Sanitation MATTERS

A Magazine for Southern Africa

ISSUE 5 – March 2014

The Sanitation Research Fund for Africa

SRFA Project

BILL & MELINDA GATES foundation

WATER RESEARCH COMMISSION

WIN-SA WATER INFORMATION NETWORK - SOUTH AFRICA -

Sanitation Matters is a knowledge sharing publication of the Southern Africa Knowledge Node on Sustainable Sanitation (SAKNNS). The purpose of the publication is to share information and knowledge on sustainable sanitation within and outside the Southern Africa region.

In this issue

We look at the **Sanitation Research Fund for Africa (SRFA) Project,** a joint fund established by the Water Research Commission and the Bill & Melinda Gates Foundation. The purpose of the project is to provide impetus for scientific based knowledge and practical solutions to the many unintended technical and operational challenges of pit latrine technologies in peri-urban areas in sub-Saharan Africa. A total of 8 sub-Saharan countries have been selected for the fund with the first project workshop held from the 30th to 31st January 2014.

Editorial offices:

Water Research Commission
Private Bag X03
Gezina 0031
South Africa
Tel: (+27) 12 330 - 0340
Fax (+27) 12 331 - 2565

Editors:

SudhirPillay (sudhirp@wrc.org.za)
Juliet Mwale (julietm@win-sa.org.za)

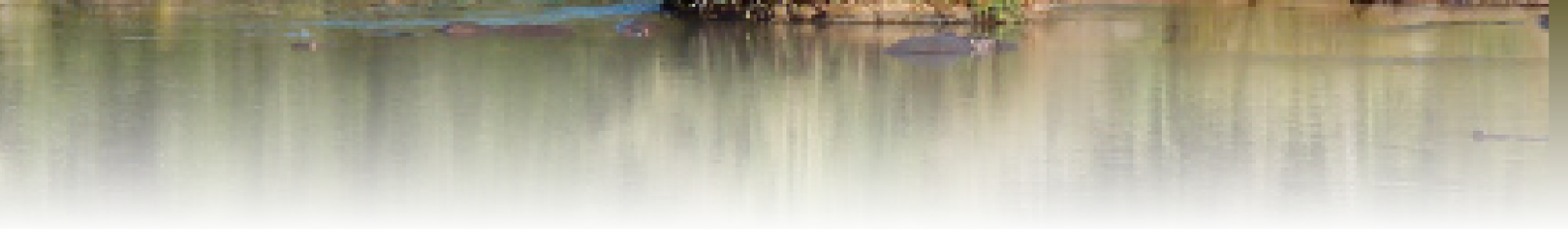
Disclaimer:

The Sanitation Research Fund for Africa

"The acceleration of dry sanitation technologies to meet the minimum level of sanitation has led to many well-documented but unintended technical and operational challenges after implementation. These include an oversight in the operational and maintenance costs of these toilets over its lifespan, the hygienic emptying of these toilets and the disposal of the contents in a safe and environmentally friendly manner. Moreover, there is a lack of technical expertise and evidence based research to deal with this challenge. Mr. Jay Bhagwan, Executive Manager of the Water Use and Waste Management at the South African Water Research Commission (WRC), tells us more on the Sanitation Research Fund for Africa (SRFA) and how the fund will be used to tackle this challenge".

In South Africa, the pressure to meet sanitation targets in the 2000's led to a proliferation of dry sanitation systems with around 1 million ventilated improved pit latrine (VIP) toilets implemented throughout the country. Most of these units are older than 5 years and would require emptying in the near future. This situation is aggravated by the fact that almost a third of water service authorities did not budget for the operation and maintenance of these toilets when they were first implemented. The Ethekwini Municipality was one of the first water service authorities to be confronted with this challenge. By 2012, around 30,000 toilets were emptied including VIP units that were not part of their original municipal boundary. Several technical and operational challenges were encountered during pit emptying such as limited accessibility to the pits (Figure 1). To add to the challenge, the safe disposal of VIP sludge was also problematic. Municipal landfills were not recommended and accepted due to the material not meeting sludge class guidelines and the introduction of highly concentrated pit sludges into the wastewater treatment network resulted in failure of the treatment process. This problem is not only confined to South Africa - many other countries where there has been an upscaling of dry sanitation technologies will experience similar challenges.

