

AD Projects abroad...

developing country cooperation

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Type of AD projects

- Joint scientific research
- Academic exchange
- PhD research on location
- Conferences / workshops
- Capacity building: curriculum development, staff development
- Consultancies
- Specialized courses
- Technology implementation
- Construction of installations
- Focus on waste(water) treatment? recovery of biogas? Resources?

Do we have the same agenda?
Expectation management!

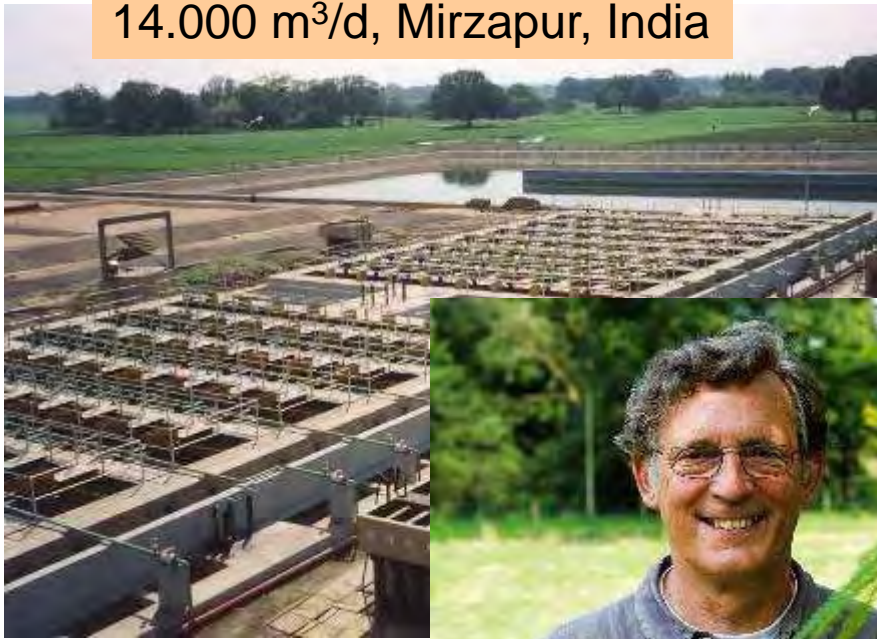
Example: Implementing UASB for municipal sewage..

'Best' results from Latin America (1990-2020): (COD < 500/600 mg/l)

COD Removal:	65 - 75%
BOD Removal:	70 - 80%
SS Removal:	65 - 75%
Pathogen Removal:	
- Coliforms:	70 - 90%
- Helminth eggs:	30-80%

Volumes: 100 - up to 50.000 m³

14.000 m³/d, Mirzapur, India



12.000 m³/d, Bucaramanga, Colombia



Survey (2010) full-scale UASB results in Brasil, India

STP	Effluent content			Removal efficiency		
	COD (mg·l ⁻¹)	BOD (mg·l ⁻¹)	TSS (mg·l ⁻¹)	COD (%)	BOD (%)	TSS (%)
India ¹	364	137	357	43	55	18
India (survey)	285	121	107	46	41	49
Brazil ²	251	98	85	65	74	71
Brazil (survey)	247	97	112	62	67	54
Middle East ³	221	83	63	71	70	85

Survey: Van Lier et al., 2010

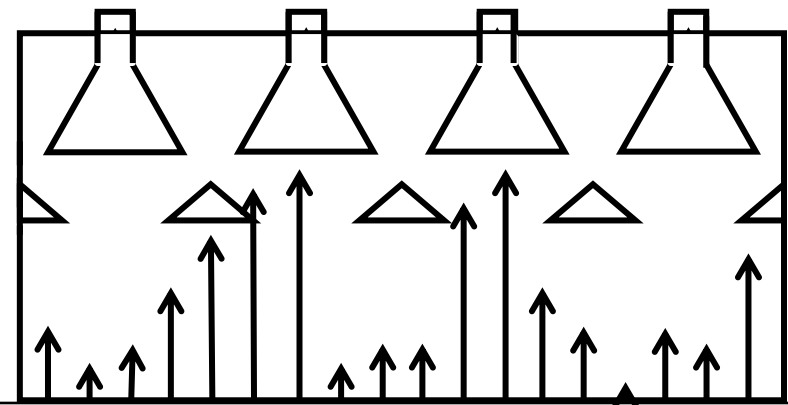
Critical comments on UASB technology:
 Dr. Vinot Tare, IIT Kanpur (2006)
 UASB technology: expectations and reality!

