Beyond development aid: Sanitation financing & revenue models in reuse (human) waste

Organized by: Institute for Fiscal Studies (IFS), UK & WASTE, Netherlands

May 15th, 2017 – The Hague
SYNOPSIS

Beyond Development Aid: Sanitation Financing & Revenue Models in Reuse (human) Waste


This conference brought together from different parts of the world; academics, practitioners and policy-makers with the aim to generate knowledge regarding sanitation financing and revenue models on sludge reuse.

The subject of the morning session was on financing of sanitation. Academic presentations on policy and impact research in sanitation financing (Britta Augsburg, Alex Armand (he also facilitated the session), Antonella Bancalari (IFS, UK), setting up of impact bonds (Jeremy Keele, Sorensen Impact Centre, Utah USA) and (micro)-financing of sanitation (Valentin Post, WASTE, Netherlands), were followed by short question and answer sessions.

The cases of practitioners; Jacqueline Barendse (WASTE for @scale), Sjef Ernes, (A4A on water kiosks), Sarbani Bhattacharya (KPMG, Sanitation Impact Bond) and Kajetan Hetzer (SEF, missing middle) were pitched and reviewed in smaller groups. Feedback from the groups was shared with the plenary.

A large part of the audience changed over lunch as the financial specialists were outnumbered in the afternoon by WASH specialists who looked into revenue models in reuse of human waste. The session was ably facilitated by Grietje Zeeman (LEAF, Netherlands). Academic presentation by Barbara Evans (Leeds University, UK on willingness to pay for emptying in rural Bangladesh), Barbara Ward (Eawag, Switzerland on end use and resource recovery) and Mariska Ronteltap (Unesco -IHE, Netherlands on pathogen management in converting human waste) were followed by a joint question and answer session.

The cases of practitioners; Pradeep Mohanty (FSMC Indian for profit converting human waste), Aart van den Beukel, (Safi Sana, Ghana for profit entity to convert faecal sludge), Andreas Schmidt (Borda Germany, emerging businesses in prefabricated dewsats converting human waste in products) and Mary Roach (Loowatt, UK making value form waste) were pitched and reviewed in smaller groups. Feedback from the groups was shared with the plenary.

Discussions were of much interest due to their potential to overcome sanitation challenges in developing countries.

The entire day was captured in the evening by Pim van der Male (DGIS, Netherlands) who viewed these direction as being the right ones, whereby (unusual) partnerships are gaining importance.

Lastly, Jacqueline Barendse (WASTE) outlined how WASTE has been structured to remain relevant and flexible in these new settings with the setting up of a Cooperation, WASTE Coop uA, next to the Foundation and the WASTE BV.
Beyond development aid:
Sanitation financing & revenue models in reuse (human) waste

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<td>9:00-9:30</td>
<td>Registration</td>
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<td>9:30-9:40</td>
<td>Introduction and background of the workshop</td>
<td>Alex Armand (IFS)</td>
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<td><strong>Session A: Finance (Session Chair: Alex)</strong></td>
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<td>09:40-09:50</td>
<td>Introduction Speakers, general overview of how session are planned</td>
<td>Britta Augsburg (IFS)</td>
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<td>09:50-10:00</td>
<td>Brief overview of relevant work at IFS (incl 3ie project)</td>
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<td>10:00-10:40</td>
<td>Talk 1 – “Impact bonds and impact monitoring, lessons learned”</td>
<td>Jeremy Keele (MD Sorenson Impact Centre, University of Utah)</td>
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<td>10:40-10:45</td>
<td>Q&amp;A</td>
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<td>10:45-11:05</td>
<td>Talk 2 – “Sanitation &amp; micro finance; Avoiding loan diversion, loan tenures &amp; quality control in micro financing sanitation”</td>
<td>Valentin Post (WASTE)</td>
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<td>11:05-11:10</td>
<td>Q&amp;A</td>
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<td>Coffee Break</td>
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<td>11:40-12:00</td>
<td>4 x 5 min talks/pitch on ongoing and planned work (primary practitioners)</td>
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<td>1. @Scale BV: bridge for financing water, sanitation and waste</td>
<td>Jacqueline Barendse (WASTE)</td>
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<td>3. Concept of a sanitation impact bond</td>
<td>Sarbani Bhattacharya, (Partner KPMG)</td>
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<td>4. Fund for the missing middle</td>
<td>Kajetan Hetzer, Director (SEF)</td>
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<td>12:40-13:00</td>
<td>Feedback from session by pitch speakers and summing up</td>
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<td>13:00-14:00</td>
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<td>Introduction Speakers, general overview, etc by Session Chair</td>
<td>Grietje Zeeman (LEAF)</td>
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<td>14:10-14:25</td>
<td>Talk 1 – On Operational Subsidies or “Towards sustainable sanitation management: Establishing the costs and willingness to pay for emptying and transporting sludge in rural districts with high rates of access to latrines”</td>
<td>Barbara Evans (Leeds University)</td>
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<td>14:25-14:30</td>
<td>Q&amp;A</td>
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<td>Talk 2 – “End use and Resource Recovery”</td>
<td>Barbara Ward (EAWAG)</td>
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<td>14:45-14:50</td>
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<td>15:05-15:10</td>
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<td>15:40-16:00</td>
<td>4 or 5 x 5 min talks/pitch on ongoing and planned work (primary practitioners)</td>
<td>Pradeep Mohanty (CEO FSMC) Aart van den Beukel (Director) Andreas Schmidt (BORDA Representative Southern Africa) Mary Roach (Loowatt global partnerships)</td>
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<td>Feedback from session by pitch speakers and summing up</td>
<td>Grietje Zeeman (LEAF)</td>
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<td>Borrel / drinks</td>
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<td>18:00-18:15</td>
<td>Recap of the day for new guests</td>
<td>Pim van der Male (DGIS)</td>
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<td>The new WASTE</td>
<td>Jacqueline Barendse (WASTE)</td>
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<td>19:30</td>
<td>Closure</td>
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<td>Sjef Ernes</td>
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Introduction and IFS-EDePo Research Agenda

Alex Armand (University of Navarra & IFS)

The SDG 6 purpose is to ensure availability and sustainable management of water and sanitation for all. Our aim is to improve understanding through evidence-based policy-making. Randomized controlled trials (RCTs) allow the reliable identification of causal effects (RCTs). Ideally, we rely on collaboration between researchers, practitioners and policymakers. RCTs remain ideal to make causal inference and understand the mechanisms behind the strengths and weaknesses in public policy.

Britta Augsburg (IFS - EDePo)

EDePo sanitation agenda: projects in Pakistan, Nigeria, India. Particularly relevant for this workshop is the project SIEF India, which aims to evaluate the impact of providing microcredits for sanitation. Key questions: Are the loans actually used for sanitation investment? (low rates make them attractive). Who are the households taking up the loan? Are there changes in total number of toilets constructed? Other unintended consequences? Less education investment? Does sanitation actually improve health? Increase in height for age observed.
Introductions and IFS-EDePo Research Agenda

Antonella Bancalari (IFS-EDePo, London School of Economics)

Shared community facilities are a viable option in densely-populated slums with low private investment, but even when these are available, open defecation persists. This may be related to low willingness to pay (WTP) for sanitation facilities. However, there is little understanding on the drivers behind this. We will study the role of information and supply-side factors (i.e. cleanliness and adequate maintenance) as determinants of WTP and usage of community toilets. The study will be conducted in Lucknow, Uttar Pradesh, where slums have widespread availability of pay-to-use community toilets. Large amount of these toilets are considered ’dirty and stinky’. Method: Lab-in-the-field experiment to measure WTP and RCT.
Session A: Finance

Valentin Post (WASTE)

6.4% of India’s growth does not occur due to inadequate sanitation investment. The necessary investment is similar to the economic loss. “Sanitation & microfinance: avoiding loan diversion, loan tenures & quality control in micro financing sanitation” Do’s and Don’ts learned from microcredits for sanitation projects in Kenya and India: Adoption increased steeply as of March 2016 after a change towards a more business oriented focus. It has now become a ”High impact” investment with very low default rates. Reuse is still happening on own plots, not commercialized yet.

Jeremy Keele (Sorenson Impact Center, University of Utah)

Development Impact Bonds. Social sector challenges: underinvestment in prevention; focus on inputs/outputs; no focus on short term funding - results; lack of data to inform monitoring of the implementation/evaluation of impact – this distorts the effectiveness of programs. Blended financing structure that combines grants (philanthropy), junior and senior investors with different risk and return profiles. The financing opportunity is there. Rationale: money saved from negative outcomes is invested in prevention.
**Session A: Finance – 5min pitches**

**Jacqueline Barendse (WASTE)**

SDG targets imply a very steep improvement in social indicators, particularly in sanitation. A fundamental, but often overlooked component is enabling environment. How to scale projects? @scale, started by Aqua4all and WASTE, is a facilitator to scale up sanitation projects by designing revenue models and linking with financing partners. Scale is needed and possible!

**Sjef Ernes (A4all)**

Public and private partnerships are a viable option as business opportunities for the sanitation sector. There is a large potential for safe water enterprises (SWE), the market is there. Decentralized sanitation services can fit into government plans and utilities’ business model. Important: work with the government while also using entrepreneurs. Giving people a choice in water is translatable to sanitation – this provides information to households. Difficulty of proving benefits makes it hard to work with SIBs.
Session A: Finance – 5min pitches

Sarbani Bhattacharya (KPMG)
Swachh Bharat Mission (SBM) toilet construction subsidies paid ex-post to repay sanitation investment loans. Funding is there by Government of India (GOI), so why an impact bond? To scale and improve results. Investors (philanthropic and other) are there, willing to fund sanitation projects by pre-financing government grants, creating demand and eligibility of finance and supporting financing.

Kajetan Hetzer (SEF)
SEF is an investment fund focusing on small and medium-size enterprises (SMEs) that provide basic needs. Large challenge to tackle: large gap in financing to achieve SDGs, but SME sector provides potential: 80% of employment. Use of “social metric tool”. Blending finance sources (grants, debt, etc) provide the right combination of risk and return to different actors. Why is there no private investment if opportunities are there? It might take time to persuade the private sector, but growth potential is there. Risk mitigation via grants, insurance companies, plays an important role.
Session B: Reuse

Barbara Evans (Leeds University)

8 million single pits have been built in Bangladesh over the last 10 years, and now need emptying every 3.7 years. Business case for sustainable, for profit, pit collection services is feasible at a cost of around 14 USD per emptying event; but stated WTP is 40% lower. This creates a deficit of USD 145,500 per year for Bhaluka subdistrict. WTP would rise if the service could be delivered on a ‘subscription’ (monthly fee) basis. Besides the link between hygienic removal of sludge, regulated transporting of sludge would generate 350 jobs. Farmers were interested in buying human sludge fertilizers, but market of fertilizers is heavily subsidized. Therefore, to sustain the service, an efficient approach would be for the municipality to provide a small operational subsidy to ensure proper treatment of FS.

Barbara Ward (SANDEC)

Quantitative comparison of different faecal sludge treatment products to generate the most profitable business model for treatment facilities. Fuel combustion products have the highest market values in some urban areas (e.g. Kampala, Uganda). Challenges: 1) dewatering and drying; 2) sludge has high ash content. Important parameters to measure: calorific value, ash fraction and heavy metals. Take-aways: 1) co-processing with biomass improves fuel quality and quantity, 2) drying is preferable to carbonization for fuel production from faecal sludge.
There is a high risk related to pathogen transfer linked to inadequate sludge treatment, including ascariasis, cholera and other enteric infections. Constructing more toilets does not solve the sanitation problem, it just shifts the problem towards more faecal sludge. Dangers persist even post-treatment technology. Disinfection mechanisms are necessary: treatment, ageing, drying, temperature, pH, exposure to urea, worms, etc. It is important to create pathogen inactivation standards for faecal sludge treatment, but it is not so straightforward: most excreta technologies produce products, not effluent as is the case in domestic wastewater treatment. Therefore, the current developments in standardization of analytical methods, technologies and maximum allowed pathogen levels are very important yet also very complex.
Session B: Reuse – 5min pitches

Pradeep Mohanty (FSMC)
FSMC develops community-led faecal sludge treatment in India. Co-compost process results in fertilizer sold locally. Q&A: social stigma, demand generation and government acceptance.

Aart van den Beukel (Safisana)
Safisana operates factories that transform waste (collected from public toilets and organic waste) into fertilizer and fuel for electricity. People are not reluctant to buy faecal-based fertilizer. They are actually aware that these products have higher nutritional value. Q&A: Need for organic fertilizer, but how feasible is this in countries where organic is not common?. Need to develop a model resilient to changing environments.
Session B: Reuse – 5min pitches

Andreas Schmidt (BORDA)

BORDA is an expert organization on reuse human waste. They are a demand-driven organization that provide services and sanitation financing. Q&A: understand the context of the market and conditions in which individuals demands these services (i.e. WTP of households and government).

Mary Roach (Loowatt)

Loowatt provides a waterless sanitation solution. The organization has set up a WTP proof-of-concept in Madagascar and seeks to work with utility and service partners to scale a sustainable business model. Q&A: there is a need to understand what models work, their sustainability and how feasible they are to scale up.
**Closing remarks**

**Pim van der Male (DGIS)**

“We are entering the SGD-era that requires a steep improvement curve. Collaboration between research, policy making, NGO’s and Government is as important as ever.”

**Jacqueline Barendse (WASTE)**

WASTE has changed its operational strategy, allowing for flexibility and to encourage and stimulate innovation. WASTE operates via a diversity of legal entities (NGO, Business, Cooperative) depending of the type of activities. Staffing is flexible and includes a diversity of experts with international background as well staff from WASTE’s vast international network.
Alex Armand is Assistant Professor at the University of Navarra (Spain) and Faculty Fellow at the Navarra Centre for International Development. His main research fields are Development Economics and Policy Evaluation. His current work focuses on the effect of providing gender-targeted cash transfers on household outcomes, rent-seeking behaviour and natural resources discovery, and education- and health-related policy interventions. During his professional career he worked on the evaluation of interventions in Eritrea, Mozambique and Eastern Europe, where he worked on the implementation and the evaluation of the first CCT in the Balkan region, the CCT for Secondary Education introduced by the Government of Macedonia. He holds a PhD in Economics from the University College London.
Antonella Bancalari is a researcher at the development sector of the Institute for Fiscal Studies, the Centre for the Evaluation of Development Policies (EDePo), and a PhD candidate at London School of Economics. Her work at EDePo concentrates on understanding constraints to willingness to pay for and usage of shared sanitation facilities in India. In the past she has worked on evaluating sanitation, nutritional and child and maternal health programmes and policies in Peru, Bolivia, El Salvador and Nigeria. At present, her research focuses on evaluating the impact of different sanitation interventions on child health in lower-middle income contexts. Antonella holds a Master of Public Administration/International Development (MPA/ID) from London School of Economics and a BSc in Economics from Universidad del Pacifico.
Beyond development aid: Sanitation financing & revenue models in reuse (human) waste

Alex Armand, PhD
Research Fellow, Institute for Fiscal Studies
Assistant Professor, University of Navarra (Spain)
Sustainable Development Goals and Sanitation

GOAL 6: Ensure availability and sustainable management of water and sanitation for all.

