

16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)Systems and Infrastructures to Implement Future Building Blocks in Space Exploration and Development  
(2)Author: Ms. Paivi Jukola  
Aalto University, Finland, paivi.jukola@aalto.fiSTRATEGIC DESIGN RESEARCH AND MASTER PLANNING FOR CONSTRUCTION OF  
COMPLEX INFRASTRUCTURE**Abstract**

Complex infrastructure projects, by their very nature, involve significant investment. Infrastructure systems facilitate the flow from information to resources and people. Space systems infrastructure is a complex system-of-systems that involves space, ground, and user components. Civil engineering Master Plan documents may identify infrastructure requirements and improvements over the next 30 years, and longer; with particular emphasis on the next 5 years. Design for infrastructure is time-absorbing, continuous and a collaborative process that involves numerous stakeholders from government officials to private investors; engineers; architects and end-users. In this paper we offer a literature review to apply system thinking to complex infrastructure design from two intertwined perspectives. Firstly, beauty. With Marcel Dassault's own words "Un bel avion est un avion qui vole bien." - For an aircraft to fly well, it must be beautiful. Secondly, sustainability. Circular economy thinking means maintaining access to materials and resources for continual and future use. The circular economy aims to keep products, components and materials at their highest utility and value at all times through life extension and maintenance, reuse, refurbishment, remanufacture and finally recycling. Despite of our recent efforts and creative problem solving for environmental waste, plastic is damaging Planet Earth; Space Debris is cluttering Low Earth Orbit; and increasingly, with Cubesat clutter. Action cannot wait. The paper proposes establishment of A Certificate and An International Decision Making Body for space sector; benchmarking with LEED (Leadership in Energy and Environmental Design) the most widely used green building rating system in the world, and benchmarking with World Green Building Council. A beautiful green Technology Park – a Moon Village without clutter, is the motivation and goal for this preliminary design study. "In order to change an existing paradigm you do not struggle to try and change the problematic model. You create a new model and make the old one obsolete." (Buckminster Fuller).