

The MICROFLUSH/BIOFIL SYSTEM: RESULTS TO DATE OF PROTOTYPE INSTALLATIONS IN GHANA

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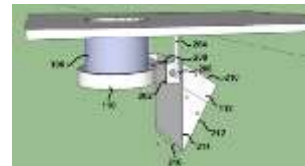
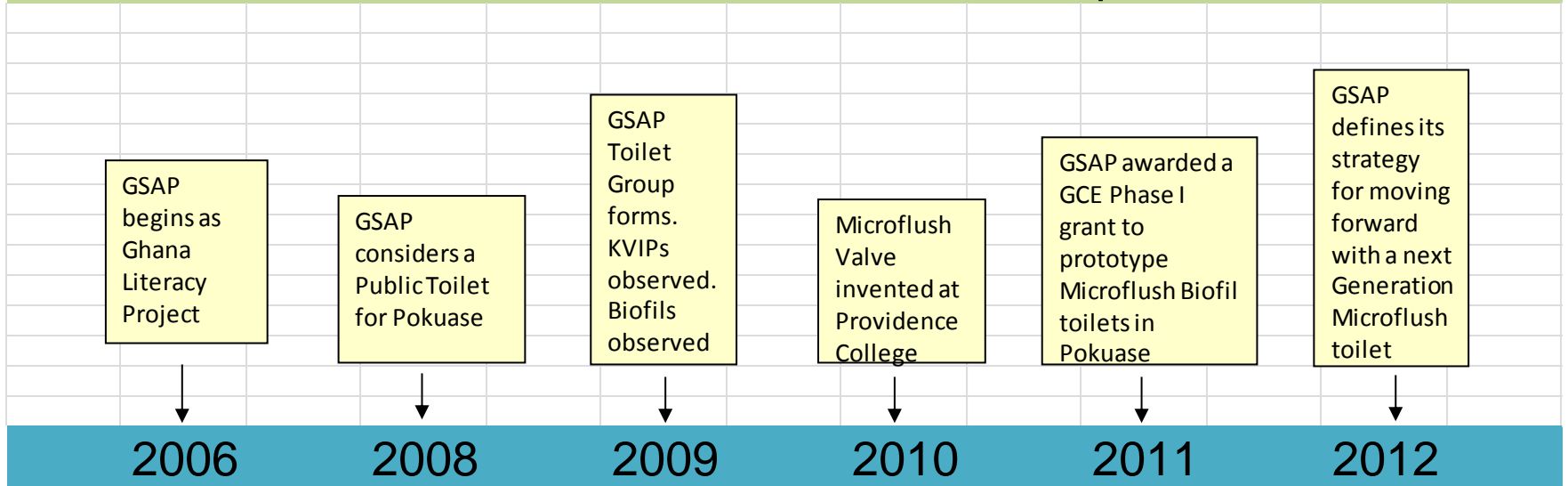
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Timeline of GSAP's Toilet Group



outline

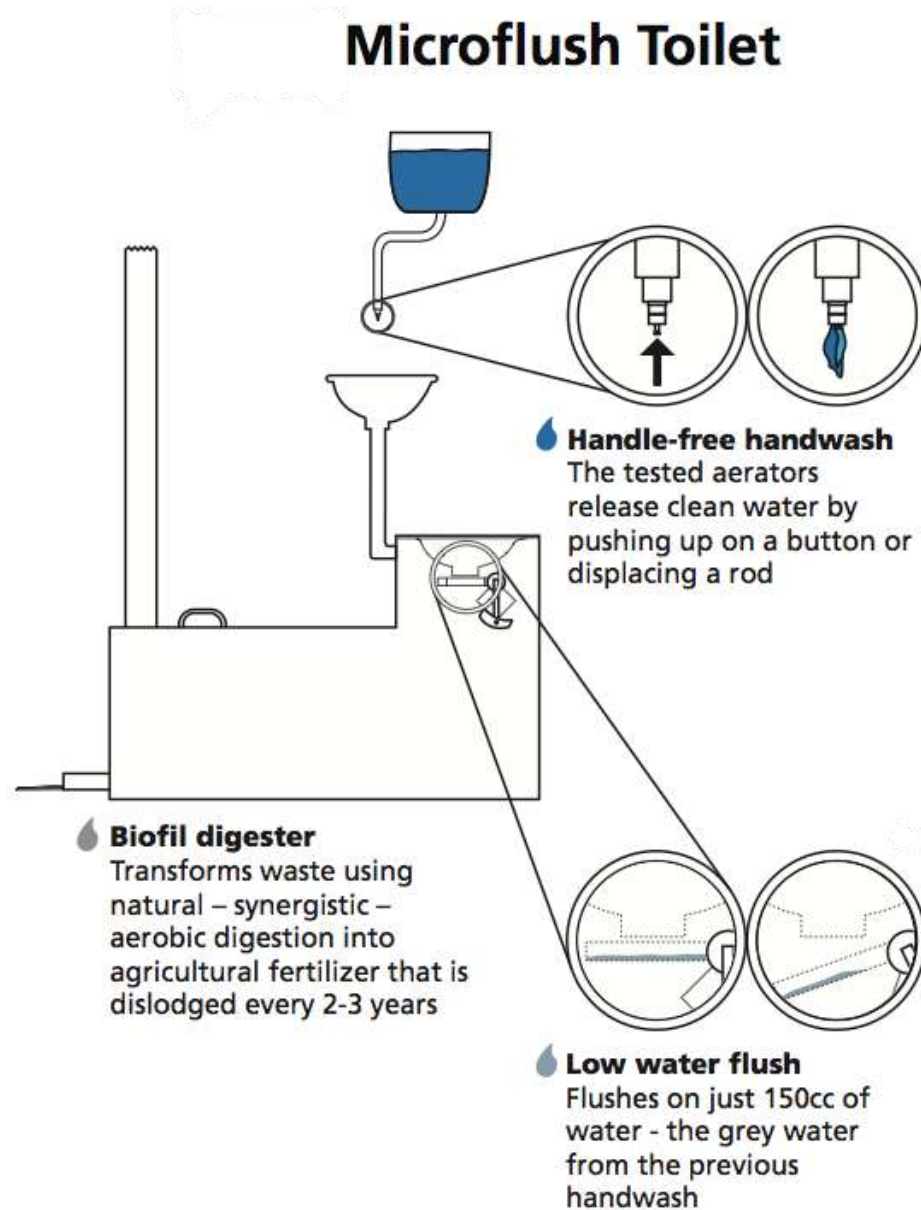
- The technology
- The prototypes
- Going forward



