

# Luxembourg Space Resources Initiative

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## Introduction

Luxembourg has started being active in space through the creation of the Société européenne des satellites (SES S.A.) in the middle of the eighties. With a significant commitment by the Government of the Grand Duchy of Luxembourg, SES launched its first publicly/privately owned Direct-to-Home communications satellite covering Europe. Since that date, Luxembourg has been actively making use of orbital resources in the form of geostationary orbital positions and satellite communication frequencies under the auspices of the International Telecommunications Union.

In 2005 Luxembourg became a Member of the European Space Agency and has since managed to develop a dynamic space sector consisting of some 30 different companies employing more than 800 people of diverse nationalities.

Luxembourg has also a long tradition in mining, dating back to 1850 with the birth of a major industrial basin. In 1913 the country was among the top ten producers of iron ore and pig iron in the world.

Luxembourg looks back at a compelling history of economic innovation and it is currently gearing up for a Third Industrial Revolution, part of which could once more occur in space. To that effect, Luxembourg is exploring the potential use of space resources, in coordination and collaboration with other states, the scientific community, as well as commercial partners.

## 1. Space Resources

Space resources, found on asteroids, the moon and other celestial bodies, hold a large potential for future technological innovation, economic activity and growth with a promise of ecologic and social benefits.

The vast majority of the asteroids can be found in the asteroid belt between Mars and Jupiter. Several of those asteroids are passing near our planet Earth.

More than 14 000 Near Earth Asteroids have been identified. They are easily accessible and might contain more valuable resources than have been already found on Earth.

Water, respectively ice, is of particular interest. Water extracted from celestial bodies is an essential and highly valuable resource on long duration space missions and for future space colonizers. It could also be broken into oxygen and hydrogen for air and rocket or satellite propellant.

The metals could be used to build or repair spacecraft off Earth as well as to build other structures for a space colony, i.e. provide material for the construction of hardware in space.

## 2. Opportunities

Space resources utilization could open up a wealth of new resources, as well as new perspectives for humanity.

The space industry is currently held back by the high cost of launching equipment and supplies into orbit. Because of current launch costs of several million dollars per ton, the number of launched satellites is limited. Even more limited is the range of business activity, which is viable in light of that cost. Large quantities of raw material available directly in space at relatively low cost, can increase satellite capacities and lower the expenses of space missions. Satellite operators could improve services delivered to their customers on Earth. Once a supply chain of materials is established in orbit, it will encourage new applications and new business models as entrepreneurs attempt to introduce even more services useful for people on Earth find.

## 3. Objectives and Strategy

Luxembourg aims to contribute to the peaceful exploration and sustainable utilization of space resources for the benefit of humankind.

While respecting its international obligations, Luxembourg is working on an attractive and recognized legal and regulatory framework promoting investment and growth of private ventures in space resource utilization.

The strategy includes actions along 5 major pillars:

- Ensure national political support and promote international cooperation,
- Build a clear legal and regulatory framework,
- Promote long-term public support through research and education,
- Offer dedicated support for Research and Development activities,
- Provide long-term funding.

Drawing on its success and proven capabilities in the commercial satellite services industry, Luxembourg aims to develop into a global leader in the peaceful exploration and sustainable utilization of space resources.