Figure 1. *Accessibility problems in Kampala, Uganda. Photo by Water for People Uganda.*



The WRC and the Bill & Melinda Gates Foundation jointly established the **Sanitation Research Fund for Africa (SRFA)** with the purpose of providing impetus for scientific based knowledge and practical solutions for faecal sludge management. The development of localised capacity and solutions is a key project objective. The two key areas which have impact on the sustainability of pit latrine technologies are being investigated, namely, 1) establishing a sound understanding of the scientific processes occurring in pit latrine sanitation systems and 2) the development of innovative solutions for the safe extraction, disposal and beneficial use of faecal sludges from pit toilets. This information will allow designers and practitioners to impart the most appropriate solutions and technologies to deal with these aspects of faecal sludge management.

A total of 12 research teams from 8 sub-Saharan countries were selected for the SRFA Project (Table 1). Six research teams from were awarded research grants to investigate the characteristics of faecal sludge within their respective regions and countries. Research teams are conducting in-depth characterisation tests of faecal sludge of different age, depth profile within the pit, and under different climate conditions. Pit filling rates are being also being recorded in these areas. The standardisation of methods among research partners to characterise faecal sludge enables a more realistic comparison and evaluation of processes occurring in VIP toilets under a variety of operating conditions and will enable designers and practitioners to develop more effective means to handle and dispose of sludge.

Table 1. Research teams in sub-Saharan Africa involved in the SRFA project.

Institute / Organisation	Country
Pit Characterisation	
University of Botswana	Botswana
Jimma University	Ethiopia
Egerton University	Kenya
University of Malawi Polytechnic	Malawi
Makerere University	Uganda
University of Zambia	Zambia
Institute / Organisation	**Country**
Developing new tools for faecal sludge management	
Mzuzu University	Malawi
ATL-Hydro	South Africa
North West University	South Africa
Rhodes University	South Africa
Water for People	Uganda
Chinhoyi University of Technology	Zimbabwe

Another 6 research teams from 4 sub-Saharan countries are developing innovative methods for desludging and disposing of faecal sludge. The main objective of these studies is to provide innovative ways of managing faecal sludge in peri-urban areas with emphasis on beneficiation routes. Various technologies across the faecal sludge management chain are being field tested and their application supported by evidence based research. From the user-toilet interface aspect, new toilet types are being tested in study areas (Figure 2). The prototype toilets are being evaluated for their community acceptance, implementation costs and operation and maintenance needs in relation to existing ones. For the desludging aspect, novel pit emptying technologies ranging from hand operated tools to mechanical prototypes are being evaluated under various operating conditions to better understand the limitations of the each technology. For the transportation and disposal aspect, novel ways in which to contain and treat faecal sludge will be evaluated by different research teams. These include the application of anaerobic digesters, pyrolysis and pasteurisation treatment systems either as separate treatment systems or combined and integrated with existing technologies to treat faecal sludge to acceptable level (Figure 3).

The SRFA project is being managed through the 40-year old WRC research model of research and innovation, which includes peer review of project related deliverable targets, and will result in the establishment and increased research capacity and solutions in the region, as well as establishing the infrastructure for long term impacts. The SRFA Project thus provides a unique opportunity for a locally driven initiative to generate local solutions.

Contact: Mr Jay Bhagwan (jayb@wrc.org.za), Executive Manager at the WRC
Dr Sudhir Pillay, Research Manager for the SRFA Project, sudhirp@wrc.org.za

Figure 2. *Pre-fabricated superstructure with low volume flushing toilet. The toilet superstructure is constructed from interlocking cement blocks enabling faster construction (left). The pour flush prototype uses low volumes of flushing water which goes into sumps (right). The same building blocks can be used to build the sumps. Photos by Water for People Uganda.*

Figure 3. *Mobile solar pyrolysis unit that converts faecal sludge to biochar via thermal decomposition. The biochar can be re-used as fertiliser replacement or fuel source. Photos by ATL-Hydro.Photo by Water for People Uganda.*

Inaugural Workshop

Emperors Palace Convention Centre
30-31 January 2014.

The Water Research Commission has recently hosted the first workshop for the Sanitation Research Fund for Africa Project from 30-31 January 2014 at the Emperors Palace Convention Centre, Johannesburg. The project is co-funded by the Bill & Melinda Gates Foundation to the value of US$2.5 million and aims to develop local scientific based and innovative solutions for faecal sludge management in Africa. Twelve research teams were competitively selected from across eight different African countries and are being managed by the WRC's 40 year old water research and innovation model – part of which involves the annual evaluation of the research teams' progress and workplans by international experts collectively known as the "Reference Group" panel.

Figure 1. *Mr Jay Bhagwan, Executive Manager of the WRC's Water Use and Waste Management greets the project leaders and international Reference Group panel.*

The purpose of the workshop was to bring the twelve research teams together and evaluate their research activities over the course of this year. The Reference Group panel provided the research teams with scientific input and recommendations to ensure that the proposed work is scientifically valid and can be achieved within the project timeline. The two workshop days were split into themes; the first day focussed on faecal sludge characterisation studies whilst the second focussed on developing innovative solutions to remove, treat and dispose of faecal sludge.

