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**TRANSFORMATION TOWARDS SUSTAINABLE
AND RESILIENT WASH SERVICES**

**Online course on faecal sludge management:
case study in Durban, South Africa**

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Globally, there is a need for substantially more professionals in the water and sanitation sector. Faecal Sludge Management (FSM) plays a key role for the provision of sustainable non-sewered sanitation and needs to form part of the education of these professionals. In 2016, an online course on FSM was designed and developed by the Global Sanitation Learning Alliance. The course targets professionals working with faecal sludge (FS) systems in developing countries and covers important aspects for the design and operation of comprehensive FSM systems. The first course attracted 80 learners, each of whom paid a fee of \$20. Ten learners completed the course. The second course was free and attracted over 350 learners. At the time of writing, the second course is still underway. The course material was updated with links to new technologies and an upgraded online user platform.

Introduction

In 2014, the International Water Association (IWA) estimated that in ten low- and middle-income countries¹, there was a cumulative shortfall of 787,200 trained water and sanitation professionals to reach universal coverage in line with the Millennium Development Goals (MDGs) including personnel in social development, management and finance, and technical fields (International Water Association, 2014). Globally, this represents a shortfall of several millions of water and sanitation professionals and since the introduction of the Sustainable Development Goals (SDGs) and the change from “basic” to “safely managed” service provision, the number of additional water and sanitation professionals needed to meet SDG6: Clean Water and Sanitation has no doubt increased. Equal numbers of people use sewerage and on-site sanitation systems worldwide though on-site sanitation dominates in Asia, sub-Saharan Africa and Oceania (UNICEF and WHO, 2017). As such, a solid understanding of the concepts of faecal sludge management (FSM) should be a key component in the training required by millions of water and sanitation professionals.

With funding from the Bill & Melinda Gates Foundation, an online course on FSM was designed and developed, with the aim of strengthening the sanitation sector in developing countries through education and training. The course focuses on important aspects for the design, operation and management of comprehensive FSM systems. The target audience was professionals currently working in planning, promoting, designing, operating or managing faecal sludge (FS) systems in developing countries, as well as graduate students with similar background and interests.

The FSM online course was first run in 2016 by a number of organisations that formed the Global Sanitation Learning Alliance (formerly the Global Faecal Sludge Management e-Learning Alliance), a platform facilitating development and dissemination of knowledge on FSM through online education. The institutions involved in this platform and who ran the first edition of the course were: IHE-Delft (formerly UNESCO-IHE); EAWAG; Asian Institute of Technology (AIT); Centre for Science & Environment (CSE); International Institute for Water & Environmental Engineering (2iE); Bangladesh University of Engineering & Technology (BUET); and the University of KwaZulu-Natal (Pollution Research Group). Funding for the entire project was provided through IHE-Delft (as lead organisation) by the Bill & Melinda Gates Foundation (BMGF).

This paper describes the experience of the Pollution Research Group (PRG) in developing and running the FSM online course. PRG is a professional research group based in the University of KwaZulu-Natal's Chemical Engineering Department in Durban, South Africa and conducts research on water, sanitation and hygiene (WASH) research projects, primarily focused on FSM, on-site sanitation systems and evaluation of innovative non-sewered sanitation technologies.

Objectives

The objectives of the online course were to:

- Disseminate knowledge on important aspects for the design, operation and management of comprehensive FSM systems;
- Target professionals (including graduate students) working on planning, promoting, designing, operating or managing FS systems in urban, peri-urban, informal or rural areas, in low-income countries and beyond.

On completion of this course, the learners were expected to:

- Have an understanding of the treatment, management, and planning aspects related to FSM, and how they interact;
- Comprehend the importance of proper FS characterisation for optimal collection and transport, treatment and reuse;
- Be able to apply engineering fundamentals to design systems for management and treatment of FS;
- Describe how valorisation of FS can be accomplished;
- Be able to place FSM in an urban waste management context for sustainable and feasible planning of FSM systems.

Methodology

Course content

The online course was divided into six main themes, split into one or more units, each of which covered one week of study load as follows:

1. Introduction to FSM (1 week of study) – understand the concept of FSM and its importance in meeting sanitation needs in developing countries;
2. Technological Fundamentals of FSM (2 weeks of study) – covers the technological fundamentals of FSM, including the characteristics of FS and the various physical, chemical and biological treatment mechanisms;
3. Methods and Means for Collection and Transport of Faecal Sludge (1 week of study) – focuses on the methods for collection and transport of FS from the point of generation to the point of treatment;
4. Faecal Sludge Treatment Technologies (5 weeks of study) – provides an overview of existing and potential future FS treatment technologies including the advantages and constraints of field application of each; and provides the principles, key considerations and potential impacts of co-treatment of FS in conventional wastewater treatment plants and the potential for resource recovery from FS;
5. Management (3 weeks of study) – focuses on the importance of operation and maintenance for FS treatment plants, stakeholders' roles in institutional frameworks and various institutional arrangements for the distribution of responsibilities in the service chain;
6. Planning (2 weeks of study) – provides methods and tools for collecting relevant data and developing a FSM project at a city level.

