

## **Committee / Council: Economic and Social Council**

**Issue: Coordinating an international response to the issue of asteroid mining**

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### **Introduction**

Asteroid mining is a new concept relevant to the exploitation of asteroids. It involves extracting raw materials or other useful substances from them. Raw materials that can be extracted are gold, iridium, silver, palladium, platinum, iron, cobalt, aluminum, titanium and others. This can prove quite profitable since extraordinary amounts of those minerals which can be extracted, can be sold at enormous profit. However, despite the potential profit that a private seller or government might make, there are issues which accompany this process. Firstly, one important issue is the process of asteroid mining itself. The process of mining in space is rather complicated. Specific technological tools would be needed. In addition to that, specialized personnel which would be able to carry out this rather complicated task is also needed. This is a very serious problem and yet there is no exact solution. Another problem with mining is that it is difficult to understand which asteroids are to be mined and how to find out which specific material they contain. In other words, which minerals exist in each asteroid, something that we cannot know without specific technology since they are hidden in it. The technology involves various radars and light sensitive telescopes which are still in process of production or if produced, their function is not perfect.

Apart from the technological barriers, on which I am going to elaborate later the study guide, the legal framework constitutes a further significant barrier, which until now discourages private firms from pursuing asteroid mining- even though many do pursue, despite the legal framework. The only way for a private company to enforce their right to mine is through national court, however, in order for the court to come to a ruling it would exercise sovereign rights and contravene the Outer Space Treaty (OST). Despite the extraordinary amount of money needed, it is necessary that efforts for its development are continued. Asteroid mining could be rather beneficial for the world economy, not only due to the new positions, jobs and investments created but also due to the raw materials which will be available in the global market creating economic growth in many sectors of the economy. Enormous amounts of raw materials which are absolutely necessary for everyday constructions and objects will now be added to the market lowering the cost for many of these objects. Water found on asteroids could be used as fuel for spacecraft or even as drinking water in the future. Moreover, asteroid mining could prove very profitable for the firms which engage with it.

### **Definition of key terms**

#### Asteroid

An asteroid is a small rocky body, which rotates around the sun.

### Asteroid mining

Asteroid mining refers to the process of exploitation of raw materials from asteroids or other minor planets, including near-Earth objects. This will happen by mining those objects and acquire various raw materials or minerals, some of which are gold, silver, platinum, iron, cobalt and aluminum, among others.

### The Outer Space Treaty (OST)

The Outer Space Treaty is formally referred to as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space and includes the Moon and Other Celestial Bodies. The Outer Space Treaty forms the basis of international space law.

### Sovereign right

"A sovereign right refers to a legal right possessed by state or its agencies and enables a state to carry out its official functions for the benefit of public. Sovereign right is distinct from certain proprietary rights because those proprietary rights may be possessed by private persons. Sovereign right is attributed through authority of law."<sup>1</sup>

### Property rights;

"Property rights refer to the theoretical and legal ownership of specific property by individuals and the ability to determine how such property is used"<sup>2</sup>

## **Background information**

Space law consists of a specific set of international treaties along with national commercialization laws, which are established by the United Nations Office for Outer Space Affairs (UNOOSA). The treaties cover major issues such as freedom of exploration, arms control, non-appropriation of space, liability for damages, prevention of harmful interference with space activities and the environment, notification and registration of space activities, the settlement of disputes and safety and rescue of astronauts and spacecraft. Approximately 100 nations and institutions are involved in negotiations. The non-spacefaring nations agreed to treat outer space as a *res communis* (common) territory that will belong to no one. Moreover, the Outer Space Treaty and the Moon Agreement are some of the regulations implemented concerning asteroid mining. Overall, it has been agreed that space can be exploited equally by all countries. The legislation though has various gaps which are going to be analyzed later on and has been criticized to be vague by many countries

The Outer Space Treaty and the Moon Agreement allow private property rights for outer space and its natural resources when removed from the surface, subsurface or subsoil of the moon or other extra-terrestrial bodies in outer space. Once removed the resources can be sold, traded and explored or used only for scientific purposes – for the benefit of all. In

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<sup>1</sup> Legal, Inc. US. "USLegal." Sovereign Right Law and Legal Definition | USLegal, Inc. N.p., n.d. Web. 08 July 2017.

