

SPACE MINING AND USE OF SPACE NATURAL RESOURCES

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What are we discussing?

- What is space mining and what all it includes?
- What kind of minerals we found in space?
- What are the benefits and uses of space natural resources?
- What are the stages involved in space mining?
- What all attempts have been made so far?
- Is space mining legal?
- What are the legal provisions relating to the space mining?
- What are the legal issues involved in space mining?

Space Mining and its Need

- Asteroid Mining or Space Mining is the hypothetical exploitation of materials from asteroids and other minor planets, including near-Earth objects.
- Space mining could be defined as “the exploitation of raw materials from asteroids and other minor planets in space”. Asteroid mining refers to the extraction of minerals and other raw materials from minor planets and asteroids in outer space. Some of the raw materials found during asteroid mining include: silver, gold, platinum, rhodium, nickel, aluminium, manganese, iron, and cobalt (among others).
- The extraction of minerals from earth's bed has placed a vital role in the development of civilization. But the race for development between the nations and the rapid rise in the population has brought the non-renewable resources on the verge of extinction.

- With the verge of depletion of non-renewable resources from Earth, the exploitation of mineral resources from the celestial bodies/objects is becoming a necessity.
- Technological capabilities for activities in space will continue to evolve to enable the extraction and exploitation of mineral resources from celestial bodies to be a feasible alternative to extracting mineral reserves from logistically difficult and environmentally detrimental areas on Earth.

Types of Asteroids potential for Mining

- **C-type** asteroids hold a high quantity of water, which could help reduce the cost of a mining mission. These asteroids also have high levels of phosphorous and organic carbon, which are needed in order to produce crop fertilisers.
- **S-type** asteroids do not hold very much water, however, they are more likely to have a wide variety of minerals for extraction. For example, a small asteroid can provide one and a half million pounds of metal, like nickel or cobalt, with fifty kilograms of this being a precious metal, like gold or platinum. This variety would help offset the increased cost of mining the asteroid.

- M-type asteroids are much harder to find, however, they hold ten times the amount of metal found in an S-type asteroid.

Stages involved in Space Mining

- Planning Segment
- Exploration Segment
- Launch Segment
- Transit Segment
- Extraction Segment
- Return Segment
- Exploitation Segment

Space Mining Activities

- 1969 to 1972, U.S.A. Apollo missions bring back Moon rocks
- 2005, Hayabusa recovers dust samples from Itokawa asteroid
- 2015, U.S.A. space mining law
- 2016, Luxembourg's SpaceResources initiative
- 2019, Russia wants to join

Is Space Mining Legal?

- There is an absence of international regulatory and legal framework which provides for the commercial space mining. In fact, the principles 'the concept of the common heritage of mankind', 'principle of non-appropriation', and 'freedoms of exploration and use' if read together, brings out the uncertainty and inconsistency in the application of International Space Law to such commercial space mining activities.

Legal Provisions relating to Space Mining

- The freedom of access and the principle of non-appropriation found in Articles I and II of the Outer Space Treaty (OST), in particular, makes activities relating to the extraction of mineral resources on celestial bodies difficult, if not impossible, to justify in law.
- When there is a movement of celestial bodies from their natural orbit to the lunar orbit or Earth, the principle relating to the appropriation of celestial bodies (commonly referred as 'Planetary Protection') gets invoked.
- The provision relating to the principle of 'Planetary Protection' can be seen under Article IX of the OST.
- However, Article IX of the OST is ambiguous with regard to the question: whether it aims to protect the celestial bodies/objects or the scientific interests of the spacefaring countries exploiting them in the name of exploration.

- Article 11 of the Moon Treaty is of fundamental importance in the whole discussion on lunar exploitation and commercial activities, as the Moon and its natural resources are proclaimed “common heritage of mankind”.

Legal Issues Involved

- environmental pollution
- State's liability
- ownership rights
- issue of '*commons*'

For Further Readings, Kindly Refer...

- Ricky J. Lee, “Law and Regulation of Commercial Mining of Minerals in Outer Space”, Springer, 7 edition, 2012.
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Thank You

Any Questions?

Any Comments?
