SanCoP 19: Container Based Sanitation

Context, challenges and safety along the entire value chain

6th April 2017, University College London

Synopsis

The 19th meeting of the UK's Sanitation Community of Practice was held on Thursday the 6th of April 2017 at University College London.

The aim for the meeting was to develop a shared understanding of the Container Based Sanitation (CBS) industry, to consider the use of Sanitation Safety Planning (SSP) to improve health outcomes, and to generate discussion and knowledge sharing to improve risk management in CBS.

Over fifty participants attended the event from universities, private enterprises, government and non-governmental institutions. The day was chaired by Luiza Campos and Eve McKinnon from UCL, and the SanCoP organising committee, Ben Skelton and Christine Cambrook.

A short synopsis of each presentation is given below, and the complete presentations are available, together with this synopsis, at http://www.susana.org/en/cop/sancop-uk.

The organising committee would like to thank University College London for hosting the event and our speakers and facilitators Luiza Campos, Eve McKinnon, Brian McSorley, Virginia Gardiner, Louise Kirby-Garton, Kory Russell, Kate Medlicott, Jonathan Parkinson and Esther Shaylor, and note takers Rich Dewhurst, Aidan Tierney and Angus Rees.

Session 1 – Building a shared understanding of the CBS industry

Eve McKinnon, UCL

Eve was unable to present due to IT issues, but spoke briefly setting the scene for the day. challenges that form part of the global sanitation crisis include rapid urbanisation, overcoming cultural and behavioural aspects, economic and institutional challenges in particular weak governance, operation and maintenance.

Container Based System (CBS) can address some of these challenges, they are adapted to urban environment, in particular low space requirements. CBS is a financially attractive option: based on life cycle cost-based analysis preferential to alternative systems (BCG report 2016). "Sanitation as a service" is not just technology, but addresses whole service chain. It is an opportunity to reclaim paradigm of waste management to resource re-use. Circular economy model is important, urine/excreta can be extracted as a valuable resource for post processing commodities.

Despite opportunities there are challenges, including acceptance, financial, but also institutional from government buy in and regulatory frameworks that can include CBS within safe sanitation management.
Therefore, in the medium to long term objectives are to achieve safely managed and sustainable sanitation: CBS must focus on reaching these standards to meet SDG's goals and access to attached financing.

Brian McSorley, Oxfam

Brian presented on Oxfam's experience in CBS in Kenya from 2010 to date. Traditional solutions were not working for low income settlements in Nairobi. In home container based solutions were the preferred approach, primarily because they require no additional land.
Oxfam became manufacturers by necessity, not because they wanted to as there were no products available on the market that met their needs. They were looking for a product that was affordable to the poorest. The product developed was called the 'jitegemee' toilet – meaning to help oneself.

In 1994, an 8 week pilot was carried out in two informal settlements, 94 households, and the toilet was found to be socially acceptable, with lots of positive feedback from women and children. Men did not use the toilet but felt it was beneficial for other members of their households. The pilot study was located close to public toilets with existing disposal facilities, hence focused only on collection and containment, but there is a need to consider collection models further. Resistance from local authorities was primarily due to the similarity to bucket latrines.

For the next stage, the product was redesigned to be a urine diversion model. It was designed around the available plastic containers for cost reasons, which proved to be a limitation of the design. Oxfam were working together with Sanergy at this point, who then took over the design process and developed a fibreglass prototype, and used this for a 3 week trial with focus groups and took on their feedback to improve the design. Sanergy were able to link in with their existing collection model to provide twice weekly collection, and are offering the product alongside their bigger (and more expensive) toilet model. The product is in 30 households for now, and the first bulk production run was December 2016 – being produced locally in Nairobi.

Areas that need further work include the business model, and the perception of CBS. People are currently not buying into the service model, so this needs work – there need to be policy changes to incentivise service providers.