<sup>2</sup> Staff, Investopedia. "Property Rights." Investopedia. N.p., 15 Mar. 2017. Web. 15 Sept. 2017.

general, extracting space resources is allowed, even when used for profit by private companies, which contradicts some rules, which do not allow exploitation of universe for profit. Until now, no company has performed any action. Nevertheless, international space law prohibits property rights over territories and outer space land.

The outcome of the OST was that the foundation of international space law consists of five international space treaties namely the "Outer Space Treaty", the "Rescue Agreement", the "Liability Convention", the "Registration Convention" and the "Moon Agreement". It is generally referred to as the constitution for outer space. By ratifying the OST of 1967, 98 nations agreed that outer space would belong to humanity and that all nations would have the freedom to use and explore outer space and that both these provisions must be done in a way to benefit all mankind. Here, firms are not able to use space with views of profit, a law which practically discourages them from exploiting universe in the first place. The OST has been criticized as vague, yet international space law has worked well and has served space commercial industries and interests for many decades.

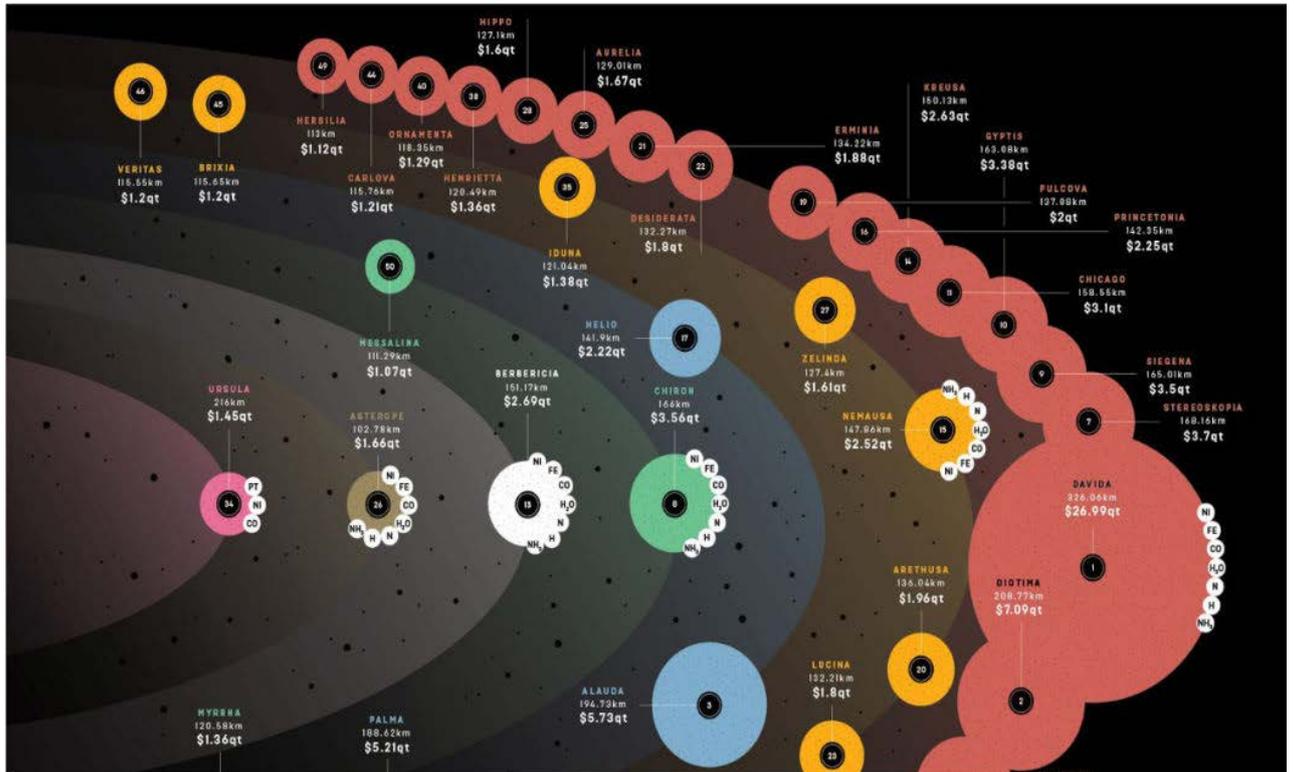
However, the economic and environmental potential of asteroid mining should definitely be considered. Enormous profits and technological improvements could be made by firms. Simultaneously, extracting raw materials from another planet would be more sustainable for our own world since it contains limited resources. By exploiting space no ecosystems would be threatened or destroyed. Earth taken into account, we understand that the international community should proceed with changes in the international legislation, in order to incentivize firms to engage in asteroid mining. A drawback however in this case is the cost. Just to extract a ton of each mineral more than 10 billion dollars are needed. However, the profits are also extraordinary. In 2015, the asteroid 2011 UW158 passed by earth. It is worth mentioning that on earth there are only 192 tons of platinum. The value of this amount of platinum is around 5.4 trillion US dollars<sup>3</sup> and assuming that such an amount entered the market of platinum, it would change it once and for all. Another similar example took place in 2013, with the asteroid 2012 DA14. Its worth was estimated to be more than 20 trillion<sup>4</sup>. Assuming that the US GDP is 17.95 trillion dollars, we can understand that such amounts of money would alter once and for all the world economy, assuming that those asteroids were exploited.

