

Digitalisation of the toilet

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Payment via mobile, replacement parts made on a 3D-printer, error messages via NFC-tag – Eawag doctoral student Caroline Saul has found some remarkable innovations in companies that market container toilets in developing countries. She sees great potential in making such technologies more widely available.

Environmental engineer Caroline Saul's dissertation is about innovative business models that can help people in poor countries obtain drinking water and sanitary facilities. Part of the dissertation involved the investigation of digital aids used by sellers of container toilets in developing countries. There is a good reason for this, as explained by her supervisor, Heiko Gebauer, Group Leader in the Eawag Department Environmental Social Sciences: "More than two billion people live without access to hygienic toilets. Nearly a billion people have no toilets at all." One of the results of this is the pollution of drinking water by pathogens.

Container toilets as an opportunity

The development agenda of the United Nations foresees everyone having access to a nearby toilet by 2030. This target could well be reached if container-toilets are installed. The technical jargon refers to "container-based sanitation" (CBS), as this includes not just the toilet itself, but also the disposal of faeces. CBS can be constructed more cheaply and quickly than our toilets connected to a sewage system. In addition, they don't need water, which is a huge plus, particularly in arid regions. In addition, they are more suitable for densely populated urban areas than latrines, as they require less space and are less likely to pollute groundwater.

"There are seven or eight major CBS suppliers in the world at present", explains Heiko Gebauer. "They each serve between 100 and 1500 households. In order to be able to grow whilst keeping their

costs as low as possible, they will need to automate their processes." Only with the help of digital tools will it possible for these companies to perhaps reach 10,000 or more households at some point in the future.

Digital solutions for every work process

Over the past seven years, the Eawag research team has worked closely with several CBS suppliers. Caroline has submitted a questionnaire to some of them for her dissertation, investigating the entire sanitary supply chain – from the toilet containing faeces to the transport of the containers and on to the treatment of faeces and their further use or disposal. In summary: every supplier that she contacted has already automated and digitalised certain of their work processes. Due to their various company histories and differing infrastructures, this has not been done in the same way in each of the countries surveyed, namely Kenya, Madagascar and Peru.

Some examples:

The organisation "X-Runner" in Peru has fitted its faeces containers with Near Field Communication tags (NFC). The firm's employees can inform the central office via smartphone of the time at which they are making a client visit, check whether or not the client has paid their bill, and record any damage or problems with the containers in a data base.

LooWatt in Madagascar operates using QR codes. These are scanned during collection and emptying. LooWatt is thus enabled, for example, to read which container is collected when, and whether the entire contents have reached the collecting point. In addition, in the case of replacement parts that are difficult or impossible to obtain, LooWatt has begun to produce these on a 3-D printer.

Employees of Sanivation (Kenya) carry a GPS tracker while they are collecting. Following each collection round, the route followed can be looked at on screen and, for example, checked to ensure that the collection has included every customer. These data can serve to plan the routes better in the long run and to optimise punctuality, thus increasing customer satisfaction.

All the organisations use digital aids for contacting their customers, especially for payment by mobile phone and also for managing their own digital customer base.

Further digitalisation planned in spite of hurdles

"All of this technology doubtless means great advantages for the CBS provider", says Caroline Saul, "but in our surveys it became clear just how much was involved in developing and implementing these innovations." For example, the employees have to be trained to gather data using a mobile phone. It was not uncommon to find that some of these people had never owned a mobile phone themselves. Furthermore, payment via mobile phone was new territory for many customers, which also meant an increased workload for CBS providers.

Another problem was that when internet access is not available everywhere, the apps have to function offline as well. This in turn requires devices with a large storage capacity. A further challenge is the high illiteracy rate, says Saul. "All kinds of organisations have had to adjust their apps accordingly."

Nonetheless, all of the organisations that completed Saul's questionnaires are already planning further steps to advance their business processes. Saul has made the results of her work available to all the participants which will help to make it easier for the CBS providers to share their knowhow.

Global network

Incidentally, the providers have joined an international branch association, the CBS Alliance. They are also members of the Sustainable Sanitation Alliance (SuSanA), of which Eawag is also a member. "Eawag is actively engaged in the global network that is working to improve drinking water supply and sanitation facilities," says Heiko Gebauer.

Another example of a major project in this area is the Blue Diversion Autarky Toilet, which was developed at Eawag — a project that has already won numerous prizes and is supported by the Bill & Melinda Gates Foundation. The aim is the development of a completely new toilet, which functions without connections to water or sewage pipes or to an electrical power source. In addition, the cost to the user should not be greater than US$ 0.05 per day. "Wastewater and faeces are dealt with separately in the Blue Diversion Autarky Toilet. "The success of this radical new sanitation technology stands or falls by the progress made in the area of digitalisation," says Gebauer.

Publications

Caroline Jennings Saul, Heiko Gebauer; Digital Transformation as an Enabler for Advanced Services in the Sanitation Sector; Sustainability, 2018. https://dx.doi.org/10.3390/su10030752 (open access) Sandec-News 18/2017 [12 MB]

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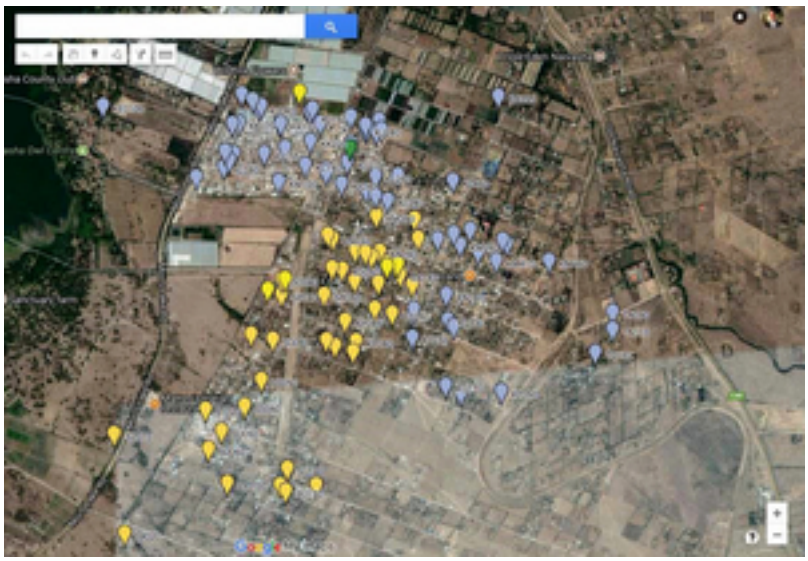
Photos



In container-based sanitation (CBS), faeces and urine are collected in a container. The CBS suppliers collect the containers regularly and dispose of the contents or process them further. (Sanivation)



An employee of a toilet supplier scans the QR code of the collected containers. (LooWatt)



Thanks to digital technology, it can be seen which containers have already been emptied, for example.

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