Q – How is the sales / financial process working?
A – The emptying service is being sold for $6/month, which allows for twice weekly collection. It's currently an upfront payment, but they are currently considering an option for payment at the end of the month so there is no upfront cost to households. Oxfam funded Sanergy to make the mould and produce the toilets. In the longer term they hope the service charge would also cover the cost of the toilet, but this is very dependent on the durability of the toilet, and they need a critical mass of customers.

Virginia Gardiner, Loowatt

Loowatt have been working to deliver CBS in Antananarivo, Madagascar. The city has open sewers which are often full of rubbish. The area floods regularly, and pit latrines are known to flood and the high water table causes leakage from pits.

Loowatt are using the same technology in Madagascar as they are in the UK, and are focusing on value generation through bi-products. The toilets are serviced once a week, and the waste is removed and transported to a plant which generates heat and power from anaerobic digestion. The system includes pasteurisation as Helminth eggs are a big issue in this area. The bi-products from treatment are energy and vermicompost. The treatment facility can serve approximately 300 households, at 25m3. There is a similar scale digester close by in the city which was built by an NGO and handed over to the local government to operate. Loowatt have had 100 toilets on the ground since September 2016, and have just started selling fertiliser.

In order to scale up and have a rapid impact, partnerships will be key. Loowatt have just started offering their service to other partner organisations. Their product is located externally to the home, as most people in the area are used to external latrines. However clearly a range of products need to be available to suit each scenario.

Loowatt's mobile app and web platform allows them to track waste through the collection process – from the toilet to the digester. This real time information provides assurance that waste is going where it needs to, and allows them to generate a heat map of events. The collectors have a basic android smart phone and scan QR codes at key points through the collection process. The waste is collected from approximately 1km radius around the AD facility. This area is not accessible by vehicle so all collections are by foot.

Loowatt have been collecting data on operation for the last 6 months and are now reviewing this and will be re-evaluating their business model. The customers are all below the poverty line. The current business model requires customers to pay an upfront deposit and then purchase the refills for the toilet on a pay as you go basis. This is seen as preferable by the customers, as they are buying a product (rather than a service), but it makes service planning for emptying difficult. Generally customers are happy with the toilet and are purchasing refills.

The facility produces 25m3 of gas, and processes 1.2 tonnes of waste per week. Much of the energy output is used to heat the pasteuriser, but surplus electricity is produced which is estimated to be worth around $500. Electricity is sold to a tenant as reselling to the grid is illegal in Madagascar.

The technology appears to be viable in Madagascar, and baseline and endline surveys following the 6 month trial appear to show that people are self-reporting less trips to the doctor. Currently they have momentum with the Municipal stakeholders. Opex is low, in part due to the poor economy which means that highly skilled people are available for low costs.

Challenges to be solved include gaining a better understanding of the value proposition for the toilets, as people can poop for free, what is the value of cleanliness, and how can this be

demonstrated? However, the demand is there, but more product design is required. Better understanding of the scale required in order to be profitable is required, what is the investment proposition? The bi-products are great and add value, but does CBS need to stand up on its own?

Q – Is the bag compostable?
A – Currently Loowatt supply compostable liners, this is one of the questions they are considering, as PE plastic bags would be much cheaper and hence would make the solution more scalable.

Louise Kirby-Garton, Sanitation First

Louise spoke about how the legislative operating environment has changed Sanitation First's work in India. The GroSan toilets use a multiple container system on rollers under the toilet to provide safe containment at the toilet, sufficient storage volume, and a safely contained transport mechanism to the treatment facility where composting is undertaken. Sanitation First started working in 2010 in Cuddalore in an inner city slum, and have now expanded to provide 43 toilets in Puducherry. Over 4,000 people use the shared facilities, and SF are now in discussion on the supply of 100 toilets to Chennai.

As part of Sanitation First's work to free at point of use shared toilets in slums, they have had to demonstrate that the work of the staff transporting the containers does not fall under the manual scavenging act. A large part of this has been developing a video which clearly explains the process and the safety systems in place to quickly demonstrate to anyone who watches the video that their process is safe and compliant with regulation.

