Innovating for Slum Dwellers

Dr. Charles Niwagaba

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Doctorate Studies: Swedish University of Agricultural Sciences, Uppsala, Sweden, 2005-2009 **Doctorate Research Area:** Environmental Technology

Title of Doctorate research: 'Treatment Technologies for Human Feaces and Urine'.

Dr. Charles B. Niwagaba, a Senior Lecturer in the Department of Civil and Environmental Engineering, CEDAT, is passionate about improving the lives of people living in slums. Dr. Niwagaba completed his PhD at the Department of Energy and Technology, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden. At SLU, Dr. Niwagaba developed technologies for the treatment of source-separated human excreta to make it safe for resource recycling. Together with researchers from the Swiss Federal Institute of Aquatic Science and Technology



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(Eawag)/Department of Water and Sanitation in Developing Countries (Sandec), they have developed an innovative way of minting money from faecal sludge produced in slums.

In another project with researchers from Eawag/Sandec, we have developed a new toilet for slums, which recycles nutrients. In another project, Dr. Niwagaba illustrates how grey water from household chores can be put to alternative use. He first developed a grey water treatment project with his Swedish main PhD advisor, Prof. Hekan Junsson of SLU, and in this project, they designed, built and successfully tested a household grey water treatment filter in Kyebando-Kisalosalo slum. As a result of the success of this project, another scaling up project was developed together with researchers from UNESCO-IHE, Netherlands, in which 20 grey water treatment filters have been constructed to clean up grey water in the slum of Kasubi I zone.

Resource efficient technologies for the

treatment of human excreta

Dr. Niwagaba has found an innovative way of minting money from human excreta or faecal matter. This involves killing the pathogens in excreta using environmentally sustainable processes to make it safe for utilization. The excreta is then use for several purposes including using it as manure for crops; trapping and anaerobically digesting it to produce biogas for cooking and lighting; or drying the waste itself and using it to burn bricks in kilns. He has disseminated this technology through local media and also, through meetings and workshops with local communities and business entrepreneurs throughout the country, as well as slum dwellers in Kampala.

Recovery toilet

Over 600,000 people in Kampala live in slums, where poor sanitation and absence of proper toilet facilities is the order of the day. It is common to find pit latrines filled, overflowing and abandoned by slum dwellers. Now with the new Resource Recovery Toilet Innovation, Dr. Niwagaba brings them new hope in managing human waste. "We are working on a resource recovery toilet for the next generation of slum users, called the Blue Diversion Toilet. This toilet is built on a concept of separating the faecal matter from urine and re-using each of them productively. The water used to flush the toilet is also pumped back, treated and re-used. With the rampant water shortages in slums, the Blue Diversion toilet facility reduces water wastage," he says. The first working model of the Blue Diversion Toilet was field tested at CEDAT and in Kifumbira and Kyebando-Kisalosalo slums in Kampala. It was taken back to the Austria-based manufacturer for re-engineering and further modifications. The second, fully re-engineered working model was successfully field tested in Mukulu slum in Nairobi.

Treatment of grey water in slums

Grey water is the wastewater from laundry, bathtubs, showers, kitchen sinks and washing dishes;

and it comprises 50–80% of the total residential wastewater generated. Grey water usually receives the least attention compared to other environmental aspects like solid waste and black water, yet it also pollutes, but at the same time, can be an important resource. In the slums, grey water is poured into drainage channels and it eventually causes a stench. By treating this water before it is allowed into the drainage, Dr. Niwagaba believes the stench will reduce. Secondly, after treatment, the water is clear and can be re-used for other purposes like gardening. He has developed a water treatment system comprised of a plastic bucket mounted into masonry wall. Inside the bucket is a layered structure aggregates, charcoal and crushed lava rock (pumice),



which performs the treatment function. The system is being piloted in Kasubi, a Kampala suburb where about 10 prototypes have been installed.

"The SIDA sponsorship opened my doors to a bigger world. I am now involved in a number of projects both at national and international levels. Thanks to SIDA," he says.

He has 15 years experience in research, teaching and consultancy in ecological sanitation; provision of on-site urban and peri-urban sanitation and development of treatment systems for excreta and grey water; environmental impact assessments and solid waste management. Dr. Charles B. Niwagaba has been involved in various research and consultancies funded locally by Government of Uganda and by various multi-lateral agencies. Dr. Niwagaba has experience in development of innovative practices in sanitation improvement (from Engineering, social marketing to financing); recycling and re-use e.g. composting, biogas latrines, grey water treatment and use, application of faecal sludge in industrial kilns and boilers etc. Dr. Niwagaba is widely travelled, has over 50 publications in conference proceedings and refereed journals.

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Policy briefs

- Lbthi, C., Niwagaba, B. C., Gbnther, I., Horst, A., Mulongo, P., Grbter, R., 2013. Ventilated Improved Latrine construction in the slum areas of Kampala, Uganda. The Urban Affordable Clean Toilets Project. Technical Factsheet. Dbbendorf, Switzerland. Available at: www.nadel.ethz.ch/forschung/Ventilated_Latrine_Slum_Kampala.pdf.
- Genther, I., Niwagaba, B. C., Lethi, C., Horst, A., Mosler, H.J., Tumwebaze, K. I., 2012. When is shared sanitation improved sanitation? The correlation between number of users and toilet hygiene. Research for Policy 2. Debendorf, Switzerland. Available at *www.nadel. ethz.ch/publikationen/policy_brief_shared_sanitation_improved_2_2012.pdf*.
- Gunther, I., Horst, A., Lbthi, C., Mosler, H-J., Niwagaba B. C., Tumwebaze K. I., 2011. Where do the Kampala's poor 'go'? Urban sanitation conditions in Kampala's low-income areas. Research for Policy. Policy brief published by ETH-NADEL, Zurich, Switzerland. Available at: http://www.nadel.ethz.ch/publikationen/Kampala_Policy_Brief.pdf.

Graduate Students Supervision

- He has supervised five Msc students to completion, in the area of environmental engineering; and another five that are ongoing.
- Supervising 4 PhD students in the area of Environmental Engineering, looking at both technical aspects e.g. development of improved sanitation technologies; collection systems for faecal sludge as well as treatment systems for resource recovery, and non technical aspects, e.g. bahaviour change to adopt improved sanitation facilities, and to operate and maintain them well, including toilet cleaning.

Membership to Professional Organisations

- Member, Uganda Association for Impact Assessment.
- Member, International Waste Working Group, IWWG.

Outreach services

- Started an NGO in 2005 called Sustainable Sanitation and Water Renewable Systems (SSWARS), www.sswarsuganda.org, which implements people centered approaches to water supply and sanitation, especially in slum areas. http://sswarsuganda.org/
- Construction of 156 improved toilets in 35 slums in Kampala under the project, U-ACT (Urban Affordable Clean Toilets), details at www.sswarsuganda.org