● Product

● Process

● Price



● Product

● Process

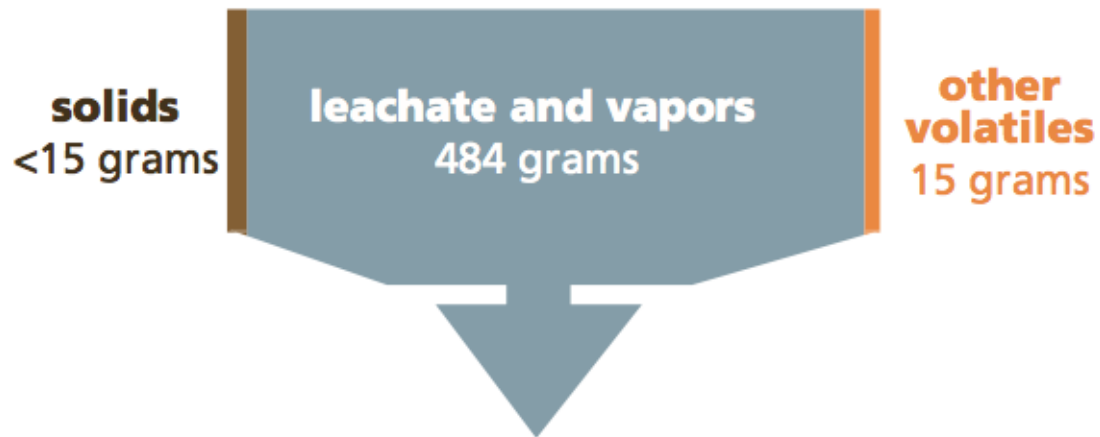
● Price

What goes in:



Filter-Dewatering + Aerobic Digestion
significant Macro organism role

What comes out:





Waste Management

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Vermicomposting toilets, an alternative to latrine style microbial composting toilets, prove far superior in mass reduction, pathogen destruction, compost quality, and operational cost

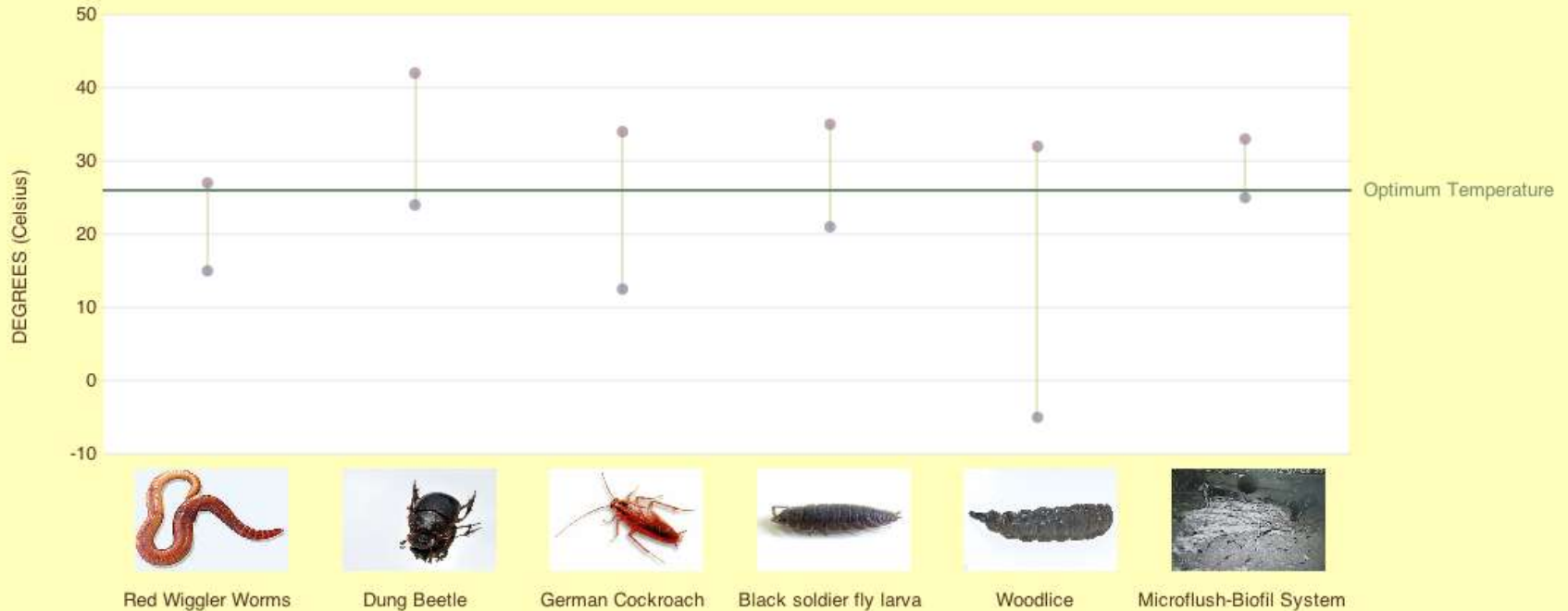
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TEMPERATURE PREFERENCES OF MACRO-ORGANISMS