The manual scavenging act is a criminal act subject to fines and even prison sentencing, designed to stop the practice of removal of human waste by hand, unprotected. Sanitation First's video explains the design in detail to emphasise the features of the design which enable it to comply with the manual scavenging act – such as the fact that the multiple container design allows the waste to be composting for 3 weeks prior to it being removed, which enables it to no longer be considered as untreated faecal waste, as well as operator protection measures such as specialised handles for removal of containers, PPE, and a detailed cleaning process.

Q – How important is user error?
A – The toilets are simple to use and are accompanied by an extensive education and training process. The only new part to most users would be the need to step to one side away from the toilet for washing.

Q – What is your financial model?
A – At present we are not for profit, based on donations, however we are talking with the Chennai corporation on government funding, and looking into the financial impacts of composting as a revenue.

The audience were encouraged to think about the following questions:

- How cheap is an unused toilet?
- What are the costs to treat the waste?
- What is the social return on investment?
- Can we carry out environmental cost benefit analysis?

Session 2 – Human Safety

Kory Russel, CBS Alliance

CBS Alliance is just starting up, but is a coalition of practitioners working on CBS, and has been started with the aim of formalising CBS as an accepted approach. It was recognised that there is a need for common guidelines and standards, such as sanitation safety plans (SSP).

CBS Alliance is currently in the initial 6 month 'formation' stage, where they are identifying what they need to be through engagement with partner organisations. They are currently assessing what the most appropriate currently available standards are for CBS, and Kory highlighted that there is a need for technical and economic validation, more research is required.

Anyone interested in becoming a member of the CBS Alliance should contact Kory for more information.

Q – Has CBSA linked up with other organisations?
A – CBSA has been speaking to the World Bank and WHO, but as the organisation is so new discussions are at early stages. This is the first event where they have broadcast the alliance.

Kate Medlicott, World Health Organisation

Kate explained the concept of SSPs and how they have been developed from a health perspective. The aim is that the SSP is used to prevent human contact with excreta at all stages within the sanitation chain. The approach doesn't favour different technologies.

SSPs were developed based on 2006 waste water guidelines, and use the approach of identifying hazards and critical control points which has been widely used in risk management in industrial processes for years, although it is new to sanitation. The aim is to minimise the negative health impacts associated with bad sanitation management, and maximise the beneficial reuse of sanitation bi-products. SSPs can be helpful for those trying to promote reuse of sanitation bi-products, or to scale up a process.
Health risks do exist, and tend to accumulate with the most vulnerable, but SSPs help through identifying risk and allowing targeted investment at the right place to minimise risks. SSPs were developed as it was realised that all the large scale reviews of sanitation interventions were showing a limited impact on health, and that much better health gains could be achieved if there was a more systematic approach to cut out subsequent exposure pathways.

Burden of disease assessments showed that moving from unimproved to improved sanitation achieved a 16% reduction in diarrheal diseases, but moving from unimproved to safely managed sanitation showed a 69% reduction. Therefore there is potential for a much greater health impact through sanitation than is currently being achieved.

Kate showed a short video demonstrating how to apply the SSP procedures across different types of sanitation. Exposure groups, hazards and controls and monitoring were all considered. Kate emphasised that SSPs are not just about improving technology, but about making incremental improvements through management, behaviour and technology to reduce risk at all step of the sanitation chain.

Q – How will SSP approach be utilised to measurement of SDGs?
A – The safety managed sanitation (6.2.1) and safely treated wastewater (6.3.1) indicators of the SDGs will be measured using course but statistically representative, globally comparable data to inform global monitoring processes. SSP (like Water Safety planning for drinking water safety) are an implementation tool to be used at the city or system level to capture the details of each systems and ensure they are safely managed in practice in line with the intent of the indicator.

Adrien Mazeau, Independent Consultant (on behalf of the World Bank)

Adrien gave a short introduction to a study that the World Bank are undertaking which will review different CBS models, to understand the specifics of each approach, categorisations and contextual variations. The study is being developed to enable CBS to be compared to alternatives in each location, and to formulate recommendations for different agencies on CBS.

