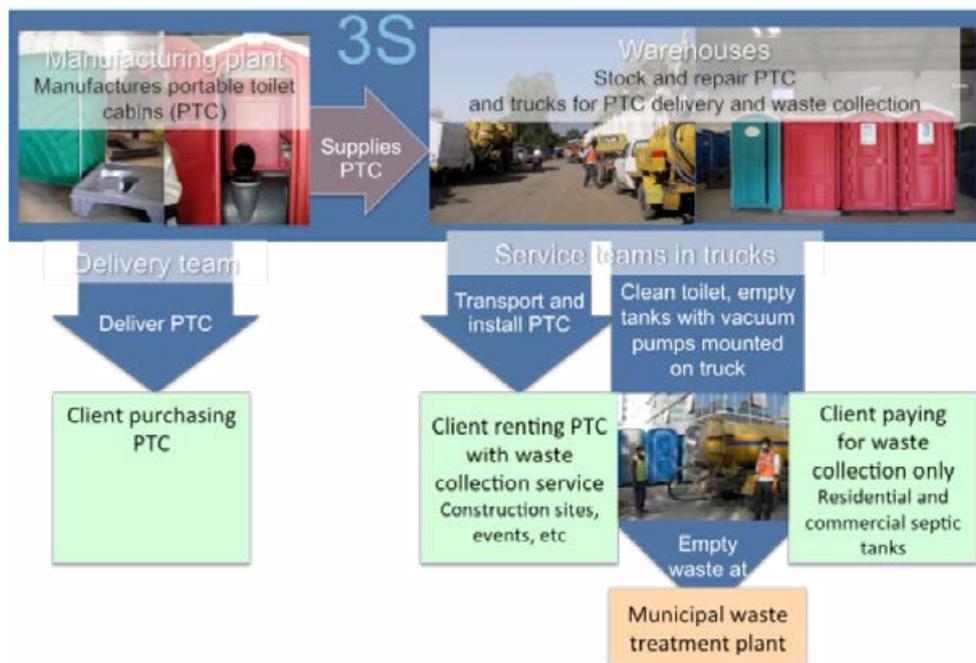


painting, basic marketing support, sales of additional related product (e.g. sanitary napkins). Entrepreneurs charge users ~\$0.80 per month per family to use community toilets (i.e. in poor residential areas, open 24 hours a day), similar or more than what they charged before 3S intervention (as they provide better service), or \$0.03 per use in public toilets

(i.e. in areas with a lot of transit, open 11am-9:30pm), which is the maximum price allowed by law for one toilet use. 3S considers these as pilots to explore opportunities of working directly in the slums, and is not charging end-consumers (costs of these pilots are covered by grants, representing less than 1% of 3S total revenues).

Value chain



Manufacturing

Toilet interiors (in plastic) are manufactured in a plant 40km outside of Pune, then assembled with the rest which is imported (side panel and roof come from the US, head pumps and foot pumps from Ireland, the rest from various cities in India). The plant can manufacture and assemble 800 toilets per month (but is currently working at only 25-30% of its full capacity, producing 200-250/month on average). Manufacturing the entire product in-house would take off 26-30% of toilet costs (some from customs and freight) and the investment in the manufacturing facility would make sense economically for 5,000 toilets per year.

Installation

Toilets go through a full check before they are dispatched to new sites. They are installed (and then maintained) by a team of 2 technicians, 1 driver and 1 supervisor, who transport the toilets in a truck and install them on site. Installing a cabin takes 5 minutes. No link with water tank or sewage is required as toilets have their own tanks, one for water that can be replenished with clean water by 3S, and one for waste that can get emptied by 3S as well, if water and sewage connections are not available on site. In case of link to a sewage system, plumbing done at the site can be done onsite.

Marketing & sales strategy and organization

The sales organization is deployed through city branches (6 cities in total), with at least four sales person in each. On average, one sale person sells rental contracts for over 100 toilets throughout a year. Sales persons are overseen by the Centre heads (in charge of operations and sales activities), located in each of the 6 main cities of operations. There has not been any issue of sales saturation so far as the market is huge and 3S is the first entrant, with their number of toilets installed doubling every year.

