2013 PTMSS Abstract

# Sustainable Development through Big Engineering for In-Situ Resource Utilization (ISRU)

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The pioneering spirit is the nature of human beings and it has led to the development of civilization, such as the discovery of America by Columbus and the Industrial Revolution in England. In the next generation, space exploration and development would be the prospective frontier fields to advance civilization. Therefore, many nations aim to procure cutting-edge technologies in space exploration.

Space technology is the most complex technology which humans have developed and it requires the cooperation between various areas of knowledge in order to develop novel technology; it also requires a scholarly method, which is called Big Engineering. Big Engineering is the collection of engineering knowledge that examines engineering on a large scale through a multidisciplinary approach.

The International Space Exploration Research Institute (ISERI) was established to research space exploration and development, especially ISRU technologies. ISERI has been conducting research on Extreme Rough Terrain Exploration Rover (ERTER), planetary drilling and anchoring system, waterless lunar concrete and lunar concrete pad, lunar simulant KOHLS-1, and so on. Furthermore, ISERI has its eye set on future research fields which includes studies regarding automated construction system for lunar development and construction.

Moreover, all of these researches can be suggested and adopted to the extreme environments found on Earth. In other words, space exploration technologies could be technical spin-offs for extreme environments, and assist in sustainable development. For example, waterless lunar concrete can be apply to hot or cold regions where existing concrete is limited, and automated construction systems could be the next chapter in innovating the construction industry.

ISERI has already begun to transfer space technology into the terrestrial area. ISERI is participating in the Smart Solar Highway Project for energy efficiency and reduction of environmental damages – an opportunity for spin-off technologies to be tested in commercial applications.