

# THE NELSON MANDELA AFRICAN INSTITUTE OF SCIENCE AND TECHNOLOGY - ARUSHA



## THE HYDROLOGY AND WATER RESOURCES PROGRAMME

# The NM-AIST

## “Academia for society and industry”

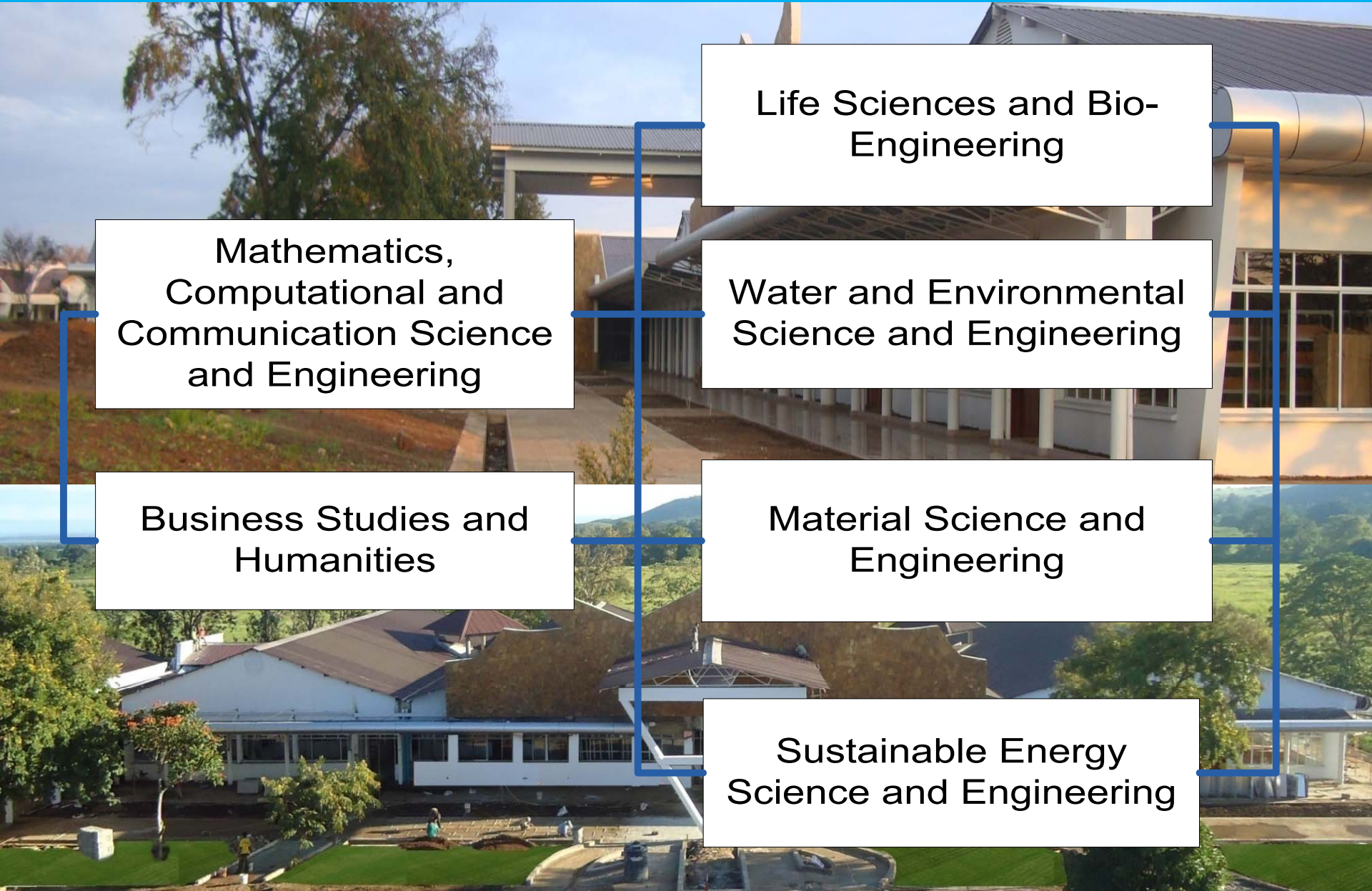
### As NM-AIST

- Aims at promoting more *effective linkages between academia, society, and local industry* so as
- to provide scientific and technological responses to local needs