The content of the course was primarily developed based on the book, "Faecal Sludge Management, systems approach for implementation and operation" (Strande et al, 2014).

Course delivery structure

The course outline and delivery programme was agreed by all partners on the project. Each unit was linked to a chapter in the FSM book (Strande et al, 2014). Each unit had a study load of 8 hours and was usually completed within one week.

The following format was used for the delivery of each unit:

- A unit plan - introducing the topic and materials of the unit;
- A keynote speech - a video recorded by an expert in the field, showing the highlights, history and expected future developments of the topic;

- Reading material in the form of the corresponding chapter from the FSM book;
- If applicable, a case study video - a video showing a particular example or relevant situation. These videos were prepared by the delivering partners as well as other experts in the field;
- Recommended reading materials in the form of papers or other types of publications in the field.

The course was run for a total of 16 weeks between March 2016 and July 2016.

Fee structure

The total cost of the course per participant was USD \$20 (payable by bank transfer, credit card or PayPal). These fees partially covered the cost of hosting the online course through an external online platform company, with the balance covered by funding from IHE-Delft as a lead organisation through funding provided by the BMGF.

Learner evaluation system

In order to verify whether the learning objectives had been achieved, and to enhance the learning process, several assignments were designed for the course. These assignments included both self-assessment quizzes and a research based written assignment. In order to successfully complete the course, the learners were required to complete:

- 6 self-assessment tests – 40% of the total mark;
- 1 written assignment – 60% of the total mark.

Outputs

A total of 80 learners registered for the online course and their distribution by country is provided in Figure 1. From the registered learners, a total of 55 were active through the course delivery. The distribution of learners' activity throughout the duration of the course is presented in Figure 2. Of the registered learners, 10 learners completed the course in its entirety (completed all of the self-assessment quizzes and submitted the written assignment), while 25 remained inactive throughout most of the course delivery.

Lessons learned and challenges

Feedback from learners was positive. Substantial material in the FSM field was covered in the four months of learning time and some of the learners needed extra time to be able to complete the course material. The structure of the course was easy to deliver for the educators and easy to follow for the learners. Over the course of the delivery time, the enthusiasm and participation of the learners reduced, as is common for online courses. In the cases where learners gave comment on their reasons for reduced participation, work commitments were most commonly cited. In order to support learners, the deadlines for self-assessment and submission of written assessments were not strictly followed.

Subsequent course presentations²

The second presentation of the FSM course started on 1st February 2018 (with an end date of 31st May 2018) and is funded by IHE-Delft through an education grant from the BMGF. Based on the outcomes of the initial course presentation, small modifications were made to increase learner participation and to enhance the overall learning experience. These modifications included additional links to updated technologies, an additional written assignment and an upgraded online user platform.

Since the running of this second presentation of the course was funded entirely by IHE-Delft, the registration for the course was free. It is important to note that this FSM online course is currently not accredited by the University of Kwa-Zulu Natal and continues to be run through the external online platform company used in the first presentation of the course. A total of 362 learners registered for the second presentation of the course, with 180 learners participating in the course, and 79 learners submitting the first written assignment. This was a substantial increase in registration and participation compared to the initial presentation of the course. The distribution of registered learners by country is shown in Figure 3. Compared to the initial presentation of the course, there was a distinct increase in registrations from learners from India, as well as other African countries. The reasons for this could be due to the increased interest in FSM in these regions, and the course being free.

Learner evaluation continues to play an important role in the second presentation of the course. In order to successfully complete the course, the learners are required to complete:

- 6 self-assessment tests – 20% of the total mark;
- 2 written assignments – 80% of the total mark (40% per assignment).

Progress to gain accreditation from the University of KwaZulu-Natal is underway and it is anticipated that this will bring added value to the course from the perspective of learners. For the current course, the successful learners (i.e. learner that complete the entire course with a mark of over 60%) will be granted a Certificate of Completion.