- How may scarce water resources be used more efficiently?
- What marketing methods are most effective in increasing adoption and use of sustainable technologies?
- What is the impact of population awareness and behavior change campaigns on adoption of sustainable technologies?
- What methods may help sustainably manage and restore healthy environments?
How can we improve the understanding of efficiency and effectiveness of development policies?

1. Evidence based policy making has become a major focus
   - Use of policy evaluation as an instrument for policymakers
   - MEASUREMENT

2. Hand-in-hand with the identification of rigorous approaches
   - CAUSAL INFERENCES and IDENTIFICATION
   - Rise of social experiments (RCTs) in the developing

3. Bring together researchers, practitioners and policymakers
Do policies work?

Some argue that this trend is of concern:

- Increased pressure on aid agencies to provide evidence from RCTs

- The quest for internal validity, design-based studies have become narrow or idiosyncratic

- The experimentalist paradigm leads researchers to look for good experiments, regardless of whether the questions they address are important
Beyond ‘whether’ – how and why?

- Rigorous and clean (if properly implemented) evaluation methods identify causal relationships.
- This makes them the ideal foundation for understanding mechanisms:
  - Why does an intervention (not) work?
  - How does it work?
  - How can it be improved?
  - How can resources be used more effectively?
Beyond ‘whether’ – who?

• Knowing impacts and understanding mechanisms provides the right information to advise implementers
• But, also impacts and mechanisms do not yet tell us the whole picture
  – We also want to understand **who is being reached** by an intervention (directly and indirectly) and who is not?
  – We also need to understand in what **form/intensity** the intervention was implemented.
  – Such questions are particularly crucial when thinking about **scale and scalability**
Plan of the day – Two sessions

1. Sanitation financing (MORNING)
   - 10 minutes presentations
   - 5 min talks/pitch on ongoing and planned work
   - Discussion

2. Revenue models in reuse waste (AFTERNOON)
   - 10 minutes presentations
   - 5 min talks/pitch on ongoing and planned work
   - Discussion
Acknowledgement

- Institute for Fiscal Studies
- WASTE
- 3ie International Initiative for Impact Evaluation (Development Priorities Window)
Sanitation financing I

- **Britta Augsburg (IFS)** 09:40-09:50
  - An overview of relevant work at IFS

- **Antonella Bancalari (IFS)** 09:50-10:00
  - Community toilet use in slums

- **Jeremy Keele (University of Utah)** 10:00-10:45
  - Impact bonds and impact monitoring, lessons learned

- **Valentin Post (WASTE)** 10:45-11:10
  - Sanitation & micro finance; Avoiding loan diversion, loan tenures & quality control in micro financing sanitation

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Sanitation financing II

5 min pitch on ongoing and planned work

11:40-12:00

• Jacqueline Barendse (WASTE): @Scale BV: bridge for financing water, sanitation and waste

• Sjef Ernes (A4A): Safe Water Enterprises - untapped potential – lessons for sanitation?

• Sarbani Bhattacharya (Partner KPMG): Concept of a sanitation impact bond

• Kajetan Hetzer, Director (SEF): Fund for the missing middle
Britta Augsburg is Senior Research Economist in the development sector of the Institute for Fiscal Studies, the Centre for the Evaluation of Development Policies (EDePo), and an affiliated researcher at the United Nations University-Merit in Maastricht, the Netherlands. Her research concentrates on understanding the effectiveness of programs and policies that tackle constraints to productivity of poverty affected individuals and households, with a particular focus on credit and technology adoption constraints. She has worked on a number of studies related to microfinance and particularly the effectiveness of this financial tool in achieving improved outcomes for the intended beneficiaries. At present, a large part of her project portfolio focuses on sanitation technology – understanding information and financial constraints to uptake at the demand as well as the supply side. To this end, she is managing a number of large scale sanitation impact evaluation projects, primarily randomized field experiments, in India and Nigeria.
Sanitation
Understanding why and how Interventions Work (Or Not)

Britta Augsburg, PhD
Senior Research Economist
@ EDePo
EDePo at the Institute for Fiscal Studies

- **EDePo**: Center for the Evaluation of Development Policies
  - Aims to promote best practice in the design, conduct and evaluation of development policies.
  - Understanding and modeling the decisions of agents (individuals, HHs, firms) and how they are affected by the environment they face
  - Strongly grounded in economic theory
  - Typically involves the design and implementation of surveys for micro-level data collection
  - Topics worked on: Human capital investment, technology adoption, consumption, labour supply,…
EDePo - Research on sanitation

• The focus lies on understanding…
  – …the effectiveness of programmes addressing different constraints to sanitation uptake and usage;
  – …the relative effectiveness of different approached and/or how interventions interact.
EDePo RCTs in sanitation: Ongoing RCTs

- Sustainable Total Sanitation (STS), Nigeria.
  *Implementer:* WaterAid  
  *Funder:* Gates Foundation

- RBF WASH Evaluation, Pakistan.
  *Partner:* OPM  
  *Implementers:* PLAN, WaterAid  
  *Funder:* DfID

- SIEF Sanitation, India.
  *Partner:* WSP, WB  
  *Implementers:* GK, ND  
  *Funder:* Strategic Impact Evaluation Fund (SIEF)

- FINISH Evaluation, India

- WTP community toilets, India.
  *Implementers:* FINISH/Cashpor  
  *Funder:* 3ie
EDePo RCTs in sanitation: Ongoing RCTs

**Research questions:**

Effectiveness of…

1. …Community-Led Total Sanitation (CLTS) in creating uptake/use?

Sustainable Total Sanitation (STS), Nigeria.

*Implementer:* WaterAid  
*Funder:* Gates Foundation
EDePo RCTs in sanitation: Ongoing RCTs

Research questions:
Effectiveness of…
1. …Community-Led Total Sanitation (CLTS) in creating uptake/use?
2. Sanitation Marketing (SanMark).

*Sustainable Total Sanitation (STS), Nigeria.*

*Implementer:* WaterAid
*Funder:* Gates Foundation
EDePo RCTs in sanitation: Ongoing RCTs

Research questions:
Effectiveness of…
1. Providing micro-credit for sanitation

SIEF Sanitation, India.

Partner: WSP, WB
Implementers: GK, ND
Funder: Strategic Impact Evaluation Fund (SIEF)
EDePo RCTs in sanitation: Ongoing RCTs

Research questions:
Effectiveness of…
1. Providing micro-credit for sanitation
2. Conducting in addition awareness creation activities

Partner: WSP, WB
Implementers: GK, ND
Funder: Strategic Impact Evaluation Fund (SIEF)

SIEF Sanitation, India.
EDePo’s contribution: Sanitation uptake/usage

- Study Design: Randomized Control Trial
  - 120 villages in which MFI operates, randomized into three groups:
    1. Provision of sanitation microcredit
    2. Provision of sanitation microcredit + information
    3. Control (credit offer as usual, no sanitation credit)

- Key dates:
  - Baseline: December 2014/January 2015
  - Intervention: From February 2015
  - Endline: About to go to the field
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- Great enthusiasm around the relaxation of credit constraints to increase sanitation uptake
- Typically based on two facts:
  1. Households stating that sanitation investments are ‘too expensive’
  2. Microfinance loans for sanitation investments are being taken up
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- Great enthusiasm around the relaxation of credit constraints to increase sanitation uptake
- Typically based on two facts:
  1. Households stating that sanitation investments are ‘too expensive’:
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EDePo’s contribution: Sanitation uptake/usage

**Project:** Microcredit for sanitation, India

- Great enthusiasm around the relaxation of credit constraints to increase sanitation uptake
- Typically based on two facts:
  1. Households stating that sanitation investments are ‘too expensive’
  2. Microfinance loans for sanitation investments are being taken up:

![Graph showing cumulative sanitation loans disbursed over intervention months]
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

• The Key Questions are though:
  1. Are the loans used to construct sanitation facilities?
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

• The Key Questions are though:
1. Are the loans used to construct sanitation facilities?

   - Sanitation credit typically cheaper than other credit.
   - Within our partner MFI, average interest rate:
     • “Productive loans”: 22-25% (avg >23%)
     • “Social loans”: 18-22% (avg sanitation: 20.8)

   ➔ Cheaper credit always preferable
   ➔ Stresses the importance of loan use monitoring
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- The **Key Questions** are though:
  1. Are the loans used to construct sanitation facilities?
  2. Are these sanitation facilities *that would not have been built without the availability of the loans*?
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- The **Key Questions** are though:
  1. Are the loans used to construct sanitation facilities?
  2. Are these sanitation facilities *that would not have been built without the availability of the loans*?

    - I.e. does the loan replace other funding? Or is it additional funding?
      ➔ Only if it is additional funding, will loans lead to an increase in sanitation coverage!
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

• The Key Questions are though:
  1. Are the loans used to construct sanitation facilities?
  2. Are these sanitation facilities *that would not have been built without the availability of the loans*?
  3. What (if any) other investments are not being made? Are there unintended consequences?
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

• The Key Questions are though:

1. Are the loans used to construct sanitation facilities?
2. Are these sanitation facilities *that would not have been built without the availability of the loans*?
3. What (if any) other investments are not being made? Are there unintended consequences?

➡️ No difference in business loan uptake in areas where sanitation loans were given and not
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- The Key Questions are though:
  1. Are the loans used to construct sanitation facilities?
  2. Are these sanitation facilities *that would not have been built without the availability of the loans*?
  3. What (if any) other investments are not being made? Are there unintended consequences?

- Delay and reduction in education loan uptake!
- Lower human capital investment due to sanitation loans?
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

• The Key Questions are though:

1. Are the loans used to construct sanitation facilities?
2. Are these sanitation facilities that would not have been built without the availability of the loans?
3. What (if any) other investments are not being made? Are there unintended consequences?
4. Do (additionally) constructed toilets improve health?
Beyond uptake, towards health impacts

The idea is simple: Sanitation….

1. …isolates faeces
2. …breaks down the faecal-oral transmission of disease
3. …reduction of diseases
4. Health improves

- So far it has been challenging to demonstrate health (and other) benefits of low-cost private sanitation (interventions), particularly in recent experimental studies
- Most notable study: Clasen et al. (2014), Lancet. ~50% uptake, no health impacts (diarrhoea, anthropometrics)
Beyond uptake, towards health impacts

- Study with FINISH in Gwalior, India (urban slums)

**Survey rounds:**
- Round 1: Feb – April 2010
- Round 2: March– Dec 2013

- 39 slums and 17 peripheral villages of Gwalior, MP, India.
- 1,992 HHs interviewed at Round 1 (8% attrition at FU)
Beyond uptake, towards health impacts

- Study with FINISH in Gwalior, India (urban slums)

- **Key findings:**
  - 10% increase in sanitation coverage -> ~0.7cm increase in 4 year old child
  - Impacts are driven by girls: 10% increase in sanitation coverage -> 1.05cm
  - Impacts primarily age 6-22 months (largest placidity in growth and not exclusively breastfed anymore)
Thank you!

britta_a@ifs.org.uk
EDePo’s contribution: Sanitation uptake/usage

Project: Microcredit for sanitation, India

- **The Key Questions** are though:
  1. Are the loans used to construct sanitation facilities?
  2. Are these sanitation facilities *that would not have been built without the availability of the loans*?

<table>
<thead>
<tr>
<th>Purpose of loan</th>
<th>Category of Loan</th>
<th>% of outstanding loan portfolio</th>
<th>Average amount of loan in Rs.</th>
<th>Interest rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(min; max)</td>
</tr>
<tr>
<td>Animal Husbandry</td>
<td>IGL: Pragati, Pragati Plus and Supplement</td>
<td>37%</td>
<td>21700 (5000;45000)</td>
<td>23.5 (22.25)</td>
</tr>
<tr>
<td>Trading</td>
<td>IGL: Pragati, Pragati Plus and Supplement</td>
<td>16%</td>
<td>20300 (5000;45000)</td>
<td>23.6 (22.25)</td>
</tr>
<tr>
<td>Transportation</td>
<td>IGL: Pragati, Pragati Plus and Supplement</td>
<td>5%</td>
<td>21600 (5000;45000)</td>
<td>23.6 (22.25)</td>
</tr>
<tr>
<td>Production</td>
<td>IGL: Pragati, Pragati Plus and Supplement</td>
<td>13%</td>
<td>20000 (5000;45000)</td>
<td>23.6 (22.25)</td>
</tr>
<tr>
<td>Education</td>
<td>Education</td>
<td>16%</td>
<td>9800                      (5000;10000)</td>
<td>18.6 (18.22)</td>
</tr>
<tr>
<td>Festival</td>
<td>Festival</td>
<td>1%</td>
<td>2000                      (2000;20000)</td>
<td>19.7 (18.20)</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Sanitation</td>
<td>9%</td>
<td>14500                     (10000;15000)</td>
<td>20.8 (18.22)</td>
</tr>
<tr>
<td>Water Connection</td>
<td>Water loan</td>
<td>0%</td>
<td>5000                      (5000;5000)</td>
<td>20 (18.20)+++</td>
</tr>
</tbody>
</table>

**Sanitation loan**: relatively high loan amount and low interest rate

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Jeremy Keele is President & CEO of the Sorenson Impact Center at the University of Utah’s David Eccles School of Business. The mission of the Sorenson Impact Center is to marshal capital for social good, empower evidence-based programs and policies, break down silos across sectors, and equip the next generation of leaders with social purpose. Jeremy’s work at the Center is dedicated to advising stakeholders from philanthropy, government, investment, and nonprofits on innovative and data-driven approaches to solving difficult social problems in their communities. Under Jeremy’s leadership, the Center has grown from three employees in 2014 to 35 in 2017, with an additional 50 graduate and undergraduate student fellows working on live projects and investments around the world every year. Center staff include experts from finance, policy, business, law, data science, communications, and sociology. Jeremy received his Juris Doctor from New York University and a Master in Public Administration from Harvard's Kennedy School.
DEVELOPMENT IMPACT BONDS:
LESSONS LEARNED