It becomes obvious by the aforementioned that asteroid mining, is an upcoming industry with unimaginable potential. As NASA observed with the asteroids that have passed by, their values is enormous. However, the international community, including the UN, have passed legislation which hardens the process of exploitation, by not allowing private firms to benefit from asteroids. Changes in the legislation are considered necessary.

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<sup>3</sup> Howell, Elizabeth "'Trillion-Dollar Asteroid' Zooms by Earth as Scientists Watch (Video)." Space.com. N.p., 28 July 2015. Web. 15 Sept. 2017.

<sup>4</sup> Howell, Elizabeth "'Trillion-Dollar Asteroid' Zooms by Earth as Scientists Watch (Video)." Space.com. N.p., 28 July 2015. Web. 15 Sept. 2017.



The above image illustrates the mining and economic potential of asteroids. The most important near-Earth asteroids are shown in the picture, mentioning their diameter, raw materials and minerals contained and finally their value. Just by checking the worth of each asteroid, we can understand that the economic potential of each are enormous. NASA estimations show that the sum of asteroids around earth hold \$700 quintillion of bounty. That's about \$100 billion per person on Earth<sup>5</sup>.

## Major Countries and Organizations Involved

### United States of America

Through the "Space Act of 2015" the United States are beginning to initiate legal framework for extraterrestrial resource extraction and are facilitating private development of space resources consistent with US international treaty obligations. On 25 of November 2015 President Obama signed the "U.S Commercial Space Launch Competitiveness Act" into law. Under this legislation, the right of US citizens to own space resources is assured and their commercial utilization is encouraged. Such change in legislation will facilitate the seeking of extraterrestrial resources for US citizens. If US was used as an example, the potential of asteroid mining would spread worldwide.

### Luxemburg

In February 2016, the Government of Luxemburg announced that it would attempt to "jump start an industrial sector to mine asteroid resources in space by creating a legal framework

<sup>5</sup> Desjardins, Jeff. "Infographic: There's Big Money to Be Made in Asteroid Mining." Visual Capitalist. N.p., 02 Nov. 2016. Web. 15 Sept. 2017.

and regulatory incentives for companies involved in the industry<sup>6</sup>. Again, changes in legislation will make it easier for private companies to exploit asteroids. Luxemburg attempts to become the central country of operations of asteroid mining in Europe, and it was one of the first to enact legislation which would contribute in initiating asteroid mining processes.

