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# Cutting-edge nanotechnology innovations that impact people's lives

NSTF-Water Research Commission Award for sustainable water management, knowledge generation and solutions

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**P**rofessor Bhekie Mamba is the executive dean of the college of science, engineering and technology at Unisa. His research has led to the creation of new nanotechnology-based systems to tackle major challenges in sustainably providing safe and clean water to disadvantaged communities.

This is a long-term project that took off in earnest in 2002. Enrolment of postgraduate students at MSc and PhD level marked the birth of the Water Research Group. Initially the project focused on the synthesis of nanomaterials and nanoporous polymers for the removal of organic and inorganic contaminants from water.

"This type of project and research requires multidisciplinary input," says Mamba. "That's why the students involved are not just chemists, but also physicists and engineers."

Positive outcomes began to emerge in 2005 with research papers appearing in international journals. Nationally, the project received further funding averaging R2.5-million per annum, for three years (2010-2012).



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Community engagements programmes have started in Mpumalanga. A prototype solar-powered membrane filtration system is already being tested for possible full-scale implementation.

"Despite our achievements, we need social scientists to help us change people's attitude about how precious water really is," says Mamba. "Scientists are really good at communicating with each other, but

we need the social scientists to communicate with the broader public. The general public often doesn't realise that the combination of a growing population and climate change will have a severe impact on our already limited water supply."

Effective and strategic collaborations with world-class researchers at institutions in India, Netherlands, Israel, UK, US, Belgium, South Korea, Singapore and Swaziland

have added an international flair to the project. These collaborations involved mainly master's and PhD student exchange programmes and co-supervision. It greatly enhanced the generation of new and innovative ideas for prototype development, patenting of research findings, and co-publishing in high impact journals.

Recently, a research unit dedicated to nanotechnology and water sus-

tainability was established at Unisa to spearhead research projects on water and sustainability. The main focus is to create prototypes for alleviating potable water shortages in rural communities. The ongoing projects in this unit continue those initiated by Mamba.

"Nanotechnology has emerged as one of the most promising technologies in solving some of the planetary environmental challenges," says Mamba. The professor and his team have created several types of polymers in different forms, such as packed granules and films. These are over 99% efficient for the removal of polluting organic species, even when present in parts per billion levels.

Through years of dedicated research on nanotechnology and water sustainability, a number of innovations beneficial to the marginalised communities of South Africa have emerged. The Silver Impregnated Porous Pot (SIPP) filter, for the production of safe drinking water at a household level, is used for wastewater treatment.

The device is now being used in Mpumalanga and Limpopo. "Provision of clean water to communities has a positive impact on health and sanitation, as well as people's livelihoods," says Mamba.

"Since the SIPP device is cheap, reusable and can be readily made from locally available materials, its application is economically viable and sustainable. Nanotechnology-based solutions are envisaged to be able to provide clean drinking water in very remote regions of the country."