Right Now! May Conference • The Hague
Jeremy Keele • President and CEO, Sorenson Impact Center
IMPACT BOND

STRUCTURE

1. Investment of Principal
2. Coordinate, Structure Deal, & Manage Performance
3. Deliver Services
4. Achieve Outcomes
5. Evaluate Impact
6. Pay for Success
7. Return of Principal plus Interest

OUTCOME FUNDER
INTERMEDIARY
SERVICE PROVIDER
POPLATION IN NEED
EVALUATOR

The Potential and Limitations of Impact Bonds: Lessons from the First Five Years of Experience Worldwide Global Economy and Development Program – BROOKINGS
IMPACT BOND
FEASIBILITY

The Potential and Limitations of Impact Bonds: Lessons from the First Five Years of Experience Worldwide
Global Economy and Development Program – BROOKINGS
EXEMPLARY SOCIAL IMPACT BOND ISSUE AREAS

- Community-based interventions that prevent institutionalization
  - Foster care, juvenile and criminal justice, behavioral health

- Health-based interventions that result in Medicaid savings
  - Home visitation

- Education-based interventions that promote grade progression, retention, and school completion
  - Pre-school

- Interventions to address homelessness
  - Supportive housing

- Workforce-based interventions
  - Job readiness
600 kids
2013 County Pilot

3,700 kids over 5 years
2014 SIB

$11,000,000 to support 4,000 kids per year
2016 Legislative Session
<table>
<thead>
<tr>
<th><strong>SIB NAME</strong></th>
<th><strong>Utah High Quality Preschool Program</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCATION</strong></td>
<td>State of Utah (Salt Lake City and surrounding areas)</td>
</tr>
<tr>
<td><strong>COUNTRY</strong></td>
<td>United States</td>
</tr>
<tr>
<td><strong>START DATE (date of contract signing)</strong></td>
<td>August 2013</td>
</tr>
<tr>
<td><strong>CONTRACT DURATION</strong></td>
<td>60 months</td>
</tr>
<tr>
<td><strong>SOCIAL ISSUE</strong></td>
<td>Limited access to Early Childhood Education</td>
</tr>
<tr>
<td><strong>TARGET POPULATION</strong></td>
<td>Up to 3,500 low income 3- and 4-year-olds across up to five cohorts of around 600 per year. The first cohort included 600 children in the 2013-2014 school year and the second cohort will include 750 children in the 2014-2015 school year.</td>
</tr>
<tr>
<td><strong>INTERVENTION</strong></td>
<td>Utah High Quality Preschool Program, a high impact and targeted curriculum to increase school readiness and academic performance among 3- and 4-year-olds</td>
</tr>
<tr>
<td><strong>SERVICE PROVIDER</strong></td>
<td>Granite School District, Park City School District, Guadalupe School, YMCA of Northern Utah, Children’s Express, and Lit’l Scholars.</td>
</tr>
<tr>
<td><strong>OUTCOME FUNDER</strong></td>
<td>State of Utah</td>
</tr>
<tr>
<td><strong>INTERMEDIARY (roles in parentheses)</strong></td>
<td>United Way of Salt Lake (oversees the implementation of the project, contracts with and manages payments to and reports from the providers)</td>
</tr>
<tr>
<td><strong>TECHNICAL ASSISTANCE PROVIDER</strong></td>
<td>Voices for Utah Children (financial structuring, research and analytic support) Granite School District (training and professional development for service providers)</td>
</tr>
<tr>
<td><strong>UPFRONT CAPITAL COMMITMENT (USDm)</strong></td>
<td>7.0</td>
</tr>
<tr>
<td><strong>NON-RECOVERABLE GRANTS</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Senior Investors</th>
<th>Subordinate Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INVESTOR NAME</strong></td>
<td>Goldman Sachs’ Urban Investment Group</td>
<td>J.B. Pritzker (individual)</td>
</tr>
<tr>
<td><strong>INVESTMENT (USDM)</strong></td>
<td>4.6</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>MAXIMUM POTENTIAL LOSS</strong></td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td><strong>OUTCOME METRIC</strong></td>
<td>Years of special education (remedial education) avoided Kindergarten through 6th</td>
<td></td>
</tr>
<tr>
<td></td>
<td>grade for students “likely to use special education services” (as defined by</td>
<td></td>
</tr>
<tr>
<td></td>
<td>testing at least two standard deviations below mean on the Peabody Picture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vocabulary test (PPVT) before entering the Pre-Kindergarten program). These</td>
<td></td>
</tr>
<tr>
<td></td>
<td>students form the “payment cohort.”</td>
<td></td>
</tr>
<tr>
<td><strong>OUTCOME EVALUATION METHOD</strong></td>
<td>Validated administrative data (special education use by those likely to use</td>
<td></td>
</tr>
<tr>
<td>[Evaluator in brackets]</td>
<td>special education given historical data) [Utah State University]</td>
<td></td>
</tr>
<tr>
<td><strong>PAYMENT SCHEDULE</strong></td>
<td>Seven annual payments from the outcome funder to the investors for each cohort</td>
<td></td>
</tr>
<tr>
<td><strong>THRESHOLD FOR PAYMENTS FROM</strong></td>
<td>Any child in the payment cohort not using special education</td>
<td>Subordinate investors are eligible for</td>
</tr>
<tr>
<td>THE OUTCOME FUNDER</td>
<td></td>
<td>repayment once senior investors are repaid.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIB NAME</th>
<th><strong>Juvenile Justice Pay for Success Initiative</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Commonwealth of Massachusetts (Chelsea, Boston and Springfield areas)</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>United States</td>
</tr>
<tr>
<td>START DATE (date of contract signing)</td>
<td>January 2014</td>
</tr>
<tr>
<td>CONTRACT DURATION</td>
<td>84 months</td>
</tr>
<tr>
<td>SOCIAL ISSUE</td>
<td>Prison recidivism</td>
</tr>
<tr>
<td>TARGET POPULATION</td>
<td>929 at-risk young men aged 17 to 24 who are in the probation system, in the juvenile justice systems, are leaving the custody of the Suffolk, Essex, Hampden, and Middlesex Houses of Correction, or are leaving the custody of Massachusetts Department of Correction.</td>
</tr>
<tr>
<td>INTERVENTION</td>
<td>Two years per participant of active education, life skills and job training, and two years of rigorous follow-up</td>
</tr>
<tr>
<td>SERVICE PROVIDER</td>
<td>Roca Inc.</td>
</tr>
<tr>
<td>OUTCOME FUNDER</td>
<td>Commonwealth of Massachusetts (Social Innovation Financing Trust Fund) and the United States Department of Labor</td>
</tr>
<tr>
<td>INTERMEDIARY (roles in parentheses)</td>
<td>Third Sector Capital Partners</td>
</tr>
<tr>
<td>TECHNICAL ASSISTANCE PROVIDER</td>
<td>Harvard Kennedy School Social Impact Bond Technical Assistance Lab (assistance to government)</td>
</tr>
<tr>
<td>UPFRONT CAPITAL COMMITMENT (USD$m)*</td>
<td>16.1</td>
</tr>
<tr>
<td>NON-RECOVERABLE GRANTS</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INVESTOR NAME</th>
<th>Senior Investors</th>
<th>Subordinate Investors</th>
<th>Recoverable Grants and Investment Guarantees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Goldman Sachs’ Social Impact Fund</td>
<td>Kresge Foundation and Living Cities (In addition, Roca Inc. and Third Sector Capital could be considered subordinate investors as they have deferred their fees and stand to earn success fees)</td>
<td>Anonymous Foundation, New Profit, and The Boston Foundation</td>
</tr>
<tr>
<td>INVESTMENT (USD$m)*</td>
<td>8.0</td>
<td>2.66 (from Kresge Foundation and Living Cities)</td>
<td>5.45</td>
</tr>
<tr>
<td>MAXIMUM POTENTIAL LOSS (% of principal)</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OUTCOME METRIC**

1. Decreases in incarceration (treatment vs control groups)
2. Increases in job readiness (number of quarters that a Roca participant engages with a Roca youth worker nine or more times)
3. Increases in employment (number of quarters that a Roca participant is employed as compared to similar young men who are not in the program)

**OUTCOME EVALUATION METHOD [Evaluator in brackets]**

Randomized Control Trial (RCT) (metric 1) and Validated administrative data (metrics 2 and 3) [Urban Institute]

**PAYMENT SCHEDULE**

Payments from outcome funders to investors in years 2 to 7

**THRESHOLD FOR PAYMENTS FROM THE OUTCOME FUNDER**

1. 5.2% reduction in incarceration
2. Any positive increase in job readiness and employment.

Potential for grant recycle at the end of the program if outcome payments exceed repayment to senior and subordinate investors

DEVELOPMENT IMPACT BONDS

INVESTORS

Money in
Return on investment depends on success

DEVELOPMENT IMPACT PARTNERSHIP

Up-front capital and performance management

SERVICE PROVIDERS

Service delivery

TARGET BENEFICIARIES

OUTCOMES FUNDER(S)

Payment based on impact

Independent verification of agreed metrics

Partner Governments can perform a range of roles including as Outcomes Funder or Investor

WHAT MAKES FOR A GOOD IMPACT BOND?

• Meaningful & measurable outcomes
• Government support for transaction
• Robust evidence that service provider could produce desired outcomes
• Credibility/capacity of intermediary
BENEFITS:

INCREASED ACCOUNTABILITY

INCREASED ACCOUNTABILITY

INCREASED ACCOUNTABILITY

INCREASED ACCOUNTABILITY

Transparent in public procurement, government values, and decision-making processes

Governments and donors only pay for what works

Payments are made only if outcomes are successfully met

Ounce of prevention

With upfront funding, working capital is available quicker and helps to drive resources to prevention rather than remediation

Funding stability for providers

Service providers guaranteed funding for a period of years to run the program

RIGOROUS PROGRAM EVALUATION

RIGOROUS PROGRAM EVALUATION

RIGOROUS PROGRAM EVALUATION

DIBs build the field of social / health science through rigorous evaluation of programs; service providers begin to constantly examine and improve their programs
POTENTIAL CHALLENGES:

LENGTHY NEGOTIATION PERIOD
Complexity surrounding structuring of DIBs and convening stakeholders leads to a lengthy start-up period

HIGH TRANSACTION COSTS
High administrative costs detract from money that could be spent on direct impact

INSUFFICIENT DATA
Difficult to obtain accurate baseline data in developing countries

DIFFICULTY IN SELECTING ACCURATE SUCCESS METRICS
Large benefits combined with low-capacity service providers creates incentives to manipulate the system

REQUIRES STRONG SERVICE PROVIDERS
DIBs most successful when service providers have a past history of success and the capacity to scale-up their operations
PITCHING DEVELOPMENT IMPACT BONDS

1. Redirects Capital Resources
2. Focuses on Outcomes Instead of Outputs
3. Allows for Innovation and Adaptation
4. Builds Knowledge Base
RAPIDLY GROWING MARKET

55+ Impact Bonds

$180+ Million raised
FIELD BUILDING

RECOMMENDATIONS

1. Establish a DIB Outcomes Fund
2. Catalyze the DIB market through foundational and philanthropic support of transaction costs
3. Facilitate information-sharing and create opportunities for sharing best practices

CASE STUDY: EDUCATE GIRLS

- **Target Population**: 18,000 children in Rajasthan, India
- **Intervention**: Enrollment, retention, and learning of marginalized children, specifically girls, through a comprehensive community program
- **Investor**: UBS Optimus Foundation
- **Outcome Payor**: Children Investment Foundation
- **Outcomes**: Increased enrollment and children’s progress in literacy and numeracy
EDUCATE GIRLS

project structure

CASE STUDY: REDUCTION OF RHODESIAN SLEEPING SICKNESS

- **Target Population**: 32 high risk districts and 18 lower risk districts in Uganda
- **Intervention**: Establishment of community-based insecticide spray network
- **Outcomes**: Reduce the level of parasites in cattle able to infect humans
SANITATION IMPACT FINANCE INITIATIVE

- National Level Impact Finance: Securitizing Global Aid
- Municipal Level Impact Finance: Social and Development Impact Bonds
- Household-Level Impact Finance: Empowering Domestic Users
Valentin Post is Deputy Director and Senior Finance, Sanitation and Waste Advisor at WASTE, Netherlands. He managed the Waste Venture Facility, and Guarantee Funds. He is the Co-founder of the Financial Inclusion Improves Sanitation and Health (FINISH), a €100 M public-private partnership in India as well as the Co-Founder FINISH in Kenya, a €12 M public-private partnership. He is co-author of the financing sanitation paper series and board member in several organisations (private and public).
BEYOND DEVELOPMENT AID: SANITATION FINANCING & REVENUE MODELS IN REUSE (HUMAN) WASTE, 15 MAY 2017

Lessons from microfinancing sanitation
Valentin Post
Imagine....
Global scenario
Public and private financing
Different cases
Partners
FINISH MF Model India
Currently supported portfolios
Loan products India
Interest rate differentials
Processes to avoid loan diversion
Repayment rates
Sanitation loan specifics
• 3.4 billion people w/o (improved) toilet
• Sanitation related illnesses leading cause infant mortality (1000 children / day die)
• Malnutrition and stunting
• Challenge for women -> privacy, security, health
• No toilets -> high school dropouts of girls (23%)
• India 6.4% GDP not realized due to sanitation related loss of work
• Market estimated at min. Euro 120 Billion.
Many sanitation programmes operate on two premises:
1. Sanitation is a public good
2. People are willing to pay, but not all people have the capacity to pay

Yet there are limited public funds
Capability or willingness to pay?

coverage (%)

- Telephone: 100%
- Television: 50%
- Toilet: 10%
Different cases

1. **Case 1**: Arba Minch, Ethiopia
   - Financing: Public financing
   - Note: Private financing: middle & upper class; Public financing poor

2. **Case 2**: Tamilnadu, Gujarat, Odisha, Maharashtra, Bihar, UP, India & Busia, Killifi, Kenya
   - Financing: Public financing
   - Note: Mixture of private and public and financing

3. **Case 3**: Rajasthan, India
   - Financing: Public financing & Donor/Private
   - Note: Private bridge and gap financing and attracting public subsidies

4. **Case 4**: Nakuru, Kenya
   - Financing: Public financing
   - Note: Private financing by landlords

