Faecal Sludge Management

Systems Approach for Implementation and Operation

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Editors

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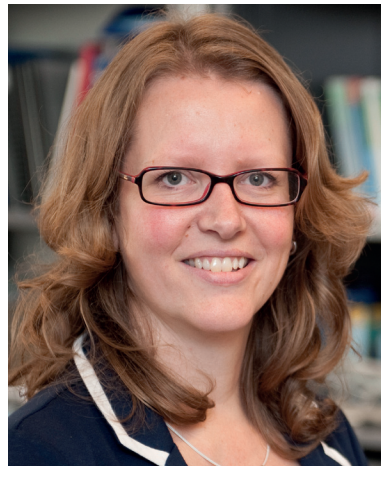
About the editors

Linda Strande

Dr. Linda Strande leads the Excreta and Wastewater Management group at EAWAG (the Swiss Federal Institute of Aquatic Science and Technology) in SANDEC (the Department of Water and Sanitation in Developing Countries). The overarching goal of Dr. Strande's research is to increase scientific knowledge that will advance and increase sustainable urban faecal sludge management technologies. In engineering and development research, she believes it is always important to consider how fundamental research can translate into real-life implementations. To achieve this, she has pursued a systems based approach to faecal sludge management, including technology, management and planning, so all aspects can integrate into complete and functional systems. Currently, the research focus of Dr. Strande's group includes optimisation of treatment technologies, innovation in resource recovery, and methods for sustainable systems level implementations. Dr. Strande has been working in the environmental sector for over 15 years and holds interdisciplinary degrees in engineering, soils science and mathematics. Her academic background, together with wide-ranging international experiences, has provided her with a global perspective, and an ability to research and apply environmental engineering fundamentals in complex, interdisciplinary situations.

Mariska Ronteltap



Dr. Mariska Ronteltap is a Senior Lecturer in Sanitary Engineering at UNESCO-IHE (Institute for Water Education), with 12 years of experience working in the field. She holds a Master's degree in Environmental Engineering from the University of Wageningen, and a PhD jointly from ETH (the Swiss Federal Institute of Technology Zurich) and EAWAG (the Swiss Federal Institute of Aquatic Science and Technology). Her PhD research involved urine separation as a novel approach in the field of wastewater technology, with a strong chemical focus including thermodynamic modelling. Her practical knowledge in the field of struvite precipitation from urine has been employed in several research pilot projects in low-income countries as well as the Netherlands. Dr. Ronteltap's main research topics include nutrient and energy recovery, water conservation and reclamation, and sustainable and

ecological sanitation. Dr. Ronteltap is supervising several PhD and master's research projects in these topics. Through connecting with international organisations and platforms, she aims to contribute to global knowledge in these fields. Dr. Ronteltap also coordinates several online and short courses at UNESCO-IHE, including the online course and the short course on Faecal Sludge Management.

Damir Brdjanovic

Prof. Damir Brdjanovic is the Head of the Environmental Engineering and Water Technology Department of UNESCO-IHE (Institute for Water Education). The professional mission of Prof. Brdjanovic is to contribute to a balance of knowledge development, research and capacity building in the urban sanitation field, with a clear view of the needs of low- and middle-income countries. The unifying vision of his research activities is integrated management of the urban water cycle, which includes provision of sanitation to the urban poor, onsite decentralised sanitation, urban drainage, wastewater collection, treatment and reclamation/reuse, and residuals management. His approach includes centralised to decentralised approaches, advanced versus low-cost technologies, and engineered versus natural systems. Prof. Brdjanovic's research group is also conducting research in emergency sanitation, resource oriented sanitation, faecal sludge management, anaerobic treatment, membrane bio-reactors and infrastructure asset management. His research is conducted through experimental work at laboratory, pilot, and field scale as well as mathematical modelling, decision support and process optimisation in municipal and industrial applications. Prof. Brdjanovic is currently leading a large research and education project for pro-poor sanitation funded by the Bill & Melinda Gates Foundation.