Roll over lines to see exact values



Red Wiggler Worms



Dung Beetle



German Cockroach



Black soldier fly larva



Woodlice



Microflush-Biofil System



● Product

● Process

● **Price**

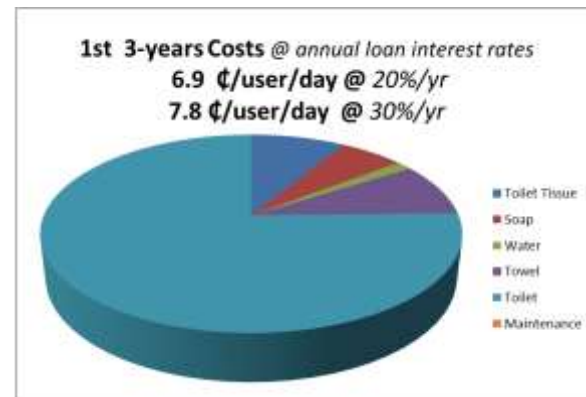
Prototypes cost 1200 USD per single stall toilet & facility
for ~ 30 uses/day

ownership costs

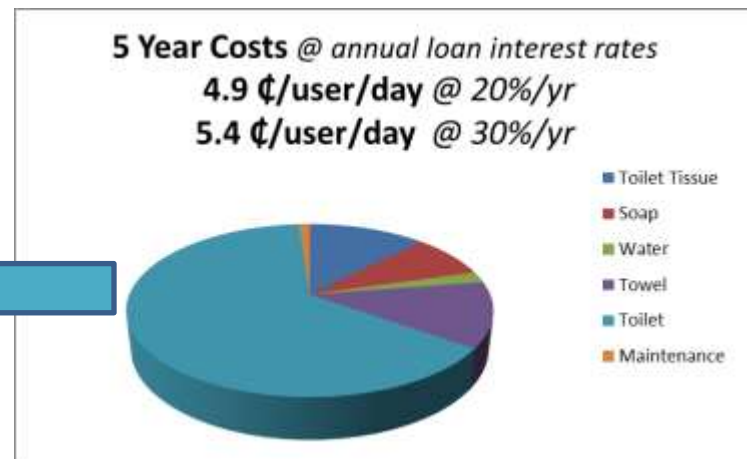
Based on 15 year life span



Based on first 3 years



Based on 5 years

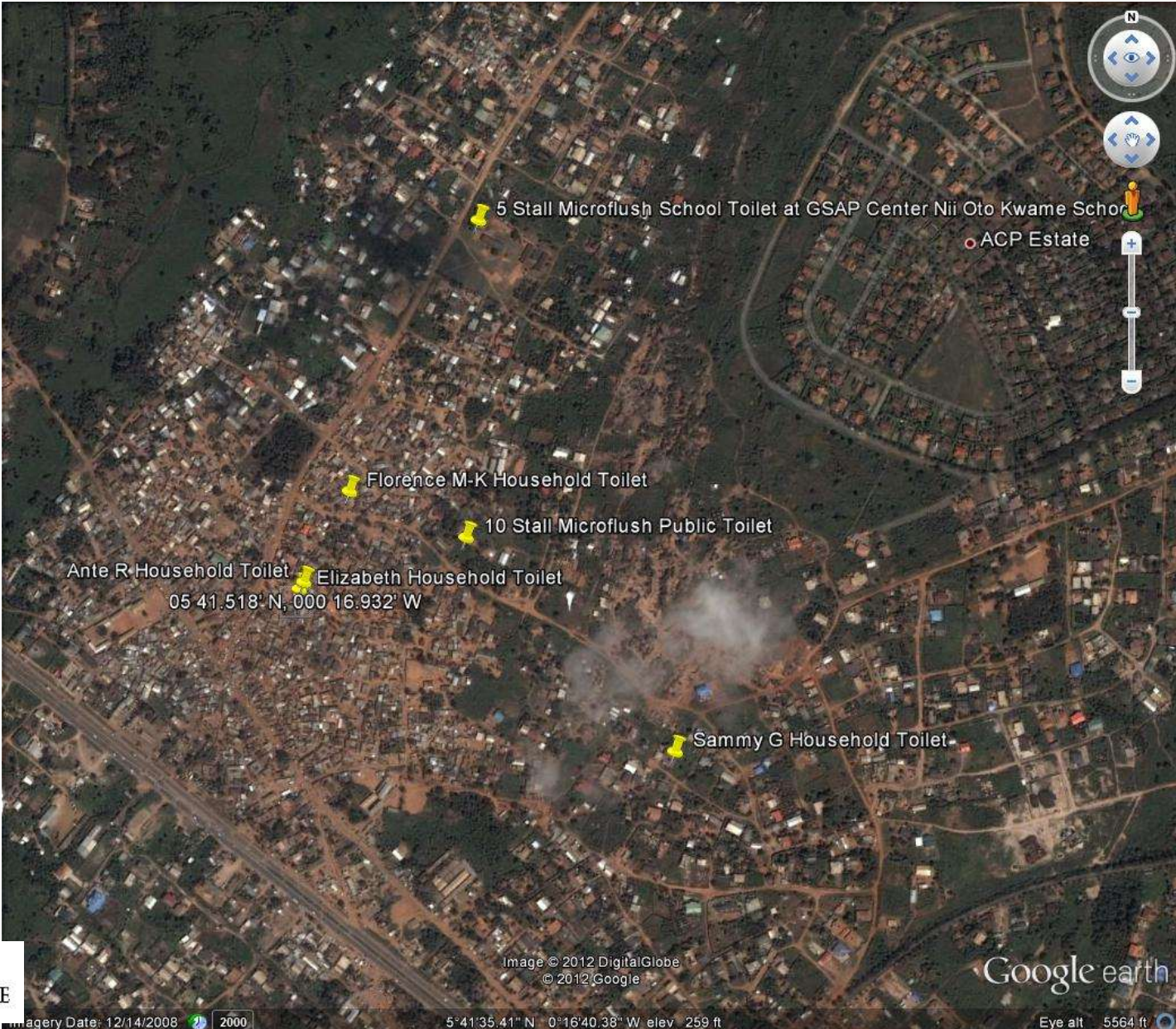


Toilet only

3.3 cents/user/day @ 20%/yr
3.8 cents/user/day @ 30%/yr



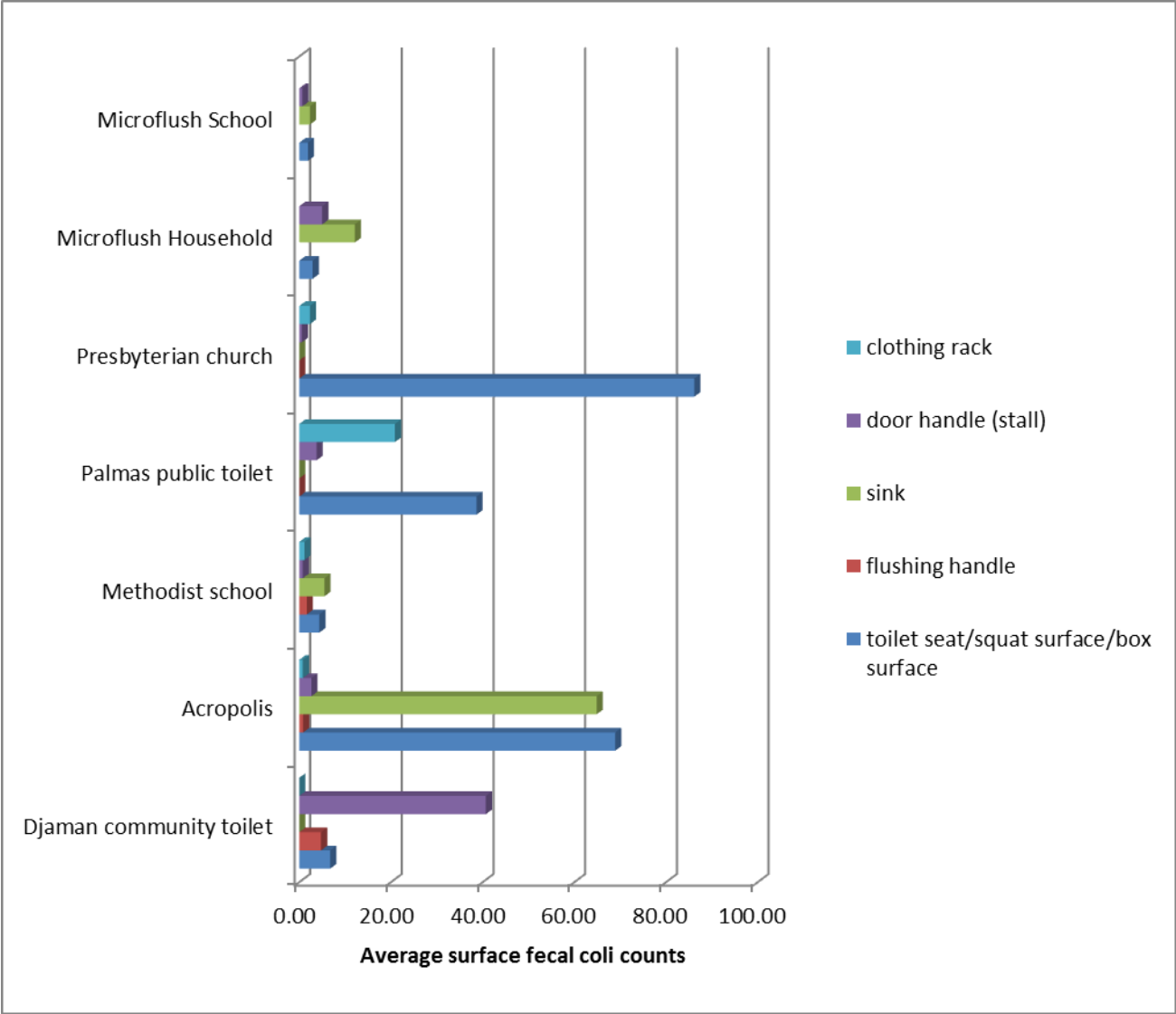
GCE Phase I Prototypes – Pokuase Village