Figure 2. *Prof Chris Buckley from the Pollution Research Group, UKZN speaking about varying conditions of VIPs encountered during their research.*

The main outputs from the first day was that teams would provide a joint standard operating protocol for faecal sludge characterisation which includes sharing of methodologies, agreement on the most essential parameters that need to be tested, standardisation of methods and data interpretation, and establishing an inventory of equipment. This product will be compiled and distributed by the WRC. Moreover, sampling and characterisation programmes are being co-ordinated between groups to produce shared publications.

Figure 3. *Mr Dave Still showing a desludging device in action*

Keynote presentations were made on the first day by Professor Chris Buckley and Mr Dave Still, members of the Reference Group panel. The purpose of these presentations was to highlight the lessons learnt from their respective team's research in faecal sludge management. Prof Chris Buckley presented pit characterisation projects funded by both the WRC and the Bill & Melinda Gates Foundation whilst Mr Dave Still presented on handling various pit desludging technologies, research that was also supported by the WRC.

Emptying of pit latrine with vacuum pump. Photo by Mr Dave Still.

Figure 4. *Dhesigen Naidoo (right), CEO of the WRC having a discussion with research teams and the Reference Group about challenges in research and innovation in their respective areas.*

At the end of day 1, research teams and the Reference Group panel were invited to a roundtable discussion with the CEO of the WRC, Mr. Dhesigen Naidoo. The purpose of the discussion was to talk about the challenges and constraints of water-related research in Africa. This gave project leaders and Reference Group members an opportunity to openly engage in one-on-one sessions with the CEO and WRC staff on various water and funding-related topics.

The second day of the workshop was about developing innovative tools for desludging and subsequent beneficiation. During the first half of the day, research teams presented technologies related to the desludging of faecal sludge and decentralised disposal and beneficiation technologies such as mobile solar pyrolysis units. Professor Kartik Chandran, Columbia University U.S.A then delivered a keynote presentation on the University of Columbia's faecal sludge biodiesel conversion plant in Ghana and imparted his knowledge and lessons learnt to the project teams working on the anaerobic digestion of faecal sludge. Emphasis was placed on the technical challenges associated with implementing full-scale faecal sludge treatment plants in developing worlds.

Figure 5. *Professor Kartik Chandran from Columbia University highlighting the major findings from his faecal sludge to biodiesel conversion plant in Ghana. The study was funded by a grant from the Bill & Melinda Gates Foundation.*

Figure 5. *Mr Jay Bhagwan, Executive Manager of Water Use and Waste Management at the WRC, gives thanks to the Reference Group panel members Professor Thammarat Koottatep (Asian Institute of Technology Thailand) and Professor Kartik Chandran (Columbia University U.S.A).*

In the second part of day 2, research teams presented their respective treatment technologies for faecal sludge beneficiation. The majority of these technologies presented in this session used anaerobic digestion as the core treatment step. A discussion was held around the potential of the anaerobic technologies, developing products from the research, the context in which the technologies shall be applied, and the most important parameters to be measured to evaluate the process. The workshop broke for lunch after which Mr Jay Bhagwan presented the Reference Group panel with gift of appreciation on behalf of the WRC.

A discussion was held after the gift ceremony summarising the important points from the first SRFA Project workshop. The main outputs of the workshop were the compilation of faecal sludge management practices across Africa; a standard operating protocol for faecal sludge sampling, characterisation and data interpretation; inventory and sharing of the latest desludging tools and designs; and shared publications, facilities and human resources among partners.

The WRC would like to acknowledge the following:
Reference Group
Prof Chris Buckley, University of KwaZulu-Natal
Prof Kartik Chandran, Columbia University
Mr John Harrison, Ethekwini Water and Sanitation
Prof Thammarat Koottatep, Asian Institute of Technology Thailand
Dr Charles Niwagaba, Makerere University Kampala
Mr Dave Still, Partners in Development
The Bill & Melinda Gates Foundation

For more information, contact:
Dr Sudhir Pillay, Research Manager for SRFA Project
sudhirp@wrc.org.za
Mr. Jay Bhagwan, Executive Manager for Water Use and Waste Management
jayb@wrc.org.za


SRFA Project


BILL & MELINDA
GATES foundation


WATER
RESEARCH
COMMISSION


WIN-SA
WATER INFORMATION NETWORK
- SOUTH AFRICA -