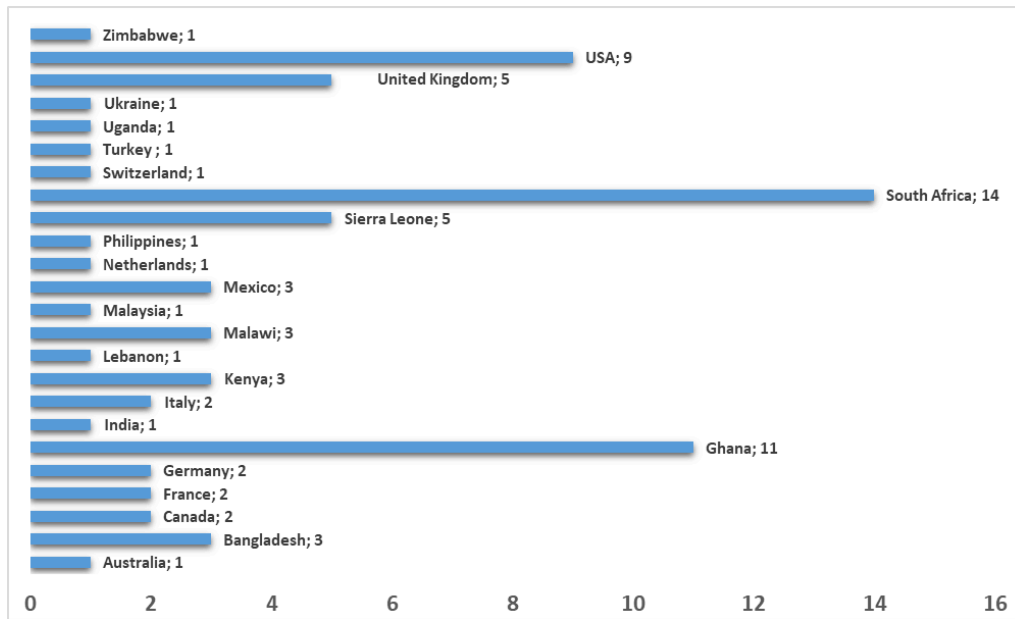


Figure 1. Distribution of learners per country (Presentation 1 - 2016)

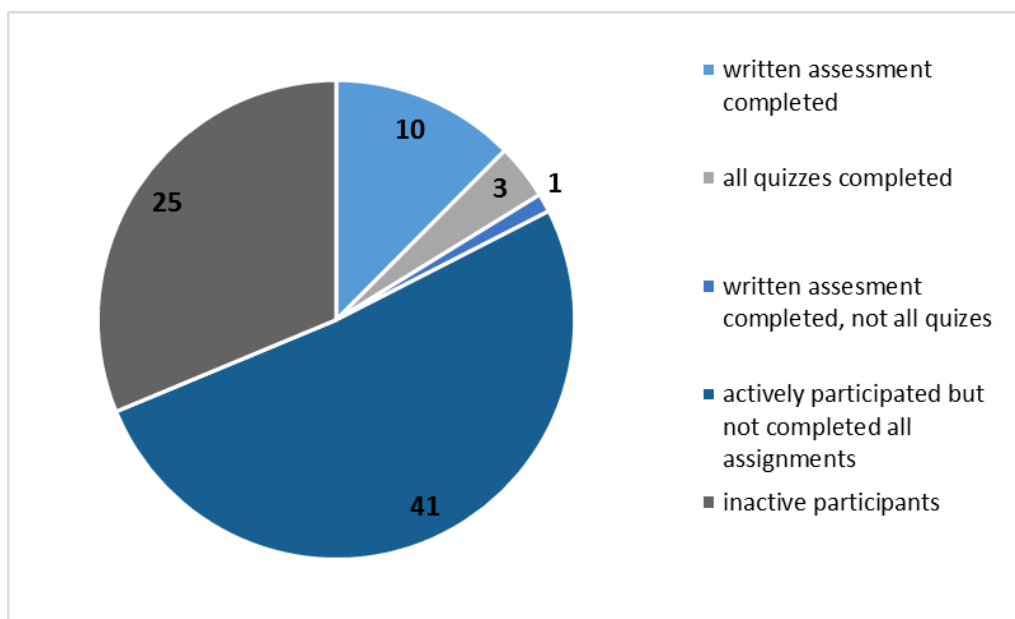
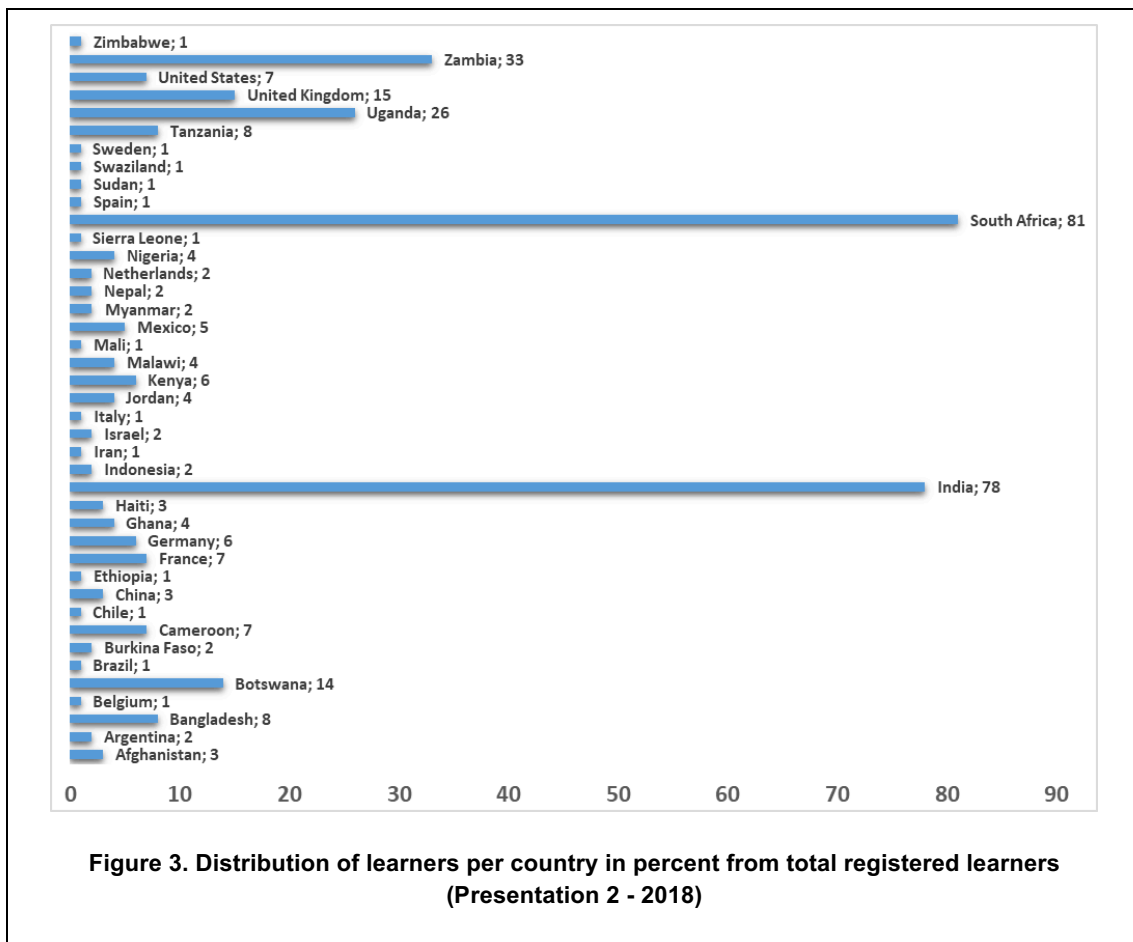