What's wrong??

- Doubtful tendering process (price over quality; starting consultants)
- Unknown wastewater specifications
- Technical shortcomings:
 - Pre-treatment (sand/grit removal) absent / inadequate
 - Inadequate distribution system
 - Erroneous hydraulic profile
 - Poor manufacturing
- Non-trained personnel
- Poor maintenance (blocked influent piping and distribution boxes)
- Office personnel versus plant personnel
- Over-**expectations...!**



Perfect short circuits in many Indian UASBs....



Full scale UASB, Sanhour, Egypt

Expectation management..

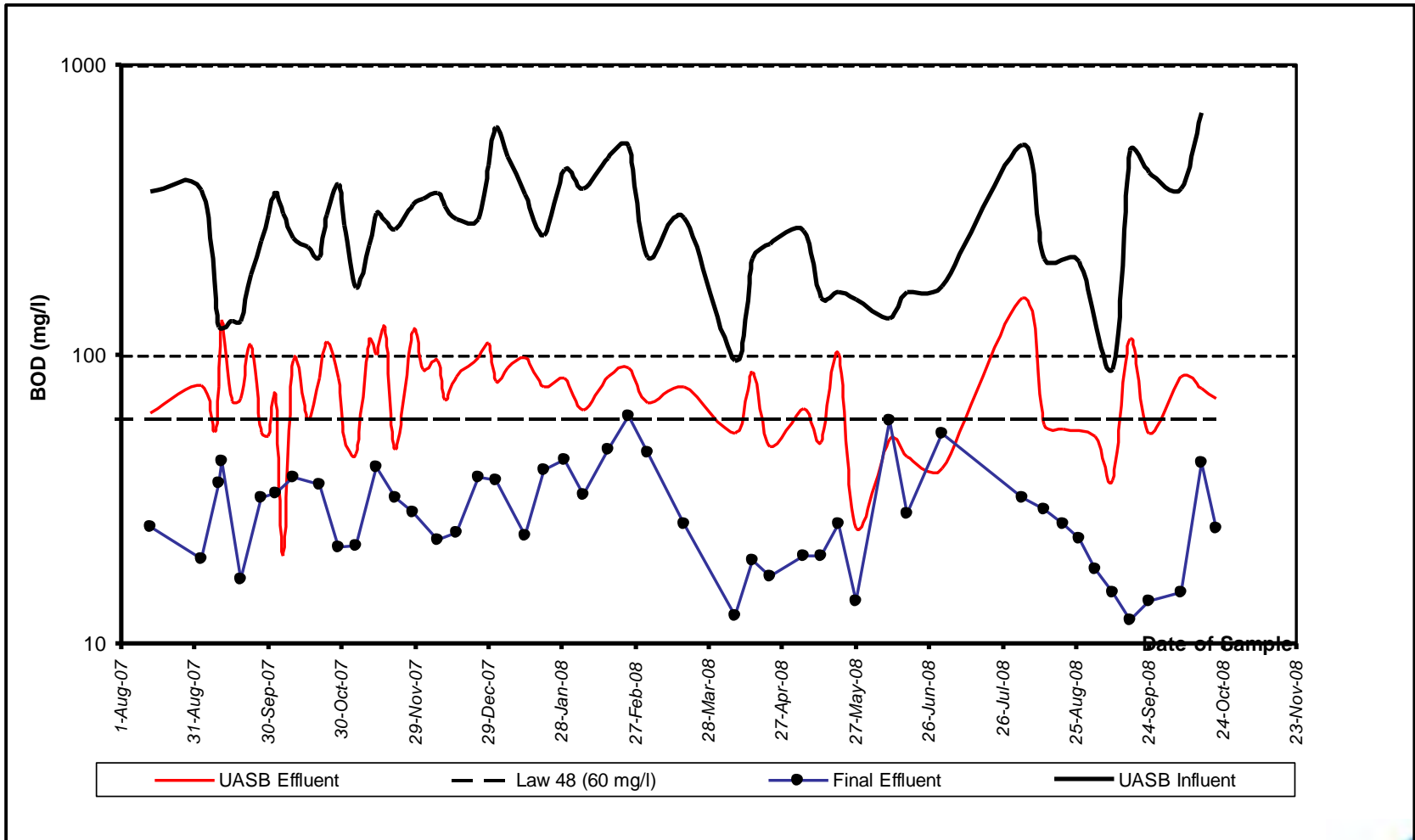
UASB + "Stone Trickling Filter"

