

From Terrestrial to Celestial: Social Licence to Operate as a Space Mining Enabler

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Introduction

Natural resources have always played an important role in the development of the human society. Technological changes and massive utilization of natural resources during the Industrial revolution fuelled the unthinkable economic development and dramatically changed the human society and enabled extraordinary growth in living standards in the 19th and 20th century. Even today, the wealth embodied in natural resources makes up a significant proportion of the wealth of most nations.¹

Utilization of natural resources in outer space has a potential to equally change the human society, in particular, revolutionary enhance its ability to explore and use outer space. It is generally acknowledged that without utilization of space resources human society can neither achieve the sustainable and robust presence on the Moon, nor continue in the deep space exploration. Minerals, metals and gases could be used directly in space as a source of energy or for the construction of lunar/celestial infrastructure,² platforms from which human exploration of the Solar System can set forth.³

As a result of man's entry into outer space, great prospects opened up before mankind. However, the current inability of the human society to utilize space resources constitutes a significant barrier to our better and desperately needed understanding of the Solar System. Utilization of space resources is a *conditio sine qua non* for further exploration and use of outer space beyond the Earth Orbit.

It is reasonable to doubt whether space agencies alone (without their complete reorganization accompanied by significant increases in their budgets) would be able to establish a sustained long-term presence on the lunar surface. Given the complexity of the utilization of space resources, private investors are undoubtedly better equipped than states, particularly in terms of financial capabilities, risk being ready to undertake, skills or experience. Hence, the U.S. Executive Order on Encouraging International Support for the Recovery and Use of Space

¹ OECD, ‘THE ECONOMIC SIGNIFICANCE OF NATURAL RESOURCES: Key Points for Reformers in Eastern Europe, Caucasus and Central Asia’ (2011) 9 <http://www.oecd.org/env/outreach/2011_AB_Economic_significance_of_NR_in_EECCA_ENG.pdf>.

² JD Burke, ‘Development of a Lunar Infrastructure’ (1988) 17 *Acta Astronautica* 669 <<http://www.sciencedirect.com/science/article/pii/0094576588901828>>.

³ 911Metallurgist.com, ‘The Lunar Gold Rush: How Moon Mining Could Work’ <<https://www.jpl.nasa.gov/infographics/infographic.view.php?id=11272>>.

Resources tasked the Secretary of State to take all appropriate actions to encourage international support for both public and private recovery and use of resources in outer space.⁴

Outer space activities have been for a long time out of interest of profit-oriented private investors. Necessary technologies were not developed, and space related business activities would be hardly profitable. There was no demand and there was no market. Outer space has been for decades a domain of states being driven by the space race, Cold War rhetoric and strategic considerations. It is worth mentioning that the Apollo program was severely criticized due to its costs, which were rationalized under the Cold War strategic rivalry.⁵

In the 21st century, however, we may observe a growing tendency towards commercialization of outer space activities. This trend is being most often referred to as *NewSpace*.⁶ However, while there is an emerging commercial marketplace on the Low-Earth Orbit, investments into deep space exploration and related technologies, including the utilization of space resources, do not keep the same pace.

Despite the rapid technological development, adequately large financial capacities of private investors and the governmental initiatives,⁷ no substantive investments into the utilization of space resources have been made so far. A major obstacle for the utilization of space resources is the inadequate and ambiguous legal framework. In fact, legal and regulatory uncertainty is among key aspects cautiously assessed by private investors when determining whether to proceed with a mining project.⁸ Risk associated with investments into space mining is simply too high.

This chapter is therefore focused on the regulatory environment in which private investments into space mining are to be made and discusses why all available regimes are not enough attractive. In the second part of this chapter, the authors suggest that the concept called Social License to Operate may play a critical role in addressing investment risks associated with extra-terrestrial mining.

Investment Risks Associated with Mining

1.1 Terrestrial mining within national jurisdiction

Private investors engaged in the terrestrial mining and energy sector have always been exposed to significant uncertainties and risks. Since states exercise permanent sovereignty over their

⁴ Executive Order on Encouraging International Support for the Recovery and Use of Space Resources 2020 (White House).

⁵ Roger D Launius, 'Interpreting the Moon Landings: Project Apollo and the Historians' (2006) 22 *History and Technology* 225 <<http://www.tandfonline.com/doi/abs/10.1080/07341510600803143>>.

⁶ According to ESPI, there is no broadly accepted definition of *NewSpace*, however, it does usually encompass following trends: new entrants, innovative industrial approaches, disruptive market solutions, substantial private investment, new industry verticals and space markets, innovative public procurement and support schemes, involvement of an increasing number of space-faring nations. See Alessandra Vernile, 'The Rise of Private Actors in the Space Sector' [2018] *SpringerBriefs in Applied Sciences and Technology* 1.

⁷ Luxembourg Space Agency, 'Frequently Asked Questions about Space Mining' <<https://space-agency.public.lu/en/space-resources/faq.html>> accessed 1 September 2019.

⁸ UNCTAD, *UNCTAD Series on International Investment Policies for Development: The Role of International Investment Agreements in Attracting Foreign Direct Investment to Developing Countries* (2009) <<https://unctad.org/en/pages/PublicationArchive.aspx?publicationid=432>>.

natural wealth and resources,⁹ they do determine whether natural resources can be subject to property rights and impose restrictions within which individuals can exercise their rights in relation to natural resources. In addition, scarcity of terrestrial natural resources together with their strategic and economic importance have caused that mining and energy sector are one of the most regulated industries.¹⁰

It is worth mentioning that mere existence of natural resources within the territory of a particular state is not automatically translated into its immediate economic growth and development. Mining operations are usually carried out by non-state actors (mining companies), because there are better equipped in terms of technological know-how and expertise. In other words, lack of private investment, know-how and expertise often prevents countries from unlocking the economic potential of their natural wealth and resources.

In this context it is important to underline that the long-term nature of investment and high capital costs make investments into the mining or energy sector very risky. Interests of states invoking permanent sovereignty over natural resources within their territory and interests of investors have always been an inherent source of tension often being resolved by courts or arbitral tribunals.¹¹ Being aware of a long-term nature of investments in the mining and energy sector, private investors cautiously analyse the amount of risk associated with every large investment. Legal stability and predictability, enforceability of their rights and the level of rule of law in the host country are among key issues analysed before an investment decision is made.¹² According to Scot W Anderson, Korey Christensen and Julia LaManna, when determining whether to proceed with a mining project, an international mining company considers following key issues: (1) Security of tenure, (2) Fiscal regime, (3) Bankability and (4) Enforceability.¹³

Against the background of the principles of public international law, most of the issues relevant for a decision whether to proceed with a terrestrial mining are addressed by domestic law. Moreover, in many countries, underground natural resources, such as oil, gas or groundwater, belong to the state.¹⁴ The content of ownership and the restrictions within which the individual can exercise the right of ownership is defined by each sovereign state. Whether natural resources may be the object of a private property rights is determined by the body of domestic

⁹ UN General Assembly Resolution 1803 (VII) of 18 December 1962.

¹⁰ Minerals Make Life, 'The Outcome of an Overregulated Mining Industry' (2019) <<https://mineralsmakelife.org/blog/the-outcome-of-an-overregulated-mining-industry/>> accessed 25 July 2020.

¹¹ Oil, Gas, Mining, Electric Power and Energy related disputes accounted for 41 % of all cases Administered by the ICSID Secretariat under the ICSID Convention, the Additional Facility Rules and Other Rules (ICSID is the world's leading institution devoted to international investment dispute settlement, a forum for investor-State dispute settlement in most international investment treaties and in numerous investment laws and contracts.) See International Center for Settlement of Investment Disputes, 'THE ICSID CASELOAD — STATISTICS, ISSUE 2020-1' (2020) <[https://icsid.worldbank.org/en/Documents/resources/The ICSID Caseload Statistics 2020-1 Edition-ENG.pdf](https://icsid.worldbank.org/en/Documents/resources/The%20ICSID%20Caseload%20Statistics%202020-1%20Edition-ENG.pdf)>.

¹² According to the United Nations Conference on Trade and Development (UNCTAD), apart from the economic determinants (market size, cost of resources and other inputs such as costs of labor or the availability of natural resources), regulatory and political stability significantly affect attractiveness of countries for foreign investment. See UNCTAD (n 8).

¹³ Scot W Anderson, Korey Christensen and Julia Lamanna, 'The Development of Natural Resources in Outer Space' (2019) 37 *Journal of Energy and Natural Resources Law* 227 <<https://doi.org/10.1080/02646811.2018.1507343>>.