5. **Theoretical Case 5**: For equitable subsidy models
   - Financing: Public financing
   - Note: Private financing superstructures with differential interest rates, public financing substruces
<table>
<thead>
<tr>
<th>Organization</th>
<th>Area of operation</th>
<th>Operation Started</th>
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<tbody>
<tr>
<td>BWDC</td>
<td>Tamilnadu (India)</td>
<td>1986</td>
</tr>
<tr>
<td>CASHPOR</td>
<td>UP &amp; Bihar (India)</td>
<td>2002</td>
</tr>
<tr>
<td>CDOT</td>
<td>Bihar (India)</td>
<td>2007</td>
</tr>
<tr>
<td>FB</td>
<td>Most counties (Kenya)</td>
<td>1985</td>
</tr>
<tr>
<td>Imarika Sacco</td>
<td>Kilifi (Kenya)</td>
<td>1967</td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>Odisha (India)</td>
<td>2004</td>
</tr>
<tr>
<td>NCT</td>
<td>MP &amp; Chhattisgarh (India)</td>
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<tr>
<td>PF</td>
<td>Odisha (India)</td>
<td>1989</td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Gujarat &amp; MP (India)</td>
<td>1998</td>
</tr>
<tr>
<td>RDO Trust</td>
<td>Tamilnadu (India)</td>
<td>1978/2013</td>
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<tr>
<td>Sidian Bank</td>
<td>Most counties (Kenya)</td>
<td>1984</td>
</tr>
<tr>
<td>SSK</td>
<td>Maharashtra (India)</td>
<td>2006</td>
</tr>
</tbody>
</table>
FINISH MF MODEL INDIA

Awareness creation: demand generation with MFI infrastructure

Access to local finances: effective demand

Mason training; supply of local material of construction → employment creation

Sustaining behaviour change
Monitoring / awareness
Health incentives
Safe reuse nutrients / carbon
## Supported portfolios several states in India

<table>
<thead>
<tr>
<th>Categories</th>
<th>2016-17</th>
<th></th>
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<th>YTD 2009-2017</th>
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<tbody>
<tr>
<td></td>
<td>Euro (M)</td>
<td>INR (M)</td>
<td>% Share</td>
<td>Euro (M)</td>
<td>INR (M)</td>
<td>% Share</td>
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<td>Finance (Bank/MFI/Other)</td>
<td>2.1</td>
<td>144</td>
<td>25.2</td>
<td>34.4</td>
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<td>Subsidy</td>
<td>1.3</td>
<td>91</td>
<td>47.8</td>
<td>39.5</td>
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<td>Self Financing</td>
<td>0.7</td>
<td>50</td>
<td>26.5</td>
<td>18.7</td>
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<td>CSR support</td>
<td>0.1</td>
<td>8</td>
<td>0.5</td>
<td>0.6</td>
<td>41.9</td>
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<td><strong>Total</strong></td>
<td>4.2</td>
<td>294</td>
<td>100.1</td>
<td>93.3</td>
<td>6530.6</td>
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<tr>
<td>Name</td>
<td>Number of sanitation loans of surveyed MFIs</td>
<td>Average amount (INR)</td>
<td>Tenure (months)</td>
<td></td>
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</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------</td>
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<tr>
<td>NCT</td>
<td>10,120</td>
<td>10,000-15,000</td>
<td>24-36</td>
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<tr>
<td>SSK</td>
<td>118</td>
<td>6,000- 15,000</td>
<td>12-24</td>
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<td>PF</td>
<td>3,020</td>
<td>10,000-25,000</td>
<td>18-24</td>
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<td>PRAYAS</td>
<td>1,579</td>
<td>10,000</td>
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<td>CASHPOR</td>
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<td>5,000- 20,000</td>
<td>12-24</td>
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<td>CDOT</td>
<td>408</td>
<td>12,000-18,000</td>
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<td>Mahashakti Foundation</td>
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<td>12,000-25,000</td>
<td>12-24</td>
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<td>RDO Trust</td>
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<td>20,000- 25,000</td>
<td>24 – 36</td>
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<tr>
<td>TOTAL</td>
<td>80,619</td>
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<tr>
<td>Name of the MFI</td>
<td>Interest rate (pa)</td>
<td>Cost to borrower</td>
<td>Selection of borrower</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>------------------------------------------</td>
<td>--------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NCT</td>
<td>12</td>
<td>13,680 (EMI 570)</td>
<td>SHG members</td>
<td></td>
<td></td>
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<tr>
<td>Sakhi Samudaya Kosh</td>
<td>7</td>
<td>2000</td>
<td>NA</td>
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<tr>
<td>Peoples Forum</td>
<td>22</td>
<td>ROI + LPF + Insurance</td>
<td>NA</td>
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<tr>
<td>PRAYAS</td>
<td>21</td>
<td>21% interest + 1% LPF</td>
<td>Loan Track record / also to individuals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>21</td>
<td>NA</td>
<td>JLGs/ 1 loan cycle without default</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bharathii Women Development Centre</td>
<td>26</td>
<td>NA</td>
<td>SHGs &amp; JLGs</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CDOT</td>
<td>26</td>
<td>NA</td>
<td>Capacity to pay</td>
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<tr>
<td>Mahashakti Foundation</td>
<td>18</td>
<td>NA</td>
<td>Capacity to pay, sanitation need, space</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>RDO Trust</td>
<td>10 - 18</td>
<td>NA</td>
<td>SHG / JLG</td>
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</tr>
<tr>
<td>Name of the MFI</td>
<td>Rate of interest</td>
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<tr>
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<tr>
<td></td>
<td>Sanitation Loan</td>
<td>Regular Loan</td>
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<tr>
<td>NCT</td>
<td>12%</td>
<td>18%</td>
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</tr>
<tr>
<td>SSK</td>
<td>7%</td>
<td>22%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF</td>
<td>22%</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>21%</td>
<td>26%</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>21%</td>
<td>21%</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>BWDC</td>
<td>26%</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CDOT</td>
<td>26%</td>
<td>NA</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>MF</td>
<td>18%</td>
<td>26%</td>
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<td></td>
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<td></td>
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<tr>
<td>MFIs</td>
<td>Process to check Loan Diversion</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT</td>
<td>Disbursing 1st installment after digging the pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>Prefabricated toilet unit installed by vendor. Direct payment to vendor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF</td>
<td>Start demand generation, check space availability. Cross questioning to check need. Post loan sanctioning, 5 days to dig pit, start construction from own funds. Loan released after completion foundation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Vigorous survey &amp; meeting with group members to identify the need of sanitation and family willingness to construct the unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Hygiene &amp; sanitation; introduce CHFs; credit; product utilization. 1119 CHFs in 12 regions. Each CHFs facilitate 12-15 Health education (HE) session on each branch / m, promote healthy practices as daily routine.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BWDC</td>
<td>Not applicable</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CDOT</td>
<td>Most toilets constructed through sanitation mart, confirms that loan is for toilet construction. Clients constructing on their own are regularly visited by field officers verifying progress construction. If for 3 months no progress is seen to be made the client have to repay the amount.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFIs</td>
<td>Default rate</td>
<td></td>
<td></td>
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<td>--------------</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT</td>
<td>&lt; 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>&lt; 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>&lt; 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BWDC</td>
<td>PAR 90 &lt; 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CDOT</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MF</td>
<td>&lt; 1%</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Reasons default:
1) Death of the beneficiary or the death of the head of the family
2) Migration
3) Over in-debtness and received more than one loan.
<table>
<thead>
<tr>
<th>MFI</th>
<th>Model designed/developed for sanitation credit</th>
<th>Technical Model</th>
<th>Operational Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCT</td>
<td>Septic tank and soak pit</td>
<td></td>
<td>Amount 10,000-15,000, balance by client IR 12%. Tenure 24-36 m.</td>
</tr>
<tr>
<td>SSK</td>
<td>Prefabricated structure of individual toilet</td>
<td></td>
<td>Group (3-7 women). IR ≤ 14%. Tenure 12-24m s per loan amount.</td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Single Pit with ‘Y’ junction &amp; Double Pit</td>
<td>Assess space, requirement &amp; interest</td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Single Pit with ‘Y’ junction &amp; Double Pit</td>
<td>Amount INR 3000-5000. IR 21.17-21.65%. Grace 14d No LPF</td>
<td></td>
</tr>
<tr>
<td>BWDC</td>
<td>Double Pit, Septic Tank with soak pit, &amp; Single pit with ‘Y’</td>
<td>Amount 5000-20,000 (Avg18,500). IR 26% with foreclosure system.</td>
<td></td>
</tr>
<tr>
<td>CDOT</td>
<td>Low cost double pit</td>
<td>IR 26%. Tenure 18m</td>
<td></td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>No specific model</td>
<td>Lower IR (18%) for the sanitation credit to individuals.</td>
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</tr>
<tr>
<td>MFIs</td>
<td>Reasons for development of sanitation loan product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT</td>
<td>Works with SHG groups, demand group members, basic requirement and for safety and dignity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>For the benefit of women and to reduce their stress.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Opportunity, government support/subsidy big help to serve local society. Funders offer term loan at reduced IR. FINISH for mason, animator Training and IEC material.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Due to demand of members for sanitation loan support.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Hygiene, health, poverty, social &amp; economic development. Sanitation products for livelihood improved hygiene &amp; health.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BWDC</td>
<td>Community health &amp; hygiene issues; credit systems. Develop ownership of community on the sanitation units.</td>
<td></td>
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</tr>
<tr>
<td>CDOT</td>
<td>Opportunity for sustainable sanitation system in the society. FINISH provided animator and mason training</td>
<td></td>
<td></td>
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<tr>
<td>MF</td>
<td>Health improvements, social-economic development community level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFIs</td>
<td>Effectiveness of sanitation lending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT</td>
<td>Effective because people’s own money, community realized importance of toilet in their daily life.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Effective, 1 year for process &amp; break even. Lot of opportunities. Process simplified &amp; loan product expanded to all branches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Yes, 99% members who construct are also using it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Visible; women decisive roles promotion &amp; management at HH; Women &amp; girls feel secure &amp; saves their privacy, prevention of water born diseases &amp; mitigation of health expenditures etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BWDC</td>
<td>Yes, demand is fair. 100 % repayment is ensured. Rate of utility is satisfactory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDOT</td>
<td>Increase in demand but many clients perceive that provision of toilets &amp; water are responsibility of Government.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>Reduces inequalities in health through focus on improving health and environmental conditions of poor people; community awareness and health standard increased through health education and promotion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFIs</td>
<td>Responses on profit from sanitation lending</td>
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<td>---------------------------</td>
<td>---------------------------------------------</td>
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</tr>
<tr>
<td>NCT</td>
<td>Sanitation lending for social cause.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSK</td>
<td>Cost of funds very high – not profitable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Profitable business but requires continuous technical and promotional support. Big potential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Sanitation loan as social cause, cost recovery.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASHPOR</td>
<td>None of the services are provided for business profit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BWDC</td>
<td>Yes, good repayment, adequate demand, good IR</td>
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</tr>
<tr>
<td>CDOT</td>
<td>NA</td>
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<tr>
<td>Mahashakti Foundation</td>
<td>Sanitation loan as social cause</td>
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</table>
### Involvement of SBM in Sanitation lending scheme

<table>
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<tbody>
<tr>
<td>NCT</td>
<td>No</td>
</tr>
<tr>
<td>SSK</td>
<td>NA</td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Through NABARD etc., ready to support local MFIs and NGOs.</td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Hasn’t reached interior areas. Some city members receiving benefits from SBM.</td>
</tr>
<tr>
<td>CASHPOR</td>
<td>No</td>
</tr>
<tr>
<td>BWDC</td>
<td>Yes</td>
</tr>
<tr>
<td>CDOT</td>
<td>NA</td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>No convergence</td>
</tr>
<tr>
<td><strong>Do’s</strong></td>
<td><strong>Don’ts</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| **LOAN PRODUCT**  
- Loan repayment monthly;  
- Minimise operating cost (product sustainable) & timely disbursement of installments; |  
- Take all un-utilization/ misuse seriously;  
- Loan diversion not negotiable;  
- Political engagement to be avoided; |
| **CAPACITY DEVELOPMENT**  
- Frequent training/orientation staff & beneficiaries;  
- Orientation group management & handholding support;  
- Creation awareness & capacity building for proper maintenance and usage of toilet;  
- Selection, mapping of villages & identification beneficiaries in organized group; |  
| **TECHNICAL**  
- Suggest suitable design pertain to the site;  
- Coordination with PRI members during selection of beneficiary & enforcement of model;  
- On site support for construction of toilet;  
- Material & technical support during construction; |  
- Individual toilet construction not encouraged with if space constraints; |
<table>
<thead>
<tr>
<th>MFIs</th>
<th>Recommendations to improve sanitation lending</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCT</td>
<td>Prepare guideline to improve sanitation lending &amp; to ensure proper physical monitoring.</td>
</tr>
<tr>
<td>SSSK</td>
<td>Need more focussed and specialized human resources</td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Reduction in TAT &amp; operational efficiency keys to sanitation lending</td>
</tr>
<tr>
<td>PRAYAS</td>
<td>People’s contribution required for success and usage</td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Amount increase to INR 8000 - 10,000.</td>
</tr>
<tr>
<td>BWDC</td>
<td>Timeliness; technical details during loan distribution. IR lower; <strong>High priority for subsidy linked loan;</strong> Simplified refurbishments loan product.</td>
</tr>
<tr>
<td>CDOT</td>
<td>NA</td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>Sanitation market development; Avoid monopoly and encourage competition for sanitation suppliers; Sharing of different case studies on sanitation at Community level.</td>
</tr>
<tr>
<td>MFIs</td>
<td>Suggestions for FINISH</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NCT</td>
<td>Technical &amp; financial support sanitation loan</td>
</tr>
<tr>
<td>SSK</td>
<td>Government linkages &amp; refinancing assistance</td>
</tr>
<tr>
<td>Peoples Forum</td>
<td>Blended finance; assist in documentation and process flow development; make entire model should be transparent and understandable.</td>
</tr>
<tr>
<td>PRAYAS</td>
<td>Refinancing assistance</td>
</tr>
<tr>
<td>CASHPOR</td>
<td>Introducing new low cost toilet structures; organize events/programs to promote demand &amp; create sanitation awareness</td>
</tr>
<tr>
<td>BWDC</td>
<td>Refinancing assistance; IEC material support; establish RSM projects; continue grant support for further three years.</td>
</tr>
<tr>
<td>CDOT</td>
<td>NA</td>
</tr>
<tr>
<td>Mahashakti Foundation</td>
<td>Proper design sanitation loan product. Orientation and CB to community people on need of sanitation loan. Guidance in proper selection of client before loan disbursement.</td>
</tr>
<tr>
<td>Organization</td>
<td>Area of operation</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Family Bank</td>
<td>Most counties (Kenya)</td>
</tr>
<tr>
<td>Imarika Sacco</td>
<td>Kilifi (Kenya)</td>
</tr>
<tr>
<td>Sidian Bank</td>
<td>Most counties (Kenya)</td>
</tr>
<tr>
<td>CEDEF</td>
<td>Busia umbrella of 12 SACCOs</td>
</tr>
</tbody>
</table>
Demand generation CLTS
Basic sanitation systems constructed about 17,000
Financial partners developed micro loan products
Capacity development masons /artisans → cost reduction 50% or more