Cash/payment collection

Construction site clients are billed once a month.

Community toilets are either pay per use or subscription system, but payment was not always enforced. In community toilets (in residential areas) supported by 3S, families are now requested to pay the monthly family amount at the beginning of each month, directly to the toilet entrepreneur (all revenues go to the toilet entrepreneurs). Before the intervention of 3S, about half of the users were not paying anything. In public toilet (in areas with a lot of traffic), the system is pay-per-use, and clients must pay INR 2 to the operator before use.

Usage and hygiene

Indian squat toilets are all provided with hand wash facilities outside the toilets, while Western toilets have hand wash inside the toilet. 3S also offers showers in a separate cabin (not very popular yet though).

Maintenance and cleaning

The toilets are sturdy and need repairs only 2-3 times in total over their 10 years lifetime. Maintenance is done in the warehouse by the installation/collection team where each toilet is dismantled, cleaned piece by piece and verified. If a problem happens on site, site supervisors can conduct basic maintenance themselves. These small repairs cost on average \$8 per year a toilet. Toilet cleaning is done by the collection team after the pit is emptied (see below in “waste storage and collection”). Technicians then add a deodorant and disinfectant solution dissolved in 5L of water, and clean the inside and outside of the structure as well. The deodorizers can be bio deodorizers or bio tab or dissolvable biosachets, all ecofriendly and made in the USA (EPA approved).

Waste storage and collection

The collection team is the same as the installation team. Hiring requirements are minimal – anyone who applies can get the job, and keep it if they respect basic discipline (e.g. being on time and present every day, respecting the safety conditions). Turnover has been lowered over the years thanks to a comprehensive HR policy (e.g. in addition to competitive salary, breakfast offered at the warehouses every day, group activities etc) and is now between 10 and 30% depending on the cities. The collection team collects the waste from each toilet daily (up to 190L waste per toilet), or every 2 days for the most remote sites, following a set route in a truck with a 1000-3000L storage tank on top. They cover 50-85 toilets per day.

Waste treatment, disposal and recovery

The collection tanks on trucks are brought and emptied at municipal treatment facilities (multiple trips a day, given the volume of waste). As of 2013, the total cost of using these waste facilities is around \$1,000/month for 3S. In Pune (city with the largest operations for 3S), the municipal waste treatment plant is currently close to full capacity and is likely to ask players like 3S to find other ways to dispose of their waste. 3S has started thinking about setting up its own treatment facility there.

Technology

Description of toilet-related technology

Key features:

- Cost: \$550 on average; Price: \$700.
- Design: Pour-flush, collective portable toilet: cabin with base, side panels, one piece door and roof, held with slide on corner moldings and a rivet system. Some models come with hover handle, coat hook, mirror and shelves. Dimensions are: 2.3m x 1.1m x 1.2m, for 68 to 80 kg. The interiors are made of LLDPE (Linear Low Density Polyethylene) and the exteriors are made of HDPE (High Density Polyethylene).
- Durability: The toilet structure (interior and exterior) can last 10 years, with some small parts needing repairs (lock, rivets for the door, etc.).
- Water and energy efficiency: The flush uses 0.3L of water per stroke, contained in a 150L water tank in the cabin replenished from a local water source (paid for by the construction site or event organizers) or by 3S clean water tank each day, as part of the service contract. Today 3S pays the various municipalities less than \$2000/year in total for water. The toilets do not require any energy (the flush works via foot pump or gravity).
- Malodors and safety: The malodor is limited thanks to the chemical disinfectant solution which is added every day. This solution helps control malodor for several days. The toilet is completely safe to use and faeces are stored in the tank below the toilet.
- Waste storage: On-site tank below the toilet (up to 200L capacity) – or when available, connection to public sewage system (which can be done even for temporary toilets).
- Waste collection: Daily collection by 3S trucks with vacuum pumps – high pressure jetting mechanism to evacuate quickly the waste and avoid that anyone touches it – or when available connection to public sewage system. Pumps are powered either via a small motor or by the truck engine.