¹⁴ Jorge E Viñuales, 'The Resource Curse: A Legal Perspective' (2011) 17 *Global Governance* 197, 207 <<http://www.jstor.org/stable/23033730>>.

administrative law setting forth conditions under which natural resources may be explored and exploited (agreements, licenses, concessions, environmental regulation) as well as conditions under which the property rights are transferred to non-state actors (taxes, royalties).¹⁵ Legal protection of rights is also determined by domestic law and to some extent by public international law. While legal relations among individuals are governed by domestic law, sources of international public law may provide individuals with an additional protection against excessive exercise of states' sovereignty, typically in form of an expropriation, nationalization or other measures having tantamount effect.¹⁶

1.2 Terrestrial mining beyond national jurisdictions

Investors seeking to carry out mining operations in the areas beyond national jurisdiction, such as the high seas, deep seabed or outer space, should in their decision whether to proceed with a mining project take into consideration special character of these areas. Areas beyond national jurisdiction are generally understood as *res communis omnium*. As a consequence, these areas are not subject to an appropriation and states are precluded from exercising territorial jurisdiction over them.¹⁷

There is no universally applicable approach towards natural resources located in the areas beyond national jurisdiction. In fact, there are completely different regimes in place. Some natural resources are considered *res communis* and can be used by all without exhausting the resources (e.g. water in the high seas). In contrast, some natural resources requiring appropriation and consumption to be of benefit, are declared *res nullius* (e. g. living resources in the high seas) and can be subject to appropriation of any states or company.¹⁸ Some natural resources have been acknowledged to be *common heritage of mankind* (e.g. natural resources located in the deep seabed) and all rights in them are vested in mankind as a whole.¹⁹

Utilization of natural resources in the areas beyond national jurisdiction is, *thus*, determined primarily by the legal status of natural resources under international law (*res nullius*, *res communis* or *common heritage of mankind*) and an international regime governing their exploration and exploitation setting forth conditions under which natural resources are to be utilized (if established).

However, besides the regulation at the international level, individuals can never escape jurisdiction of states over their nationals and quasi-territorial jurisdiction over ships, aircraft and spacecraft extending state's jurisdiction to all persons and things on board.²⁰ Economic

¹⁵ Viñuales (n 14).

¹⁶ Key sources of international obligations in this context include international investment agreements and human rights conventions.

¹⁷ Although the Antarctic Treaty precludes new claims of sovereignty on Antarctic territory, it does not definitively negate the legitimacy of pre-existing claims. The treaty clause on freedom of access and scientific research in Antarctica as well as its fundamental "peaceful purpose" imply the spirit of the common heritage principle, however, pre-existing territorial claims avoid the attribution to Antarctica of the status of *res communis omnium*. Antarctica is rather a regime *sui generis*. See Klaus Dodds, Alan D Hemmings and Peder Roberts, *Handbook on the Politics of Antarctica* (Edward Elgar Pub 2017) 243.

¹⁸ Alexandre Kiss, 'The Common Heritage of Mankind: Utopia or Reality?' (2017) 40 *Globalization and Common Responsibilities of States* 89, 421–422.

¹⁹ United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3 (UNCLOS), art 136–137.

²⁰ Bin Cheng, 'International Responsibility and Liability of States for National Activities in Outer Space, Especially by Non-Governmental Entities', *Studies in International Space Law* (Oxford University Press 1997)

activities in the areas beyond national jurisdiction are, *thus*, in parallel regulated also at the national level by domestic law setting additional conditions. The relevance of domestic law varies. When natural resources are declared *common heritage of mankind*, domestic law plays only a marginal role because key issues can only be governed at the international level. In contrast, when natural resources are declared *res nullius* or *res communis* and no international legal framework has been established, domestic law may be particularly relevant. Overall, when natural resources are not *common heritage of mankind*, private investors should pay due regard to both international and domestic regulation in place when considering whether to commence a mining project in the area beyond national jurisdiction.

In addition, when there is no or insufficient international regime governing utilization of natural resources in place, private investors should assess legal frameworks established by other states whose nationals operate in the same location. Since states exercise only personal or quasi-territorial jurisdiction in the areas beyond national jurisdiction, states can regulate only behavior of its own nationals or registered ships/aircrafts/spacecrafts *via* domestic law. In other words, private investors' mining operations relying on domestic law may be threatened by harmful interference caused by operators whose behavior is regulated by domestic laws adopted by their home states (if national laws are not harmonized).

Space Resource Activities in the Context of International Space Law

Fundamental legal principles applicable to activities in outer space are enshrined in the Outer Space Treaty being often referred to also as the 'Principle Treaty', or the 'Constitution of Space Law'.²¹ When the OST was drafted, exploitation of space resources was not considered feasible and *thus*, the treaty does not contain any specific reference to the utilization of space resources. Subsequent treaties were intended to be concluded once new problems emerge and a more detailed regulation is needed.²² The utilization of space resources was addressed a decade later *via* the Moon Agreement.

*Acknowledging the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies,*²³ the Moon Agreement declared the Moon and its natural resources the *common heritage of mankind* and its contracting parties have undertaken to establish an international regime to govern their exploitation "*as such exploitation is about to become feasible.*"²⁴ However, this sole instrument of international space law addressing the utilization of space resources has been ratified only by 18 states,²⁵

622–626 <<http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780198257301.001.0001/acprof-9780198257301>>.

²¹ Lotta Viikari, 'Natural Resources of the Moon and Legal Regulation' in Viorel Badescu (ed), *Moon* (Springer Berlin Heidelberg 2012) <<http://link.springer.com/10.1007/978-3-642-27969-0>>.

²² Such was the process for the conclusion of the first three specific treaties – the Rescue Agreement of 1968, the Liability Convention of 1971, the Registration Convention of 1976. All three treaties were widely ratified. See United Nations, *International Space Law: United Nations Instruments* (UNOOSA 2017).

²³ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (adopted 5 December 1979, entered into force 11 July 1984) 1363 UNTS 21 (the Moon Agreement) Preamble.

²⁴ The Moon Agreement (n 23) Article 11.

²⁵ Armenia, Australia, Austria, Belgium, Chile, Kazakhstan, Kuwait, Lebanon, Mexico, Morocco, Netherlands, Pakistan, Peru, Philippines, Saudi Arabia, Turkey, Uruguay, Venezuela.

and its widespread acceptance remains elusive. The rest of the international community is bound only by the Outer Space Treaty and international customary law.²⁶

Thus, there are two regimes applicable to the utilization of space resources - the Moon Agreement regime and the Outer Space Treaty regime.

The Moon Agreement regime addresses uncertainty about the legal status of space resources by declaring them *common heritage of mankind*, however, the regime conditions exploitation of space resources by the establishment of a special international regime. Until such regime is established, private investors, being nationals or legal entities incorporated in the states bound by the Moon Agreement, cannot effectively proceed with an extraterrestrial mining project. The authors of this chapter argue that this is the only conclusion drawn from the provisions of Art 11 of the Moon Agreement “*states parties to the Moon Agreement undertook to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon*”²⁷ and “*neither the surface nor the subsurface of the Moon, nor any art thereof or natural resources in place, shall become property of any state, international or non-governmental organization, national organization or non-governmental entity or of any natural person (...), without prejudice to the international regime referred to in paragraph 5 of this article.*”²⁸ In addition, the common heritage of mankind character of space resources *per se* implies that the establishment of an international regime on their management is the only option.²⁹

The Outer Space Treaty regime does not explicitly address the utilization of space resources. Nonetheless principles enshrined in the OST determine the legal status of space resources and as well as under what conditions they may be used, particularly the non-appropriation principle (Art II of the OST) and the common benefit clause (Art I of the OST).

In contrast to the Moon Agreement, the OST does not declare space resources to be *common heritage of mankind* and their utilization is not conditioned by the establishment of an international regime. Pursuant the Outer Space Treaty, space resources are *res nullius* and can be exploited by anyone.

However, the legal status of space resources should be distinguished from the usage of space resources. The OST imposes number of limitations on the use outer space. In particular, *the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.*³⁰ The so-called common benefit clause has been proved to be by far

²⁶ The OST has 110 State Parties. However, several foundational principles codified in the UN space treaties, particularly the Outer Space Treaty, are also rules of customary international law. See Ram S Jakhu and Steven Freeland, ‘The Relationship Between the Outer Space Treaty and Customary International Law’ (2016) 53 SSRN Electronic Journal 1689, 3 <<https://www.ssrn.com/abstract=3397145>>.

²⁷ The Moon Agreement (n 23) Article 11 (5).

²⁸ The Moon Agreement (n 23) Article 11 (2).

²⁹ Some aspects of the common heritage of mankind such as peaceful use, disarmament, cooperation, common usage and international management have attained legal status. See Mary Victoria White, ‘The Common Heritage of Mankind : An Assessment The Common Heritage of Mankind : An Assessment’ (1982) 14 Case Western Reserve Journal of International Law 533–535.