Loan portfolio € 40,000

Hence from March 2016 refocus:
1. Sanitation marketing
2. Supply side interventions
3. Institutional sanitation
FINISH MODEL KENYA

Awareness creation (CLTS- Amref / MoH): Sanitation marketing (Amref / MoH/INK)

Sustaining behaviour change
Monitoring / awareness
Health incentives
Safe reuse nutrients / carbon
Institutional MF

Access to local finances: effective demand

Mason training; supply of local material of construction
→ employment creation
→ MF clients
Supported portfolios two counties in Kenya in KSh

Monthly Cumulative Loan Portfolio by Partner Financial institutions

<table>
<thead>
<tr>
<th>Upto April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2017</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Legend:
- Family Bank
- Sidian Bank
- Imarika Sacco
- Busia Saccos
- FI's Monthly Totals
<table>
<thead>
<tr>
<th></th>
<th>Family Bank</th>
<th>Imarika Sacco</th>
<th>Sidian Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount KSh</td>
<td>29,943,000</td>
<td>80,678,415</td>
<td>192,192,499</td>
</tr>
<tr>
<td>Number of loans</td>
<td>95</td>
<td>1158</td>
<td>1774</td>
</tr>
<tr>
<td>Range in KSHs</td>
<td>45,000-1,000,000</td>
<td>45,000-750,000</td>
<td>40,000-2,084,000</td>
</tr>
<tr>
<td>Tenure (months)</td>
<td>24</td>
<td>Maximum 24</td>
<td>3-24; exceptional 36</td>
</tr>
<tr>
<td>Interest rate</td>
<td>15% (flat)</td>
<td>18%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Cost to the borrower</td>
<td>LPF 3%; insurance fee 0.5%; credit life 0.5%</td>
<td></td>
<td>Application fee 1.5%; insurance fee 1%; SME only disbursement fee 1.5%</td>
</tr>
<tr>
<td>LOAN PRODUCTS KENYA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Bank</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Imarika Sacco</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sidian Bank</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Client Selection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open an account; collateral 20%; normal appraisal processes; Chattels or group guarantee, log book, school assets;</td>
<td>Active members only; savings account balance ≥ KSh1,000 repayment ability Loan secured ≥ 4 Guarantors Local Area Chief Endorsement Not a defaulter in any other loan</td>
<td>Open an account; for group model – group guarantee; cash collateral 20%; affidavits for loans ≤ KSh 150,000; tangible security loans ≥ KSh 300,000</td>
<td></td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application form with toilet work quotation. Work with artisan (FINISH-INK trained and/ or approved)</td>
<td>The Sacco pays the materials supplier/trained masons via cheque.</td>
<td>Individuals &amp; groups; entrepreneurs in sanitation and related activities</td>
<td></td>
</tr>
</tbody>
</table>
### MFIs

<table>
<thead>
<tr>
<th><strong>Reason for development of sanitation loan product</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Bank</strong></td>
</tr>
<tr>
<td>Targets low income households; both new and existing clients; all types of toilet construction and improvement; biogas; exhauster trucks; waste incinerators (girls schools): SMEs</td>
</tr>
<tr>
<td><strong>Imarika</strong></td>
</tr>
<tr>
<td>Strong demand from clients (households, <em>schools</em> and entrepreneurs); good potential (based on partnership arrangements)</td>
</tr>
<tr>
<td><strong>Sidian</strong></td>
</tr>
<tr>
<td>Increased health status and social-economic development clients; cheap source of deposits; increase number of clients; cross-selling; goodwill &amp; loyalty clients; loan portfolio growth; deposits growth</td>
</tr>
<tr>
<td>Households, institutions, SMEs. Bank allocated KSh 500M; institutionalise sanitation loan product</td>
</tr>
</tbody>
</table>
CONCLUSIONS

- Micro Financing sanitation is feasible
- MFIs see it as market opportunity, for some based on client demand
- Wide variations in models applied by MFIs
- Most need some sort of ODA / subsidy to create awareness and generate demand, sometimes lower IR & cost of monitoring (diversion) higher
- Repayment rates are at least on par with regular MF
- High impact investment ➔ blended finance / ODA
- Additional differences India & Kenya MF model
- India demand generation through infrastructure MFIs – community level with attention for construction
- India household financial inclusion through infrastructure MFIs
- India supply side construction – capacity development masons – attached to MFIs / some linked to vendors
- India sustained behaviour change; reuse & incentives
- Kenya demand generation through partnership (Amref / MoH) in two stages: CLTS + sanitation marketing/ sales
- Kenya supply side development; CD artisans / entrepreneurs / aggregators initial financial support, market for MF / SME finance and SGB (SEF)
- Kenya sustained behaviour change; schools & health volunteers turned entrepreneurs
Kenya: Stronger focus on supply side development:
- CD masons → lower costs, this increases market size
- new financing market for MFIs (entrepreneurs, aggregators)
- Reuse markets at HHs not mature yet;
  → institutional exists (biogas schools)
- Commercial and soft commercial leverage on ODA 10 – 20 x
Jacqueline Barendse
Managing Director, WASTE

Jacqueline has over 30 years working experience in business development, finance and development aid. In the early years she was product and business development manager for Philips Electronics. Intrigued by the role of financing ‘to make things happen’ she moved to the financial sector (ING Bank, Triodos Bank, an own investment company and a consultancy organisation) in various roles (investment manager, board member, consultant), and in various countries in Europe, Africa, Asia. Over the years the focus shifted from corporate finance to development financing. At the moment Jacqueline is among others Managing Director of WASTE, board member of the Netherlands Water Partnership NWP), member steering group ViaWater (innovation in water / sanitation), member of expert team on Output Based Aid of the World Bank (GPOBA).
Basic needs, (local) entrepreneurship, sustainable solutions
SDG AMBITIONS: RULES OF THE GAME HAVE CHANGED

source: Unicef /DGIS review meeting Liberia march 2017
### What

<table>
<thead>
<tr>
<th></th>
<th>Need Basic Service</th>
<th>Need Safely managed service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>2.3 billion people</td>
<td>4.5 billion people</td>
</tr>
<tr>
<td><strong>Sanitation</strong></td>
<td>3.4 billion people</td>
<td>5.3 billion people</td>
</tr>
</tbody>
</table>

**Financing (nil to safely managed service):**

- $100 billion infrastructure
- $100 billion operations & maintenance
- $……………
- $……………
- $…. billion p.y. till 2030
### What is needed

<table>
<thead>
<tr>
<th>What</th>
<th>Need Basic Service</th>
<th>Need Safely managed service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>2.3 billion people</td>
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<tr>
<td>Sanitation</td>
<td>3.4 billion people</td>
<td>5.3 billion people</td>
</tr>
</tbody>
</table>

**Financing (towards safely managed service):**

- $100 billion infrastructure
- $100 billion operations & maintenance
- $21 billion enabling environment
- $221 billion p.y. till 2030
### On earth:

<table>
<thead>
<tr>
<th>Who</th>
<th>What</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samirah (Ethiopia)</td>
<td>Public toilets</td>
</tr>
<tr>
<td>Joseph (Haiti)</td>
<td>Water kiosks</td>
</tr>
<tr>
<td>Pradeep (India)</td>
<td>Toilets</td>
</tr>
<tr>
<td>Who</td>
<td>Business</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Samirah - Public toilets</td>
<td>‘Very busy, great revenues’</td>
</tr>
<tr>
<td>Who</td>
<td>Business</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Samirah - Public toilets</td>
<td>‘Very busy, great revenues’</td>
</tr>
<tr>
<td>Joseph - Water kiosks</td>
<td>‘Ok, around break-even’</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Who</td>
<td>Business</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Samirah - Public toilets</td>
<td>‘Very busy, great revenues’</td>
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<tr>
<td>Joseph - Water kiosks</td>
<td>‘Ok, around break-even’</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Pradeep - Toilets</td>
<td>‘Scale: 1/4/24/365’</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
...@SCALE

- ...@scale = facilitator
- Revenue models
- Link with financing (blending) ➡ Transactions
- Inclusive !!! (100%)
- ...@scale is not a fund
- Aqua4all and WASTE
THANK YOU

...@SCALE
**Sjef Ernes** is managing director of Aqua for All since 2004. His career has been water-dominated: water technology-consultant, managing director of a drinking water utility, entrepreneur in industrial water services and now enabling the integrating of business & finance on interventions providing access to safe drinking water & sanitation to the BoP via Aqua for All. Since 2005 Aqua for All has successfully contracted DGIS grant support to provide leverage on private and civil interventions, totaling up to € 74 million by 2017, matching with over € 80 million from private sector and philanthropy participation. Aqua for all recently completed an acceleration-assessment on 24 business propositions in the sanitation finance & business working field. They provide gate funding to promising gamechangers in sanitation as businesses like FINISH and Safi Sana. Together with WaterNet-Amsterdam Aqua for All organizes the bi-annual Sarphati Sanitation Award.
Sanitation  Financing & revenue models

Value for money. Money for value.  15th may 2017
What can we learn from Kiosk business funding?

SWE-report: the untapped potential of SWE’s at large scale

march 2017 (see www.aquaforall.org)

Questions:
1. Is there also an untapped business potential for toilets?
2. Why is WASH-BoP funding always blended finance?
3. Is PPP approach helping?
4. Are kiosk funding structures applicable for sanitation?
PPP business opportunities in Safe Water services
PPP business opportunities in sanitation services?
The findings of the SWE study

**Market is there**

Huge untapped market potential for SWE’s, as one of the 3 broader access models, providing safe & sustainable services, ready to scale

1.7 billion people underserved, using water that is unsafe and poorly treated

2 billion, underserved, using a source of decentralised improved water, but this is not treated or safe

While it is estimated that as many as 4.4 billion people lack reliable access to clean, SAFE drinking water

**In line with gvt, social impact**

SWE’s add value, support the safe water policy, with high quality, cost effective services, provides benefits to all 4 stakeholders (end consumer, government, investors and private sector)

Safe Water Enterprises can play a key role in the service delivery spectrum, for governments achieving SDG6 with sustainable services

SWE’s provide pathways to increased market penetration, cost effectiveness, efficiency and scale and create clearer articulation of social impact.
The findings in other words

• There is a business opportunity
• There is a PPP opportunity for gvt
• There is a (sleeping) demand
• There is a willingness to pay for service
• Revenue drivers are cash flow proven
• Investments are much more cost effective, in CAPEX and in OPEX, compared to piped solutions
• There is an impact that unlocks outcome payers
• Scale, technology, proven concepts, SME’s: all there
Scaling barriers are the same!

- Weak business model or structure
- Weak proposition to customers/producers
- Weak leadership
- Lack of managerial and technical skills
- Lack of capital

- Lack of suitable labor/inputs
- Weak sourcing channels from BoP producers
- Weak distribution channels to BoP customers
- Weak linkage between BoP producers and end demand
- Lack of financing for customers, distributors and producers
- Lack of support service providers

- Lack of awareness of new product categories/classes and appreciation of their benefits
- Lack of industry information and knowhow, e.g., customer insight, business models
- Absence or ineffectiveness of standards e.g. for quality
- Lack of infrastructure

Source: Monitor Deloitte analysis

- Inhibitory laws and regulations
- Inhibitory fiscal regimes
- Adverse intervention by politicians or officials
Like SWE’s: diversity in chain activities
Like SWE’s: add value to Utility-infra

The Safe Water Challenge: Role of SWEs

<table>
<thead>
<tr>
<th>Logistics manager</th>
<th>Last mile distributor</th>
<th>Quality enhancer &amp; logistics manager</th>
<th>Quality enhancer &amp; last mile distributor</th>
<th>Quality enhancer</th>
<th>Support centralized providers by using value adding purification technologies (e.g., chlorination on relatively good quality bore well water), and ensure last mile distribution.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support water delivery logistics to widen catchment area and ensure last mile distribution.</td>
<td>Work with centralized providers to provide last mile or door step distribution services.</td>
<td>Work with centralized providers by using value adding purification technologies (e.g., chlorination on relatively good quality bore well water), and ensure last mile distribution.</td>
<td>Support centralized providers by using value adding purification technologies (e.g., chlorination on relatively good quality bore well water).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent operator</th>
<th>Quality assurer &amp; last mile distributor</th>
<th>Quality assurer</th>
<th>Support centralized providers by using appropriate on-site purification and provide last mile distribution systems (e.g., use utility connections as a water source, treat it and provide last mile distribution).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide access to safe drinking water independently from extraction to delivery.</td>
<td>Bring in appropriate on-site purification and provide last mile distribution systems (e.g., use utility connections as a water source, treat it and provide last mile distribution).</td>
<td>Support centralized providers by using appropriate on-site purification technologies (e.g., RO technology on untreated utility water).</td>
<td></td>
</tr>
</tbody>
</table>

---

Access to centralized/piped water

Level of involvement for SWEs

- High
- Medium
- Low

Source: Dalborg analysis
Analogies between SWE’s and toilets!!

Decentral sanitation services fit in the gvt policy, add value to existing sanitation policy, but require protection in legislation & regulation.

People are willing to pay for service, not for bricks

Make sanitation visible as value, comfort, money saver, ..(demand creation, just like in safe water)

Create the value drivers (circular economy, value chain activities) that stimulate the wish for sanitation

Finance structures are the same: PPP finance, blending, include outcome payments (credits, impact, bonds, SROI)
Sarbani Bhattachary is a client partner in financial services for KPMG. Sarbani ensures the effective positioning of KPMG’s services, seamless implementation, focussed and coherent relationship management. Sarbani also represents KPMG at the Dutch Trade and Investment Board, India werkgroep and as a Board member with Finish Society, an NGO which is active in sustainable ventures in the sanitation and health space in India and other parts of the world.
**Status of sanitation:** As per Swachh Bharat Mission (Clean India Mission) Government management information system at the beginning of FY2016-17, the All-India sanitation density was 51.74%. In Dec 2016 it stands at 58.55%. Leaving a gap of nearly of 75 Million toilets to be completed by 2019 if India is to be ODF – GOI goal! It requires INR 899 Billion!