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Foreword

Doulaye Kone

After decades promoting sanitation in low- and middle-income countries, several countries and the global sanitation community have come to realise that it is time to rethink the approach to accelerating access to quality services. Since 2000, the Joint Monitoring Program (WHO/UNICEF) of the Millennium Development Goals (MDG) has consistently reported that the share of the population in low- and middle-income countries that use pit latrines, septic tanks, and systems termed as 'unimproved' sanitation facilities is growing. It is now estimated that between 2.1 – 2.6 billion people in low- and middle-income countries rely on onsite technologies that produce tons of untreated faecal sludge (FS) every day. When septic tanks and pit latrines become full, the sludge that is collected from them is largely discharged untreated into open drains, irrigation fields, open lands, or surface waters. The amount of untreated FS discharged into the open environment poses a serious public health risk. A 5 m^3 truck load of FS dumped into the environment is the equivalent of 5,000 people practicing open defecation. Adding to this is the heavy load from open defecation of raw faeces excreted in the open by an additional 1.1 billion people who still do not have access to any toilet. The consequences of this waste entering the environment are staggering. The World Bank estimates that poor sanitation costs the world 260 billion USD annually. Poor sanitation contributes to 1.5 million child deaths from diarrhoea each year. Chronic diarrhoea can also hinder child development by impeding the absorption of essential nutrients that are critical to the development of the mind, body, and immune system. It can also impede the absorption of life-saving vaccines.

In the 1980s, under the leadership of Roland Scherteinleib and Martin Strauss, the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) established the Department of Water and Sanitation for Developing Countries (SANDEC) with a strong research and development focus on FS management (FSM). Since then, SANDEC has been a research pioneer in developing, evaluating and testing sanitation solutions, complemented by a strong policy and advocacy program. It has both informed and driven a global call to action on the issue.

This book is an impressive resource that capitalises on recent scientific evidence and practical solutions tested at scale by sector professionals. It compiles lessons drawn from rigorous scientific and case study investigations to formulate operational approaches and solutions for planners, engineers, scientists, students, and researchers. I personally coordinated an intensive and very exciting part of this work while working at SANDEC as a program officer and as team leader of the FSM team, which later became the Excreta and Wastewater Management (EWM) Group. This book builds on lessons gathered from Latin America (Argentina), Africa (Benin, Burkina Faso, Cameroun, Cote d'Ivoire, Ghana, Kenya, Mali, Nigeria, Senegal, Togo, Uganda, South Africa) and Asia (Thailand, Cambodia, China, India, Indonesia, Malaysia, Philippines, Thailand, Vietnam). It fills important FSM knowledge gaps, while at the same time acknowledging persistent gaps and identifying new areas of innovation for future research. It is a valuable handbook for any sanitation professional or academic. It is solution-oriented and addresses the issues that real practitioners face (e.g. city managers, engineering companies, development organisations).

From its inception, the Bill & Melinda Gates Foundation's Water Sanitation and Hygiene (WSH) programme has emphasised the strategic importance of improving FSM globally. We have engaged new partners and supported established organisations such as EAWAG/SANDEC and UNESCO-IHE to propose and promote catalytic solutions that can positively impact the lives of billions of people in low- and middle-income countries who do not have access to FSM services. The technologies, project planning tools, and FSM business operation and management practices shared in this book will help stakeholders globally begin to build functional and viable sanitation service chains that benefit poor communities. Key insights on the potential and limitations of technologies, FSM operations, businesses, and the financial and economic value that can be recovered from FS processing will all help to transform sanitation service provision into a more sustainable and profitable business service chain. As the global community is currently looking forward to the 2015 post-MDG solutions, this paradigm will inform new public-private partnership models that promote quality and affordable sanitation services, especially in poor communities where the large majority still live with toilets that are not connected to any infrastructure or public utility services.

Doulaye Kone, PhD
Bill & Melinda Gates Foundation
Seattle, March 2014

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