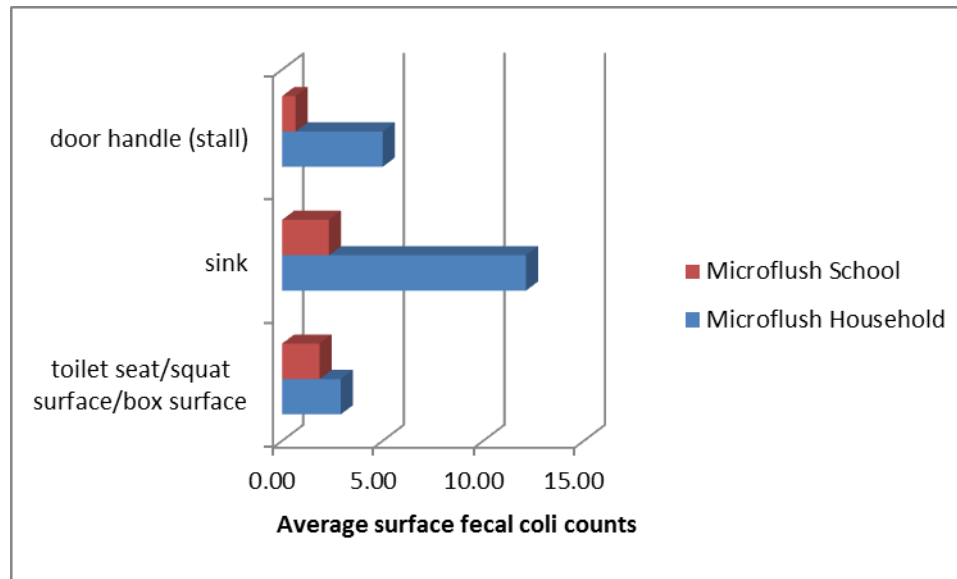
The single stall prototypes



Surface fecal coli counts



Microflush-Biofil Surface Fecal Coli Counts



household



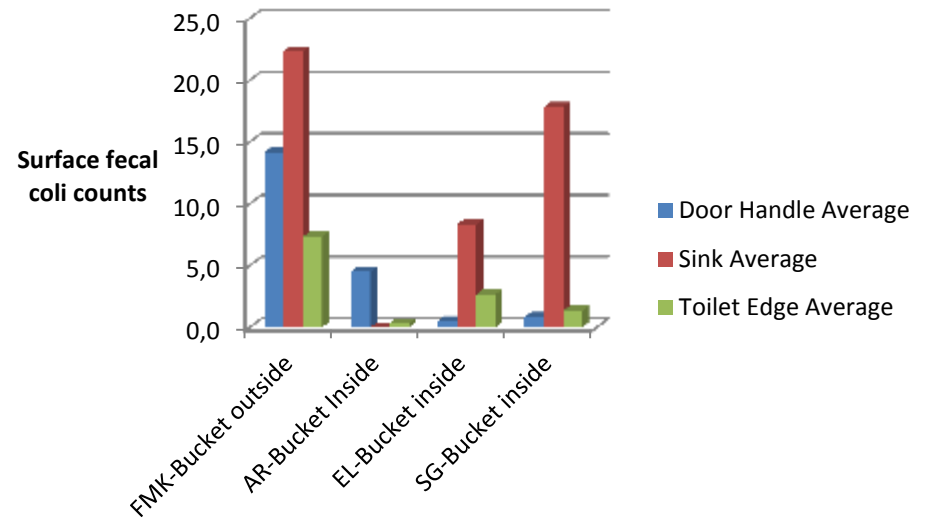
- Handwash done inside stall
 - Ordinary faucet used
- BUT
- Absence of a day tank forced use of a bucket

school



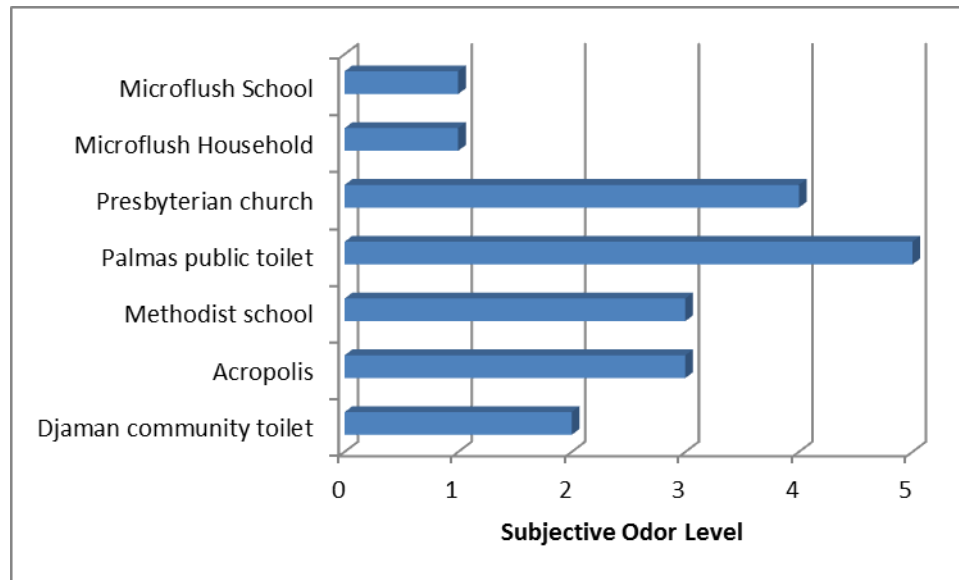
- Handwash done inside stall
- Faucetless aerator used

Where is the bucket with the wash water?



Bucket inside

Odor level



Only 4 single stalls – anecdotal evidence

“We like our toilet – our family – even the children.”

“We will never go back to using the KVIP (public toilet).”

“It is nice.”

“You know, one of the children who was always getting sick (stomach ache & diarrhea), has stopped getting sick.

We don't know why.” - mentioned 2 months after installation of the family toilet and during summer break from school-

Microflush-Biofil Toilet Procedures

	<p>Sit or Squat</p>	
	<p>Clean – leave Paper in Toilet but no plastics and Flush</p>	
	<p>Wet Hands Soap Rub Rinse Hands</p>	
	<p>Spray or Brush to remove any clinging waste from toilet</p>	
	<p>This is YOUR Toilet Follow procedures Avoid Odor Clean each day</p>	



Household prototypes – lessons learned

- Reluctance to install the Microflush-Biofil systems with the push-button or bar aerators and day tanks. Preferred bucket and scoop for handwash.
- Market for the toilets is strong.
- At \$1200 for a 30 use per day facility, the price is high.
- Prototypes owned by those who are poor by western standards but above the average in household income.
- GSAP convinced that an effective community-based deployment model will result in more rapid scaling of the technology
- The little things – aerator, day tank, plumbing – are as important as the technology

The school prototype toilets



Adapter for compressional fit

Gender changing

Time-adjustable low flow aerator



Early Challenges

- Similar installation ‘stubbornness’
 - Plumbing done poorly
 - Didn’t use same standard that was used in household facilities
 - Flexible corrugated drain tubing vs PVC– not meant for plumbing
 - Improper installation of drain fittings
 - Clumsy installation of aerators
- Water system
 - Restored an abandoned well
 - Plumber from Biofilcom installed supply pipe overhead of the ferro-concrete tank!
 - School and local community overdrew the well – pump ran 24-7 for 7 weeks!
- School and Children’s habits
 - Toilet tissue
 - Soap
 - Cleaning