³⁰ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (adopted by the General Assembly in its resolution 2222 (XXI), opened

the most controversial principle of the OST relevant for the utilization of space resources. It is understood as a limitation to the rights granted by the same art (freedom of exploration, use and access). However, the precise content of the clause remains unclear, especially whether it amounts to an obligation of sharing of the benefits of outer space activities.³¹

The most concrete document aimed at shedding light on the interpretation of the common benefit clause is the UN General Assembly's Declaration on Space Benefits.³² It reveals that no general obligations to grant benefits to non-space-faring nations are incumbent upon the space-faring nations.³³ On the other hand, this declaration does not explicitly address the utilization of space resources. The authors of this chapter are of the opinion that once space resource activities become feasible, some form of redistribution of profits obtained from space mining is likely to be advocated especially by developing countries invoking the common benefit clause. Thus, the common benefit clause and hypothetical redistribution of profits obtained from space mining may significantly hinder the creation of the stable legal environment necessary to encourage entrepreneurs to venture into space mining.³⁴

Pursuant to Article II of the OST *the 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*. One may argue that the application of *the non-appropriation principle* effectively precludes any utilization of space resources. However, an analysis of already existing regimes including the high seas, the deep seabed or even the Moon Agreement regime based also on *the non-appropriation principle* reveals that an exploitation of natural resources is perfectly compatible with *the principle of non-appropriation*. In fact, the utilization of natural resources is legally possible pursuant to all already existing regimes governing areas beyond national jurisdiction. Thus, an application of *the non-appropriation principle* enshrined in Art II of the OST *per se* does not preclude the utilization of space resources.³⁵

Overall, there are two regimes applicable to space mining. The Moon Agreement regime declares space resources *common heritage of mankind* and prevents any space mining related activities until an international regime is established. In contrast, space mining related activities are legally possible under the OST regime, however, the regime suffers from various imperfections. It requires *the exploration and use of outer space shall to be carried out for the benefit and in the interest of all countries* without specifying how the common benefit clause should be interpreted, it does not address practical aspects of mining operations, such as an establishment of safety zones aimed at avoiding harmful interference of space mining operations. Relations between operators are not regulated either under this regime.

for signature on 27 January 1967, entered into force on 1 October 1967) 610 UNTS 205 (Outer Space Treaty or OST).

³¹ Stephan Hobe and others, *Cologne Commentary on Space Law. Vol. 1, Outer Space Treaty* (Carl Heymanns Verlag 2009).

³² 'UN General Assembly Resolution 51/122 of 4 February 1997' <http://www.unoosa.org/oosa/ootadoc/data/resolutions/1996/general_assembly_51st_session/ares51122.html>.

³³ Hobe and others (n 31).

³⁴ Edwin Paxson III, 'Sharing the Benefits of Outer Space Exploration: Space Law and Economic Development' (1993) 14 Michigan Journal of International Law 487.

³⁵ Martin Svec, Petr Bohacek and Nikola Schmidt, 'Utilization of Natural Resources in Outer Space: Social License to Operate as an Alternative Source of Both Legality and Legitimacy' [2020] Oil, Gas & Energy Law.

Since the Moon Agreement has not been ratified by any spacefaring nation only little attention is given to the establishment of an international regime governing exploitation of space resources envisaged by its Art. 11. In contrast, there are several ongoing initiatives aiming to address legal uncertainty surrounding the utilization of space resources under the OST. Informal consultations on the establishment of a working group on the development of an international regime for utilization and exploitation of space resources within the UN COPUOS's Legal Subcommittee³⁶ were originally scheduled for 2020,³⁷ however, the 59th session of the Legal Subcommittee was cancelled due to the COVID-19 pandemic. The most noteworthy attempt beyond the UN includes activities of The Hague International Space Resources Governance Working Group, a forum established to discuss legal questions regarding the use of space resources and to prepare the ground for future negotiations of an international agreement or a non-legally binding instrument.³⁸ On 12 November 2019, the Working Group adopted the Building Blocks for the Development of an International Framework on Space Resource Activities.³⁹

However, due to divergent views among delegations expressed at the UN COPUOS⁴⁰ and a non-legally binding character of the Building blocks adopted by The Hague International Space Resources Governance Working Group, a comprehensive international legal framework is not likely to be established in the near future.

Domestic law governing the utilization of space resources

In contrast to the Moon Agreement regime, legal uncertainty surrounding the utilization of space resources under the OST regime can be to some extent addressed *via* domestic law (national space law). *Res nullius* status of space resources implies that space mining would not constitute a violation of international law, however it can hardly serve as a basis of property rights precluding others from recovering the same natural resources.

Hence, commercial companies (especially Planetary Resources and Deep Space Industries, pioneers of space mining, both incorporated in the U.S.) seeking to invest in the utilization of space resources have pressed for the adoption of national space law to address issues unsatisfactory addressed at the international level. This effort has resulted in the adoption of

³⁶ Utilization of space resources is discussed as agenda item 14 entitled „General exchange of views on potential legal models for activities in exploration, exploitation and use of space resources”.

³⁷ Report of the Committee on the Peaceful Uses of Outer Space Sixty-Second Session (12–21 June 2019) UN Doc A/74/20; Report of the Legal Subcommittee of the UN COPUOS on Its Fifty-Eighth Session (1 to 12 April 2019) UN Doc A/AC.105/1203.

³⁸ Leiden University International Institute of Air and Space Law, ‘The Hague International Space Resources Governance Working Group’ <<https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group>> accessed 1 September 2019; The Hague Space Resources Governance Working Group Information provided by the Netherlands during the Fifty-Seventh Session Committee on the Peaceful Uses of Outer Space Legal Subcommittee (9–20 April 2018) UN Doc A/AC.105/C.2/2018/CRP.18.

³⁹ The Hague International Space Resources Governance Working Group, ‘Building Blocks for the Development of an International Framework on Space Resource Activities’ <https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht--en-ruimterecht/space-resources/hisrgwg_building-blocks-for-space-resource-activities.pdf>.

⁴⁰ ‘Report of the Legal Subcommittee of the UN COPUOS on Its Fifty-Eighth Session (1 to 12 April 2019) UN Doc A/AC.105/1203’ (n 37).

the 2015 US Commercial Space Launch Competitiveness Act including the Title IV dedicated to space resource exploration and utilization.⁴¹ The long-term economic potential of outer space encouraged Luxembourg and the United Arab Emirates to create attractive business environment for private investors engaged in space activities and space mining in particular. In 2017, Luxembourg passed Law on Exploration and Use of Space Resources,⁴² and in 2020, the United Arab Emirates adopted Federal Law No. 12 on the Regulation of the Space Sector including provisions dealing with extraction, exploitation and utilization of Space Resources.⁴³

The U.S, UEA's and Luxembourg's domestic laws explicitly acknowledge that space resources are capable of being appropriated. Recognition of property rights to space resources, at least at the national level, can be an important milestone in developing space economy. Once property rights are recognized, space resources brought back to Earth can be traded and what is more, property rights can be legally protected and enforced on the respective national level. Space mining operations would be consequently protected against an inference of operators having the same nationality. In other words, adoption of domestic space mining law has potential to significantly mitigate investment risks associated with extraterrestrial mining.

However, personal jurisdiction and quasi-territorial jurisdiction are the only jurisdictions states can exercise in outer space and national law has, *thus*, only a limited effect. As a consequence, number of investment risks remain to be unaddressed, particularly risks of harmful interference cause by other operators carrying out their mining activities in the same area under the conditions set forth by other states *via* their domestic law (risk of incompatibility of domestic laws),⁴⁴ risk of non-recognition of property rights by other states preventing exploited space resources from entering international market.

However, the lack of explicit recognition of legal rights at the international level is not the only obstacle to be addressed. Pursuant to Art I of the OST, *the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.*⁴⁵ If national space law does not implement the common benefit clause, it may be challenged by other actors/states due to its incompatibility with the Outer Space Treaty.

In this context, it is worth noting that none of the abovementioned space mining related national laws (USA, Luxembourg, U.E.A.) implement the OST's common benefits clause and does not impose any legal obligations on commercial companies in this regard. Hence, it is questionable whether the future authorized activities will be considered as being compatible with

⁴¹ Frans G Von Der Dunk, 'Asteroid Mining : International and National Legal Aspects' (2018) 26 Michigan State International Law Review 83 <<https://digitalcommons.law.msu.edu/ilr/vol26/iss1/3>>; Fabio Tronchetti, 'Title IV – Space Resource Exploration and Utilization of the US Commercial Space Launch Competitiveness Act: A Legal and Political Assessment' (2016) 41 Air and Space Law 143.

