



Seeking tranquillity: Embedding sustainability in lunar exploration policy[☆]



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ABSTRACT

Given the renewed interest in exploring and exploiting the resources of the Moon, this paper will explore the proposition that sustainability should be a fundamental consideration when formulating policy in respect of regulating lunar activities. The current lunar regulatory framework, however, is a product of the Cold War and conceived at a time when sustainability and space environmental issues were not within the contemplation of policy makers. Yet there is an increasing awareness of the need for space sustainability within the space community and this should be focused towards shaping policy in respect of lunar exploration. Inherently linked to this is a new multi-sectored era of space activity with emerging space nations and private companies competing alongside established space actors to exploit the natural resources of the Moon. Disputes over legally binding methods of lunar resource allocation are harming the chances of obtaining any consensus regarding sustainable development. This discussion will show that there is no compelling evidence that commercial mining of the Moon will yield the vast natural resources that would make such a venture economically viable. It will be advocated that a policy of promoting the use of the moon for scientific and exploratory purposes by means of existing fora such as IDAC and using non-binding codes to create normative values of sustainability should be placed at the heart of lunar exploration policy.

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There has been a recent surge of interest in utilizing and exploring the natural resources of the Moon. The payload review of Bigelow Aerospace lunar habitat by the US Federal Aviation Administration (FAA),¹ ongoing attempts by the US legislature to develop the ASTEROID ACT² and a proliferation of private and international lunar missions have led to talk about the start of a possible lunar revolution.³ The exploitation of the Moon may well hold promise for

developing the resource base of humanity but the current emphasis on mercantile expansion, means questions regarding sustainability of future lunar activity are being overlooked. The difficulties of dealing with space debris in Earth orbit and current terrestrial difficulties regarding climate change illustrate the dangers of neglecting such problems.⁴ The discussion will therefore frame the debate around the issues that need to be considered when conceiving a policy on lunar sustainability. The current interest in lunar development should be exploited to ensure that the inertia that has occurred in addressing terrestrial and orbital environmental issues is not replicated in respect of the Moon.⁵

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¹ Foust J. FAA Review a Small Step for Lunar Commercialization Effort, Space News. February 6 2015. Accessed April 2015. <http://spacenews.com/faq-review-a-small-step-for-lunar-commercialization-efforts>.

² The American Space Technology for Exploring Resource Opportunities in Deep Space (ASTEROIDS) Act of 2014, H.R. 5063, 113th Congress, 2d Session is one such attempt. See Tronchetti F. Private property rights on asteroid resources: Assessing the legality of the ASTEROIDS Act. Space Policy 2015;30:193–196.

³ Kramer M. The Future of Moon Exploration, Lunar Colonies and Humanity, Space.com. July 2 2014. Accessed April 2015. <http://www.space.com/26584-future-of-moon-exploration.html>.

⁴ For details of the political and policy difficulties regarding the latest round of climate change talks in Lima see Tobin P. The Politics of Climate Change: Can a deal be done? Political Insight 2015;6:32–35.

⁵ For ongoing discussion on this area see Slann P. Space Debris and the need for space traffic control. Space Policy 2014;30:40–42 and for a detailed discussion on the broader environmental problems facing the space environment see Viikari L. The environmental element in space law: assessing the present and charting the future. Leiden, The Netherlands: Martinus Nijhoff Publishers; 2008.

The situation is not helped by the fact that lunar regulation is based on cold war treaties. This body of international space, law, encompassing the Outer Space Treaty⁶ and the unsuccessful, but wholly relevant Moon Treaty,⁷ fails to recognize the new multi-sectored era of space activity and opportunities for lunar exploration. In this new epoch, both emerging space nations and private companies are competing alongside established space powers. This means that technical expediency, the rush to develop workable systems and a desire to see return on investment tends to override sustainability concerns. As a result of these factors, policy is being formed in something of a legal vacuum, given the general reluctance of states to commit to the Moon Treaty. Issues of resource allocation are harming the chances of obtaining consensus and a new overarching international space treaty is unlikely. Alternative international agreements and existing fora for sustainability should be explored as means of ensuring cooperation on sustainable lunar development.

This paper argues that sustainable development of the Moon is a key consideration for lunar activities and one that needs to be addressed by all space-faring actors. The discussion will begin by exploring theories of sustainability and examine the issues that make environmental protection such a key part of sustainable lunar development. The issue of commercial mining activities on the Moon will be considered alongside whether such activity is both necessary and compatible with sustainable development. There will be analysis of the underpinning legal framework for all lunar activities, highlighting the failure to embed sustainable development within regulation. It will be acknowledged that the space community is already incorporating sustainability into policy discussions surrounding Earth orbit and will offer policy recommendations to promote cooperation on sustainable development (from an environmental and commercial viewpoint) in future lunar activities.