### Swachh Bharat Mission (SBM) Rural

#### Achievement BLS Report

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>State Name</th>
<th>No of HH as per BLS</th>
<th>Toilet Coverage as of Dec 2016</th>
<th>% Coverage</th>
<th>Toilet GAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MADHYA PRADESH</td>
<td>12,079,133</td>
<td>6,074,194</td>
<td>50.29</td>
<td>6,004,939</td>
</tr>
<tr>
<td>2</td>
<td>MAHARASHTRA</td>
<td>12,114,064</td>
<td>8,550,078</td>
<td>70.58</td>
<td>3,563,986</td>
</tr>
<tr>
<td>3</td>
<td>ODISHA</td>
<td>9,020,107</td>
<td>3,371,103</td>
<td>37.37</td>
<td>5,649,004</td>
</tr>
<tr>
<td>4</td>
<td>RAJASTHAN</td>
<td>11,486,956</td>
<td>8,094,757</td>
<td>70.47</td>
<td>3,392,199</td>
</tr>
<tr>
<td>5</td>
<td>TAMIL NADU</td>
<td>9,540,299</td>
<td>6,301,787</td>
<td>66.05</td>
<td>3,238,512</td>
</tr>
<tr>
<td>6</td>
<td>UTTAR PRADESH</td>
<td>28,720,844</td>
<td>13,145,316</td>
<td>45.77</td>
<td>15,575,528</td>
</tr>
<tr>
<td><strong>All India</strong></td>
<td><strong>180,755,688</strong></td>
<td><strong>105,825,833</strong></td>
<td><strong>58.55</strong></td>
<td></td>
<td><strong>74,929,855</strong></td>
</tr>
</tbody>
</table>
Financing through an impact bond

- Commercialisation of social development
- Demand for investment for social impact/ CSR requirement in India
- Complex chain of financing dependent on Government grant of 12,000 INR per individual household
- Banks and micro finance institutions play a key role in providing Financial support needed for:
  - Pre-financing Government grant
  - Creation of demand and eligibility of finance
    - Understanding the region and the issue
    - Development of audio-visual / IEC aids
  - Skill Training of Masons
  - Vendor aggregation
  - Support financing
- Line of credit to be established
  - Pre-financing/ working capital and balance financing
Financing through an impact bond

400,000 toilets at € 250 each = € 100 million in 24 months

- Euro 250 = 20000 INR per toilet
- Central/State Government grant: 12,000
- Grant or self finance or loan : 8,000
- TOTAL finance requirement: 20,000

Expenditure:
- Toilet hardware and making: 16,000
- Demand creation: 1,000
- Interest and other costs: 3,000
- TOTAL: 20,000

In some States, the State Government has increased its share. This does not change the fundamentals, as the share of grant or self finance will correspondingly reduce.
Financing through an impact bond

- **Fund to float bonds for investment in India guaranteeing social impact to be visible.** Such bonds would typically be attractive at 12% to 15% per annum in Europe without considerations of foreign exchange impacts.

- **The fund would LOAN the money collected to one or more scheduled banks in India** under a legal undertaking that the money will be loaned to parties for the exclusive purpose of building individual toilets to be re-imbursed (partly) by the central Government scheme.

- **MFIs Corporates or Trusts** maybe included to complement or add to the role of banks

- **The arrangement would include five types of parties:**
  - Scheduled banks (interest on financing more than the interest to be paid to the bond)
  - Vendors (profit on making the toilet)
  - State Governments (fund for development/ need to show performance)
  - FINISH Society (demand creation, vendor aggregation, technical assistance and managing the process)
  - 3R WASTE (Ensuring the “going concern” between the money suppliers (investment fund and bond parties) and on the other the money spenders (FINISH Society, vendors and individuals).
Investment fund manager or bond issue

Scheduled Bank or MFI or Trust or Corporate

Vendor credit

FINISH SOCIETY

Individual

WASTE

Due Diligence

Risk

Responsibility for implementation

Supply

Demand

Individual or grant company

Government Grant

Bears the cost
- Fund to float bonds for investment in India guaranteeing social impact to be visible.
  - What is a reasonable expectation in terms of volume, return and cycle time
  - What kind of guarantees would be required at each stage
  - What are the concerns

- MFIs Corporates or Trusts maybe included to complement or add to the role of banks
  - Profile
  - Due diligence
  - Legal commitments

- State Governments and local bodies
  - Commitments

- Other Commitments
  - Scheduled banks
  - Vendors
  - FINISH
  - WASTE/3R WASTE
  - Individuals
Kajetan Hetzer has worked for more than 10 years in the financial sector as an analyst on Environmental, Social, Governance (ESG) aspects of investments. During this period, he initiated the innovative SNS REAAL Water Fund (2006) and was appointed as its Fund Manager. After his career in the financial sector, Kajetan worked as sustainability consultant for various international organizations, NGOs and development agencies. In 2014, he joined WASTE where he works to date with specialization on business development, finance, strategy, acquisition and partnership development. In 2015, he was appointed Executive Director of the Social Equity Fund. Next to his job Kajetan is adviser to think-tanks and several advisory boards related to sustainable development, including for young enterprises and for the business platform of CEWAS (International Centre for Water Management Services) in Switzerland. He is the Chairman of “Gooood Foundation” that aims to accelerate the transition to sustainable communities by initiating and supporting circular design principles.
Targeting the Missing Middle – Investing in Small & Growing Business which provide Basic Needs

Conference

Beyond development aid:
Sanitation financing & revenue models in reuse (human) waste
15 May 2017, The Hague
Professor Barbara Evans holds the chair in Public Health Engineering in the School of Civil Engineering at the University of Leeds. Her research activities centre on sanitation, hygiene and water services in the global south with a particular focus on urban sanitation in cities and towns. Within these areas, particular emphasis is placed on the development of effective strategies for management and disposal of faecal sludge, alternatives to conventional water borne sewerage in dense urban areas, effectiveness of rural sanitation programmes, sustainability and equity in community-wide approaches which eliminate open defecation, health impacts of sanitation and water services, technologies and institutions to link community sanitation and water investments with city networks. Professor Evans’ career spans 30 years; she worked as a consultant and at the World Bank for over twenty years before joining the University in 2009 and has lived and worked in South Asia, Africa and Latin America. Professor Evans now leads a multi-disciplinary team working on global development and public health. She has over forty publications with a direct link to urban WASH services, planning, costing and financing of urban sanitation.
Managing a million pits...
towards an understanding of rural feecal sludge management in Bangladesh

Professor Barbara Evans
Centre for Global Development
University of Leeds
Background

- Bangladesh – has made strong progress in elimination of open defecation
- Estimated 8 million single pits have been installed in the past 10 years
- Only about 20% of these have yet been emptied
- More than a million cubic meters of fecal sludge needs to be moved every year
- There is an urgent need for active management of rural fecal sludge
- Value at the end of the Value Chain project addresses this challenge
Our core hypothesis is that this system would result in effective sustainable management of faecal sludge only if costs are covered by payments from:

- Households for pit emptying
- Farmers (or others) for end product
- Government to finance any gap (subsidy (GOB/LGI))
FS collection and transport
Current arrangements

Pourashava/ Municipality

Household
Pit emptier
Farmer
FS collection and transport
Current arrangements

- Farmer
- House hold
- Pit emptier

Pourashava/ Municipality

Faecal sludge

$
FS collection and transport
Current arrangements
FS collection and transport
The public sector model

Household → Pit emptier → Treatment works → Pourashava/Municipality → Farmer

Faecal sludge

$
FS collection and transport
The public sector model
FS collection and transport
Can we incentivise good treatment?

Household

$ Faecal sludge

Pit emptier

Pourashava/Municipality

Faecal sludge

Treatment works

Faecal sludge

Farmer
FS collection and transport
Can we incentivise good treatment?
FS collection and transport
Can we incentivise good treatment?

- Household
  - Faecal sludge
  - $ to Pit emptier
  - Faecal sludge

- Pit emptier
  - $ to Treatment works
  - Faecal sludge

- Treatment works
  - $ to Compost shop
  - Compost

- Compost shop
  - $ to Farmer

- Farmer
  - Compost

- Pourashava/ Municipality
  - $ to Pit emptier

- Pit emptier
  - $ to Household

- Household
  - Faecal sludge
  - $ to Pit emptier
FS collection and transport
How might this look in practice?

Regulation of pits and emptying
Regulation of H&S, disposal and charges
Licences, uniforms, and health insurance?

Household
Faecal sludge

Pit emptier
Faecal sludge

Pit emptier association

Treatment works
Faecal sludge

Compost shop
compost

Pourashava/Municipality

Farmer

NGO/Regulator: Collects and reports data
FS collection and transport
How might this look in practice?

Regulation of pits and emptying
Regulation of H&S, disposal and charges
Licences, uniforms, and health insurance?

Household $ Faecal sludge
Pit emptier $ Faecal sludge
Pit emptier association

Pourashava/ Municipality $ contract

Treatment works
Compost shop
Community interest c/o: Compost producer

$ Farmer

Compost

NGO/Regulator: Collects and reports data
FS collection and transport
How might this look in practice?

Regulation of pits and emptying

Pourashava/ Municipality

Contract

$\rightarrow$

Household

Faecal sludge

Pit emptier

$\rightarrow$

Pit emptier association

MOU, uniform etc

Treatment works

Compost shop

NGO or private operator

Faecal sludge

Compost

Farmer

Regulation of pits and emptying

NGO/Regulator: Collects and reports data
FS collection and transport
How might this look in practice?
Our core hypothesis is that this system would result in effective sustainable management of faecal sludge only if costs are covered by payments from:

- Households for pit emptying
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Our core hypothesis is that this system would result in effective sustainable management of faecal sludge only if costs are covered by payments from:

- Households for pit emptying
- Farmers (or others) for end product
- Government to finance any gap (subsidy (GOB/LGI))
So the big questions are...

- How much does it cost to empty and transport feacal sludge?
- How much are households willing to pay for this service?
- How much would they be willing to pay more for a ‘better’ service?
- How much does it cost to treat feacal sludge?
- Is it possible to sell the product?
- And therefore what is the extent of the public subsidy required?
Household and community engagement

To understand the perceptions towards faecal sludge compost product and the pit emptying constraints and opportunities:

- **BRAC Household Survey** (Total 1440)
- **Non-BRAC Household Survey** (Total 660)
- **FGD** (8 in total held Bhaluka, Mymensingh)
- **KAP and Willingness to Pay Study**
Feecal Sludge characterisation

5 Upazilas: 38 sampling points

Characterizing parameters: TN, TOC, TVS, MC, pH, Conductivity, PO$_4$-P, Total Coliform, E. Coli and Helminth Eggs.

Wash Water: pH, Conductivity and TDS
Perceptions and use of equipment for emptying

**Gulper**
- Heavy and difficult to handle
- Need to remove superstructure (fragile in maximum case) of latrine
- Unhygienic for health and environment in terms of spill over effect
- High possibility to damage slab and ring

**Electric Pump**
- Low voltage of rural electric supply hampers its operation
- Can empty quickly the liquid sludge
- Trashes hamper its operation frequently and it seems unhygienic for health and environment
Perceptions and use of equipment for emptying

**Diesel Pump**
- Can empty pits very quickly, but found not suitable to use in rural pits
- Quite weighty

**Diaphragm Pump**
- Suitable for pit emptying and easy to carry from one place to another
- Hygienic in terms of a health and safety environment for workers, in comparison with the other three technologies
We also looked at options for transport – including light trucks and tankers.

Pit emptiers wearing Personal Protective Equipment
Sludge treatment
Sludge treatment

Co-Composting
Costing emptying and transport in rural Bangladesh

- 8 million single pit latrines in Bangladesh which need emptying
- In Bhaluka 77,413 new single pit latrines which need active management
- The pits have on average 2.4 rings, with a diameter of 0.83m. The typical sludge accumulation rate in Bhaluka is estimated at 0.11 liters/person/day
- The typical latrine will need to be emptied approximately once every 3.7 years
- For the whole population, that results in the need for 20,760 emptying events each year, and a total of 15,219 m³ of sludge to be emptied and transported annually
- Typical manual transport and driving distances from village to union and from union to upazilla were mapped using a GIS platform
Options for emptying and transport

<table>
<thead>
<tr>
<th>Option</th>
<th>Method of Emptying</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Village to Union</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Union to Upazila</td>
</tr>
<tr>
<td>1</td>
<td>Manual</td>
<td>Trucks</td>
</tr>
<tr>
<td>2</td>
<td>Manual</td>
<td>Trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tanker</td>
</tr>
<tr>
<td>3</td>
<td>Diaphragm Pump</td>
<td>Trucks</td>
</tr>
<tr>
<td>4</td>
<td>Diaphragm Pump</td>
<td>Trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tanker</td>
</tr>
</tbody>
</table>
## Options for emptying and transport

<table>
<thead>
<tr>
<th>Option</th>
<th>Method</th>
<th>Nr of Units</th>
<th>Transport</th>
<th>Total staffing (people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manual</td>
<td>49</td>
<td>Trucks: 228, Tankers: -</td>
<td>603</td>
</tr>
<tr>
<td>2</td>
<td>Manual</td>
<td>49</td>
<td>Trucks: 169, Tanker: 3</td>
<td>491</td>
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<tr>
<td>3</td>
<td>Diaphragm Pump</td>
<td>10</td>
<td>Trucks: 228, Tanker: -</td>
<td>466</td>
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<tr>
<td>4</td>
<td>Diaphragm Pump</td>
<td>10</td>
<td>Trucks: 169, Tanker: 3</td>
<td>354</td>
</tr>
</tbody>
</table>

Source: Authors' calculation
## Total costs of emptying and transport services

<table>
<thead>
<tr>
<th>Option</th>
<th>Total capital costs</th>
<th>Annualised capital costs</th>
<th>Labour</th>
<th>Operating costs</th>
<th>Total</th>
<th>Cost per emptying event</th>
<th>Cost per household with a pit</th>
<th>Monthly cost per household with a pit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>142,321,000</td>
<td>10,523,891</td>
<td>13,595,855</td>
<td>21,654,197</td>
<td>45,773,943</td>
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<td>591</td>
<td>49</td>
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<tr>
<td>2</td>
<td>110,185,000</td>
<td>8,264,596</td>
<td>11,061,555</td>
<td>6,402,234</td>
<td>25,728,385</td>
<td>1,239</td>
<td>332</td>
<td>28</td>
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<tr>
<td>3</td>
<td>142,572,000</td>
<td>10,555,314</td>
<td>10,412,666</td>
<td>21,654,197</td>
<td>42,622,178</td>
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<td>551</td>
<td>46</td>
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<tr>
<td>4</td>
<td>110,436,000</td>
<td>8,296,020</td>
<td>7,878,366</td>
<td>6,402,234</td>
<td>22,576,620</td>
<td>1,088</td>
<td>292</td>
<td>24</td>
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<tr>
<td>USD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,824,628</td>
<td>134,922</td>
<td>174,306</td>
<td>277,618</td>
<td>586,845</td>
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<td>105,956</td>
<td>141,815</td>
<td>82,080</td>
<td>329,851</td>
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<td>0.36</td>
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<tr>
<td>3</td>
<td>1,827,846</td>
<td>135,325</td>
<td>133,496</td>
<td>277,618</td>
<td>546,438</td>
<td>26</td>
<td>7</td>
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<td>4</td>
<td>1,415,846</td>
<td>106,359</td>
<td>101,005</td>
<td>82,080</td>
<td>289,444</td>
<td>14</td>
<td>4</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Source: Authors' calculation

1. Annualised capital costs includes cost of servicing capital, capital maintenance and operational wear and tear, over the operational period which is 25 years.
2. Operating costs includes fuel, and other operational supplies.
3. 1USD = BDT78
Cost breakdown (Annual cost - BDT)
Empyting cost: $14 per emptying event, $4 per household per year, $0.31 per household per month.

