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LEESB – LUXEMBOURG ECOLOGICAL EARTH AND SPACE BIOSPHERE

Abstract

Within the project LEESB – Luxembourg Ecological Earth and Space Biosphere – an ecologically based biosphere will be developed by combining both approaches of bioregenerative life support systems and ecologic, sustainable, off-grid houses being summarized in the Earthship concept. To develop the LEESB concept and design the system, the project partners Centre for Ecological Learning Luxembourg a.s.b.l. (CELL), and Blue Horizon S.à.r.l. cooperate by sharing their knowledge. The novel combination of the Earth-bound ecological aspects of Äerdschëff which is built by CELL and the research aspects of closed-loop life support systems promises to harbor advances in both areas. Traditionally, a life support system is composed of three main components, being air, water and food recycling systems. A biological life support system can fulfill these tasks with technologies relying on the action of living organisms from different trophic levels like higher plants, microalgae, bacteria, and animals. An Ecological and Bioregenerative Life Support System (EBLSS) aims to close the main material flows, namely CO2, O2, water, as well as to provide the basic elements such as C, H, N, O, P and S which are essential for biological systems. EBLSS technologies represent a sustainable solution for supplementary life support for long duration space missions including waste recycling and closed-loop systems. The working principle of the Earthship relies on resource management of water, power, heating and food. This is not only synergistic to EBLSS ideas for space application but a prerequisite for future resource management on Earth as well. For Blue Horizon the Earthship serves as testbed for future exploration and resource utilization technologies. Besides, the project allows the development of a commercial approach for marketing the developed products as well as their use in sustainable homes. For CELL the project promises an increasing degree of closure of material flows by applying EBLSS technologies and therefore a higher autarky of houses. With the help of these technical systems a constant monitoring of water and air quality is possible which will increase safety and well-being for inhabitants. In total the project shall increase the awareness and knowledge about circular economy, sustainable houses as well as the behavior of closed regenerative systems for Earth and Space application.