Eve McKinnon, UCL

Eve spoke about her PhD research which has been looking at sanitation hazards, human safety and risks in a community using CBS. She has been using SSPs to assess risks by identifying exposure pathways, critical control points, and factors contributing to risk.

Eve's research has been based in Kenya, covering 60 households including in-depth interviews. Discussion of health risks was deliberately limited so as not to alter user perception of the risks. The methodology used a mix of contextual mapping of hazard exposure pathways, shadowing, informal discussion, and structured interviews. Through the study period there were 67 exposure events, primarily related to safety culture. Most pathways were via the hands, with the handling of the being a key area – container surfaces and cross contamination (faeces and urine) being important issues, and hygiene around hand washing was a key opportunity for improvement. Hygiene knowledge locally focused on flies as a transmission route. It was acknowledged that E.Coli as an indicator of faecal contamination

has weaknesses, however results showed that 21% of all waste containers and 26% of toilet contact surfaces were contaminated.

A multiple barrier approach is needed to improve safety culture, reduce technical failures and human error. It should be remembered that there are risks associated with everything, discussing risk should not have negative connotations, managing risk is what is important.

Challenges include access to good health data, resistance to discussing risk, a lack of money and time for sanitation safety planning in new organisations, and large enough trials to be statistically valuable.

Q - What are the top 3 things to do to prevent exposure at household level?
A - Proper cleaning and disinfection of containers to ensure surfaces are not a hotspot of contamination, regular servicing of sanitation facilities to ensure that they do not over flow, and improved designs to ensure they are easy to use and robust

Q - Is CBS perceived as a feasible, safe solution?
A - The study reviewed events without implementing control measures – and it's recognised that similar exposure can occur with other sanitation technologies (septic tanks etc.). There may be benefit in a comparative analysis between CBS and other sanitation systems to understand which exposure pathways are the same or different.

Session 3 – Discussion Groups

For the third session the room broke into groups for lively discussion on the following questions:

- What are the factors that increase the risk to the CBS operator, and what indicators can be monitored to reduce those risks? This discussion was framed around a disease risk framework which consider interaction of socio-economic factors, biological, physical, institutional and behavioural.
- What are the key exposures during use and operation was discussed. The group used worksheets and photos of to identify hazardous events, exposure pathways and identified types of control measures.
- The hazardous events and exposure routes were described according to the five system components (User interface, Emptying, transport, treatment and disposal)
- Design of the User interface was also assessed by teams to identify technical risk factors.
- CBS is not considered as an improved sanitation technology under the JMP categorisation. What are the implications of this to CBS and how can CBS move up the ladder?
- How to support development of sanitation risk management policy who is important in doing this
- A free-thinking table posed questions around definitions of CBS (what is included under the umbrella) and the cost comparison with other sanitation systems. This was also discussed around the scalability on CBS – which relies on definitions and standards being defined.

Session 4 - Facilitated Plenary led by Jonathan Parkinson

Questions were put to a panel; panel members were Peter Hawkins, Georges Mikhael, Brian McSorley, Eve McKinnon, and Kate Medlicott.
Question to panel: If it's correct that there are only 5000 container based sanitation systems, how much would a requirement to use SSPs affect the potential increase in CBS? What can be done to prevent any negative impact on take up or resource requirement?

Responses:

- SSPs shouldn't be a barrier, operators who are following standard operating procedures should find their procedures apply within the SSP framework.

- The distinction between bucket toilets and CBS needs to be clearly understood, SSPs can form a useful part of this and will be useful for advocacy to local governments, particularly as a recognised WHO approach. Therefore they will be beneficial in the long term even if there is an initial impact on CBS provider resource requirements.

- A regulatory vacuum exists around CBS, progress has been made without legislation.

- SSP are not compulsory, there is no WHO requirement to produce SSP, but what it should do is give transparency as to how risks are being managed. Investment in the form of time and money to produce SSP should be recovered in the long term as the SSP can help to identify the main risks and the ways they are being managed, and can avoid expensive technological interventions where a simple risk management approach could achieve the same outcome.