Figure 2. Distribution of learners per activity on the course (Presentation 1 - 2016)



Lessons learned and way forward

Online courses offer an opportunity to reach and educate a large number of sanitation professionals and experts that are required globally. The FSM online course presented by the PRG demonstrates that there is interest in such courses, although maintaining learners' interest throughout the course can be challenging. Unsurprisingly, free courses attract a greater number of registered learners, however it remains to be seen how the registration to completion ratio is affected.

In order to increase FSM learning and capacity building in the WASH sector, the following actions have been highlighted by learners and the course providers that aim to improve future online courses offered through the PRG:

1. Knowledge in FSM is constantly changing and updating as this is a relatively new field with great potential for new science, applied research and industry. The development and the continuous run of online courses in this field is seen as one of the tools for dissemination of the latest updates, development and trends. Whilst courses such as this will always require a strong component on the basics of FSM, additional insights of practical application and lessons learned can be included through the addition of relevant case studies.
2. The learners that these online courses target, but are not limited to, are young professionals in the FSM field, experienced professionals that have shifted their focus to FSM and graduate students with different background (engineering, social science, economics, management etc.) and for this reason the modules are designed to deliver content to a broad audience. It should be taken into account that the target audience usually have competing demands on their time and as such, it is necessary to design learning materials that fit into a busy schedule, e.g. by breaking a single lecture-style video into smaller bite-sized chunks that are easy to follow. This approach is being adopted for new case study videos being filmed by PRG. Some leniency may be required in allowing learners time to complete coursework.
3. Building capacity and expanding the pool of experts in FSM, particularly in a local context, is one of the primary objectives of the FSM online course. Hence, accreditation of the course through the University of KwaZulu-Natal is seen as a mechanism to attract more professionals to take part in such courses as

part of their continuing professional development (CPD). Another approach would be to design FSM online courses that require shorter delivery time and are tailor made for professionals or graduates with different academic background – e.g. FSM online course for engineers, FSM online course for social scientists, FSM online course for economists and financial experts.

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Notes

1. Countries included were: Burkina Faso, Ghana, Lao PDR, Mozambique, Niger, Philippines, Papua New Guinea, Senegal, Sri Lanka, Tanzania.
2. All information correct at time of print.

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