⁴² Philip De Man, 'Luxembourg Law on Space Resources Rests on Contentious Relationship With International Framework' 1 <http://www.spaceresources.public.lu/content/dam/spaceresources/press-release/2016/2016_11_11PressReleaseNewSpacelaw.pdf>.

⁴³ United Arab Emirates, Federal Law No. 12 on the Regulation of the Space Sector 2019.

⁴⁴ Atsushi;Fujii, Kojiro;Ishido, Shimpei Mizushima, 'What Is an Appropriate Interaction Between International Law and Domestic Legal Systems to Promote Space Resources Development?' (2017) 42 Air and Space Law 543, 551–552.

⁴⁵ The Moon Agreement (n 23) Article 11.

international space law. These concerns have been explicitly and frequently questioned by various delegations at the UN COPUOS⁴⁶ as well as legal scholars.⁴⁷ The point has been often raised that only a multilateral approach to addressing issues of space mining could ensure that states adhered to the principle of equality of access to space, and that the benefits of the exploration and use of outer space were enjoyed by all humanity. It is worth noting that some delegations argued that resolving a legal aspect of space resources based on the principle of ‘first come, first served’ was not desirable or compatible with the principles of equality of access to space and allocating its resources to all humanity.⁴⁸

In conclusion, national space mining law is undoubtedly an important step toward developing the space economy. An adoption of domestic law may significantly address and mitigate number of risks associated with the extra-terrestrial under the Outer Space Treaty regime. However, lack of state’s territorial sovereignty due to *the non-appropriation principle* (and beyond national jurisdiction character of outer space) prevents domestic law from creating stable regulatory environment in outer space. In addition, national space mining legislation based on the interpretation of international law which is not accepted/acknowledged by the rest of the international society may undermine mining company’s reputation, international tradability of its products and may be even translated into financial sanctions or boycotts of such company as well as its home state. In this regard, we argue, that national laws will not have incentive effect towards critical investments into space mining until the international consensus related to the common benefit clause is reached.⁴⁹

Lack of legal framework: A risk or an opportunity

Space mining is considered as a massive economic opportunity – what some are referring to as the next gold rush.⁵⁰ Such narrative resonates especially among the U.S. companies trying to initiate a space mining industry.⁵¹ For instance, Chris Lewicki, president and CEO of Planetary Resources said: *"I would love to be the first gold miner in Sutter's Mill [in California] and in the Yukon [in Canada], where gold mining [consisted of] walking up the street and picking up*

⁴⁶ ‘Report of the UN COPUOS Legal Subcommittee on Its Fifty-Fifth Session (4- 15 April 2016) UN Doc A/AC.105/1113’; ‘Report of the Committee on the Peaceful Uses of Outer SpaceSixty-Second Session (12–21 June 2019) UN Doc A/74/20’ (n 37).

⁴⁷ Stephan Hobe and Philip de Man, ‘The National Appropriation of Outer Space and Its Resources’, Presented on 27 March 2017 at the IISL/ECSL Symposium on “Legal Models for Exploration, Exploitation and Utilization of Space Resources 50 Years after the Adoption of the Outer Space Treaty” <<http://www.unoosa.org/documents/pdf/copuos/lsc/2017/symp-08.pdf>> accessed 1 September 2019; José Monserrat Filho, ‘Developing Countries and the Exploitation of Space Resources’, Presented on 27 March 2017 at the IISL/ECSL Symposium on “Legal Models for Exploration, Exploitation and Utilization of Space Resources 50 Years after the Adoption of the Outer Space Treaty” <<http://www.unoosa.org/documents/pdf/copuos/lsc/2017/symp-07.pdf>> accessed 1 September 2019.

⁴⁸ ‘Report of the UN COPUOS Legal Subcommittee on Its Fifty-Fifth Session (4- 15 April 2016) UN Doc A/AC.105/1113’ (n 46).

⁴⁹ Svec, Bohacek and Schmidt (n 35).

⁵⁰ Calla Cofield, ‘Extraterrestrial Gold Rush: What’s Next for the Space Mining Industry?’ (www.space.com, 2016).

⁵¹ Atossa Araxia Abrahamian, ‘How the Asteroid-Mining Bubble Burst’ (www.technologyreview.com, 2019) <<https://www.technologyreview.com/2019/06/26/134510/asteroid-mining-bubble-burst-history/>> accessed 25 July 2020.

*the shiny things. And what people don't realize is that space resources will, in a sense, start from a base that is very similar to that.*⁵²

The California Gold Rush begun at the end of the Mexican War in 1848 when California experienced a complete disintegration of its government, law and social order. What is more, there were no institutions to enforce the laws, there were no laws governing property rights in mineral lands.⁵³ In 1848, during the first year of the gold rush, the region remained a commons and there was no need to address private property rights. As McDowell explains, the first miners, mostly soldiers and sailors, grabbed what they could and moved on without staying anywhere long enough to form a community that could devise and enforce property rights.⁵⁴ However, it is worth noting that even early American miners soon found appropriate to create, codify and enforce a new system of property rights.⁵⁵

Due to the low capital costs, the first miners in California could undertake the risk associated with the lack of regulation in place. In fact, the lack of regulation was perceived as an opportunity. However, when substantial capital expenditures are required, typical for mining operations in the areas beyond national jurisdiction, investment risk associated with the lack of regulation increases.

It may be useful to learn a lesson from the historical experience of non-governmental entities seeking to commence mining operations in the areas beyond national jurisdiction in 1970s. The only source of law available at that time, was the Convention on the High Seas and the Convention on Fishing and Conservation of Living Resources of the High Seas. None of them addressed the legal status of natural resources of the deep seabed. An international regime governing their exploration and exploitation was only discussed in the international fora – The Third United Nations Law of the Sea Conference. Although it was possible to claim that the mining of the seabed beyond the limits of national jurisdiction may proceed as a freedom of the high seas under international law and natural resources deep seabed could be validly perceived as *res nullius*,⁵⁶ several major companies committed substantial investment capital on the assumption that a stable legal framework for deep seabed mining would be available to protect their interests when needed, instead of commencing the exploration and exploitation without any regulation in place. However, a slow pace of the international deliberations did not result in the establishment of an international legal framework and led the mining industry to press for alternative means. Deepsea Ventures, Inc., a mining company, filed a notice of discovery and claim of exclusive mining rights in relation to a deposit of seabed manganese nodules in the specified area in the Pacific Ocean, and requested for diplomatic protection and protection of investment.⁵⁷ The company requested states, persons and all other commercial entities to respect the exclusive rights asserted. Copies of the letter were filed with the

⁵² Cofield (n 50).

⁵³ Andrea McDowell, 'From Commons to Claims: Property Rights in the California Gold Rush' (2002) 14 Yale Journal of Law & the Humanities 1.

⁵⁴ *ibid.*

⁵⁵ *ibid.*

⁵⁶ It is worth noting that this was the position of the U.S. expressed in response to the notice of discovery and claim of exclusive mining rights, and request for diplomatic protection and protection of investment filed on November 15, 1974 by a mining company Deepsea Ventures, Inc. See 'Deepsea Ventures, INC.: Notice of Discovery and Claim of Exclusive Mining Rights, and Request for Diplomatic Protection and Protection of Investment' (1975) 14 International Legal Materials 51 <<https://www.jstor.org/stable/20691374%0A>>.

⁵⁷ *ibid.*

embassies of 12 nations.⁵⁸ No government recognized their claim, however, the request does represent an inspiring attempt not only to bypass the lack of an international legal framework in the area where no state may validly purport to subject any part of such area to its sovereignty, but to address investment risks associated with mining in the areas beyond national jurisdiction. Since no recognized central authority existed to grant or register claims to exclusive rights on the deep seabed, Steven J. Burton argues that the Deepsea Ventures' claim was an understandable response to an uncertain situation.⁵⁹

In conclusion, while the utilization of natural resources within national jurisdiction is by many considered to be often overregulated and states' sovereignty (regulation) is viewed as a source of risk, utilization of natural resources in the areas beyond national jurisdiction suffers from an opposite problem - an inadequate regulation.

The authors argue that it is doubtful whether the current OST regime accompanied by national space mining law can effectively provide private investors with (A) broadly recognized property rights to space resources, (B) clear conditions under which natural resources may be explored and exploited and (C) legal protection and enforceability of their rights.

Commercial space mining projects

Although space mining remains an industry that is not yet economical,⁶⁰ new technologies as well as new opportunities (the U.S. program Artemis aimed at achieving a sustainable and robust presence on the Moon announced in 2019, the Executive Order on Encouraging International Support for the Recovery and Use of Space Resources released on 6 April 2020 acknowledging that successful long-term exploration and scientific discovery of the Moon, Mars, and other celestial bodies will require partnership with commercial entities to recover and use resources, including water and certain minerals, in outer space) are expected to make space mining increasingly attractive in the upcoming decade.