- Technology always advances ahead of regulation, technological change will dictate where regulation is required. Providers should work with regulators. To work totally without regulation is a business risk for CBS providers.

Question to panel: Are CBS providers being asked to prove themselves more than previous technologies? For example, pit toilets were frequently installed without regulation. Will encouraging regulation stifle the industry before it's developed?

Responses:

- CBS providers are innovators within the sector, we don't want to leave a legacy of unhygienic, unsafe containers. Systems need regulation in order to ensure progress is made in a controlled, safe way, and to ensure a professional service is provided. CBS does have to prove itself more, because of the legacy of bucket toilets.

- Does CBS necessarily have to cover the whole chain, or should they focus on containment and collection only, and work with other agencies to provide treatment? While one of the benefits of CBS is that the waste is generally much better suited to

treatment, you don't necessarily need CBS to provide everything. However if CBS doesn't include treatment, it isn't much more than a bucket.

- Costs should be considered in order to understand the relative costs of collection and treatment. For many CBS providers, using the waste as a product which can add value to the process is a large part of cost, but also an important part of the business plan. On collection only, some data is starting to come forward suggesting CBS can compete with sewers on the cost of collection.

Question to panel: Water Safety Plans (WSP) targeted utility companies, who should be responsible for the production of SSP?

Response: WHO envisage that the Health department within the Local Authority would be ultimately responsible, as they have the overview of the entire sanitation system. However within CBS, any CBS provider can take responsibility for the sections of the SSP that they can influence.

Esther Shaylor – Susana

Esther gave an overview of Susana, the information and resources available. Susana is being refreshed in order to make it more relevant to practitioners, a Wikipedia page function has been added which can be edited by all, and the web interface will be updated shortly.

http://www.susana.org/en/

Attendees

	First Name	Last Name	From
1	Adrien	Mazeau	Independent
2	Adan	Tierney	WEDC
3	Angus	Rees	WEDC
4	Ben	Skelton	Dig Deep
5	Benedict	Krueger	Imperial
6	Berta	Moyer	Cranfield
7	Brian	McSorley	Oxfam
9	Christiane	Duering	IOD PARC
10	Claire	Scott	Cranfield
11	Colin	Ives	Kildwick
12	Dan	Sanger	Independent
13	Dani	Barrington	Cranfield
14	Daniel	Ratcliffe	Leeds
15	David	Crosweller	Sanitation First
16	Dorian	Jornet	Cranfield
17	Esther	Shaylor	Oxfam
18	Eve	McKinnon	UCL
19	Georges	Mikhael	WSUP
20	Gracient	July	Cranfield
21	Harriet	Wood	Dig Deep
22	Ian	Ross	Oxford Policy Management
23	Jenny	Lamb	Oxfam
24	Jincy	Jose	Newcastle
25	Joanne	Beale	Independent
26	John	Archer	Gather
27	Jonathan	Parkinson	Oxfam
28	Joshua	Palfreman	Wastedar
29	Kojo	Howard	Cranfield
30	Komal	Saini	Leeds
31	Kory	Russel	Oregon U.
32	Kristin	Ravndal	Cranfield
33	Lindsey	Noakes	Gather
34	Louise	Kirby-Garton	Sanitation First
35	Lucy	Stevens	Practical Action
36	Luiza	Campos	UCL
37	Noemie	de La Brosse	Practical Action
38	Peter	Hawkins	None (ex WB)
39	Pippa	Scott	iSan
40	Priti	Parikh	UCL
41	Rebecca	Scott	WEDC
42	Remi	Kaupp	WaterAid
43	Richard	Dewhurst	WEDC
44	Sam	John	Mahatma Gandhi U.
45	Seray	Wright	Student
46	Simon	Bibby	DFID
47	Syed	Yasir Ahmad	IMC
48	Tim	Brewer	WEDC
49	Tommy	McManmon	WEDC Graduate
50	Tristano	Sainati	Leeds
51	Tse-Hui	Teh	UCL
52	Virginia	Gardener	LooWatt
53	Yamikani	Yafeti	Cranfield
54	Zoe	Van den Bossche	Cranfield