

International Workshop on
“Space Law and Policy Strategies for
Building Moon Bases and Exploiting Its Space Natural Resources”

Legal Analysis of
National Space Legislation
for the **Exploitation** of Space Resources

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Yuri TAKAYA (Ph.D.)

Visiting Researcher, The University of Tokyo

Goal

To understand the difference between the **exploitation** and **appropriation** of space resources on celestial bodies in order for their better **exploitation**.

	exploitation (=use)	appropriation
Legality	legal	Illegal?
Legal basis	Article 1 of OST The Principle of Free Exploration and Use of Outer Space	Article II of OST The Principle of Non-Appropriation of Outer Space
Scope	Use of space resources for scientific investigation or sharing benefit with other countries	Claim severity by any means Own celestial bodies → but “space resources” are not written in the provision

OUTLINE

1. Introduction
2. Development of National Space Legislation for SR
 - ① The Case of U.S.
 - ② The Case of Luxemburg
3. International Reaction to Their Enactment
 - ① Academia in 2015
 - ② UN COPUOS in 2016
 - ③ UN COUPOS in 2017
4. Exploitation vs. Appropriation
 - ① Difference
 - ② Efforts to Avoid Appropriation
5. Conclusion

1. Introduction

✓ As of present, the **feasibility to extract space resources on celestial bodies** has been proved through the sample recovery missions from:

Moon (U.S. Apollo mission)

Asteroid (Japan, Hayabusa and Hayabusa -2)

Comet (EU, Rosetta mission).

✓ When a U.S. private entity **Planetary Resources** made a ranking list of asteroid, **Asterank**, space mining activities attracted attention in the industry and needed national legislation to start business related space resources.

<http://www.asterank.com/>

The screenshot shows the Asterank website interface. At the top, there is a navigation bar with links: Asterank, Home, About, Full 3D View, Discover **beta**, Exoplanets, Dark Matter, and APIs. Below the navigation bar, there is a search area with a query dropdown set to 'most cost effective' and a 'Lookup:' field containing 'eg. 433 Eros'. To the left of the search area, there is a sidebar with text: 'Asterank is a scientific and economic database of over 600,000 asteroids. We've collected, computed, or inferred important data such as asteroid mass and composition from multiple scientific sources. With this information, we estimate the costs and rewards of mining asteroids.'

Name	Type	a (AU)	e	Value (\$)	Est. Profit (\$)	Δv (km/s)
Ryugu	Cg	1.190	0.190	82.76 billion	30.07 billion	4.664
1989 ML	X	1.272	0.137	13.94 billion	4.38 billion	4.889
Nereus	Xe	1.489	0.360	4.71 billion	1.39 billion	4.985
Bennu	B	1.126	0.204	669.96 million	185.00 million ⁴	5.096

1. Introduction

- ✓ In order to meet the need, the U.S. enacted the **Commercial Space Launch Competitiveness Act** in 2015 and Luxemburg enacted the **Law on the Exploration and Use of Space Resources** in 2017.

Question: Is it possible to own space resources to sell?
→ see, [3. Int'l Reaction]

- ✓ It is a pressing issue because...

The asteroid “Ryugu” which **JAXA’s Hayabusa-2** is heading for is on the top of **Asterank**; therefore, certain rules are needed to avoid any conflict between space science mission and commercial mission.

<http://www.asterank.com/>

Asterank is a scientific and economic database of over 600,000 asteroids. We've collected, computed, or inferred important data such as asteroid mass and composition from multiple scientific sources. With this information, we estimate the costs and rewards of mining asteroids.

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Query: most cost effective | Lookup: eg. 433 Eros

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Didymos	Xk	1.645	0.384	62.25 billion	16.40 billion

2. Development of National Space Legislation for SR

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① U.S. Commercial Space Launch Competitiveness Act of 2015

Title I: Spurring Private Aerospace Competitiveness and Entrepreneurship

Title II: Commercial Remote Sensing

Title III: Office of Space Commerce

Title IV: Space Resource Exploration and Utilization Act])

51301. Definitions.

51302. Commercial exploration and commercial recovery.

51303. Asteroid resource and space resource rights.

Date: Signed by the former President Obama on 25 November 2015

Entered into force as Public Law 114-90

Purpose: To facilitate a pro-growth environment for the developing commercial space industry by encouraging ① private sector investment and creating more ② stable and predictable regulatory conditions, and for other purposes.”

2. Development of National Space Legislation for SR

① U.S. Commercial Space Launch Competitiveness Act of 2015

Title IV: The Space Resource Exploration and Utilization Act of 2015

§ 51301. Definitions

In this chapter:

- (1) ASTEROID RESOURCE.—The term ‘asteroid resource’ means **a space resource found on or within a single asteroid.**
- (2) SPACE RESOURCE.—
 - (A) IN GENERAL.—The term ‘space resource’ means **an abiotic resource in situ** in outer space.
 - (B) INCLUSIONS.—The term ‘space resource’ includes **water** and **minerals.**
- (3) UNITED STATES CITIZEN.—The term ‘United States citizen’ has the meaning given the term ‘citizen of the United States’ in section 50902.

2. Development of National Space Legislation for SR

① U.S. Commercial Space Launch Competitiveness Act of 2015

Title IV: The Space Resource Exploration and Utilization Act of 2015

§ 51303. Asteroid resource and space resource rights

A United States citizen [...] shall be entitled to any asteroid resource or space resource obtained, including **to possess, own, transport, use, and sell** the asteroid resource or space resource obtained in accordance with applicable law, including the **international obligations** of the United States.

→ To possess, own, transport, use and sell space resource, private entities need to obtain **ownership** for the resources.

However, is it possible to own part of celestial bodies by state or its nationals?