- Potential and limitations:
 - » The industrialized collection process set up by 3S is economically viable with one truck for at least 50 toilets visited daily, which is feasible in dense areas but can become more challenging in more dispersed environments.
 - » The routes could be further optimized with IT; trucks with larger capacity would limit the number of trips to the waste treatment facility. 3S is working on both.

Social impact

- Scale: Over 3,000 toilets rented at any point in time, 3,450 in total available for rental, 300 sold in 2013, 700-900 sold since inception. Assuming 50 users per toilet in average, this means that over 150k users use 3S toilets every day.
- Penetration: It is assumed that most workers use the toilet, as this is the only free sanitation facility available. In some instances, if allowed by the site manager, other people from the neighborhood might be using them as well. There is no clear monitoring of usage.
- Acceptance and usage: N/A.
- Customer satisfaction: 90% of construction companies sign up for a new contract after their first one. S3 has just set up a 3-person hotline to answer any client concern or user question. At end user level, anecdotal evidence of S3 construction workers being first time users of toilets and deciding to build a toilet at home.
- Evidence of impact on health: NA.
- Promotion of related behaviors: In addition, on construction sites where 3S installs toilets for the long term, 3S staff conducts at least one awareness campaign on sites – about open defecation, good hygiene practices such as how to wash hands, how to use a toilet, the benefit of bathing and keeping the residence area clean, etc., using a UNICEF movie, pictures and other media. According to Saraplast, around 40% of users attend the training, and that most of them claim that they were applying what was taught. As of 2012, over 6000 participated. In addition, 3S has installed free toilets in various schools (grant-based project), and uses the schools as a platform to raise awareness on the importance of clean sanitation. Finally, the company launched a “City 100% Sanitation Campaign” to generate awareness on these topics among Pune’s citizens and stakeholders.
- Waste collection and disposal strategy: The toilets are rented for a fee, which includes daily collection done entirely by 3S. There is no ensured compliance for the toilets that are sold, or for the public toilets that 3S helps run.

Economic sustainability

End consumers

- Affordability for end users: Free for end-user in the case of rented contracts, pay per use at \$0.03 or pay per month at \$0.83 per household in case of collective toilets (0.3% of household income with 3 persons working).
- End consumer financing: N/A

Upstream organization

- 3S: 3S charges its institutional clients \$75-100 for the set up and servicing of a toilet per month (for long-term contracts) or \$25-33 per day (for short term events – this higher cost includes an attendant). One route needs 50 toilets per truck to breakeven in 15-18 months (on the costs of the toilets, plus the truck, plus the local team operating the truck, plus cost of waste disposal – which is as of now minimal in municipal waste treatment plant). 3S also generates revenues from advertising on toilets. 3S is currently profitable.
- Public toilet operators: Revenues from user fees. Initial pilots show that if well run, public toilets can be a small business for local entrepreneurs (earning over \$60/month, in areas where average salary is around \$80/person).

Downstream organization

So far, 3S has to pay for disposal of waste at the municipal treatment plant (\$1,000/mth for all 6 locations, covered by the margins of the upstream organization). However as the Pune plant is reaching full capacity, the municipality will likely ask 3S to treat their waste themselves. It is also likely that the price of water will increase as water is becoming scarcer. Hence S3 is thinking of building its own waste treatment plant that should allow to convert 80% of the waste into a water clean enough to clean toilets (for S3 own use), or to be mixed to make cement (if sold to construction sites). The pay-back of such a plant (based on savings on municipal waste treatment plant fees and reselling the clean water) would be around 2 years.

Innovations

- 3S has found a truly profitable business model by targeting clients who are not the users themselves, but people who are ready and able to pay for toilets: construction site managers willing to provide a better work environment for their workers. The fact that workers can avail this facility free of cost allows spreading the experience of regular and clean toilet use.
- 3S markets its cabins with free trials: when construction site managers hesitate to take on the service, 3S provides its toilets and service for free for a month. 50% of managers then decide to take on the paying service.

Remaining hurdles and bottlenecks

- Finding a sustainable model to educate and serve end-users directly in the slums: 3S is only catering to a limited market segment. It still needs to find a way to better cater directly to end-users in slums:
 - » Upgrading community toilets can be challenging as these are often government buildings and local governments are reluctant to let a company interfere with their work
 - » Organizing waste collection for small home toilets (i.e. waste in a bag) is forbidden in India (a law forbids to carry waste by hand, to make sure the scavenger's job disappears)
 - » Households still prefer septic tanks, when they can afford; which 3S could service and is in the process of acquiring equipment and new technology to cater this vast market.

