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TOWARDS MORE COMPREHENSIVE TECHNOLOGY DEVELOPMENT PLANS FOR SPACE RESOURCE UTILIZATION: A STRUCTURED APPROACH TO STAKEHOLDER CONSULTATIONS FOR INFORMED DECISION-MAKING.

Abstract

The In-Situ Resource Utilization (ISRU) strategy, which revolves around the use of the natural resources present on the Moon, Mars, and asteroids, is envisioned as a key enabler for the future of sustainable human and robotic presence in space. To achieve these ambitious objectives extensive efforts are currently directed towards the elaboration of dedicated programmatic and technology development activities. Now, the value of this activities strictly depends on the knowledge available for what concern the operational conditions for extracting, processing, distributing, and utilizing space resources and on the required technology. Considering the level of uncertainty surrounding many of these aspects and the interdisciplinarity of the subject, it is clear that the collaboration of international space and non-space actors is an essential resource. Endorsing this perspective, major space agencies are conducting multiple activities to promote the involvement of the wider community, mapping the interests and needs of key stakeholders and gathering their inputs and prospective on the present and future of ISRU. This abstract introduces a new approach designed to strategically frame stakeholder consultation activities and to provide data driven recommendation to support decision-making. It integrate the following analytical tools: i) Power-Interest Matrix-based stakeholder analysis [1]; ii) Cognitive Mapping for problem structuring through Value-focused thinking process [2,3]; iii) Multi-Attribute Decision Making method [4]. The capabilities of this approach have been demonstrated in the framework of a European Space Agency (ESA) activity consisting of developing a terrestrial analogue of a lunar pilot plant, called Ground-based Pilot Plant (GBPP), which is envisioned to extract metal and oxygen from lunar regolith. Proposed as open platform for the ISRU community, the GBPP is intended to serve as a dynamic test bed for international stakeholders to integrate their technologies and ideas, facilitating testing and advancement of key ISRU capabilities. This framework provides several elements for demonstrating the principal implementation step and the overall potential of this new approach.

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Bibliography:

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