#### Kepler Energy and Space Engineering

Kepler Energy and Space Engineering has as vision to upgrade science for the purpose of advancing research and development of space and earth resources. What they want to achieve is the technology they develop to have specific capabilities, which are going to be supportive in asteroid mining and will be able to survive the rough process which will take place in the space. The Automated Mining System Mission is still under designing process, and will return several metric tons of asteroid regolith to Low Earth Orbit for manufacturing space vehicles. The project will provide a continuous flow of raw materials from asteroids to LEO, which will enable the manufacturing of all the "futuristic technological designs" that are now only an unimaginable scenario.

#### Planetary Resources

Planetary resources, as the aforementioned companies, invest in creating technology which would make asteroid mining possible. Their aim is through the technological advancements, to utilize the raw materials and any other type of resource extracted from near-Earth asteroids. They have sent spacecraft for research in space, in an attempt to find appropriate for exploitation asteroids. The firm recognizes the fact that the environment outside earth's atmosphere is rather harsh. Radiation is prevalent. At the same time communication with Earth is just a few minute process. Planetary Resources insist to believe that the perfect place is where the aforementioned conditions exist, and this place is magnetosphere.

#### United Nations Office for Outer Space Affairs

UNOOSA is a UN organ responsible to deal with the exploration of space and its exploitation. It is responsible for relevant technological advancements, geopolitical changes and aims in finding a way to achieve sustainable development in space, using appropriate technology. UNOOSA introduced the "Space Law", a legislative body which deals with governing space relevant activities. Through that, a variety of international agreements, treaties, conventions and a number of General Assembly's resolutions have been created. Its role on the issue of asteroid mining is extremely important, since it is the one responsible to supervise the process of exploitation and hammer out its rules.

### **Timeline of events**

1995	The NEAT (Near-Earth Asteroid Tracking) is a project which operates at the airforce base in Hawaii. At the specific area, the rate
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<sup>6</sup> Morris, David Z. "Luxembourg Announces Big Funding to Mine Asteroids." Fortune.com. Fortune, 05 June 2016. Web. 15 Sept. 2017.

	of asteroids passing from there is than 10 times more.
1996	An asteroid within orbit which can potentially hit the Earth is discovered.
1999	The "Torino Scale" is published by astronomer Rick Binzel. In this book, the author tries to calm the fear of public towards the near-Earth asteroids which have been discovered and have a chance of hitting earth. It also classifies all the potential effects of such an event, using a scale of 0-10, with 0 being no risk at all and 10 being a definite world devastation.
2001	An asteroid (DA) is discovered that still has the highest known possibility of impact. IN 1950 DA has a 0.0017% chance of striking Earth in 2880
2004	<p>NASA using Stardust spacecraft collects comet dust and manages to take close up pictures, from Comet Wild 2, on January 2nd.</p> <p>Until now, the highest danger in the Torino scale is 4 (The Torino Scale uses an integer scale from 0 to 10. A 0 indicates an object has a negligibly small chance of collision with the Earth, compared with the usual "background noise" of collision events, or is too small to penetrate Earth's atmosphere intact), as it was reported on December 2004. The name of the asteroid is <i>Aphophis</i>, and due to improved orbital calculations the threat level has been decreased to 1.</p> <p>NASA's Deep Impact spacecraft becomes first object deliberately sent into collision with a comet, called <i>Tempel 1</i>, on the 4th of July.</p> <p>A method is proposed to move an asteroid from a collision course without touching it, using solely gravity.</p>
2005	The US Congress directs NASA to extend search for NEAs to all objects larger than 150-metres-wide, rather than those wider than 1 km
2006	The Stardust spacecraft returns to Earth on 15th of January, carrying samples of comet

	dust and having taken various pictures for analysis.
2029	It is expected that by 2029, <i>Apophis</i> will have made the closest approach to Earth ever predicted for a sizable asteroid on 13 April. It will come close enough to be visible to the naked eye and the Earth's gravity will change its orbit.
2036	<i>Apophis</i> may impact Earth on 13 March – but only if it passes through a particular “keyhole” in 2029. The chances now stand at 1 in 6250.

