SPACE-CENTRIC CONCEPT TO ANSWER TOMORROW SPACE CHALLENGE: A SMALL STEP FOR FUTURE SPACE LAW

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Abstract

Space activities have shown significant progress since they begin in the late '50s. Under current development, the U.S. with Artemis program and Luxembourg with its space mining program will enhance their outer space involvement. Most of those programs will elevate private sector involvement. Furthermore, the future space program will mainly intersect with the space environment as the primary consideration. It remains high-risk activities that could have catastrophic results if not regulated immediately. However, the current existing space law began obsolete because it was composed more than 50 years ago and too geocentric by putting the earth as the primary protection area. Consequently, existing space law could not govern future space programs properly, including protecting the space environment defense, Etc. Afterward, this paper will introduce the space-centric concept. Space-centric concepts create to answer future space challenges from legal perspectives. This concept emphasizes how future regulation and policy should cover all space objects equally, recalling outer space is vulnerable to such activities by humans, and how the best way to mitigate unforeseeable calamity on outer space.

Keywords*: Space Law; Moon-Mars Mission; Harmful Contamination; Space-Centric*

1. Introduction

Space activities were concurrently penetrating new age where non-government entities (private actors) are more involving. The author has three separations of the era to be explained as follows:

Figure 1 Global Space Activities Transition by Author.

At the first stage in 1957-1991 as the cold war era, where the space activities recent development of technologies by launching Sputnik and Ranger program to outer space, on the other hand, this time also marks the new space race between west-eastern bloc.[1] 2. Interregnum means the transition era after the cold war ceased in 1991; this time, private actors started raising

[1] Christopher J. Newman and Mark Williamson, "Space Sustainability: Reframing the Debate," *Space Policy* 46, no. May 2017 (2018): 30–37, https://doi.org/10.1016/j.spacepol.2018.03.001.

in launching sector business. 3. Space capitalism is marked by highly intense private actors' activities in space technologies development, and private total investment spike up to $ 1 Billion.[2]

Afterward, in 2017 Trump administration enacting Space Policy Directives 1-4 (SPDs)[3]as part of the U.S. initiation to light up U.S. space activities, which was a vacuum since 2011. SPD-1 clearly emphasized this intention as follows: "…to lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities…, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations....."[4] From those sentence, is the mind that the U.S. would like to bring back their pride in space activities yet not only by NASA, and at the same time to encouraging U.S. space private such as (Space X, Blue Origin, and Boeing) actors involving in the future program of U.S. government.[5]

Furthermore, in response to SPD-1 U.S. government had an initiative program called Artemis to send the first woman and man back to landed on the moon since the last time during the Apollo mission in 1976. The core Artemis mission is to mining moon minerals in the first stage and Mars in the next scene.[6] Moon mining in the Artemis program has an endorsement fromthe U.S. president by announcing executive orders: "…Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. Outer space is a legally and physically unique domain of human activity. The United States does not view it as a global common…."[7] Executive order inspired by Space Act 2015 as Space Act mentions that the U.S. and its private actors possibly claimed the minerals resources (*Property Rights*) found in the moon and other celestial bodies. Property Rights, as stated following: "Any asteroid resources obtained in outer space are the property of the entity that obtained such resources, which shall be entitled to all property rights to that consistent with

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2 ESPI, "ESPI Yearbook 2019: Space Policies, Issues and Trends," 2020, 191.

3 John Wegner and Christian Davenport, "Trump Criticizes NASA Promotion of Returning to the Moon. He Directed It 18 Months Ago.," *The Washington Post*, June 2019.

4 Presidential Memoranda, "Space Policy Directive–1, Reinvigorating America's Human Space Exploration Program," 82 Federal Register § (2017).

5 Jamie Carter, "'Historic' NASA-SpaceX Rocket Launch Will Begin New Era In Human Spaceflight This Week," Forbes, 2020.

6 DLA PIPER, "Artemis Accords : New Law for the Moon and Outer Space ?," 2020.

7 Executive Order, "Executive Order on Encouraging International Support for the Recovery and Use of Space Resources," White House, 2020, https://www.whitehouse.gov/presidential-actions/executive-order-encouraging-international-support-recovery-use-space-resources/.

applicable provisions of Federal law and existing international obligations."[8] in short, we know the Artemis program's core will exploiting outer space resources.

