

Research Work Title

# Achieving sustainable development goals using multi-functional Nanomaterials



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## Abstract

As of today, approximately 55% of the global population lives in urban areas. It is estimated by 2050, this number reaches around 2.5 billion, with about 90% of the increase occurring in Asia & Africa. With such a significant rise in urban population and the concurrent impact of climate change on seasonal atmospheric temperatures, there are several numerous challenges related to achieving Sustainable Development Goals. In this context, Science, Technology and Innovation (STI) as well as Research and Development (R&D) play a crucial role in addressing these challenges within the realms of energy, water, and health. In the energy sector, the utilization of Vanadium-based thermochromic nano-coatings holds great potential for smart window applications. These coatings effectively regulate solar heat radiation without requiring any additional energy input, thus enabling green air-conditioning. Likewise, the application of nano-fluids as advanced coolants can greatly contribute to waste heat recovery. In addition, recent research has demonstrated that carbon dioxide (CO)<sub>2</sub> can be utilized to bio-engineer several multifunctional carbonates. These carbonates exhibit properties such as effective fertilization response and high reflectivity similar to radiative cooling paint, and significant porosity and hardness, making them a promising Supplementary Compound Material (SCM) for cement industry. The purpose of this study is to highlight on the above-mentioned properties and their interconnections.

Professor Malik Maaza is a co-founder of the African Laser Centre and South African Nanotechnology Initiative, which was established in 2001. He has played a leading role in initiatives such as the Nanosciences African Network, the African Materials Research Society, and the African Light Source. Since 2013, he has been a professor at the University of South Africa and associated with iThemba LABS since 2005, a renowned scientific research center also known as the National Accelerator Centre.

