

**Environmental Engineering**

**and Earth Sciences**

**EEES Department Seminar**

‟Challenges and Opportunities in Global Sanitation: Systems Analysis and the Case of Mechanized Pit Emptying Technologies”

**Presented By**

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**North Carolina State University**

**Abstract:** Most people don’t think about or don’t want to think about what happens to human waste- fecal material. Where do we poop, where does it go? This is a big, global problem: 2017 WHO/UNICEF data show that 4.5 billion people- 61% of the global population- don’t use a toilet or latrine where the fecal material is safely treated and disposed. This is a wicked problem that touches on engineering, public health, social and cultural dimensions, and has economic impacts in less developed countries. This presentation will discuss a systems view of the sanitation “value” chain- from the user interface, the toilet or latrine, to the collection and transport of fecal material, to treatment and disposal.

One major project is developing a hygienic and dignified way of emptying pit latrines. Every day, pit latrines receive an estimated 0.6 billion kg of feces and 2.1 billion kg of urine from 1.77 billion people around the world. Once pits are full, fecal sludge has to be removed, before being transported and treated/reused. Manual emptying of pit latrines using buckets and shovels still exist today - a high-risk, unsanitary, and undignified job. One of the biggest challenges in this field is developing a single pit emptying technology that can empty trash-filled pits at a competitive cost. Our NC State University team has perfected the innovative pit-emptying device, the Flexcrevator. This device removes fecal sludge even in the presence of trash in pits. The Flexcrevator system has been developed over 6 years with extensive field testing in South Africa, Zambia, Malawi, Kenya, and India, with funding from the Bill & Melinda Gates Foundation and has recently been patented. Our overall goal is to demonstrate how the Flexcrevator can scale-up to meet global demand for hygienic and profitable pit emptying, thereby improving sanitation practices and access world-wide. The presentation includes the design evolution of the trash exclusion head, lab testing results with fecal sludge simulants and trash, and field-testing results from Zambia, Kenya, Madagascar, and Rwanda. The challenges and lessons learned in designing this technology will be discussed.

**About Dr. de los Reyes:**

A person wearing glasses and smiling at the camera

Description automatically generatedDr. Francis L. de los Reyes III is a Professor of Civil, Construction, and Environmental Engineering, University Faculty Scholar, Associate Faculty of Microbiology, and Training Faculty of Biotechnology at North Carolina State University. He is the Faculty Lead of the Global WASH Cluster. His research focuses on environmental biotechnology/engineering, and water and sanitation in under-resourced countries. He is a TED Fellow and has received awards for research, teaching, and service from WEF, AAEE, AEESP, IWA, PAASE, RELX, NC State University, Iowa State University, and the University of the Philippines. He is an international consultant on wastewater treatment, sanitation technologies, and molecular biotechnology.

***Friday, November 8, 2019***

***2:30 PM***

***Rich Lab Auditorium***

***Refreshments following Seminar***

***“Attendance is mandatory for graduate students enrolled in EES 8610, EES 9610, and GEOL 8510.”***