2. Development of National Space Legislation for SR

② Luxembourg

The Law on the Exploration and Use of Space Resources

February 2016: Space Resources Initiative

February 2016: Agreement with Deep Space Industries

October 2016: Agreement with Planetary Resources

March 2017: MoU with Ispace inc.

August 2017: Entered into Force

Article I

Space resources are **capable of being appropriated**

- ✓ It regards celestial bodies and its resources as having different legal status
- ✓ The Act does not have any provision to define SR.
- ✓ Luxembourg also commits itself to comply with **international obligation**.

3. International Reaction to Their Enactment

3. International Reaction to Their Enactment

① Academia in 2015 (to the U.S.)

Against

- ✓ As any state is not entitled to claim sovereignty over celestial bodies, it is unable to authorize its nationals to own national resources.
- ✓ This enactment results into the violation of the principle of N-A

Not Against

- ✓ It is the exploitation of space resources, not their appropriation.
- ✓ The principle of non-appropriation does not apply to private entities
↑ not correct
- ✓ The principle does **not prohibit** the appropriation of space resources.
- ✓ The U.S. enactment is just **a first step** for proposing regulatory framework for the industry to pursue its space activities.

3. International Reaction to Their Enactment

② UN COPUOS in 2016 (to the U.S.)

Against

STSC: Russia (Conference Room Paper)

“The [U.S.] vividly demonstrated a connection between diminishing the Committee’s role and powers, on the one hand, and manifestations of **total disrespect for international law order**, on the other, by adopting the [Act].”

LSC: Belgium

As it was concerned about **the global economic imbalance** that space resource exploration could entail. It would prefer **an international approach**, “**space resources cannot be appropriated by extension of national jurisdiction**”

→ New agenda item was added to LSC of UNCOPUOS “General exchange of views on potential legal models for activities in the exploration, [...] of space resources.

3. International Reaction to Their Enactment

③ UN COPUOS LSC in 2017

Against

- ✓ This enactment results into the violation of the principle of non-appropriation
- ✓ The use of space resources should not be determined unilaterally, it should be considered multilaterally

Comments

- ✓ rule-based approach to the peaceful use of outer space is needed
- ✓ Key terms such as “province of all mankind” needs to be clarified
- ✓ Non-binding arrangement is appropriate for such a rapid development of space mining activities.

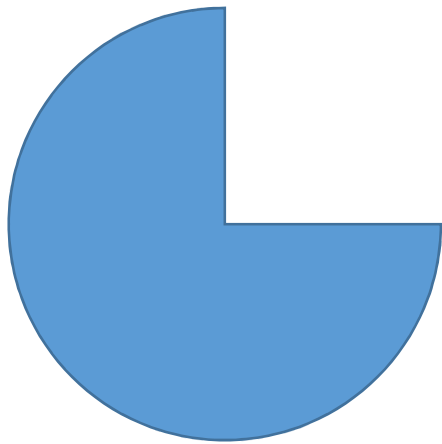
→ more comments calling for international regulatory framework.

4. Exploitation vs. Appropriation

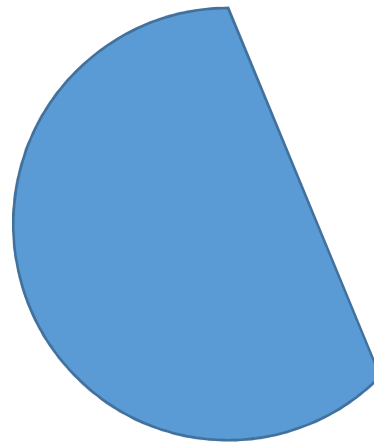
4. Exploitation vs. Appropriation

Problem:

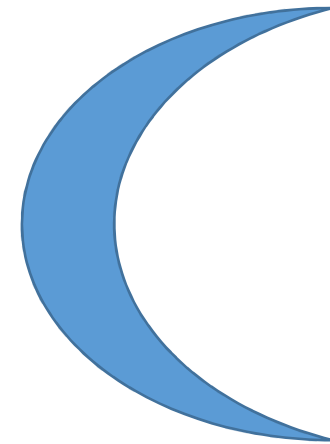
Both exploitation and appropriation of SR **consume** them...



Exploitation



Exploitation...



Exploitation...?
No! Appropriation!

4. Exploitation vs. Appropriation

① Difference

Art. II of the OST: Principle of Non-Appropriation

“Outer space, including the Moon and other celestial bodies, is not subject to **national appropriation** by claim of sovereignty, by means of use or occupation, or by any other means.”

As the legal status of outer space including celestial bodies is *Res communis* (all states can use, but not own it)

	Celestial bodies	Space resources (water, mineral)
claim sovereignty	×	×
use	○	○
Exclusive use (= ownership)	×	× or ○ ?

4. Exploitation or Appropriation

② Efforts to Avoid Appropriation

To exclude “exclusive elements” in exploiting space resources..

1) International regulatory framework by International Organization

example: ISA (International Seabed Authority)

ITU, ICAO

2) New Treaty or Soft Law?

Efforts of The Hague International Space Resources Governance WG

Challenges How to ensure treaty compliance?

How to share benefit with developing countries?

How to avoid interference between science mission and

commercial mission?



Common rules for exploiting space resources need to be set

(for portion in particular)

5. Conclusion

In efforts to avoid appropriation of space resources, either at the national level and international level, a line between exploitation and appropriation of SR needs to be drawn from technical and legal aspects, particularly concerning:

- ✓ Portion;
- ✓ The way of extracting;
- ✓ Rules beyond Article IX of the Outer Space Treaty “diplomatic consultation”;
- ✓ Occupying the mining zone.

In addition, multilateral technical means for verification/monitoring concerning space mining activities need to be considered.

THANK YOU

yuritakaya@hotmail.com