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Human Exploration of the Moon and Cislunar Space (1)

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TECHNOLOGICAL AND LEGAL PERSPECTIVES FOR SUSTAINABLE HUMAN PRESENCE ON THE MOON

Abstract

Returning to the Moon and establishing a permanent human presence is the next step in space exploration. However, achieving it will require a collective effort by all of humanity because of the challenges associated with its exploration, including technological advances and international interactions among the various countries and actors involved. During the Southern Hemisphere Space Studies Program (SHSSP23), our team identified the most pressing challenges and sought practical solutions to ensure a sustainable human presence on the Moon. We identified energy, in situ resource utilization (ISRU), and human habitation as the most critical components for the physical sustainability of a lunar settlement.

Because the possibility of achieving a sustainable human presence on the Moon is directly related to available technology and research, our team developed a roadmap that addresses sustainability challenges in three-time frames: short-term (to 2030), medium-term (to 2040), and long-term (to 2050). For each time frame, we provided a detailed presentation of the current status of the developed technologies, presented the challenges for sustained human settlement on the Moon and provided recommendations for their future use in all phases of a beneficial human presence on the lunar surface.

During constructive discussions, the team highlighted the gaps in the current international legal framework regarding the appropriate means to address contemporary issues related to planned activities in cislunar space and on the Moon. We proposed a new version of international treaties based on the Artemis Accords and the Antarctic Treaty to address this problem. We envision a two-tier system to manage international interaction among the parties involved in lunar activities.

At the end of our work, we made comprehensive recommendations from both technological and legal perspectives to provide a solid basis for future considerations of peaceful and sustainable lunar exploration.