Current WTP is $6.50 per emptying event (covers 47% of the cost).

A deficit of USD 154,500 per year for Bhaluka subdistrict.

BUT a monthly subscription service at household level would cost $0.31 per month (considerably less than the average monthly expenditure on phone calls).

Willingness to pay for this service would rise – it could potentially cover treatment costs.

The service would result in the creation of around 350 jobs.

Smart delivery of a subsidy via the treatment service would optimize public health outcomes.
FS collection and transport
How might this look in practice?

Option 1: Separate FS collection and compost production

Household → Pit emptier

Regulation of pits and emptying
Regulation of H&S, disposal and charges
Licences, uniforms, and health insurance?

Pit emptier assoč

FAecal sludge

Pourashava/ Municipality

Treatment works

Community interest as: Compost producer

Compost shop

Farmer

NGO/Regulator: Collects and reports data


Thank you
BJ Ward is a project officer at Sandec: the Department of Sanitation, Water and Solid Waste for Development, at Eawag: the Swiss Federal Institute of Aquatic Science and Technology. She has a background in chemical and environmental engineering, with a focus on energy recovery from excreta and faecal sludge, and optimization of treatment endproducts. BJ previously researched pyrolysis and combustion of dried excreta and faecal sludge at the University of Colorado. At Sandec, she studies faecal sludge dewatering for improved resource recovery.
End use and resource recovery from faecal sludge – focusing on solid fuels

BJ Ward, Dr. Linda Strande
Management of Excreta, Wastewater and Sludge research group
Sandec: Department of Sanitation, Water and Solid Waste for Development
Faecal sludge target treatment products

- soil conditioner
- solid fuel
- insect protein
- plants
- building materials components
- biogas feedstock
- aquaculture
Selecting target treatment products
Market driven approach

www.sandec.ch/fsm_tools
Faecal sludge as a solid fuel

Potential market values for treatment products (USD/ton)

- Solid fuel has highest revenue potential
- Large industrial markets
  - exist within urban areas
  - have large and consistent demands

www.sandec.ch/fsm_tools
Treatment technology considerations

Dewatering and drying are key

> 95% water

50% water

< 10% water
Treatment technology considerations
Getting from 50% to <10% water

Bioburn pelletizer decreases time and space for sludge drying
Solid fuel treatment products

Important parameters:
- Calorific value
- Ash fraction
- Heavy metals
- Emissions
Solid fuel characterization

Calorific value and ash

Gold et al., 2017, Englund et al., 2016, Hafford et al., 2017, Muspratt et al., 2014
Solid fuel characterization
Heavy metals and emissions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Kampala Mean</th>
<th>SD</th>
<th>FS Dakar Mean</th>
<th>SD</th>
<th>Wastewater sludge</th>
<th>Industrial limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>%</td>
<td>27.8</td>
<td>3.1</td>
<td>28.8</td>
<td>3.4</td>
<td>16.9–31.6</td>
<td>–</td>
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<tr>
<td>Hydrogen</td>
<td>%</td>
<td>4.2</td>
<td>0.5</td>
<td>4.2</td>
<td>0.4</td>
<td>3.3–7.6</td>
<td>–</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>%</td>
<td>3.2</td>
<td>0.4</td>
<td>3.0</td>
<td>0.6</td>
<td>0.4–4.2</td>
<td>–</td>
</tr>
<tr>
<td>Sulfur</td>
<td>%</td>
<td>0.7</td>
<td>0.1</td>
<td>1.7</td>
<td>0.0</td>
<td>0.7–1.6</td>
<td>&lt;2.5–0.5</td>
</tr>
<tr>
<td>Chlorine</td>
<td>%</td>
<td>0.04</td>
<td>0.01</td>
<td>0.14</td>
<td>0.03</td>
<td>0.07–0.4</td>
<td>&lt;0.5–0.2</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>%</td>
<td>1.4</td>
<td>0.4</td>
<td>1.0</td>
<td>0.1</td>
<td>3.1</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Arsenic</td>
<td>ppm</td>
<td>0.6</td>
<td>0.4</td>
<td>2.8</td>
<td>0.5</td>
<td>&lt;0.3–14</td>
<td>–</td>
</tr>
<tr>
<td>Cadmium</td>
<td>ppm</td>
<td>&lt;2.0</td>
<td>0.0</td>
<td>&lt;1.8</td>
<td>0.4</td>
<td>4–10.1</td>
<td>–</td>
</tr>
<tr>
<td>Chromium</td>
<td>ppm</td>
<td>485</td>
<td>298</td>
<td>401</td>
<td>212</td>
<td>190–530</td>
<td>–</td>
</tr>
<tr>
<td>Copper</td>
<td>ppm</td>
<td>114</td>
<td>12</td>
<td>216</td>
<td>47</td>
<td>5.3–400</td>
<td>&lt;3,000–1,000</td>
</tr>
<tr>
<td>Mercury</td>
<td>ppm</td>
<td>&lt;0.9</td>
<td>0.5</td>
<td>&lt;0.8</td>
<td>0.4</td>
<td>2.1–5.4</td>
<td>&lt;10</td>
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<tr>
<td>Nickel</td>
<td>ppm</td>
<td>24</td>
<td>4</td>
<td>30</td>
<td>1</td>
<td>40–45</td>
<td>–</td>
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<tr>
<td>Lead</td>
<td>ppm</td>
<td>28</td>
<td>8</td>
<td>59</td>
<td>14</td>
<td>220–365</td>
<td>–</td>
</tr>
<tr>
<td>Zinc</td>
<td>ppm</td>
<td>646</td>
<td>56</td>
<td>918</td>
<td>257</td>
<td>1,132–4,900</td>
<td>–</td>
</tr>
</tbody>
</table>

Proximate analysis values comparable to wastewater sludge - below industrial limits for emissions

Faecal sludge fuels have lower heavy metals than wastewater sludge – meet industrial limits

Gold et al., 2017
Pilot-scale testing

- Faecal sludge worked well in kilns
- Gasifier performance limited by ash fraction
- Negligible odor during combustion

Brick-firing kiln, Kampala
Dried sludge

Gasifier, Kampala
Pellets

Waste oil regeneration kiln, Dakar
Pellets and briquettes
Barriers to progress

- High ash fraction
- Inefficient dewatering
- Insufficient quantity of sludge fuels produced to meet industry requirements

Clinker deposit from gasifier
Improving faecal sludge fuels

- Co-processing with biomass
  - Ash reduction and increased fuel volume
- Improved dewatering is major research focus
  - Bioburn pelletizer, geotextiles, locally-available conditioners
- Pyrolysis not recommended for industrial fuels
Check out Sandec’s new MOOC for more information about faecal sludge fuels and innovative options of resource recovery!
Mariska Ronteltap has worked as a Senior Lecturer in Sanitary Engineering at IHE Delft Institute for Water Education for the last 10 years. Her research focuses mainly around non-sewered sanitation: faecal sludge management, source separation of waste streams and resource recovery in sanitation. She is one of the authors of the IWA Publication called Faecal Sludge Management - an integrated systems approach. She teaches these topics at IHE Delft as well as in short courses and other trainings. Next to that she supervises research, develops teaching material, and is developing a new Master Program in Nonsewered Sanitation.
Pathogens in human excreta management

What to look for, and how?

Claire Furlong, PhD
Mariska Ronteltap, PhD
*Environmental Engineering and Water Technology Department*
IHE Delft Institute for Water Education
Why focus on pathogens?
Ascariasis: most common soil transmitted worm infection

- 1 in 7 infected
- > 60,000 deaths annually
- Associated with poor WASH and using faeces as a fertilizer (CDC 2017; GNNTD2017)

Proportion of children aged between 1 and 14 who are infected with soil transmitted helminths (WHO, 2017)
- acute enteric infection
- caused by ingesting *Vibrio cholerae*
- Primarily linked to insufficient access to safe water and proper sanitation
- 1.3 - 4.0 million cases
- 21 000 to 143 000 deaths worldwide
Extra risk: exponential growth #refugees

65.3 million forcibly displaced people worldwide

Refugees 21.3 million
16.1 million under UNHCR mandate
5.2 million Palestinian refugees registered by UNRWA

Stateless people 10 million

Refugees resettled 107,100 in 2015

Where the world’s displaced people are being hosted

- 29% Africa
- 39% Middle East and North Africa
- 14% Asia and Pacific
- 12% Americas
- 6% Europe

http://www.unhcr.org/figures-at-a-glance.html
UNHCR, 20 June 2016
MDGs: more toilets means more FS

The world has missed the MDG target for sanitation by almost 700 million people

- 68 per cent of the global population now uses an improved sanitation facility
- 2.1 billion people have gained access to an improved sanitation facility since 1990
- In 2015, 47 countries have less than 50% coverage of improved sanitation
- Half the rural population uses improved sanitation facilities compared with four out of five people in urban areas
- One in three (2.4 billion) people still lack improved sanitation facilities and one in eight people (946 million) practice open defecation
Typical representation: F-diagram

...pathogen transfer - even post-technology!

-> sanitisation crucial

Interventions:
Sanitation; clean water; barrier approach; hygiene
### Pathogen types found in sludge

<table>
<thead>
<tr>
<th>Pathogen group</th>
<th>Illness</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>Cholera</td>
<td>Watery diarrhea, severe dehydration</td>
</tr>
<tr>
<td></td>
<td><em>E. Coli</em> infection</td>
<td>Mild to severe diarrhea</td>
</tr>
<tr>
<td></td>
<td>Typhoid fever</td>
<td>Headache, fever, nausea, vomiting, paralysis</td>
</tr>
<tr>
<td>Viruses</td>
<td>Hepatitis A and E Rotavirus</td>
<td>Fever, nausea, stomach pain, jaundice, anemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nausea</td>
</tr>
<tr>
<td>Protozoa</td>
<td>Cryptosporidiosis</td>
<td>Watery diarrhea, stomach cramps and pain</td>
</tr>
<tr>
<td></td>
<td>Giardiasis</td>
<td>Diarrhea, abdominal cramps and pain</td>
</tr>
<tr>
<td>Helminth</td>
<td>Ascariasis</td>
<td>Abdominal pain, coughing, or no symptoms</td>
</tr>
<tr>
<td></td>
<td>Hookworm</td>
<td>Stomach pain, anemia, local itching, or no symptoms</td>
</tr>
<tr>
<td></td>
<td>Schistosomiasis</td>
<td>Stunting and anemia in children; flu-like symptoms, painful urination, liver and intestinal pains</td>
</tr>
</tbody>
</table>
Excretion of organisms: mainly in faeces, some in urine

- Excreted amounts pathogens per g faeces
  - Bacteria $10^{6-8}$
  - Viruses $10^{8-10}$
  - Parasites $10^{3-5}$
Typical disinfection mechanisms

- Chemical treatment or dehydration
- Ageing
- Competition
- Predation / defense system
- UV
- Temperature increase
- pH increase or decrease
Disinfection methods: biological + chemical

- Biological treatment
  - Storage
  - Composting
  - Anaerobic digestion

- Chemical treatment
  - Lime
  - Ash
  - Acid
  - Ammonia
  - Oxidation

Heat treatment:
- pasteurization 70°C, 1 hour (or similar)
  - 5log10 Salmonella
  - 5log10 Enterococcus
  - 3log10 Heat stable virus
  - 3log10 Ascaris (chemical heating through lime, acids)
Composting: very effective heat treatment

![Graph showing temperature (°C) and pH changes over composting time. The graph indicates three phases: Mesophilic, Thermophilic, and Curing.](image)
Lactic acid fermentation

- Obtained by storing organic waste together with lactic acid bacteria
- No biogas; lactic acid instead; product = fertile soil
- Process also inactivates pathogens (though further processing needed)
Lactic acid fermentation

Table 3.4 - Density of pathogen indicator organisms in faeces: biowaste mix before treatment, after lactic acid fermentation and combined lactic acid fermentation/thermophilic composting or vermi-composting (average values of the samples analysed during 2013-2014).

<table>
<thead>
<tr>
<th>Pathogen indicators</th>
<th>Bacterial density log_{10} CFUg^{-1}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw material</td>
</tr>
<tr>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>coliforms</td>
<td>7.09±0.5</td>
</tr>
<tr>
<td>E. coli</td>
<td>6.7±1.2</td>
</tr>
<tr>
<td>E. faecalis</td>
<td>7.2±0.4</td>
</tr>
<tr>
<td>C. perfringens</td>
<td>5.0±0.0</td>
</tr>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>coliforms</td>
<td>5.3±0.5</td>
</tr>
<tr>
<td>E. coli</td>
<td>4.6±0.0</td>
</tr>
<tr>
<td>E. faecalis</td>
<td>6.7±0.0</td>
</tr>
<tr>
<td>C. perfringens</td>
<td>1.0±0.0</td>
</tr>
</tbody>
</table>

1LAF - lactic acid fermentation; 2LAF+TC - combined lactic acid fermentation and thermophilic composting; 3LAF+ VC - combined lactic acid fermentation and vermi-composting.
Non-dissociated VFAs during anaerobic digestion
Most excreta technologies: products, not effluent..