Contact information

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Ulka Sadalkar, co-founder and Director: ulka@3sindia.com

Appendix

Sources: Field visit of Pune operations, December 10-11, 2013. Interview with Ulka Sadalkar, Director, Ranjit Kher, Director, Colonel A.A. Gune, Lead for operations in Pune and for India, Tapan Apte, Chief Financial Controller, Amey Mahure, Business Development CLTS (Community Led Total Sanitation) ; www.3sindia.com; www.businessinnovationfacility.org/page/saraplast-3s-shramik-portable-sanitation-and-waste-management-in-; www.planetedentrepreneurs.com/wp-content/uploads/entrepreneurs/Inde/Shramik/Pdf_Shramik.pdf

Exchange rate: 1 USD = 60 INR

BANZA LTD.



Project	Banza Sanitation Project
Organization	Banza Ltd.
Geography	Kenya, Nairobi
Areas	Urban
Solution	Individual
Date started	April 2013 (in-field pilot)
Stage	Pilot
Scale	38 toilets, ~190 users



Banza Prototype Toilets. Photo by Patrick Kiruki

Project description

History of organization

Banza Ltd is a Kenyan company founded by Patrick Kiruki, an industrial designer, who developed the Banza Toilet. Banza started field-testing the product prototype in April 2013 in the Mathare slums of Nairobi, and installing units in August 2013, in partnership with Community Cleaning Services (CCS), a Kenyan NGO which trains and manages mobile cleaning teams from local underprivileged youth, who in turn collect the waste from the installed toilets. Banza was grant-funded by Grand Challenges Canada and is now fundraising to expand its production facilities significantly.

A modified design is in preparation in response to requests from relief agencies for units that may be used in refugee and emergency situations. These modified units will be used as community facilities in conjunction with a Banza shelter.

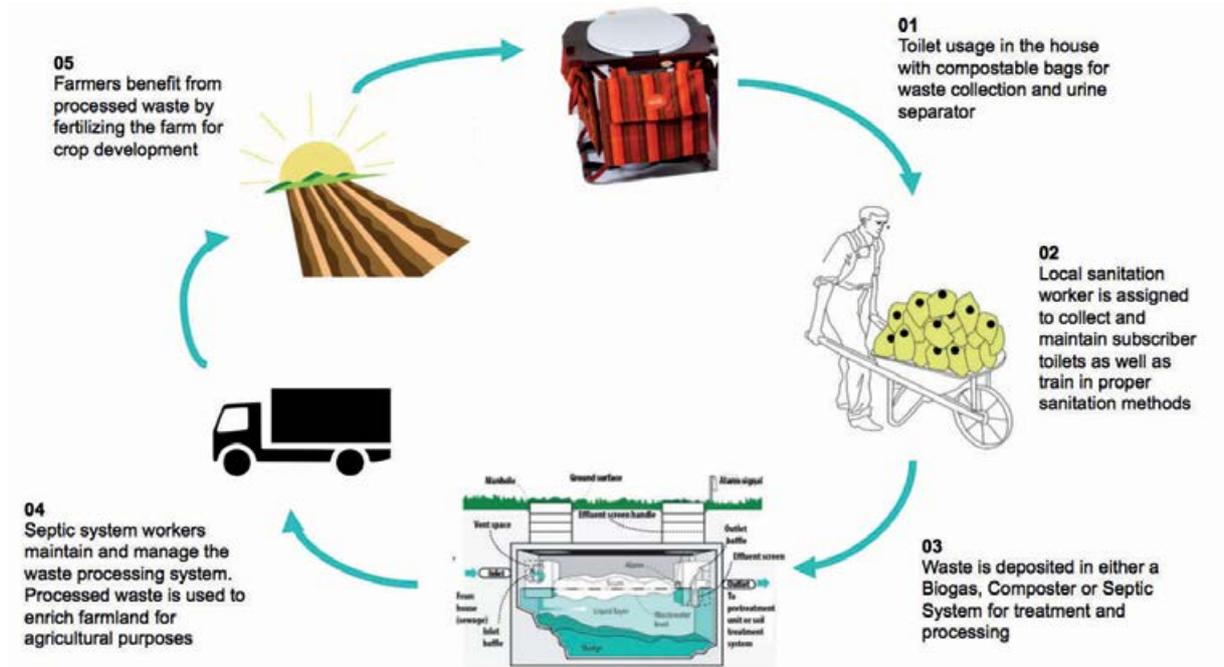
Value proposition and profile of customers

