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Author: Mr. Miracle Israel Nazarious
Luleå University of Technology, Sweden, miracle.israel.nazarious@ltu.se

Mr. Abhilash Vakkada Ramachandran
Luleå University of Technology, Sweden, abhilash.vakkada-ramachandran@ltu.se

Dr. Anshuman Bhardwaj
Sweden, anshuman.bhardwaj@ltu.se

Dr. Shaktiman Singh
Luleå University of Technology, Sweden, shaktiman.singh@ltu.se

Prof. María-Paz Zorzano

1. Luleå University of Technology, Sweden; 2. Centro de Astrobiología (INTA-CSIC), Sweden,
maria-paz.zorzano.mier@ltu.se

Prof. Javier Martín-Torres

1. Luleå University of Technology; 2. Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Sweden,
javier.martin-torres@ltu.se

SPACE SOLUTION TO WORLD'S WATER CRISIS: A CASE STUDY WITH REMOTE SENSING,
SCIENCE AND TECHNOLOGY IN SYNERGY

Abstract

The certain imbalance in the water utilization and distribution have significantly affected the water security globally including megacities like New York, Chicago in the United States, Brazil's São Paulo, South Africa's Cape Town and various parts of China and India. Studies suggest that, this is being driven not just by climate change, but by population, economic growth and poor water management. Innovation in space products and services have provided the potential to address this pressing problem and find new solutions, not only to diagnose them, and will continue to do so. Space assets have been recently used for monitoring the sustainable land and water-use practices, reporting the greening of China and India.

In this work, we demonstrate a synergic effect of utilizing remote sensing, science and technology in tandem to assess the causes and contingencies of the prevailing water problem and provide solutions for its efficient management. This case study focusses on the metropolitan city of Chennai, located in the south eastern part of India. MODIS satellite data was used to track the land-use patterns in the past decades to understand the change in utilization and distribution of water reservoirs and the impact it has on water scarcity. We developed a time sequence model to signify the changing area of surface water storage reservoirs and the occupation of those land with constructions. The results quantify the water availability (minimum, average and maximum) in different seasons and propose a solution to efficiently manage the available water resources to the human masses. Alternative ways to harvest water from the atmosphere using low energy means were evaluated for its sustainability by retrieving high resolution T/RH map for the region. We evaluated the efficiency of water farming methods which rely on T/RH changes through the day and seasons such as the ones that are currently under development for HABIT/ExoMars 2020, an in-situ technology demonstrator on Mars, and other hygroscopic products like metal organic framework (MOFs) or hydrogels.

This model can be globally applied to any water demanding regions on Earth and the applications can be modified accordingly. One such action has already been initiated with the Dubai Future Foundation based on the HABIT concept. We also discuss the potential impact on the policy scale to be implemented by the local governments and the technology transfer associated with these actions.

Keywords: Water scarcity – Remote sensing – Water farming – Policy-oriented – Technology transfer