- Standard methods....
- Pathogen analysis not really included
- How to define limits for different products? [ISO]
- Safety strongly depending on final use
- Qualified labs..
Current developments

- Standard methods for FS
- Standards for the products
- Adaption of methods for products
- Development in testing kits
- Development of regional FS labs
- Qualified FS labs:
  - UKZN; CSE; AIT; Eawag & partners; IHE Delft & Blue innovations
Thank you for your attention..!
Schistosomiasis

1. Infective Stage
2. Eggs hatch releasing miracidia
3. Miracidia penetrate snail tissue
4. Sporocysts in snail (successive generations)
5. Cercariae released by snail into water and free-swimming
6. Penetrate skin
7. Cercariae lose tails during penetration and become schistosomulae
8. Circulation
9. Migrate to portal blood in liver and mature into adults
10. Paired adult worms migrate to:
    - mesenteric venules of bowel/rectum (laying eggs that circulate to the liver and shed in stools)
    - venous plexus of bladder

A = S. mansoni
B = S. japonicum
C = S. haematobium

IHE DELFT
Pradeep Mohanty is a social entrepreneur associated with semi-urban, rural & tribal community development of India, particularly the state of Odisha, since the year 1994. Pradeep worked with the local community for social development and economic empowerment through an integrated approach. His experience spans across compost, plantation, sanitation, hygiene, water, micro finance and micro insurance.

**Pradeep Mohanty**
CEO, FSMC
Finish Services Management Company (FSMC) promoted Co-Compost Unit
Brief Introduction

- FSMC is a for profit company registered in India.
- Registered in the year 2014 at Ahmedabad, Gujarat.
- Operates in 2 states of India, Odisha, Maharashtra.
- Operates as a supply chain service provider in the WASH & allied sector.
Community Awareness
Co-Compost Input
Co-Compost Process
Co-Compost Application
## Financials

<table>
<thead>
<tr>
<th>Item of Expenses</th>
<th>Cost Per Unit (Euro) (3 Beds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Capital</td>
<td>9300</td>
</tr>
<tr>
<td>Working Capital</td>
<td>6616</td>
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<tr>
<td>Total Unit Cost</td>
<td>15916</td>
</tr>
</tbody>
</table>
# Financials

<table>
<thead>
<tr>
<th>Cost Benefit Analysis (Euro)</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
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<tbody>
<tr>
<td>Revenue</td>
<td>9771</td>
<td>9771</td>
<td>9771</td>
</tr>
<tr>
<td>Cost</td>
<td>15916</td>
<td>6616</td>
<td>6616</td>
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<tr>
<td>Profit / Loss</td>
<td>-6145</td>
<td>3155</td>
<td>3155</td>
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<tr>
<td>Challenges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Stigma - Labour / Usage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand Generation - Competition with subsidised product</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Acceptance - Reuse of Fecal Sludge in Agri</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thank You..
In 2007 Aart started working for Ecoventures, an incubator for business start-ups in the renewable energy sector. Aart was responsible for developing a business in small-scale household biogas systems for the Asian and African market. In 2009 the holding company (Econcern) had to terminate Ecoventures because of the world wide economic crisis. Aart decided to pitch the biogas concept to investors to further develop the concept. He got in contact with a Dutch NGO called Aqua for All. They had developed a business plan for what is now called Safi Sana, but they lacked an entrepreneur to set up the business. Aqua for All had already formed a consortium with Shell, Rabobank and DHV (now known as Royal HaskoningDHV) to further develop the concept. Aart was recruited to grow the Safi Sana concept into a success with an initial start capital by all consortium partners. In 2010 Aart founded the Safi Sana Holding BV and Safi Sana Ghana Ltd. The initial focus was on testing the concept on technology and market potential for waste sourcing and sale of bio-fertiliser and energy. Ghana was selected as pilot country. Since then the Safi Sana model has been tested and in September 2016 the first commercial factory was opened with a treatment capacity of 25 tonnes of waste daily. The team in The Netherlands has 3 fulltime staff and the team in Ghana has 20 people staff. Currently the project is rolled out with support of the African Development, the Dutch government and a small group of investors.
New challenges

URBANISATION

SANITATION | WASTE | FOOD | ENERGY

Negative impact:
economic, environmental, social

new sanitation | organic farming | renewable energy
A business approach
Market segmentation

A. CAPEX & OPEX subsidized / public funded

B. CAPEX public or CSR funded; OPEX covered with operational revenues.

C. Full Commercial

FINANCIALLY SUSTAINABLE & HIGH IMPACT

Safi Sana plant Ashaiman

resource quality / quantity

Public / CSR driven

Commercial

new sanitation | organic farming | renewable energy
Operations
Power to grid
Compost and seedlings
Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Concentration (g kg⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>17 – 22</td>
</tr>
<tr>
<td>P2O5</td>
<td>10 – 24</td>
</tr>
<tr>
<td>K2O</td>
<td>10 – 24</td>
</tr>
<tr>
<td>Ca</td>
<td>1.6 – 3.0</td>
</tr>
<tr>
<td>Mg</td>
<td>10 – 1.4</td>
</tr>
<tr>
<td>Fe</td>
<td>5000 (mg kg⁻¹)</td>
</tr>
<tr>
<td>Zn</td>
<td>140 (mg kg⁻¹)</td>
</tr>
<tr>
<td>Pb</td>
<td>200 (mg kg⁻¹)</td>
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<tr>
<td>Ni</td>
<td>180 (mg kg⁻¹)</td>
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<tr>
<td>Cr</td>
<td>10 (mg kg⁻¹)</td>
</tr>
<tr>
<td>Cd</td>
<td>51 (mg kg⁻¹)</td>
</tr>
<tr>
<td>EC</td>
<td>1.5 – 2.0 (mg kg⁻¹)</td>
</tr>
<tr>
<td>pH</td>
<td>8</td>
</tr>
</tbody>
</table>

Love your land

Asase Gyefo® Organic Fertilizer

- optimized for use in all types of crop production
- increases yields by more than 20%
- improves soil structure and porosity
- enhances soil fertility
- offers high quality – every time

Where and how to buy?


CONTACT Sonia Folikumah
sales@asasegyefo.com.gh
Tel. 030 297 2380

VISITOR ADDRESS
Location: 200 meters away from Tema-Motorway underbridge, Adjei-Kojo Ashaiman
GPS coordinates: 5.68345, -0.04932
Love your land

Asase Gyefo® Seedlings
- are high quality seedlings
- producing high yields
- increasing revenue
- improving the livelihood of farmers

How to order:

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PS. Also try Asase Gyefo® Organic Fertilizer

www.asasegyefo.com.gh
Capacity building

new sanitation | organic farming | renewable energy
Process and impact monitoring
1. Project development (government, corp.)
2. Services
3. Gains ownership
Roadmap

1. Expand to new locations internationally
2. Develop project finance strategies
3. Knowledge building
Safi Sana and partners

new sanitation | organic farming | renewable energy
Contact details

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Managing Director
Safi Sana Holding BV

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E: aart@safisana.org

Office NL:
Stationsplein 30
Weesp, The Netherlands

www.safisana.org
Andreas Schmidt is a Senior Technical Expert holding a Postgraduate Diploma in Water Resources Management, a Master degree in Environmental Process Engineering and a Bachelor degree in Mechanical Engineering with 15 years of professional experience in IFI-financed international projects in the field of sanitation with project cycle experience comprising of identification, feasibility studies and design, appraisals, implementation planning and management, operation and maintenance and sustainability, monitoring and evaluation.
Beyond development aid:
Sanitation financing & revenue models in reuse (human) waste

Pre-Fabricated DEWATS

Andreas Schmidt
May 15th, The Hague
**Demand**

### On-site dry sanitation
- **Coverage:** 40%
- **WW generation:** 20%

### On-site wet sanitation
- **Coverage:** 30%
- **WW generation:** 40%

### Sewer-born sanitation
- **Coverage:** 30%
- **WW generation:** 40%

---

**Case study Dar es Salaam 2022**

Data estimated by BORDA

Decentralized wastewater treatment capacities needed for ca. 220,000 m³ per day or 22,000 plants to be installed

<table>
<thead>
<tr>
<th>Year</th>
<th>Population in million</th>
<th>Total water demand (m³/d)</th>
<th>Total sludge generation (m³/y)</th>
<th>Total waste generation (t/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>1.62</td>
<td>290,000</td>
<td>105,000</td>
<td>1700</td>
</tr>
<tr>
<td>2002</td>
<td>2.45</td>
<td>345,000</td>
<td>144,000</td>
<td>2250</td>
</tr>
<tr>
<td>2012</td>
<td>4.36</td>
<td>496,000</td>
<td>200,000</td>
<td>3899</td>
</tr>
<tr>
<td>2022</td>
<td>7.00</td>
<td>703,000</td>
<td>268,000</td>
<td>7631</td>
</tr>
</tbody>
</table>
What is DEWATS?

A technical concept that provides safe & sustainable wastewater treatment solutions according to the local socio-economic condition.

What is pre-fab?

Industrial fabricated wastewater treatment plants as an instrument to scale up DEWATS dissemination and to develop the wastewater industry in developing countries.
Pre-fab features

Application

Residential households and institutions
5 – 10 m³ WW per day per unit, up to 50 m³ WW per day in parallel modules

Advantage towards conventionally built systems

Construction cost: + 20% more
Project management cost: - 80% less
Implementation time: - 80% less
Market barriers for the private sector in developing countries

- Un-regulated or wrongly regulated environmental sector (technical & environmental standards only paper or don’t relate to socio-economic situation, weak law enforcement)
- Technologies or raw-materials need often to be imported and import taxes increases the product costs
- Ineffective technical standards leads to lowest quality = lowest cost = wins the tender
- Too little technical and financial support by the government for the environmental industry
- High product promotion and marketing cost in order to develop awareness and the market
Break-out session: remaining challenges

Besides the market entry challenges, new technologies face additional barriers when entering developing markets (esp. in immature sectors such as sanitation)

Lead questions:

• How can we facilitate technology transfer?
• How can we empower investors and entrepreneurs in the target markets?
Mary Roach is the Head of Global Partnerships at Loowatt, a waterless toilet company based in the UK. Mary joins Loowatt from Ceniarth, a single-family office, where she was responsible for their energy access portfolio. Prior to joining Ceniarth in 2015, Mary was responsible for the GSMA’s M4D Utilities Innovation Fund supporting organizations leveraging mobile technology to improve access to energy, water and sanitation. Mary’s interest in the role that infrastructure can play in development emerged from her combined experiences working on the first pilot of M-KOPA’s pay-as-you-go product, 5-years working with GE Power Generation, and a decade of involvement with Engineers without Borders Canada at home and abroad. She holds an MBA from Oxford University and a Bachelors in Chemical Engineering from McGill University.
Loowatt
Sanitation Solutions for a Water Scarce World

Making money from waste?
Powerful Motivation

Mission

Loowatt develops safe, closed-loop sanitation solutions that provide high-quality access for all
Biopolymer film refill passes through patented sealing technology for a waterless, odourless, clean “flush.”

Waste and film are contained beneath toilet in a sealed cartridge which is emptied into an anaerobic digester, where waste and film are converted to energy.

“A toilet experience like no other. Very impressed indeed."
– UK customer, 2016

“Loowatt changed my life. I can even read magazines in the toilet!”
– Madagascar customer, 2016
21st Century Sanitation Value Chain

Every stage solution

Toilets, Refills and Containers

Capture

Waste pre-processing equipment

Storage

Mobile app & web platform

Transport

Expertise and Standard Operating Procedures Across Value Chain

Treatment

Reuse

Every stage solution
Global Underserved

Route to Market

Build Technology

Proof of concept: end-to-end toilet and waste to value system proves technology to end users, funders and municipalities

Generate Demand

Develop business model for household serviced toilets. Create SOPs that utility partners will customise to meet their needs.

Transition to Sales

Transition into sales of toilet hardware, toilet refills, waste to value technology. First such sale to Laguna Water (Philippines) in 2017.
Suite of product solutions to meet price points and needs of global users.

**Roso:** existing solution in operation in Madagascar.

**Laguna:** 2017 pilot in the Philippines adapted for easy installation and washers.

**Economy:** create ultra-affordable “Better than bucket” service.
Proof of Concept

Urban pilot system in Antananarivo, Madagascar:
• 100 household toilets installed, 600 toilet users a day
• 25 m³ anaerobic digester including CHP generator, pasteurisation system, and net energy yield of 40 kWh/day, and vermicompost
• 1.4 tons household toilet waste processed every week
• >95% Roso toilet customers purchase a refill every week for c. US$ 1.00
• 75% contract holders are women
Important points about Tana/Madagascar

- Some existing AD infrastructure in high-density areas limiting need to transport FS long-distances
- Flood-prone!!
- LDC country with HDI ranking of 158 of 188 countries
Making sanitation financially sustainable

**Questions we need to answer:**

- Who pays?
- Can we create a model that can recover the CAPEX and OPEX?
- How do we create a service model that is attractive to 3rd party servicers?
- How can we generate additional revenues?
- Do we need to create the systems/processes/vehicles to support the deployment of appropriate subsidies (if needed) and help 3rd party service providers gain access to funding?
Results from our vermi-compost trials

Insights:

- Vermicompost is of higher quality than traditional FS-derived compost
- Vermicomposting is quicker!
- While localized AD is useful for FS treatment, composting only becomes significantly profitable at scale
- Digestate sales can also be lucrative!
- Things to consider: how to control digestate quality, “transport” is a significant cost, seasonality of organic material supply
Prof. Dr. Grietje Zeeman, has more than 35 years of experience in R&D and application projects in the field of treatment of waste, wastewater and sanitation, with a specialization in anaerobic treatment. Since March 2012 she is appointed as Endowed Professor in ‘New Sanitation‘ at the department of Environmental Technology of Wageningen University and Research (WUR-ETE). Since October 2016, she is emeritus professor. She still works with LeAF, a spin-off company of Wageningen University, to bring New Sanitation to practice. Grietje initiated projects on Decentralised Sanitation, aimed at recovery of energy, organics, nutrients and water, from 1999 onwards. She was able to develop and demonstrate that Decentralised Sanitation is a feasible alternative for conventional sanitation concepts. As a result of the scientific, technological research the DeSaR (Decentralised Sanitation and Reuse) concept was developed and applied in a new housing estate of 32 houses, in Sneek, The Netherlands since 2006. The concept is now applied in full scale at 5 locations. She was and is (co)promotor of more than 25 PhD students and published more than 100 peer reviewed papers.
Pim van der Male is a Senior Policy Officer Water Management, at DGIS Foreign Affairs Ministry. Human Geographer by trade, Pim has been working with organisations like SNV, UNFPA and UNDP in a range of countries (e.g. Papua New Guinea, Sudan and Tanzania). He joined the Ministry of Foreign Affairs in 2005 and has been involved in the water sector for 7 years. Planning, Monitoring and Evaluation (PME) and results based management have been a common factor in his assignments; current focus is on programming for the new WASH strategy which includes financing for WASH.