## Previous Attempts to solve the Issue

Asteroid mining is an issue which has been brought up in the last decade and until now it has not become reality. The international community has not yet taken any measures to solve anything. However, as plans are progressing, the issue becomes more and more important for the international community. Up until now the only measures taken by the international community are the ones which have already been mentioned in the previous sections regarding international legislation.

- The Outer Space Treaty

The Outer Space Treaty is a global treaty which aims at hammering out the rules of exploitation of the universe. It also ensures the right of private firms to exploit asteroids and extract resources only for the benefit of science. The Outer Space Treaty is one of the few global and common agreements regarding the issue. However, it contradicts other global pacts, such as the Moon Agreement, which assure the right of firms to exploit universe at a profit. The Outer Space Treaty has been ratified by most of the countries globally.

- The Moon Agreement

The moon agreement is another treaty which aims at controlling the way countries or private firms exploit celestial resources. Opposing to the Outer Space Treaty it distinguishes two forms of potential resource utilization. Firms can exploit universe for scientific purposes or for non-scientific ones, like trading. However, the Moon Agreement has not been ratified by many countries, especially the most prominent spacefaring ones.

## Possible Solutions

Change the legislation

A way that the international community could approach the issue of asteroid mining is by drafting specific legislation, which will specify the rules of exploitation of extraterrestrial objects. Using as an example the effective UN Convention "Law of the Sea", it becomes clear how this form of legislation will affect the efforts of nations to exploit asteroids. There, it is defined clearly the way that Sea is divided among countries, and also the rules of exploiting sea. As mentioned previously in the study guide, the main problem of asteroid mining, apart from the economic and technological, is the legal one. The existing legislation (Moon Treaty, Outer Space Treaty) has been criticized as vague. While technology proceeds, it becomes more and more possible that asteroid mining endeavors occur. Thus, a new, more effective and clear legal framework like the "Law of the Sea" is needed, in order to avoid international tensions.

(In addition to the previous legal changes that need to happen, there are some UN rules which need to be altered, in order to make asteroid mining possible. UN rules say that anyone is free to mine as long as it is for the benefit of society and not for profit. However, this is a hindrance to the development of a space economy, which involves mostly private firms interested in investing in asteroid mining. Unless the UN incentivizes private firms to invest on efforts of asteroid mining then it will be impossible to develop such an industry. Thus, a legal framework which allows firms to mine for profit should be created.)

### Creation of a space economy

In order to make asteroid mining more specific and clear to the potential investors, it is necessary to form a specific sector in the economy called space economy. Today, space economy exists, however, it needs to be strengthened. In order to achieve this, it is necessary to invest large amounts of money in technology, research and development, experiments and most importantly actual attempts and operations to perform asteroid mining. That way a whole industry will be created. In this case, if many countries invest massively, the operational costs will be reduced, making asteroid mining a much more realistic idea. It would be easier if the international community, all together, invested money on such endeavors. This could happen by a collaborative research program or by a specific organization funded by countries interested in participating and monitored by the United Nations. That way a global effort to create a space economy would be initiated, leading probably to more desirable outcomes. The space economy will expand when the raw materials extracted from the asteroids are injected into the world market, which they will impact.

## Key Investment Facts



On the above image, all the facts about the process of asteroid mining are shown. On the above columns, the economic potential of asteroid mining is briefly shown, along with the technology needed and the countries which are in collaboration, in the preparations of asteroid mining. On the columns below you can see the new offices which are going to open in Luxemburg- and soon will be expanded in other countries in the world. - Along with the media support, in which many significant newspapers are involved and finally some legal actions which the Deep Space Industries have taken place, by creating patents, to protect their ideas in the global market asteroid mining will strive. We can see that DSI are already in the process of developing technology and ideas for asteroid mining, in an international collaborative spirit, including companies from three different countries. The figures and ideas described above illustrate the involvement of the company in the space industry.

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