Opportunities assessment
- Technology roadmap
- Socio-economic benefits
- Final report
- Opportunities for Luxembourg

Technical note

Opportunities analysis
Technology roadmap
Socio-economic impacts
Tailoring to Lux landscape

Stakeholders consultation

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THE POTENTIAL VALUE CHAINS FOR SRU WERE CHARACTERIZED ON THE BASIS OF APPLICATIONS, RESOURCES AND MISSION PROFILES

1 Applications considered

- Life support to astronauts
- Propellant for launch vehicles and other space vehicles
- Construction of in-situ infrastructure
- Radiation shielding
- Manufacturing of equipment in space
- Earth-based use of Platinum Group Metals (PGM)

2 Resources considered

- Water, and others: H, O, N, C
- Methane
- Metals (Fe, Ni, Co)
- Regolith
- Platinum Group Metals (PGMs)

3 Mission Profiles

SRU value chain

- Prospect
- Establish
- Mine
- Transport
- Refine
- Manufacture
- Supply
The main drivers and risks have been discussed with stakeholders, leading to conclusions which reflect the highest consensus within experts. 

- SRU will support exploration missions feasibility, cost efficiency and autonomy
- Provision of propellant should be the first application to target
- Scientific missions led by space agencies would be the first customers
- Earth mining industry needs to be involved for their expertise and practical understanding of extracting and processing techniques

- The challenge in refining the "geological" knowledge remains a strong barrier
- Strong scepticism on the realism of bringing back PGM
For further information, including the study, please contact the Luxembourg Space Agency

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