The Water Resources and Hydrology programme is designed to contribute into this aim



# NM-AIST is made up of well Integrated Academic Units hosting the different programmes



Life Sciences and Bio-Engineering

Water and Environmental Science and Engineering

Material Science and Engineering

Sustainable Energy Science and Engineering

Mathematics, Computational and Communication Science and Engineering

Business Studies and Humanities



# The Water and Environmental Science and Engineering Department hosts



**Hydrology and Water  
Resource Engineering**



**Environmental Science  
and Engineering**



*Meteorology and Climate  
studies*



# Specializations in HWRE programme

- Hydrology and Climate Studies
- Water Resources Engineering and Management
- Water Supply and Sanitation
- Irrigation Engineering

Both Master's and PHD degrees are offered in the Hydrology and Water Resources Engineering (HWRE) Programme

# Duration of the programmes

- Masters of Science programme is 2 years with the 1<sup>st</sup> year devoted to coursework and research proposal development while the 2<sup>nd</sup> year is devoted to research work
- PHD programme is 3 years with the 1<sup>st</sup> year devoted to coursework and research proposal development while the 2<sup>nd</sup> and 3<sup>rd</sup> years are devoted to research work



# Challenges

- Getting qualified staff for the Programme is a major challenge. We currently depend on part time staff to teach some of the HWRE courses
  - Provision of visiting professors/lecturers to supplement teaching staff at NM-AIST would be an interesting area for collaboration



# Challenges cont...

- Inadequate Laboratory facility
  - Our lab is still in the process of being equipped. Links with other institutions where our students could do part of their research work through student exchange would be highly beneficial



# Water Challenges

- Un-availability of adequate (quantity and quality) water for various purposes
- Destruction of water sources (deforestation, pollution, improper landuse)
- Mis-management of Watersheds





# Rampant use of unsafe water





**BROAD AREAS OF**  
**RESEARCH**



# I. WATER MANAGEMENT

- Improve access and availability of water
- Improve quality
- Improve water allocation



## 2. RAIN WATER HARVESTING

- Designing of RWH facilities
- Lining materials
- Reduction of siltation



# 3. WATER TREATMENT

Major water quality problems in Tanzania are

- Contamination with disease causing pathogens
- Contamination of drinking water with fluoride from natural sources (geology)  
– major problem in Arusha
- High salinity in some ground water sources



# RESEARCH IN WATER QUALITY IS DIRECTED TO

- De-fluoridation processes
- Disinfection processes
  - (e.g. solar, nanotech)
  - Membrane filters (ceramic, polymeric)
- Desalination processes
- Development of Biosensors for water quality
- Development of simple systems for (un-piped) water treatment at community level



# Current PHD Research Topics

- Water distribution and water use systems of the Pangani River basin: Contributing to sustainable water management in Kikuletwa catchment
- Assessment of Levels and Fate of Nutrients and Heavy Metals in Springs and Groundwater in the Meru District, Tanzania.
- Assessment of Agrochemicals in Wastewater From Horticulture Farms in Arusha and their Removal by Constructed Wetland Systems
- Persistence and Removal of Zoonotic Pathogens in Constructed Wetlands Receiving Untreated Domestic Wastewater in Tropical Environment



# PHD Research topics

- Development of Low Cost De-fluorination Technique at Point of Discharge around Mount Meru.
- Characterization of surface-groundwater dynamics and assessment of Climate and land use change Impacts on the Lake Duluti water resources
- Radionuclides contamination on Minjingu phosphate fertilizer: Plants uptake, distribution and their potential impacts to the environment
- Addressing the challenges of water reuse for irrigation through optimal wastewater treatment in Tanzania





**Thanks**