Plans to utilize space resources announced by the pioneers of space mining – the US companies – Planetary Resources,⁶¹ Deep Space Industries⁶² and Moon Express⁶³ have not yet been materialized. Although Planetary Resources carried out several successful flight tests of asteroid prospecting technologies it failed to close a funding round, experienced financial difficulties and was finally acquired by ConsenSys, Inc.⁶⁴ Deep Space Industries (referred to also as “DSI”) originally sought to develop technologies for prospecting and eventually

⁵⁸ Steven J Burton, ‘Freedom of the Seas: International Law Applicable to Deep Seabed Mining Claims’ (1977) 29 *Stanford Law Review*, 1141 <<https://www.jstor.org/stable/1228080>>.

⁵⁹ *ibid.*

⁶⁰ Anderson, Christensen and Lamanna (n 13) 9.

⁶¹ Planetary resources announced their plans in 2012. See Dave Thier, ‘It’s Official: Planetary Resources Announces Plans to Mine Asteroids’ (www.forbes.com/, 2012).

⁶² Deep Space Industries unveiled its program of asteroid reconnaissance, exploration and utilization in 2013. See Rod Pyle, ‘Deep Space Industries: A New Asteroid-Mining Company Is Born’ (www.space.com, 2013) <<https://www.space.com/19462-asteroid-mining-deep-space-industries-birth.html>> accessed 25 July 2020.

⁶³ Loren Grush, ‘To Mine the Moon, Private Company Moon Express Plans to Build a Fleet of Robotic Landers’ (www.theverge.com, 2017) <<https://www.theverge.com/2017/7/12/15958164/moon-express-robot-landers-private-mining-outpost>> accessed 25 July 2020.

⁶⁴ Jeff Foust, ‘Asteroid Mining Company Planetary Resources Acquired by Blockchain Firm’ (www.space.com, 2018) <<https://www.space.com/42324-asteroid-mining-company-planetary-resources-acquired.html>> accessed 25 July 2020.

extracting space resources, such as water ice, from asteroids,⁶⁵ however, recently DSI pivoted towards smallsats, including the production of a propulsion system.⁶⁶ In 2019, DSI was acquired by Bradford Space.⁶⁷ Moon Express won \$1 million in an X-Prize competition for being the first company to present and test a lunar lander spacecraft and became the first company to receive U.S. government approval to send a robotic spacecraft beyond traditional Earth orbit and to the Moon.⁶⁸ Moon Express appears to be the only pioneer company still seeking to recover space resources and its mission the Harvest Moon expedition including the first commercial sample return mission, expected to begin the business phase of lunar resource prospecting, is scheduled for 2020.⁶⁹

iSpace is the first privately Japanese led mission to land on the Moon. Its current plans include three missions. The first mission (scheduled for 2021) will perform a soft landing on the Moon, the second mission (scheduled for 2023) will perform a soft landing and deploy a rover for surface exploration and data collection on the Moon, and since the third mission rovers will be deployed to the lunar surface to pioneer the discovery and development of lunar resources, enabling the steady development of lunar industry and human presence on the Moon.⁷⁰

Extraterrestrial commercial mining companies assess investment risks just as any other commercial company. Testimony of Peter Marquez, vice president for global engagement Planetary Resources, before the U.S. Senate Subcommittee on Space, Science, and Competitiveness in 2017 revealed how is stability and predictability in both domestic and international legal landscapes important for entrepreneurs seeking to commence utilization of space resources. Although he appreciated that the 2015 Commercial Space Launch and Competitiveness Act recognized the legal right to own resources extracted from asteroids, he underlined that consistent interpretation and application of the Outer Space Treaty is equally important. In other words, only effective domestic legislation that can be responsive to technological advancements coupled with a stable international legal regime agreed to by all global players (the OST's enabling framework for space resource utilization is the most crucial) may allow commercial actors to effectively prosper. Against the background of discussions in the international community about how to interpret and apply the Outer Space Treaty, he encouraged the U.S. to be actively engaged in the international community in order to find common direction on the interpretation of the Treaty in a manner that promotes innovative, ground-breaking commercial space activities.⁷¹

It is unlikely that private investors seeking to harvest space resources will chose as a place to be incorporated or registered countries being contracting parties to the Moon Agreement. As

⁶⁵ Pyle (n 62).

⁶⁶ Foust (n 64).

⁶⁷ Jeff Foust, 'Deep Space Industries Acquired by Bradford Space' (www.space.com, 2019) <<https://www.space.com/42906-deep-space-industries-acquired-by-bradford-space.html>> accessed 25 July 2020.

⁶⁸ 'US Startup Moon Express Approved to Make 2017 Lunar Mission' (www.theguardian.com, 2016) <<https://www.theguardian.com/science/2016/aug/03/us-startup-moon-express-2017-lunar-mission>> accessed 25 July 2020.

⁶⁹ 'Moon Express - Our Mission' (www.moonexpress.com).

⁷⁰ 'iSpace - Project' (www.ispace-inc.com) <<https://ispace-inc.com/project/>> accessed 25 July 2020.

⁷¹ AND COMPETITIVENESS THE US SENATE SUBCOMMITTEE ON SPACE, SCIENCE, 'TESTIMONY OF PETER MARQUEZ VICE PRESIDENT FOR GLOBAL ENGAGEMENT PLANETARY RESOURCES BEFORE THE SENATE SUBCOMMITTEE ON SPACE, SCIENCE, AND COMPETITIVENESS' (2017) <<https://www.commerce.senate.gov/services/files/FA24AE95-91CB-4D6D-A54C-57544B6DAB21>>.

we already explained, until a comprehensive international legal framework based on the principles enshrined in the Moon Agreement⁷² is established, space mining would constitute a violation of the Moon Agreement. Therefore, the companies that announced their plans to commence commercial mining operations have chosen as a place to be incorporated or registered countries that are not bound by the Moon Agreement and who adopted domestic space mining laws. However, as examples of Planetary Resources or DSI revealed, even the combination of the regime under the OST and domestic space mining law is far from being perfect. Only an agreement among all global players on the interpretation of the OST accompanied by domestic space mining law seems to have potential to establish an environment in which entrepreneurs can flourish.

SLO for Investment Risk Mitigation in Space Mining

Previous chapters revealed that, under the OST regime, natural resources in outer space are *res nullius* and can be utilized. However, no significant investments have been made and no mining projects have been commenced yet, because investment risks associated with space mining are too high. The authors have identified the key risks discouraging commercial entities from making significant investments into the utilization of space resources, particularly (A) broadly recognized property rights to space resources, (B) clear conditions under which natural resources may be explored and exploited and (C) legal protection and enforceability of rights. Unfortunately, neither the Outer Space Treaty, nor national space laws effectively address these risks.

Building on the experience with terrestrial mining operations within national jurisdiction and concepts designed to mitigate social risk, the authors believe that states are not the only actors who can respond to legal uncertainty. To address both inadequate regulatory framework and lack of legitimacy,⁷³ terrestrial extractive industries developed a so-called Social License to Operate (SLO). The authors of this chapter view the SLO concept as highly applicable for mitigating investment risks in space resource utilization (SRU). In this part, we firstly review the basic characteristics of SLO before describing its relevance and possible uses for SRU.

1. Terrestrial experience with SLO: Key Characteristics

SLO emerged as a term in the mid-1990s in order to respond to social risks.⁷⁴ Experience of actors engaged in the energy sector revealed that obtaining a formal license to operate from the

⁷² In particular, the orderly and safe development of the natural resources of the moon; the rational management of those resources; the expansion of opportunities in the use of those resources; an equitable sharing by all state parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration. See the Moon Agreement (n 23) Article 11.

⁷³ Especially in developing countries, we can see governments failing to sufficiently regulate new areas in need of governance and thus failing to manage rival interests between commercial entities and local stakeholders or citizens.