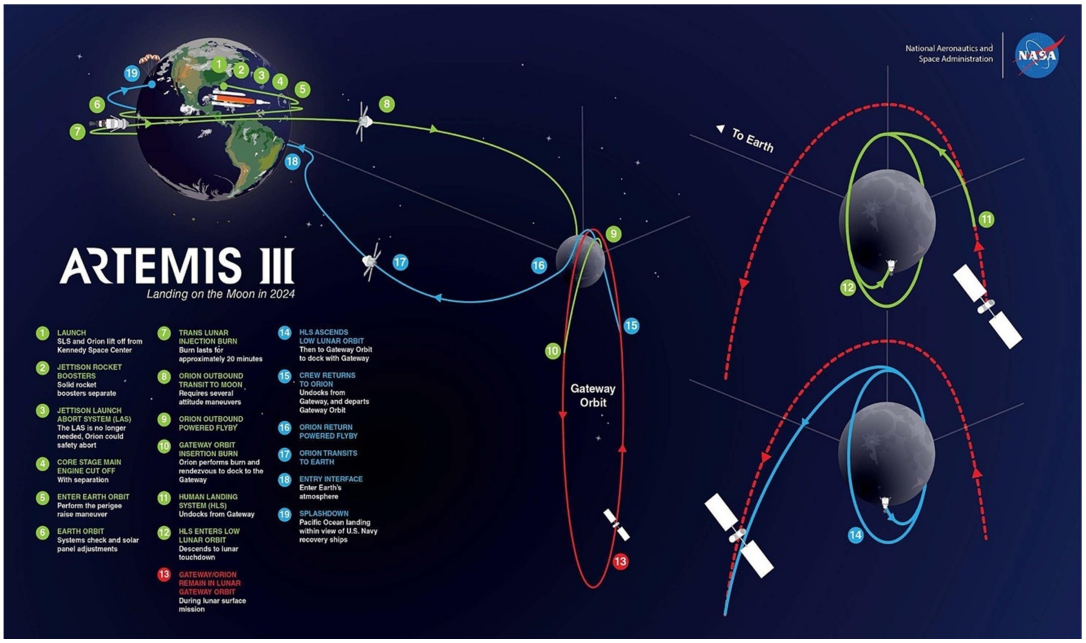

Figure 2. Artemis Roadmap, First Crewed lunar Mission Since Apollo in 1972. https://www.nasa.gov/artemisprogram.

Artemis program is not only run only by the U.S. government.[9] It will be inter-governmental cooperation to establish a global coalition in the hope outer space can benefiting in *lato sensu*. U.S. government aware in the previous Apollo program is limited for the U.S. and Soviet Union, and on the other hand, reducing price tags becomes more affordable. Luxembourg has the same effort to legalize its space resource utilization in a different place. Furthermore, in 2017 Luxembourg enacting the Luxembourg Space Resources and Utilization Act 2017 (LSRU), which stated: "Space Resources are Capable of Being Owned."[10] Such a claim by U.S. and Luxembourg will be fascinating if we refer to the global south with its *stricto sensu* about privatization space resources cannot be claimed as private ownership. However, in this case, the author has *a contrario*. Following Isabel Feichtner's argument, which outer space a territorial

[8] U.S. Government, § 51303, "Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015" (2015).

[9] F P C Briefing et al., "Artemis Accords – Enabling International Partnerships for Lunar Exploration," 2020.

[10] DU GRAND-DUCHÉ DE LUXEMBOURG, "Loi Du 20 Juillet 2017 Sur l'exploration et l'utilisation Des Ressources de l'espace," JOURNAL OFFICIEL § (2017), https://doi.org/10.1016/s1297-9570(01)90011-1.

must be impossible to claim sovereignty by a state; however, it will not be impacted on "space materials." It will not consider as Article 2 of the OST.[11]

Meanwhile, the existing space law *Corpus Juris Spatialis* began obsolete to handle future space programs such as domination in space activities by private actors, the human-crewed mission to the moon and mars, space mining, etc., including space environmental issue. Future space programs have been projecting to the lunar mining and other celestial bodies and further establishing colonies on Mars. Those action plans made the outer space environment a crucial issue. Unfortunately, in Art 9, the OST covered adverse effects to the earth only[12]. According to SPD-1 and Space Act 2015, the private sector has the discretion to arrange its mission program. The potential question has arisen: by what means if these private actors would have an adverse accident to the space environment such as biological contamination. Referring to the OST Art 6 and Liability Convention 1975, Art 2 concludes as follows: "launching state is liable." This means private actors have no liability obligation for any disadvantages causing,'*Nullalexnullainiuria*.'

