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Contribution of Space Activities to Solving Global Societal Issues (2)

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FUTURE SPACE TECHNOLOGIES FOR SUSTAINABILITY ON EARTH

Abstract

The United Nations 2030 Agenda for Sustainable Development is based on 17 Sustainable Development Goals with 169 targets and indicators. Space science, technology and its applications can provide a wide range of solutions to help achieve the Sustainable Development Goals and thus contribute to achieving economic, social and environmental sustainable development. This paper addresses the contributions of space activities from three different perspectives: policy, strategy and technology. It focuses on a subset of challenges linked to the Sustainable Development Goals, namely global health, water, energy and urban development. The proposed strategy perspective considers elements, such as interdisciplinarity, spin-in and spin-off transfers, open innovation processes, and sustainability at large. Space exploration programmes are usually conceived around space mission requirements and technologies with a maturity level which allows for their implementation into planned technology roadmaps. Therefore, it is discussed how such roadmaps could better integrate policy and strategic aspects linked to sustainability on Earth. What if a system is efficiently designed to operate in space and at the same time allows for sustainable development on Earth? The further integration of key enabling technologies (big data, artificial intelligence systems, advanced robotics) are opening a new era in the exploration of other planets where autonomy is an essential requirement. At the same time such developments can become an integral part of the future developments on Earth, providing smart solutions to the citizens of tomorrow and opening up new business sectors associated to these spin-offs. For example, the development of Additive Layer Manufacturing technology will simplify the production of mechanical components and their logistic chain. However, it will also open up new ways of thinking on a large scale, for instance in the construction of buildings and structures using local materials, such as Moon regolith or Earth sand. Other examples are In-Situ Resource Utilisation and viewing a building or a city as a spaceship system, which will not only allow space habitats to include self-regenerative functions, but also allow smart cities on Earth to become greener and more sustainable, especially in view of the expansion of population, the resulting densification and increase of urban areas. The aim of the strategy proposed in this paper is to approach sustainability for development from a holistic perspective looking not only at a product of space technology and how one could transfer this into a terrestrial application but also at strategies for achieving spin-offs in compliance with the most urging topics of this century.