REINVENT THE TOILET CHALLENGE PHASE II DATA ACQUISITION AND FIELD SUPPORT

WATER AND SANITATION

ETHEKWINI MUNICIPALITY

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

SANITATION SYSTEMS

Household VIP

Community Ablution Block VIP

School Toilet VIP

Urine Diversion Dehydration Toilet

Pour Flush

Sampling toilet cubicle

Emptying and Collection

A pit-emptying contractor removes sludge from VIPs and transports it to the LaDePa machine at Tongaat WWTW.

Urine is collected from selected UDDTs by EWS staff and transported to a central tank at the Newlands Mashu Research Site.

rttc@ukzn.ac.za

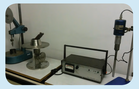
LABORATORY RESEARCH

Analysis and Data Collection

Sampling of sanitation systems

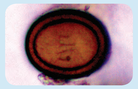
PRG researchers take samples of the faecal sludge from VIPs, UDDTs and pour flush systems during the emptying process. Urine samples are collected from central tanks. Fresh faeces are collected as needed through solicited requests.

Laboratory analysis



Mechanical properties
rheological, calorific and thermal properties

Chemical properties
Total solids content, organic and inorganic content and nutrients.

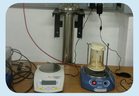


Biological properties
biodegradability and parasitic content of samples

Processing of excreta streams: research projects

Urine and flush water

Forward osmosis
Investigatation of forward osmosis to desalinate urine to obtain water and a concentrated fertilizer product



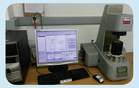
Micro-filtration
Investigation of microfiltration to remove contaminants from flush water or urine prior to further processing

Thermo physical properties of urine
Obtaining experimental data on the thermo physical properties of urine to aid for process design

Nano-filtration
Investigation of nano-filtration as a treatment step for urine and flush water processing

Faeces and faecal sludge

Thermal properties
Determination of calorific value, drying and pasteurisation rates of faecal sludges for use in process design



Rheology, extrusion and pelletisation
Investigation of the mechanical properties of faecal sludge to assist in the design of pit emptying and sludge processing equipment

LaDePa – Latrine Dehydration and Pasteurisation
Determination of the impact of varying the operational parameters of the laboratory-scale LaDePa and to characterise the resultant pellets

Pour flush faecal toilets
Investigation of the mechanical and chemical properties of sludge and transformation processes from pour flush sanitation systems

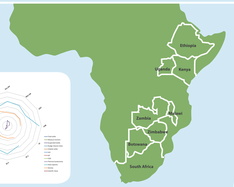
AVAILABLE RESOURCES

Sanitation tour
Provides an overview of the different sanitation systems and technologies used in Durban

Prototypes testing
Prototypes developed by other Gates grantees can be tested in the laboratory or in the field

Hosting of visitors
Visiting researchers are welcome to make use of the office, laboratory and field facilities

Data requests
Requests invited for specific tests to on excreta streams (depending on availability of equipment and capacity)



Data from other African countries
Partner institutions in African countries are obtaining data from local pits under guidance from PRG

FIELD RESEARCH

Newlands Mashu Research Site

Urine processing
VUNA project investigates the performance of struvite and nitrification reactors and a distiller for the production of nutrient products

Agricultural trials
Field trials and growing tunnels are used to investigate the use of anaerobic baffled reactor effluent and different urine fractions on crop production

DEWATS
Investigations on a demonstration DEWATS plant (anaerobic baffled reactor, anaerobic filter and constructed wetland) provide insight into the operational requirements and process efficiency

Tongaat Wastewater Treatment Works

LaDePa
The latrine dehydration and pasteurisation (LaDePa) pelletiser treats VIP sludge to produce pellets which can be used as a soil conditioner

Northern Wastewater Treatment Works
Site for the testing of prototypes which require large quantities of sludges to produce electricity

Marianhill Wastewater Treatment Works
Site of a new demonstration project to investigate the treatment of sludge from UDD toilets

INTERACTIONS WITH OTHER RESEARCH PROJECTS

Data from other research projects provide input into the RTTC Phase II project. This includes:

- Water Research Commission funded projects awarded to UKZN
- Gates foundation funded projects awarded to UKZN

INTERACTIONS WITH OTHER ORGANISATIONS

Interactions with international and other African organisations through provision of data, hosting of visitors, assistance on research projects, testing of prototypes and exchange of information. **These include:**

International Organisations

- Asian Institute of Technology
- Climate Foundation
- Sanergy
- Delft University of Technology
- Duke University
- Research Triangle Institute
- University of the West of England, Bristol
- Loughborough University
- Synapse
- Swedish Environmental Institute
- London School of Hygiene and Tropical Medicine
- University of Maryland
- University of Colorado Bolder
- Samtec
- Beaumont Design
- EliEnergy Partners
- UNESCO-IHE
- Kansas State University
- Swiss Federal Institute of Aquatic Science and Technology (EAWAG)
- Cranfield University
- University of Toronto
- Oklahoma State University
- Plymouth Marine Laboratory
- University College, London
- North Carolina State University
- Swedish University of Agricultural Sciences
- Janicki Industries
- Wageningen University
- Reckitt Benckiser
- AgriProtein
- Boston Consulting
- Path
- Firmenich
- Mott MacDonald
- ETH Zurich
- University of Laval, Montreal
- Unilever
- Bear Valley Ventures
- Bremen Overseas Research and Development Association (BORDA)
- Hering International (and South Africa)

African Organisations

- Khanyisa Projects
- Partners in Development (PID)
- **African Municipalities**
  - Kitwe Municipality
  - Kabwe Municipality
  - Botswana Government

SANITATION RESEARCH FUND FOR AFRICA PROJECT

Pit Characterisation

- Jimma University, Ethiopia
- Egerton University, Kenya
- Makerere University, Uganda
- University of Malawi, Malawi
- University of Zambia, Zambia
- University of Botswana, Botswana

Developing Innovative Tools for Dredging and Beneficiation

- Water for People, Uganda
- Mzuzu University, Malawi
- Chinhoyi University, Zimbabwe
- North-West Uni., RSA
- ATL-Hydro, RSA
- Rhodes University, RSA

Funded by the
Bill & Melinda Gates Foundation

PRG
pollution research group