⁷⁴ Kieren Moffat and Airong Zhang, 'The Paths to Social Licence to Operate: An Integrative Model Explaining Community Acceptance of Mining' (2014) 39 Resources Policy 61-62. See also Jędrzej Górski and Christine Trenorden, 'Regulatory Framework on Environmental Impacts and Community Acceptance of Shale Gas' (24 May 2018) ShaleXenvironment Horizon 2020 project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D.11.1, sec 2.3 at 31-33; Jędrzej Górski and Christine Trenorden, 'Social License to Operate (SLO) in the Shale Sector: A Contextual Study of the European Union' (28 May 2019) OGEL 1-121.

government and meeting regulatory requirements have become no longer adequate. Socio-political opposition to mining has become more common in developed, emerging and developing economies.⁷⁵ Mining companies are now often exposed to delays, interruption or even shutdowns of mining operations initiated by public opposition.⁷⁶ From the industry's perspective, SLO has become a response to those risks, an instrument to avoid costly conflicts with affected communities that claim some rights to the territory with valuable resources.⁷⁷ Thus, an acceptance and approval by local /affected community in the form of SLO has become an essential instrument to ensure long-term profitability of investments in the sectors with high visible business activities, long time horizons and high exposure to global markets.⁷⁸

While the SLO concept continues to lack a clear and widely accepted universal definition, we can identify some of the most apparent characteristics and principles. It is traditionally understood as an intangible, impermanent indicator of ongoing acceptance of company's activities by communities.⁷⁹ As such, a social license to operate in mining has been widely and quickly adopted by a broad range of mining industry stakeholders.⁸⁰ Besides the industry, the SLO has also been employed by the civil society to reach their own individual goals.

Thomson and Boutilier describe the SLO as an ongoing process of acceptance and approval based on a relationship between the community and the industry.⁸¹ This relationship ought to be built on legitimacy, credibility and trust. To achieve this, the industry uses structural, relational and cognitive devices to create a degree of practical, psychological and communicative interconnectedness with the specific community, which allows for gradual and consecutive development of legitimacy, credibility and later trust towards the industry. However, all these questions are dependent on the definition of the community. This also varies and SLO can include the community or people directly affected due to their location,⁸² a

⁷⁵ RG Boutilier, LD Black and I Thomson, 'From Metaphor to Management Tool: How the Social License to Operate Can Stabilise the Socio-Political Environment for Business.' [2012] International Mine Management 2012 Proceedings 227.

⁷⁶ Moffat and Zhang (n 74).

⁷⁷ *ibid.*

⁷⁸ Melanie (Lain) Dare, Jacki Schirmer and Frank Vanclay, 'Community Engagement and Social Licence to Operate' (2014) 32 Impact Assessment and Project Appraisal 188.

⁷⁹ RG Boutilier, 'Frequently asked questions about the social licence to operate' (2014) 32 Impact Assessment and Project Appraisal 264.

⁸⁰ Rachel Kelly, Gretta T Pecl and Aysha Fleming, 'Social Licence in the Marine Sector: A Review of Understanding and Application' (2017) 81 Marine Policy 21, 68 <<http://dx.doi.org/10.1016/j.marpol.2017.03.005>>.

⁸¹ Ian Thomson and Robert Boutilier, 'The Social License to Operate', *SME Mining Engineering Handbook* (Society of Metallurgy and Exploration 2011).

⁸² Kieren Moffat and others, 'The Social Licence to Operate: A Critical Review' (2016) 89 Forestry 477.

broader civil society⁸³ or even extend beyond mere local dimensions and include a variety of social licences from different communities⁸⁴ or a multinational community.⁸⁵

SLO adopted in the context of mining operations, has its roots in the principles of public international law; mainly the right of peoples and nations to permanent sovereignty over natural resources (PSNR) located within their territories,⁸⁶ and the right of indigenous people to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired.⁸⁷ PSNR requires natural wealth and resources to be exercised in the interest of national development and of the well-being of the people of the state concerned.⁸⁸ However, SLO is most often understood and used as a tool addressing a lack of legitimacy, rather than legal claims.

The paradigm of governance beyond government and a growing empowerment of civil society, have been gradually translated into communities around the world increasingly demanding more involvement in decision-making for local mining projects, a greater share of benefits and assurances that mineral development will be conducted safely and responsibly.⁸⁹ In this context, SLO often serves as an instrument ensuring that mining operations are perceived as beneficial even by local communities.⁹⁰

Overall, SLO can effectively address a situation when the legal framework in place does not provide reliable business environment, especially when the regulation and conditions imposed by domestic law are perceived as insufficient and commercial activities as illegitimate by an affected community. Definition of what counts as the affected community varies in the type of effect (direct or indirect) as well as geography (local, national, transnational). A better definition of an SLO community is one based on the main purpose of the SLO from the industrial perspective – a community effectively threatening a long-term sustainability of the investment.

Whether SLO can mitigate risks associated with extraterrestrial mining, a community opposing commercial activities and effectively threatening a long-term sustainability of the investment must be identified. Since SLO is not a one-and-off ad-hoc agreement but a continuous acceptance of extracts actions based on a complex relationship based on legitimacy, credibility and trust, it is necessary cautiously analyze actors' motivation. The most challenging

⁸³ Thomson and Boutilier (n 81); Jason Prno and D Scott Slocombe, 'Exploring the Origins of "social License to Operate" in the Mining Sector: Perspectives from Governance and Sustainability Theories' (2012) 37 Resources Policy 346.

⁸⁴ Dare, Schirmer and Vanclay (n 78).

⁸⁵ The Shell Brent Spar incident is cited as an example of a multinational SLO community. See *ibid.*

⁸⁶ UN General Assembly Resolution 1803 (VII) of 18 December 1962.

⁸⁷ UN General Assembly Resolution 61/295 of 13 September 2007.

⁸⁸ UN General Assembly Resolution 1803 (VII) of 18 December 1962.

⁸⁹ Dr Michelle Voyer and Dr Judith van Leeuwen, "'Social License to Operate" in the Blue Economy' (2019) 62 Resources Policy 102, 102 <<https://doi.org/10.1016/j.resourpol.2019.02.020>>; Prno and Scott Slocombe (n 83); Coco CA Smits, Judith van Leeuwen and Jan PM van Tatenhove, 'Oil and Gas Development in Greenland: A Social License to Operate, Trust and Legitimacy in Environmental Governance' (2017) 53 Resources Policy 109, 109 <<http://dx.doi.org/10.1016/j.resourpol.2017.06.004>>.

⁹⁰ Prno and Scott Slocombe (n 83) 348.

component of SLO is relationship-building between the community and industry, which largely depends on finding an overlap between different motivations of the actors.

2. *Space mining SLO: Extractive industry vs. international community*

In general, we can identify two criteria usually applied for an identification of the community for the purposes of SLOs. Firstly, SLO is gained from the community directly and indirectly impacted by the utilization of natural resources and/or claims some rights to the natural resources or the land where they are located.⁹¹ Secondly, the SLO is gained from the community that poses social risk and is capable to inflict additional costs, disrupt operations or delegitimize mining and extraction activities.⁹²

At the first glance, the physical separation of space resources from anything that might be construed as a local/affected community may put the applicability of SLO to the utilization of space resources into doubts. However, the combination of legal and practical aspects points out that the community capable of granting a SLO and to address uncertainties surrounding the utilization of space resources is the international community consisting of all countries.

The most realistic and explored forms of space mining are focused on oxygen in the Lunar regolith and water in permanently frozen regions of the Moon's poles.⁹³ From a practical point of view, such extractive operations would eject large amounts of lunar dust into the microgravity environment.⁹⁴ Lunar operations would not only affect the very surrounding of the lunar mining field but will likely affect parallel lunar activities and astronauts' safety all over the Moon.⁹⁵ In this context it is worthy to recall the UN COPUOS' efforts to promote the long-term sustainability of outer space activities, aimed particularly at keeping outer space free for exploration and use by all states without discrimination of any kind, on a basis of equality, keeping free access to all areas of celestial bodies.⁹⁶ There is a broad consensus that outer space should remain an operationally stable and safe environment that is maintained for peaceful purposes and open for exploration, use and international cooperation.⁹⁷ The authors believe

⁹¹ Thomson and Boutilier (n 81); Grant Jordan, *Shell, Greenpeace and the Brent Spar* (Springer 2001); Moffat and others (n 82); Dare, Schirmer and Vanclay (n 78).

⁹² John R Owen, 'Social License and the Fear of Mineras Interruptus' (2016) 77 *Geoforum* 102; Rachel Davis and Daniel Franks, 'Costs of Company-Community Conflict in the Extractive Sector' (2014); John R Owen and Deanna Kemp, 'Social Licence and Mining: A Critical Perspective' (2013) 38 *Resources Policy* 29 <<http://dx.doi.org/10.1016/j.resourpol.2012.06.016>>; Jason Prno, 'An Analysis of Factors Leading to the Establishment of a Social Licence to Operate in the Mining Industry' (2013) 38 *Resources Policy* 577 <<http://dx.doi.org/10.1016/j.resourpol.2013.09.010>>.

⁹³ Lukas Schlüter and Aidan Cowley, 'Review of Techniques for In-Situ Oxygen Extraction on the Moon' (2020) 181 *Planetary and Space Science*.