Banza manufactures Banza toilets, which are compact, waterless, portable units to be used in homes by families not connected to the sewage. While the toilets remain the property of Banza, they are promoted and serviced daily (against a fee) by a team of waste collectors who pick up and dispose of the waste which is contained in biodegradable bags under the toilet seat. For now, the team disposes of the bags in the main sewage line (with the authorization from the municipal authorities), but Banza is currently developing partnerships with organizations which can treat and process the waste (e.g. Sanergy).

Users are families living in the slum neighborhoods of Mathare, a district selected because it already has been the focus of education efforts to improve hygiene and sanitation. Early adopters included people who were actively involved in these sanitation education efforts, families with bedridden people, families where women value the convenience and safety of having home toilets at night in particular. 90% of slum residents are renters (1000-2500 KSH monthly rent), who live in ~9m² rooms (mixed type of habitations, ranging from metal to solid walls constructions), and earn monthly 7000-10,000 KSH/household (out of which 2000 KSH goes to the rent if it is a metal shack), working as hawkers, factory workers, cleaners, tailors, etc.; 60% of those do not have a sanitation solution at night, when the public toilet is closed and it may be dangerous to defecate in the open. A number of Banza toilets were also installed in public institutions (school, church, health center).

Once they agree to rent a toilet, they sign a simple contract agreement, which lays out the conditions and the price at which they hire the toilet. They pay an upfront one-month deposit, which covers the initial servicing costs, and then regularly at the end of each month. Pricing was initially set at 450 KSH, but was brought down to 200 KSH (which is roughly the double of what a family would pay at the 'basic' public toilet, and about the same as their electricity bill, five times more than weekly garbage collection, and over three times more than the price of public tap water – assuming 20L/day/household).

Value chain



Manufacturing

Banza sources and assembles the different components of the toilet (plastic, metal and fabric) from China, Taiwan and Kenya. The compostable BioBags used for waste collection are imported from Belgium. Current cost of the prototypes is ~\$85/unit. For 3000 units, production costs (without overhead) could be brought down to \$35 USD, as the plastic unit manufacturer would invest into molds (estimated cost of \$15k). Production cost could be brought down to as little as \$30 each, for 10k pieces.

Marketing & sales strategy and organization

The Toilets are promoted by a team of 6 mobile cleaners. These are youth with limited or no education, who set up a micro-enterprise around mobile cleaning services (they clean institutions, homes, do garbage collection, operate public toilets), with the help of CCS in 2007, and who operate it under CCS name and license¹⁷. It was easy for

them to 'expand' into home toilets cleaning, as they say this as an extra addition to their line of work, and there were until now limited expansion opportunities in Mathare (otherwise, it would have been challenging to find 'fresh' entrepreneurs). They receive no commission for identifying new clients, as this is their business. CCS however believes that such promotion would not have been possible, were it not for all the community sensitization work that happened previously in these areas. Previous to the Banza Project Pilot Study, the communities would not only have welcomed the idea of home toilets, but would have also questioned the utility of having the toilets cleaned.¹⁸ The fact that CCS and this team of youth are present and known in Mathare also significantly facilitated the adoption of the service.

The cleaning team does most of the promotion (demonstrations, door-to-door every two weeks), but it seems that a lot of the sales latest pick-up comes from word-of-mouth.