According to Moltz.[13] In general, there have three tiers of spacefaring criteria. First-tier countries such as U.S., European Space Agency countries member (ESA), Russia, as notable spacefaring nations as first developers, and control high-end space technologies, their national space legislation and policy mostly were well developed. Second-tier countries, such as China, India, and South Korea, have shown up after a cold war break in 1991 and focused on space defense programs, including on the moon and mars. Third-tier countries such as the Philippines, Malaysia, Indonesia have not launched space activities, yet the focus program is to develop a small satellite for communication, forecasting, and agricultural purposes. These matters have tied with how far a country has been ready to ensure its space activities meet the minimal safety requirement as a mandate in the OST to fulfill due diligence and due regard principles.

In author thought, these future issues cannot be answered by today's law because the law was too 'geocentric' and left the question of how if there's an accident by private actors and causing severe harmful contamination in the moon surface or other celestial bodies. *Corpus juris Spatialis* likely will vacuum on those issues because the central protection is dedicating to earth.

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[11] Isabel Feichtner, "Mining for Humanity in the Deep Sea and Outer Space: The Role of Small States and International Law in the Extraterritorial Expansion of Extraction," *Leiden Journal of International Law* 32, no. 2 (2019): 255–74, https://doi.org/10.1017/S0922156519000013.

[12] UN, "The Outer Space Treaty," 23 Bulletin of the Atomic Scientists § (1967), https://doi.org/10.1080/00963402.1967.11455151.

[13] James Clay Moltz, *ASIA ' S SPACE RACE National Motivations, Regional Rivalries, and International Risks* (New York: Columbia University Press, 2012).

With such future programs, begin to realize we need as *de minimus* amended the OST or even further creating a new law to facing the next challenge on space activities to protect vulnerable outer space environment area.

This conceptual article will divide the discussions into four sub-chapter as follows: 1. Space mining activities; 2. Outer space environmental protection; 3. Liability on space private actors; And 4. Introducing a space-centric concept as a model could make future draft regulations and laws more equal for all circumstances and protect our next generation from any harmful effect that causing by space activities today.

2. Discussion

2.1. Space Mining Activities

As the author mentioned above, in part of the consequences of technological advancement, the U.S. and Luxembourg are willing to extract the moon and other celestial bodies' minerals through their national legislation as part of the high demand for rare minerals for electronics equipment product.

Suppose space mining activities are not contrary to international space law, particularly to the OST 1967. In a compromise, the author saw sentences (without endorsing) from both national legislations emphasize property rights on the minerals extracted from its source and not claim sovereignty over the moon area and other celestial bodies. It was mentioned by Art 2 the OST 1967 as follows; “Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, utilizing use or occupation, or by any other means.”

Art 2 of the OST 1967 has *sensu stricto* prohibiting claiming territories over the moon areas or other celestial bodies only, and minerals that have been extracting will be different. Furthermore, according to Art 1,“outer space, including the moon and other celestial bodies, shall be free to utilize for all state benefit.” Therefore, U.S. and Luxembourg have only mentioned: "minerals can be claiming as who found it and become private right to such owner." Less or more, these provisions are inspiring by the Guano Islands Act laws affirming, who found the minerals in areas that have not been subjected to other government jurisdictions can claiming their territory into part of U.S. territory. Furthermore, Luxembourg argument based on *Principes de Droit Civil Français* 1878 stated, in the high seas cannot be appropriated; however fish and shellfish are being capable appropriated, later on in draft of Luxembourg space utilization act

has *argumentum ad rem* as stated: "Space resources are appropriable, in the same way as fish and shellfish are, but celestial bodies and asteroids are not, just like the high sea is not."[14]Sovereignty claim and property rights such it must be distinguished. A state cannot claim territory over *the res communis omnium* area, and this is a standard practice in high seas; later on, if a state wants to claim sovereignty, there must be two crucial legal actions such *corpusocupandi* and *animus ocupandi* and private actors cannot do it.

The U.S. and Luxembourg will impossibly claim property rights if Art 2 of the OST has performed *res communishumanitatis*, a fundamental maxim for Common Heritage of Mankind principles (CMH) such as Moon Agreement 1979 (M.A.) stated. Nevertheless, keep in mind first-tier countries never ratifying Moon Agreement (M.A.). Consequently, M.A. has limited scope.However, the author sees significant issues that need to resolve. Art 2 of the OST 1967 as *Clausulaeinconsuetae semper indicuntsuspicionem* form 'global-south' perspective *ad argumentum* means of Art 2 will be inclusive "minerals ore" and not only territories matter.