⁹⁴ Christopher Immer and others, 'Apollo 12 Lunar Module Exhaust Plume Impingement on Lunar Surveyor III' (2011) 211 *Icarus* 1089.

⁹⁵ Rachel Caston and others, 'Assessing Toxicity and Nuclear and Mitochondrial DNA Damage Caused by Exposure of Mammalian Cells to Lunar Regolith Simulants' (2018) 2 *GeoHealth* 139.

⁹⁶ 'The Guidelines for the Long-Term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space. Report of the Committee on the Peaceful Uses of Outer Space (20 August 2019) UN Doc A/74/20 Para 163 and Annex II.' <http://www.unoosa.org/oosa/en/oosadoc/data/documents/2019/a/a7420_0.html>.

⁹⁷ *ibid.*

that for the purposes of the application of SLO, all countries may be identified as a community whose interests are to be affected by SRU.

While the permanent sovereignty over natural resources within national jurisdictions can be claimed by nations or indigenous people, space resources are *res nullius* and can be owned by any person. However, the OST is very explicit about how these resources shall be developed - *for the benefit and in the interest of all countries*.⁹⁸ In other words, no community can claim an exclusive ownership over space resources, but they can invoke *the common benefit clause* and claim benefits.⁹⁹

In order to identify the community that poses social risk and is capable to inflict additional costs, disrupt operations or delegitimize mining and extraction activities, special nature of space operations should be taken into consideration. Mining operations are reliant on extremely sensitive space instruments being easily disrupted in the space environment. These risks are mostly associated with severe safety risks and a lack of any regulation limiting further space resources development.¹⁰⁰ For instance, low gravity, lack of atmosphere, fine-grained regolith and static-charged particles create an environment in which a simple proximity landing of another spacecraft could have detrimental disruptive effects to the operations. These disruptions can be caused technically by both governmental entities and even non-state actors and both of these actors may be identified as a community for the purposes of SLO.

Nonetheless, even disruptive activities carried out by non-state actors may be prevented by states since they are required to assure that national activities are pursued in conformity with the OST.¹⁰¹ According to the OST, states bear the legal responsibility for space actions of entities whom they have personal or quasi-territorial jurisdiction over. In that sense, states recognizing legality and legitimacy of space mining operations can effectively prevent their nationals from physically disrupting extractive operations and causing additional costs.

Further, nation states can also cause additional legal costs and delegitimize operations by legal actions arguing unlawfulness of space resource activities. Governments are likely to claim violation of the non-appropriation principle and the common benefit clause. These disputes may include disputes between the country being responsible for the respective space activities (because states are required to authorize and supervise any space activities carried out by their nationals) and the rest of the international community. We can also imagine boycotts or financial sanctions against space mining companies that are allegedly ill-compliant with international space law or even countries authorizing such space activities. Thus, all states should be the ones from whom the investors should seek to gain SLO to prevent disruptions by nation states themselves but also prevent disruptions by non-state actors.¹⁰²

Our analysis of criteria usually applied for an identification of the community for the purposes of SLOs reveals that all states are equally impacted by the utilization of natural resources and

⁹⁸ Outer Space Treaty (n 30) art I.

⁹⁹ Svec, Bohacek and Schmidt (n 35).

¹⁰⁰ Ram S Jakhu and Joseph N Pelton, 'Regulation of Safety of Space Mining and Its Implications for Space Safety (2016) 3 Journal of Space Safety Engineering 67.

¹⁰¹ Outer Space Treaty (n 30) art VI.

¹⁰² Svec, Bohacek and Schmidt (n 35).

the common benefit clause allows them to claim the benefits derived from the exploitation of space resources. Moreover, all states pose both direct and indirect tools capable to inflict additional costs, disrupt operations or delegitimize mining and extraction activities.

One may argue that negotiations with all countries would be too lengthy, complicated and outright impossible. However, even companies seeking to utilize terrestrial natural resources are confronted with a coalition of interest groups endeavoring to convince both national and global audience that the mining license should not be granted. An interesting example to be mentioned is an attempt of Nautilus Minerals Ltd, a corporation seeking to obtain the deep-sea bed mining license.¹⁰³ When it wished to claim ownership of a social license to operate the world's first deep sea mine, it had to deal with a complex network of 'civil society' actors who were thoroughly opposed to the project.¹⁰⁴ However, the company lacked a local community from which it could claim to have obtained a social license, because there was neither a community of 'project area landowners', nor a 'mine-affected' community in the conventional sense of that term. Therefore, an artificial community – the “costal area of benefit” – was created.¹⁰⁵

Building on the SLO-concept flexibility, the United Nations appears to be a possible artificial community representing all countries. The UN Charter defines the UN as a center for harmonizing the actions of nations in the attainment of common goals and achieving international co-operation in solving international problems.¹⁰⁶ In this context, the authors of this chapter believe that private investors seeking to commence space resource activities, may approach states directly, as Deepsea Ventures, Inc., did,¹⁰⁷ or approach the UN as an artificial community representing all countries.¹⁰⁸

3. *Finding common interests in space mining*

SLO aims at managing the interests of the two sides outside of the existing governance frameworks. Specifically, SLO aims at making the mining operations both profitable for investors and beneficial for affected communities. Therefore, securing the SLO implies a cautious balancing of the interests of those communities and the interests of the mining companies through distributing a fair share of the benefits from mining projects.¹⁰⁹ According to Boutilier, mining companies should make sure that the disproportionate costs of mining borne by affected communities are reduced and balanced with meaningful benefits (not

¹⁰³ Colin Filer and Jennifer Gabriel, 'How Could Nautilus Minerals Get a Social Licence to Operate the World's First Deep Sea Mine?' (2018) 95 *Marine Policy* 394 <<https://doi.org/10.1016/j.marpol.2016.12.001>>.

¹⁰⁴ *ibid* 395.

¹⁰⁵ *ibid* 398.

¹⁰⁶ Charter of the United Nations (adopted 26 June 1945, entered into force 24 October 1945) 1 UNTS XVI (UN Charter).

¹⁰⁷ 'Deepsea Ventures, INC.: Notice of Discovery and Claim of Exclusive Mining Rights, and Request for Diplomatic Protection and Protection of Investment' (n 56).

¹⁰⁸ Svec, Bohacek and Schmidt (n 35).

¹⁰⁹ UNDP and UN Environment, *Managing Mining for Sustainable Development: A Sourcebook* (2018) <https://www.undp.org/content/dam/undp/library/Sustainable_Development/Extractives/UNDP-MMFSD-LowResolution.pdf>; Emma Wilson, 'What Is Benefit Sharing? Respecting Indigenous Rights and Addressing Inequities in Arctic Resource Projects'.

necessarily financial).¹¹⁰ In other words, unless the stakeholders believe they will receive some meaningful benefits from a project, they are unlikely to grant it a social license.¹¹¹

Most of what mining gives back to society is given in the form of tax revenue.¹¹² However, if no local tax credit schemes ensure that more of the benefits of mining stay in the community, affected communities often view the disproportionate costs of mining borne by them as not being adequately reduced and balanced. Needless to say, that financial compensation frequently cannot make up for the extraction burdens. Therefore, mining companies use community and local infrastructure investment funds, local procurement and hiring, partnerships with community, social and environmental groups, collaboration with local business and industry groups, in order to help ensure that stakeholders' daily cost/benefit calculations are positive.¹¹³

There are legal, practical and technological considerations for the discussion about the parameters for finding common benefits. Firstly, for legal and practical reasons, SLO for space mining needs to originate from the balance of interest between an extractive entity and the international community of nation states. This may lead to a provocative question, of whether we should prioritize achieving the interest of each and every country or focus on truly global challenges and view all countries as an international community, as a mankind. In this context, it is worthy to recall Art. I of the OST declaring the exploration and use of outer space to be *the province of all mankind*.¹¹⁴ We are of the opinion that instead of putting together individual interests of single countries, it might be more effective to define an interest that represents all countries together, something that would qualify as a global interest. Such community-wide interests cannot be determined by an outside authority but by the community itself in relation to other stakeholders, the extractive industry. This can be effectively addressed by the SLO as a concept based on an ongoing relationship or more precisely based on an ongoing relationship between the community and the industry. So instead of subjectively discussing what should be the ad-hoc global shared objectives and goals to which the extractive industry should contribute to obtain the SLO, it is the relationship which continuously defines the criteria upon which the community awards a SLO to the industry.¹¹⁵

Secondly, we can think of various formats of how space resources are utilized in the benefits and interests of all countries. However, space resources have never been utilized so far and the use of outer space is very much dependent on the development of technologies. This can make the determination of both the interests and the benefits particularly difficult and formats of their satisfaction by SRU very fluid. In this context, SLO as an ongoing approval and acceptances can be particularly helpful since it can reflect dynamic nature of the development of space activities. Both the interests and needs are likely to change over time and new technologies,

¹¹⁰ Boutilier, Black and Thomson (n 75).