¹⁷ CCS also sells them toilet cleaning products and cleaning equipment, which CCS buys in bulk. Over the past 4-5 years, CCS trained over 200 youth, organized in about 10 teams. It developed a rather 'water-proof' methodology to identify which youth could turn out successful cleaning entrepreneurs, mostly gauging whether the youth is well known and respected in the community, and whether he owns a trusted enough network of neighbors to be able to rent at least 3 toilets. Finally, CCS plays a central role in communicating and coordinating with the local authorities, for them to authorize and support the project.

¹⁸ Previous 'CLTS-like' work in the Mathare slums surfaced well engrained open defecation practices (i.e. all families would go to a given place, early morning before going to work, to defecate and meet). Hence, few households understood the importance of improved sanitation, and many would question the usefulness of changing if everyone else was still open defecating, without seeing much inconvenience to it.

Installation

Transport of units is provided by CCS. No installation is needed. Home delivery is organized by the team of mobile cleaners, who explain the functioning of the toilet and have the servicing agreement signed on.

Cash/payment collection

Cash payment is done on a monthly (60%) or bi-monthly basis (40%), and collected by the cleaning team. In one third of the cases, there is delayed payment.

Usage and hygiene

The cleaning team provides initial advice to customers on how to use the toilet (e.g. do not throw sanitary napkins into it).

Maintenance and cleaning

Cleaning is done by the household users of the Banza Toilet (the cleaning team only provides cleaning services to institutional users). No maintenance is required. Banza is in discussions with Kim-Fay East Africa to explore the opportunity of selling and providing personal care, tissue and hygiene products to households.

Waste storage and collection

The cleaning team collects used bags daily from each household and replaces them with new bags (which are provided/delivered by CCS, after being purchased in bulk by Banza). They also empty the urine tanks into a barrel for disposal. Urine and bags are carried away to be deposited into the main sewage line (with the authorization from health authorities). In practice, one team member is in charge of the collection for each day of the week, which he does in 1.5-2 hours, early morning, leaving plenty time for other small jobs. They do it altogether on Sundays to finish earlier. Hence, CCS believes that 1 cleaner could do as many as 50 visits a day. Two CSS supervisors monitor the work of the cleaning team, follow progress, random check satisfaction of customers, and help liaise with the local authorities. These two supervisors could oversee many more teams, if working at scale.

Waste treatment, disposal and recovery

The team leaves the waste in the main sewage line, which terminates with the Ruai municipal treatment plant. In future, it is planned that waste reuse will be contracted out to available providers in each area served. For example, Banza is establishing working relationships with Sanergy, which is working at setting up a waste disposal and recovery operation.

Technology

Description of toilet-related technology

Key features:

- **Design:** Portable toilet unit designed for in-home use, easily stored when not in use. The toilet has five components: Tubular steel structure capable of holding up to 130 kg; the seat of the unit is in high impact plastics (current prototypes use wood); the urine diversion part (in plastic); the bag holder (in metal); and the urine diversion tube (in plastic). The urine diversion limits odors, and enables composting of the solid human waste. Urine is collected in a separate tank.
- **Durability:** Estimated lifetime is 5 years for the plastic version of the toilet.
- **Water and energy efficiency:** Waterless toilet.
- **Malodors and safety:** Malodor is a major issue currently (as faeces lay directly in the bag under the toilet). The team is currently redesigning the toilet to explore how to seal the waste compartment when not in use, and possibly add suitable chemicals to address the issue of smell by creating a better user experience.
- **Waste storage:** Solid human waste is stored in biodegradable, compostable, hygienic, easy to use bags, where waste is contained up to 24 hours. These bags contain no plastic and, while durable, fully dissolve in water or when composted and also can be burned without harmful residues. The cleaning team advises against throwing newspaper, sanitary and feminine hygiene products into the bag, to ensure they can then be easily processed into compost. The bag (currently purchased in very small retail quantities) costs 10 \$ cents/bag. This could possibly brought down to 3 cents, with bulk purchasing.
- **Waste collection:** The route is worked out by the cleaning team; waste (liquid and solid) is collected in 2 hand-carried containers.
- **Other:** The Banza Toilet is in the process of being endorsed by the Kenya Bureau of Standards, which may allow the team to import its components at lower tariffs further reducing the cost of the Banza toilets.