The good news – for the most part, these have been overcome

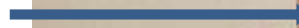
10 Stall Public Toilet



Day tank



Rainwater harvesting tank



- 5 women 5 men stalls
- Small solar system for lighting & water to tank



Note the gutters

Planning and design

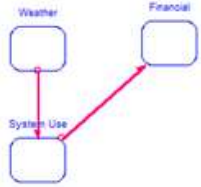
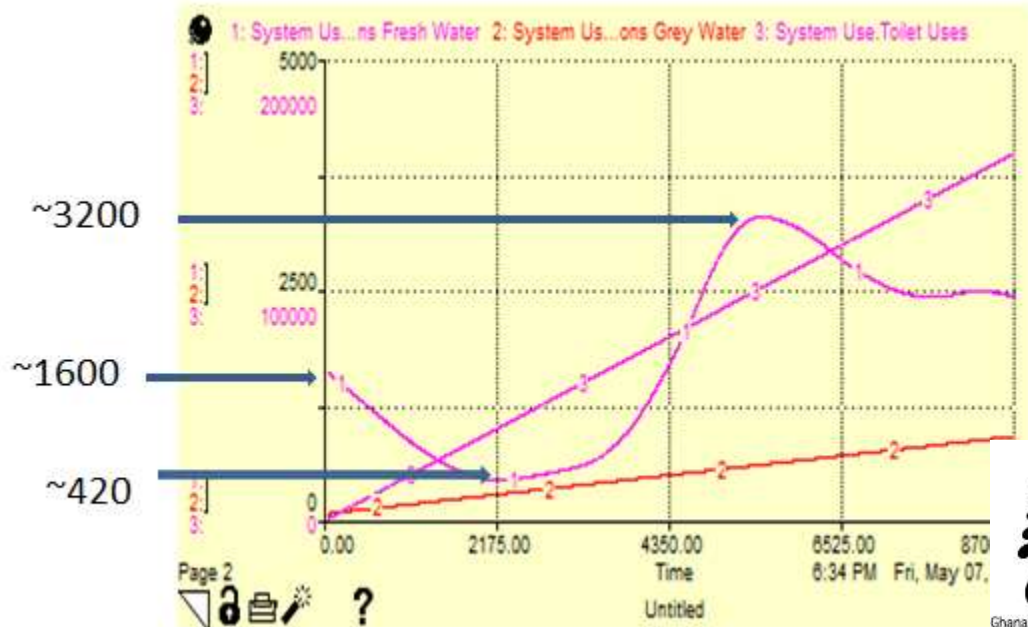
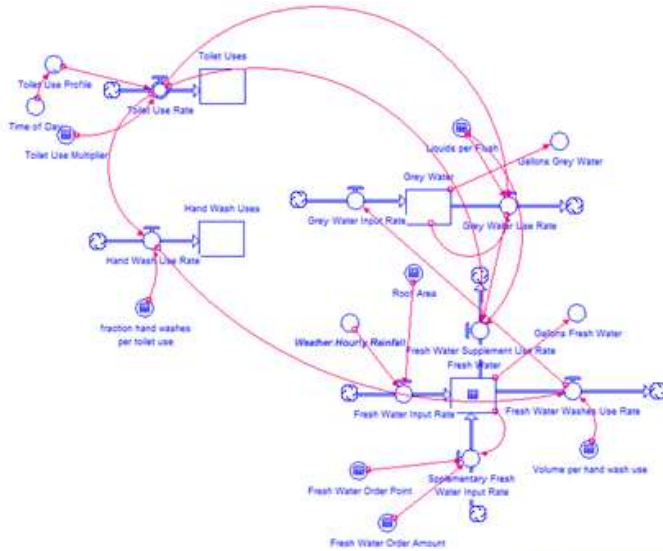