¹¹¹ World Bank and International Finance Corporation, 'Large Mines and Local Communities: Forging Partnerships, Building Sustainability' <<http://siteresources.worldbank.org/INTOGMC/Resources/largemineslocalcommunities.pdf>>; Boutilier, Black and Thomson (n 75) 236.

¹¹² World Bank and International Finance Corporation (n 111) 2.

¹¹³ Boutilier, Black and Thomson (n 75) 236; World Bank and International Finance Corporation (n 111) 3.

¹¹⁴ Outer Space Treaty (n 30) art I.

¹¹⁵ Svec, Bohacek and Schmidt (n 35).

growth in supply chains and developments in the whole cislunar economy will continue to change the quality and quantity of valuables derived from space resources.

Only through a strong community engagement, dialogue and a transparent relationship between investors and affected stakeholders a fair share of benefits can be defined.¹¹⁶ There are essentially two forms of community engagement, according to Melanie Darea, Jacki Schirmer and Frank Vanclay, operational and strategic. While operational engagement is related to the particular mining operation and its day-to-day direct impact, strategic engagement is linked to long-term indirect impacts, which need to be influenced by the affected communities to grant a social license to operate.¹¹⁷ With regard to the utilization of space resources, the community engagement should be a key pillar in both operational and strategic sense.

A critical requirement for operational and strategic relationship to be functional is transparency. This means that all countries need to be provided with SRU plans and impact assessments on both Earth and space environment. Operational engagement is likely to focus on transparent disclosure and information on of the negative impacts (space traffic congestion, increased dustiness in lunar microgravity, temporary access restrictions to extraction zones). An operational engagement as one of the parameters of the discussion can provide a full disclosure of impacts that derive from SRU. With the current limited technical knowledge of space mining impacts, we can predict that some of the issues could include increased levels of dust particles in the wider region of extractive operations, demand for orbital slots and frequencies, increased pressure on space traffic management from related orbital congestion and space debris and growing number of launches from the Earth.

Strategic engagement has the potential to outweigh these short-term negatives by enabling long-term solutions to this short - term issues and provide global benefits. Firstly, there is a scientific objective for humans to learn more about the composition of celestial bodies, origins of our Solar System and other aspects of space science. Secondly, there is a space settlement and space exploration dimension in providing critical resources for the establishment of a cislunar economy and overall off-Earth human presence. SRU can enable us to address issues of space debris but also understand the nature of lunar environment to deal with the risks of dust particles, cosmic radiation or micrometeors. Thirdly, it can serve as a security objective in terms of allow significantly better detection and analysis of potentially hazardous asteroids, contributing to our shared global security. Overall, the list of globally beneficial outcomes includes protection of satellite assets for understanding and addressing climate change, new capabilities for dealing with cosmic hazards (from Space Weather to Near Earth Objects) to unpredictable development of new technological solutions with spin-off uses outside of space.¹¹⁸

From strategic perspective, the negative impacts can include depletion of unique space resources. The process of balancing negative impacts with benefits for the community in operational and strategic domains should take into account global interests in long-term sustainability of outer space activities,¹¹⁹ but also to give individual actors an opportunity to

¹¹⁶ Dare, Schirmer and Vanclay (n 78).

¹¹⁷ *ibid.*

¹¹⁸ Svec, Bohacek and Schmidt (n 35).

¹¹⁹ The Guidelines for the Long-Term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space (n 95) para 163 and Annex II.

assess their own interests. For both operational and strategic engagements to be transparent, an independent verification and assessment would be needed.

The authors of this chapter see the UN, specifically the UN Committee on the Peaceful Uses of Outer Space with its Scientific and Technical Subcommittee and Legal Subcommittee, as ideal places for such engagements taking place. Detailed plans with impact assessments can be proposed during technical sessions, aided by the United Nations Office for Outer Space Affairs to make information, benefits and impacts digestible and understandable even to non-spacefaring nations.

The process of gaining legitimacy, credibility and then trust of the affected community, in our case the international community, can appear too complex or even impossible. However, widely practiced use of SLO by the terrestrial community is at least as complex, bringing together multinational corporate mining businesses with indigenous local communities with as different structural, relational and cognitive perceptions as possible. We believe that the SLO relationship building for space mining on the international level might be even easier. The shared social reality between nations state and space mining representatives will be likely larger on the UN grounds than between representatives of commercial companies and local communities. Existing international fora do represent a structure that can be employed to effectively engage the international community. Relationships between diplomatic representatives and more similar cognitive backgrounds at the issue-specific committees such as COPUOS make an engagement easier. Further, existing frameworks such as the OST or LTS Guidelines provide some level of shared norms upon which an alignment of operational and strategic interests can emerge. SLO in this set up can provide an informal agreement on the social level that fixes the legal gap in the international space law.

Conclusion

This chapter has revealed that lack of regulation and legal uncertainty surrounding the utilization of space resources constitute an investment risk, which discourages private investors. The regulation of areas beyond national jurisdiction may be effectively addressed by an international framework setting forth conditions under which natural resources can be utilized, ensuring that property rights to natural resources are recognized and providing for legal protection and enforceability, however, such international framework is unlikely to be adopted soon due to divergent views among governments.

The authors of this chapter identified two parallel regimes in place under which space resources can be utilized – the Moon Agreement regime and the Outer Space Treaty regime. The Moon Agreement declares space resources to be *common heritage of mankind* and conditions their utilization by the establishment of an international regime governing their utilization. Until such regime is established, space resource activities, carried out by either governments or non-state entities, cannot be considered compatible with the Moon Agreement. In contrast, the Outer Space Treaty regime considers space resources *res nullius* and their utilization is not conditioned by the establishment of any international regime. However, the OST regime suffers from various imperfections, such as the ambiguousness of the OST or the lack of rules governing practical aspects of space mining. While some of these imperfections, such as explicit recognition of property rights to natural resources, can be addressed by national space law, some issues cannot be bypassed unilaterally. Especially the OST's requirement that *the exploration and use of outer space, (...), shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind* can hardly be met by national space law. In conclusion, the OST

regime accompanied by national space law recognizing property rights to space resources does not appear to be attractive enough for private investors.

Private investors' concerns have been aptly expressed by Peter Marquez, vice president for global engagement Planetary Resources, before the U.S. Senate Subcommittee on Space, Science, and Competitiveness in 2017, asking the U.S. for being actively engaged in the international community in order to find common direction on the interpretation of the OST. An agreement among all states on the interpretation of the OST is essential for legal predictability and regulatory stability and can never be bypassed by national space law.

Terrestrial mining commercial companies often face a situation when the legal framework in place does not provide reliable business environment and their activities are perceived as illegitimate. Socio-political opposition to their project can cause additional costs or even disruptions of operations. Social Licence to Operate has been adopted by the extractive industry to fix these regulatory and legitimacy gaps. The authors therefore propose a conceptual move of the SLO from the terrestrial to extra-terrestrial, adopting investment risk mitigation approach based on an ongoing continuous relationship and engagement between affected communities and extractive industry from Earth mining to off-Earth mining.

First, bearing in mind the unique character of outer space, the authors argue that the international community qualifies as an affected community because it possesses the legal and technical tools to disrupt space mining operations and threaten investments. Second, SLO as a concept based on an active engagement and ongoing relationship is suitable for the ever-changing environment of space mining, characterized by the fluidity of space technology and interests of the members of the affected community. Third, the UN COPUOS appears to be an ideal platform for building the ongoing relationship between the extractive industry and the affected community, as it offers an environment with shared structural, relational and cognitive devices, which are critical for creating a degree of practical, psychological and communicative interconnectedness between the two sides.

In other words, the SLO can be used to avoid investment risks associated with extraterrestrial mining under the OST regime. A dialogue between all countries and the investors can ensure that the interests of all countries are determined and accordingly observed and that the space resources activities are *carried out for the benefits of all countries*. Community engagement may ensure that space mining operations are carried out in sustainable manner. Acceptance and recognition of space mining operations may ensure that property rights to natural resources claimed by commercial companies are not challenged.

The regime under the OST in combination with national space law and SLO may create a fluid environment in which not only entrepreneurs can flourish but also new norms and frameworks emerge. Legal certainty and stable socio-political environment achieved via SLO has potential to accelerate commercialization of space activities and unlock the great potential of outer space for humanity. Further, SLO can ensure that the exploration and use of outer space will be truly beneficial for all states and for the mankind, propelling humanity beyond earth-bound territoriality into a shared fate in the universe.