Social impact

- Penetration: 100 toilets were produced for this pilot. 50 of them were made available in the Mathare slums (out of which 38 were installed over the past 6 months, serving about 200 individual users). In the small area covered by the project (2 square km), it is believed that 1800 households could potentially benefit from Banza toilets services as they have no night sanitation solution¹⁹ (~9% current penetration). The other 50 prototype units will be used to test the concept with organizations considering large-scale adoption and institutions such as the Red Cross, World Vision, Water for People, and other organizations with a greater reach to people in need of sanitation services. The demand for the toilets has been doubling every month, after the first few months when toilets were introduced.
- Acceptance and usage: No customers have returned the toilet to date. However, most customers only use the toilet at night (given the smell, and the lack of privacy), significantly limiting the benefits they could draw from having toilets at home.
- Customer satisfaction: Customer satisfaction is randomly done by the two CCS supervisors. Main topic of complaint is related to smell and lack of privacy. A key plus in the eyes of customers is the servicing dimension (i.e. someone comes and takes care of their toilet at home).
- Evidence of impact on health: Too early to tell.
- Promotion of related behaviors: None. CCS feels it may be unproductive to have the toilet cleaners, which it wants to position as a business, also do what is perceived as 'NGO talk' on hygiene and hand-washing.
- Waste collection and disposal strategy: The toilets remain the property of Banza. Hence customers only rent them, and the fee contributes to paying for toilet servicing

Economic sustainability

End consumers

- Affordability for end users (% of total household income): The monthly servicing fee is 200 KSH for families and 400 KSH for institutions. The initial price for home toilets was set at 450 KSH, which was not accepted by most potential users since they had not seen the Banza unit to put a value to the toilet in relation to the service.
- End consumer financing: N/A

Upstream organization

- Main organization: Banza and CCS currently operate on a subsidized basis because the project is currently a pilot study.
 - » *Banza hopes to significantly increase production and sales* (notably by focusing on big institutions buyers, such as NGOs, sanitation projects, government tenders, private players in tourism, extraction/construction industry), so as to bring production costs down and generate a margin for themselves.
 - » *CCS plans to sell the bags to the cleaning entrepreneurs* to cover part of its operations, but would be unable to pay for the initial community education work out of this revenue stream. It could also sell its facilitation and coordination services, in the case of a bigger contract with a development organization or the government. However, it feels it would struggle if it would specialize into such kind of projects. For them, it does and would make sense as a 'complementary' line of work, given their focus on setting up youth-based enterprises in the field of cleaning services – for which their work is totally subsidized at present as the financial model is tested during the pilot phase.
- Staff: CCS supervisors working on the Banza pilot are currently financed out of the grant managed by Banza (KSH 27,000 salary).
A cleaning team member earns in average KSH 1400/month (as they split the revenues over the 6 of them, and do not pay anything for the bags yet). Given the little time worked (1.5 hours, 4-5 times a month), this is a lucrative supplement income source (about KSH 200/hour, which compares with KSH 84/hour for the formal minimum wage). There is very little turnover in the cleaning team working in Mathare (80% of them remain the same over the past 5 years).

¹⁹ Or 60% of the total population living in the area.

Innovations

- The simplicity and cost of the technology allows for a whole new segment of users to access home toilets.

Remaining hurdles and bottlenecks

- The main hurdles to the wider and faster adoption of this toilet are: the smell, which in turn leads to lower utilization and lesser benefits, including economic ones; and the education on sanitation and hygiene, not only at the individual level, but at the community level is also seen as essential to create some level of demand.

Contact information

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Joseph Njenga, General manager, Community Cleaning Services: joseph.njenga@communitycleaningservices.org

Appendix

Sources: www.alrudesign.com/Banza_home_page.html;
www.banzasanitation.wordpress.com; www.facebook.com/photo.php?v=10151698800546301&set=vb.238360899612863&type=3&theater; www.youtube.com/watch?v=9gBXvtCEMmg&feature=youtu.be

Interview with Patrick Kiruki and David Dunn (Banza) on 29 November 2013; Interview with Joy Kiruki (Banza) and Joseph Njenga (CCS) on 2 December 2013; Field visit of Mathare slums operations on 3 December 2013

Exchange rate: 1 USD = 85 KSH
