

18th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and
Development (1)

Author: Ms. Arjumand Alvi

University of Houston, United States, arjumand.alvi.usa@gmail.com

ACHIEVING SUSTAINABLE PLANETARY EXPLORATION THROUGH NATURAL AND
INDUSTRIAL METHODS**Abstract**

The long-term impacts and sustainability of space exploration missions in the space environment are not evident when evaluating past, present, and future space mission designs. Historically, the space exploration vision of government and commercial entities have referred to planetary sustainability as a need for mission assurance rather than an evaluation of long-term viability. NASA is one organization that has proposed a more long-term vision, evident in the "Moon to Mars" approach and the Artemis Program. This paper investigates the concept of planetary sustainability as a means to enable the long-term viability of spaceflight endeavors by evaluating both accessibility and resource limitations of the space environment. Rooted in traditional systems engineering and reshaped through multi-disciplinary perspectives, this investigation proposes a planetary sustainability framework to advance the long term space exploration vision. By utilizing multidisciplinary scientific taxonomies and resource classification methods to explore a variety of planetary exploration approaches, the framework can be used by organizations wishing to integrate sustainability into the design of space exploration missions. By leveraging an understanding of existing natural terrestrial relationships, industrial processes, and space systems engineering processes, this paper illuminate new pathways towards achieving planetary sustainability.