

25th IAA SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY (E5)
Models for Successfully Applying Space Technology Beyond Its Original Intent (2)

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SPACESHIP EARTH. SPACE-DRIVEN TECHNOLOGIES AND SYSTEMS FOR SUSTAINABILITY
ON GROUND.

Abstract

As awareness towards the problem is growing, eco-friendliness is today a paramount requirement for all space activities and in particular for the ground segment, fully comparable to other industrial sectors. The present work focuses on the assessment and the sustainable development enhancement of a ground-based space facility, the European Astronaut Centre (EAC), located in Germany. The project is framed within the European Space Agency development of an environmental outlook, which aims not only at the full compliance with the legislation and at assessing the impact of its activities, but also at laying the foundation for future evolution through innovation. Indeed, ESA promotes the sustainable use of space as a necessity and duty for Europe. As history teaches us, technical knowledge emerged within the space sector serves as innovation driver in other industrial branches: the goal of the project is to transform the EAC building into a spaceship integrated with the territory through the conscious management of this spontaneous process, fostering the contamination between the space sector and the architecture and civil engineering fields. The work explores the potential of space technologies, processes and systems applied on ground and presents a range of space-driven innovative concepts which may improve the sustainability of the EAC building, focusing on different aspects of its resource demand - energy, water and waste management - and defining the integration with the pre-existing compound, the limitation of the impact on the surrounding landscape and the participation of the local community as additional fundamental requirements. Indeed, the project embraces the full concept of sustainability, which considers not only eco-friendliness but also its balance with economical and social aspects. Two factors - a certain urgency for action, which leaves little space for research and experimentation, and a call for ground-breaking solutions - guided the design activity: taking advantage of these conflicting requirements, a comparison between standard technologies and innovative space-related concepts was performed. When dealing with complex

and uncertain scenarios, decision among the possible solutions is not straightforward and needs to be supported by appropriate methodologies: a multi-criteria and quantitative decision-making tool, able to concentrate on the main goal while considering all other relevant aspects – environmental, economical, social sustainability - was therefore developed. Furthermore, the project promotes local community participation in the decisional process, as a way to enhance knowledge, generate understanding and promote consensus towards the EAC redesign, space activities and their potential innovative impact on sustainability.