Figure 10a. System Model Segments



Public prototype challenges



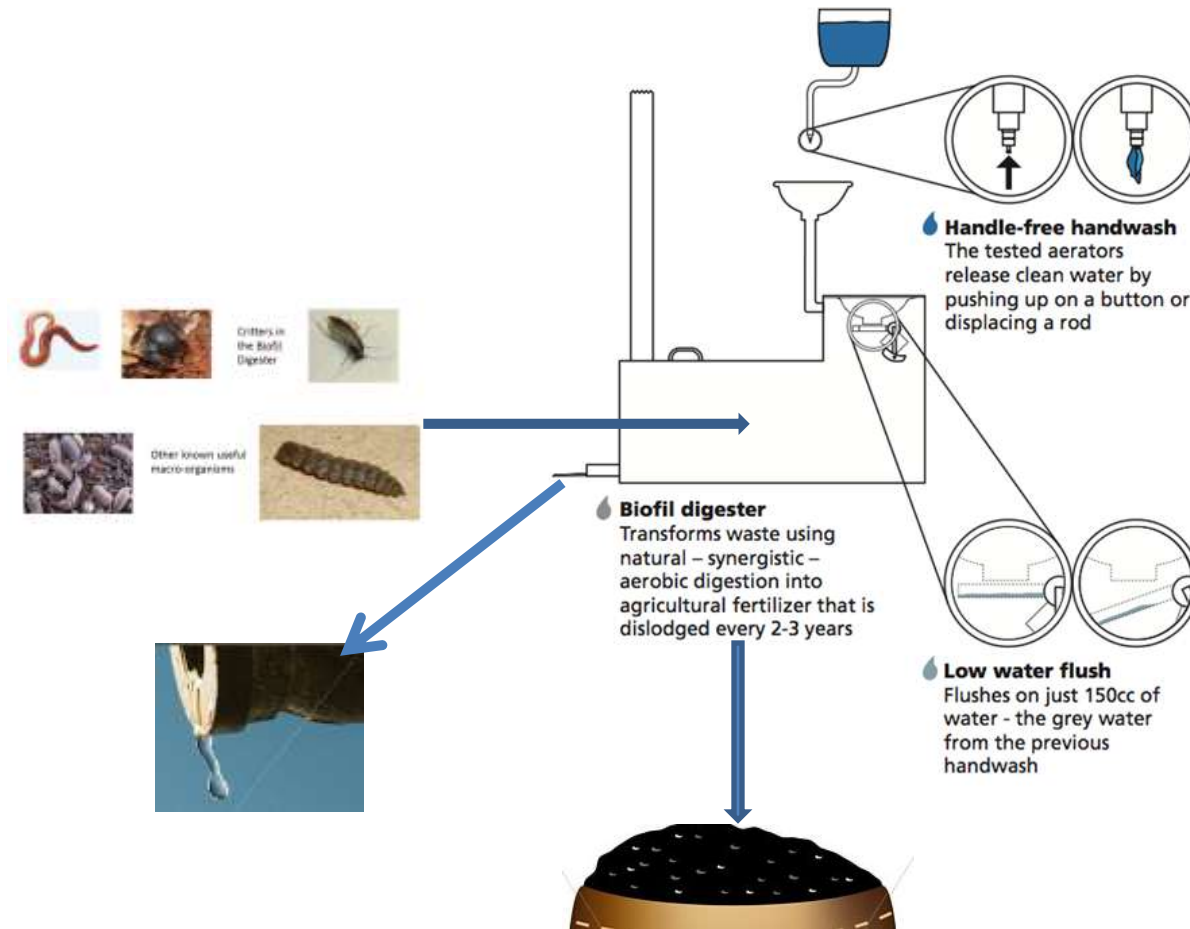
We paid for these gutters *TWICE* !!



and this as well !!



technology essentials



Physical factors - order of importance:



1. Toilet technology
2. Interior handwash
3. Accessories (day tank, faucetless aerator)

and last

4. Facility interior – walls,..







Toilet Access - Ownership

Functionality (technology/design/contextual fit)

Affordability (Cost, Access to funding)

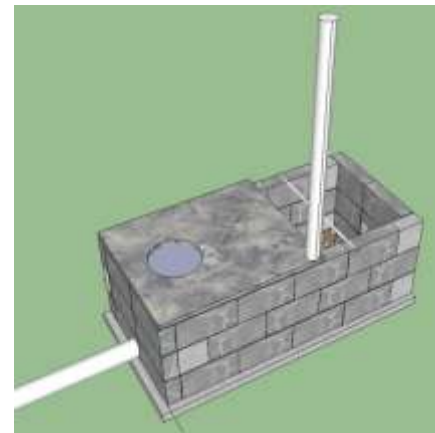
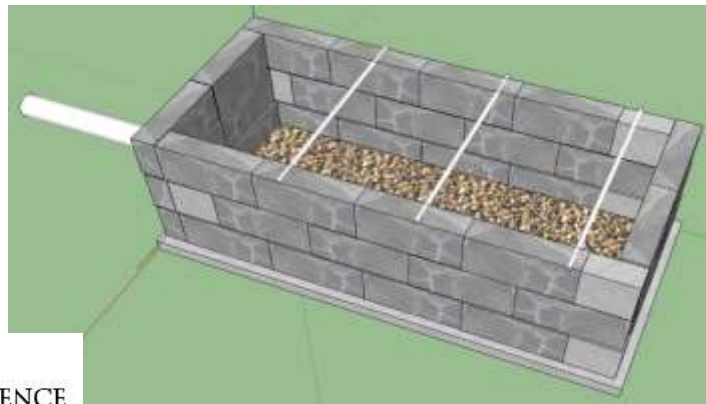
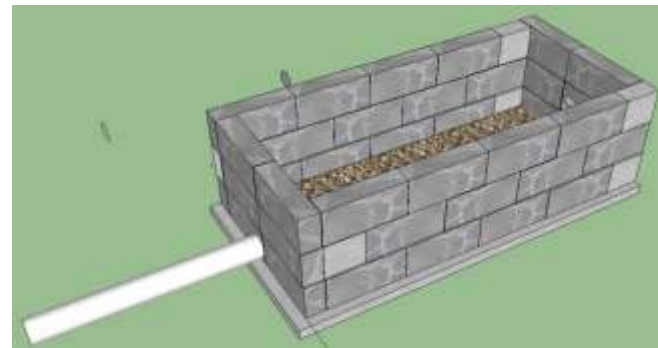
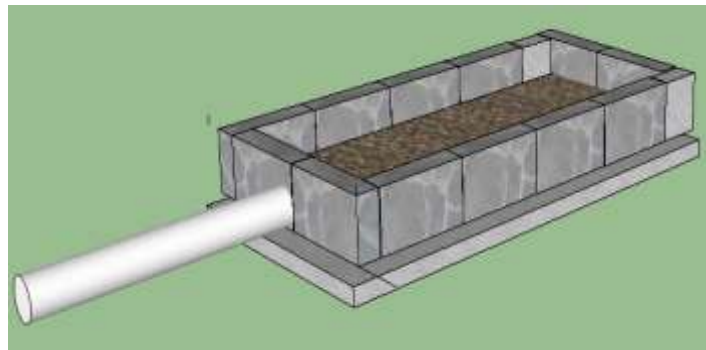
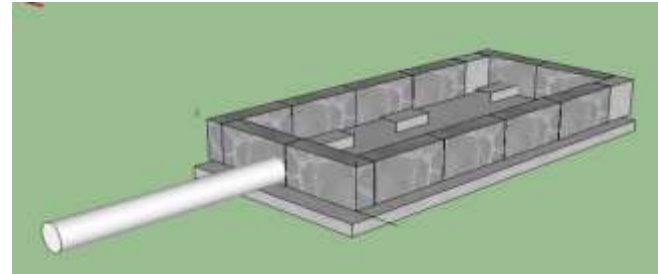
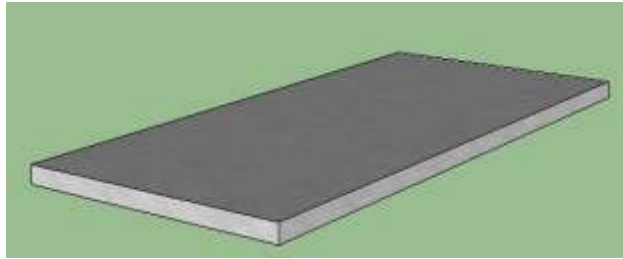
Install-ability(local practice, skills, materials)