2.2. Outer Space Environmental Protection

Space mining will have a significant result on the moon and other celestial bodies' environment, and the author has found lacuna under *corpus juris Spatialis* for the outer space environment. It will be causing a catastrophic impact if we have not immediately regulated the protection of space environments. Contamination shall distinct into two categories. First, material contamination as space debris and biological contamination has two approaches: forward and backward contamination.[15]Art 9, the OST 1967 imposed on any state parties, has to avoid harmful contaminants that can harm the earth's environment.

There will be severe issues that the outer space environment against forwarding contamination is still in a grey area or *vacuum juris*. *In sensu stricto* during G.A. meeting in 1964[16] reaffirmed further contamination matters should be kept for the following decades, utterly hard to define contamination during today's achievement. Furthermore, Chairman Khruschev mentioned this issue as "heavenly matters" in his letter to President Kennedy. Later on, M.A. had a more comprehensive development of space-based environment protection by said any state parties should prevent the moon environment's disruption. The MA Art 7 was evident obligated

[14] Government of the Grand Duchy of Luxembourg, "Draft Law on the Exploration and Use of Space Resources," 2016, 1–17.

[15] Forward contamination, introducing of earth microbial creatures to the space environment by space vehicle. Furthermore, backward contamination is introducing of extraterrestrial matters from outer space to the earth.

[16] "UNOOSA Documents.Pdf," n.d.

state parties to perform in a reasonable way for avoiding biological contamination in the moon. In short, the OST 1967 as the widely ratified treaty was too geocentric and possibly causing a conflict between its parties because there is no clarity about outer space environmental protection

Furthermore, the Artemis Accord draft has introduced the deconfliction principle. This principle will ensure a safety zone on the moon surface free of potential contamination, which could be causing adverse interference for the parties. The OST should be amending and adopted this principle that formulation has moved from geocentric to space-centric.

2.3. Liability on Non-Governmental Entities

Private space sectors are encouraging to be more involved, as mentioned by SPD-1 and LSRU 2017. Ram Jakhu ever said that every nation or its private entities who wish to join the Artemis program should be reconsidered about liability matters if someday the program failed or its entities causing fatalities (contamination or other entities property loss) because party capable to liable only state according to Art 7 the OST 1967 and Art 2&3 Liability Convention 1975,[17]*corpus juris Spatialis* have not much mention private sectors as mentioned: "the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty." this can be understandable, during the discussion of the OST in 1960's private entities just an only small number with no significant role, at the time majority space activities owned by states.

The author has not found that Liability Convention being skewed to answer this challenge. European Space Policy Institute has released data that the private sector has more investment rather than most countries' space budgets. It seems unfair[18]if the state bears responsible while private actors gain more profit from space activities. Furthermore, and there are two opponents regarding this matter, one side has *sensu stricto* that private actors cannot be responsible directly. On the other hand, private actors should be liable for any accidents resulting from their activities.

Lastly, the Liability Convention does not cover any accident that impacted the environment in outer space. As the author mentioned, Art 2 and Art 3 Liability Convention has delivering liability based on two main focus; firstly, "state parties must be liable for any damage to the earth, including aircraft in flight by its activities." Secondly, "state parties should be

[17] Webinar, *Artemis Accords Challenge and Opportunities* (Kanada: McGill IASL-IAASS, 2020).
[18] Yun Zhao, "The 1972 Liability Convention: Time for Revision?," *Space Policy* 20, no. 2 (2004): 117–22, https://doi.org/10.1016/j.spacepol.2004.02.008.

responsible if the accident happened elsewhere than on the surface of the earth which caused the loss of other parties property." Hence, property means man-made objects such as satellites, orbiter, launcher, lander, Etc and there is no explanation under Liability Convention about space environment. Based on this discussion, Liability Convention 1972 shall be amended and focus more on space-centric rather than earth-centric.

2.4. Space-Centric Concept as Concept for *De Lege Ferenda*

As the author mentioned above, significant issues on future space activities development have arisen. We can consider that existing space law cannot satisfy future space challenges because *corpus juris Spatialis* was too geocentric. Human activities in the following years will be more diverse in outer space. In these circumstances, the author would like to introduce Space-Centric as a basis to make *spatial de lege ferenda* as guidance to outer space activities could be a more feasible and broader scope to the new space activities. The author has created a figure to explain more clearly why we need a new concept.