1. Sustainability, necessity and the lunar environment

As has been seen in respect of other areas of environmental concern, both terrestrially and in respect of orbital debris, it is not enough to engender a general awareness that action is necessary. In order to entrench sustainability and prevent an ecological and environmental crisis affecting the moon, policy makers should start to build a new consensus regarding the exploration of the Moon. Understanding of the need for sustainable development within space is growing, thanks to the activities of the United Nations, International Space Debris Advisory Committee and Secure World Foundation. Their deliberations however, focus almost exclusively on Earth-based security issues and debris management. Whilst undoubtedly significant, this concentration on activities in Earth orbit means that an important opportunity is being missed and is leading to lunar sustainability falling through the cracks of policy debates.

The concept of sustainability is a relatively recent construct and one that has evolved alongside discussions of environmental

protection generally. Sustainability has been defined as: ‘*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*’⁸ In relation to space activity generally, this has been held to mean: ‘*Ensuring that all humanity can continue to use outer space for peaceful purposes and socioeconomic benefit now and in the long term.*’⁹ This definition covers all exploration and scientific endeavour. One would think that private companies would be resistant to such innovation, equating sustainability with expensive and burdensome regulation. This is not the case, however, with Robert Bigelow, founder of Bigelow Aerospace articulating the view that:

“We had better start to change our behavior here, and we cannot export, off of Earth, the same irresponsible behavior that we not only are conducting today on this planet, but have conducted for millennia. As human beings, our record is absolutely terrible. I think we owe a responsibility to space exploration, space existence of an entirely different level of attitude and respect.”¹⁰

What sustainable development requires is that both commercial and state actors ameliorate harmful consequences of exploration so future ventures do not require additional expenditure to mitigate previous activity.

Whilst the above-mentioned attempt to speak about space sustainability generally, there is no existing definition of sustainability in a wholly lunar context. Drawing from these general theories, it is clear that lunar sustainability requires current lunar activity, either commercial or scientific, should not impair future lunar exploration nor be unnecessarily harmful to the lunar environment. A fundamental aspect of any policy of lunar sustainability will be establishing *what* harm is considered necessary in the context of lunar exploration and *who* should determine this necessity.¹¹ In the early years of the space race, the detrimental effects of exploring the Moon were largely overlooked. Indeed early attempts at lunar exploration involved simply crashing probes sent from the Earth into the lunar surface and measuring the force of the impact.¹² The sustained exploration of the Apollo program further contributed to this surface debris and “*many tonnes of spacecraft and rocket-body debris ha(s) been crashed onto the Moon*”. This may not yet pose a problem to the lunar environment but, as one observer noted, “*we must guard against repeating in outer space our past mistakes of underestimating the cumulative, enduring and potentially synergistic environmental effects of our actions here on Earth*”.¹³

The creation of surface debris, if unchecked, poses a risk to future lunar exploration. There is also the issue of lunar orbital debris, which Williamson highlights:

‘the need for action to protect the Earth’s orbital environment is now well recognised, it is important not to forget lunar orbit. Without proper safeguards, an increase in lunar traffic could

⁶ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies: 610 UNTS 205; 1968 UKTS 10, Cmnd. 3519; 18 UST 2410, TIAS 6347; (1967) 6 ILM 386; (1967) 61 AJIL 644. It was adopted by the General Assembly of the United Nations on 19th December 1966 and opened for signature on 27th January 1967 in London. It entered into force on 10th October 1967. Herein it will be referred to as the Outer Space Treaty 1967 (OST).

⁷ Agreement Governing the Activities of States on the Moon and other Celestial Bodies, UN Doc. A/34/664. New York (UN) 5 December 1979. Both the OST and Moon Treaty are available at http://www.oosa.unvienna.org/pdf/publications/ST_SPACE_061Rev01E.pdf.

⁸ World Commission on Environment and Development. *Our Common Future*. Oxford University Press. Oxford UK, 1987. Quoted in Pope J, Annandale D, Morrison-Saunders A. Conceptualizing sustainability assessment. *Environmental Impact Assessment Review*, 2004;24:595–616.

⁹ <http://swfound.org/our-focus/space-sustainability/>.

¹⁰ Kramer M, *supra* note 3.

¹¹ For an exploration of the way in which Environmental Impact Assessments could serve to facilitate this see Kramer WR. Extraterrestrial environmental impact assessments – A foreseeable prerequisite for wise decisions regarding outer space exploration, research and development. *Space Policy* 2014;30:215–222.

¹² Williamson M. *Space: The Fragile Frontier*. Reston, VA: American Institute of Aeronautics and Astronautics; 2006 at Chapter 4 for further details.

¹³ Kramer WJ, *supra* note 11 at 216.

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