Two Models for scale-up

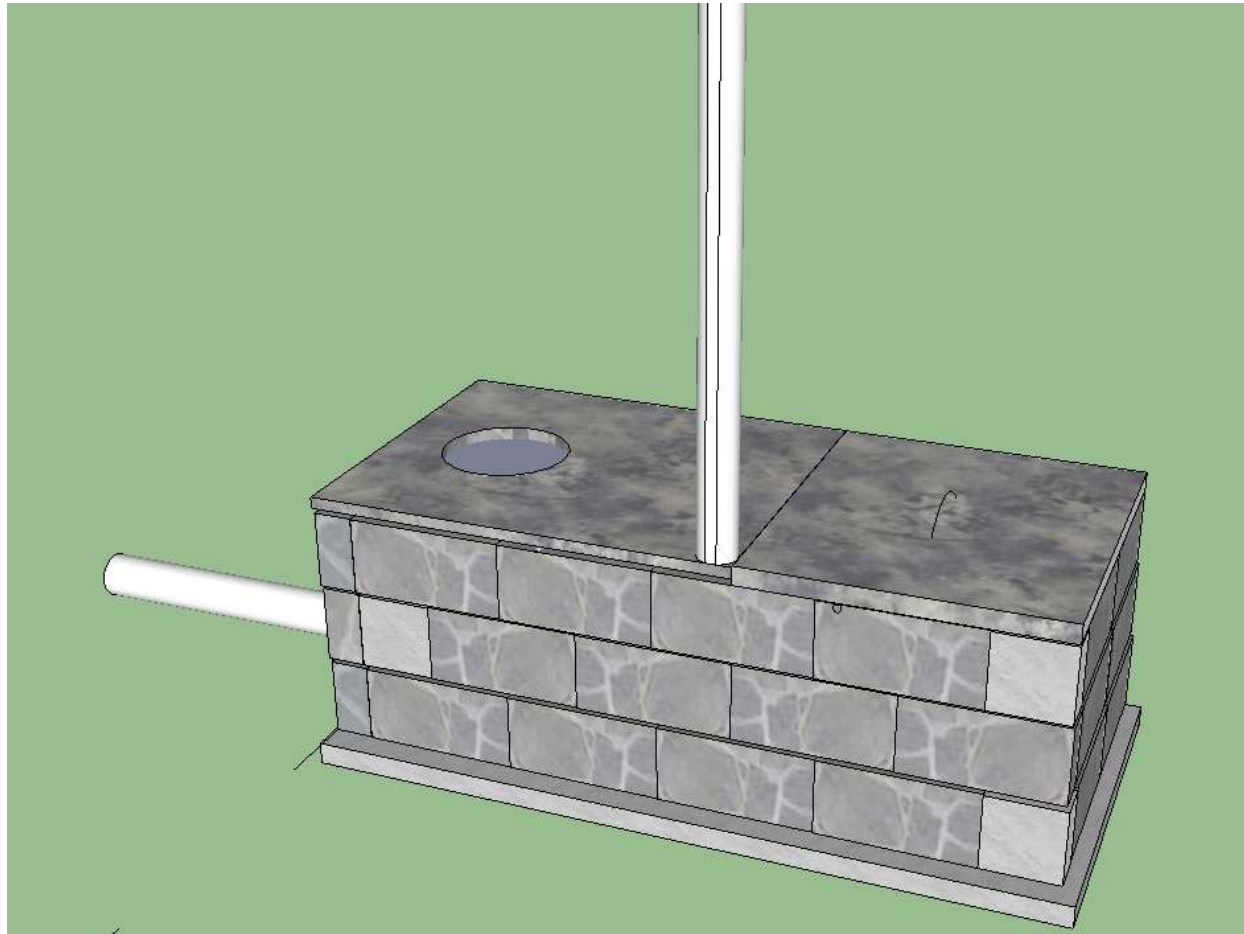
- Factory Production, Sales, Deployment, Maintenance (Biofilcom's model)
 - + High degree of quality control
 - + Future benefits of mass production
 - High start-up costs in capacity building and tooling
 - Higher end-user costs (transportation, service, middlemen)
- On-site-fabrication (OSF), using local craftsman-entrepreneur, local materials, service (GSAP's model)
 - + Contribute to the local economy
 - + Very low cost to the end-user
 - + Consistent with off-grid non-centralized philosophy
 - Challenge to implement the Microflush toilet technology with ALL local materials, skills



GSAP OSF Model



The Microflush-ready OSF Model



Going Forward

Providence College Research Team

- Research supporting the local OSF Model
- Impacts of material changes from the prototypes
- Digester housing, Filter
- Efficacy of blackwater purification options
- Installation density considerations
- Suitability of local macro-organisms common to tropical developing countries



GSAP Toilet Group

- Identifying local partners
- NGO's, Service organizations, Peace Corps volunteers
- Providing advanced training guides for the process (print, electronic, video)
- Supporting partner identification of suitable local craftsmen-entrepreneurs
- Market/Cultural barriers and opportunities

Acknowledgements

- Bill & Melinda Gates Foundation
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