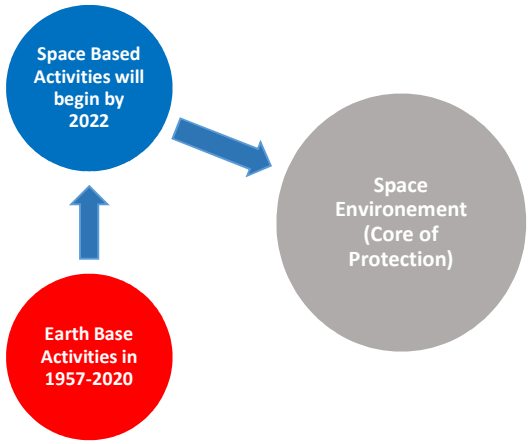

Figure 3 Space Activities Trends Transition. by Author

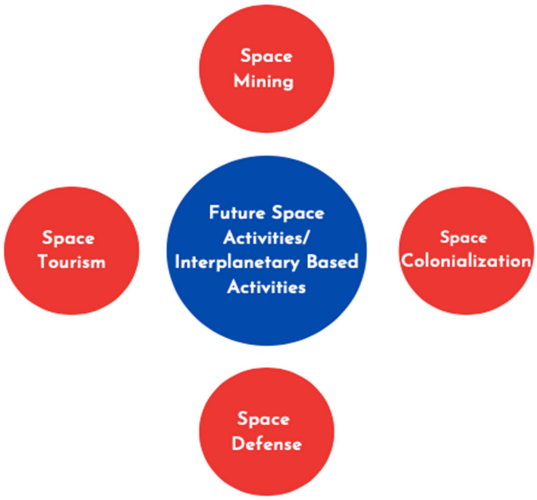

Figure 4 Space-based Activities. by Author

In the red dot, we can see most activities at the time are focusing on the earth, which means the earth is the centre of outer space development, and mainly on the development of the satellite. As described in "pale blue dot book," we see the space activities have a transition, which means the earth could be not a center of space technologies developed in the future because spacefaring nations are more focused to set their equipment on the moon at the first stage to made moon missions more sustainable, such as in-situ research, moon mining, lunar station, and build mars colonies in the next decade. From this point, any further space activities based on space-centric cannot neglect any longer.

The space-centric core ensures that any human activity will not be causing harmful interference for other parties and the earth. If borrowing some diction from Biodiversity Beyond National Jurisdiction (BBNJ), all activities beyond national jurisdiction "should not undermine to the environment."[19]Space-centric emphasized that Planets, Natural Satellite, Asteroids, and Comets should be protected to avoid harmful effects on those objects which can disadvantage the space environment and other parties or persons caused by space activities.

Furthermore, this concept proposes a new perspective on liability issues caused by space activities, whether they arise from government or private sectors. That whomever by its activities in outer space causes damage and disadvantage shall be directly liable through compensation if

[19] Elizabeth Mendenhall et al., "A Soft Treaty, Hard to Reach: The Second Inter-Governmental Conference for Biodiversity beyond National Jurisdiction," *Marine Policy* 108, no. August (2019): 103664, https://doi.org/10.1016/j.marpol.2019.103664.

damage occurs to other parties or persons, and environmental recovery if damage occurs to the space environment.

3. Conclusions

Future space activities need a new legal approach to ensure that all future challenges can adequately answer. This space-centric concept is a fruit of the author's mind that might be suitable for future space law implementation. The space-centric concept focuses on how future space law should be arranged, recalling outer space is vulnerable from any alien interference. The concept itself emphasizes that not only earth should be protected, but all celestial bodies on our solar system (inner and outer planets) shall also be equally protected. The author also recognized that amendment or making new law through UNCOPUOS would be though because the global south and global north had different ways of interpreting *corpus juris Spatialis*. Furthermore, the Artemis program and Luxembourg's plan to mining in the moon and other celestial bodies shall be a wake-up call for any space legal expert to discuss more deeply how to protect not only the earth but also outer space as single entities.

Lastly, space-centric must be covered all space material inner and outer planets. Inner planet means planets, moon, asteroids, and comets located inside the asteroid belt, and outer planet consists of planets, moons, asteroids, and comets beyond the asteroid belt. As a result, Art 9 the OST 1967 should stipulate on three primary focus as stated below;

1. "in every planetary and moon mission (including asteroids) by either government entities or private sectors should not undermine which erected from biological contamination and material contamination which can result in imbalance to the environment in outer space and earth."
2. In every planetary and moon mission, either government entities or private actors should fulfill the minimum safety requirement by doing environmental impact assessments to prevent forward and backward contamination. Furthermore, either government entities or private actors should be satisfied with the deconfliction principle by sharing their research results to ensure the safety's outer space operations.
3. Every space actor, government, and private actor should be liable directly if their outer space activities cause harmful and adverse changes to the space and earth environment and other parties in every interplanetary and moon mission.

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