Commissioned: 2007

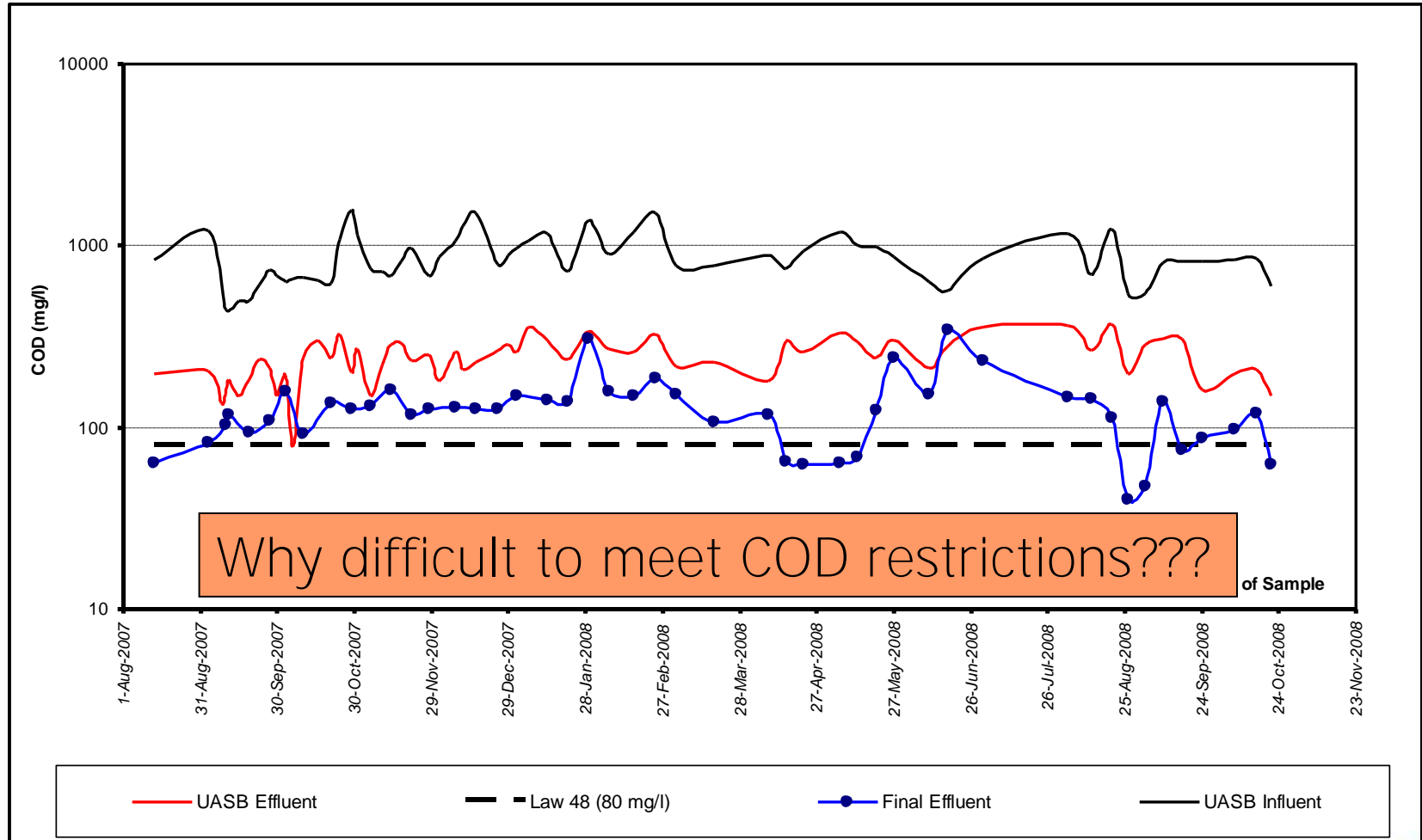


Compared to activated sludge:
Investments costs: 40% lower
O&M costs: 85-90% lower !

Sanhour WWTP BOD Removal; Law 48-effluent: 60 mg/L

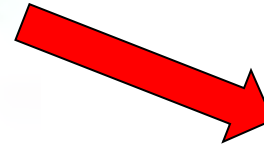


Sanhour WWTP COD Removal; Law 48-effluent: 80 mg/L



Rural Sanitation in the Nile Delta

“Proceeding with Law 48/1982”



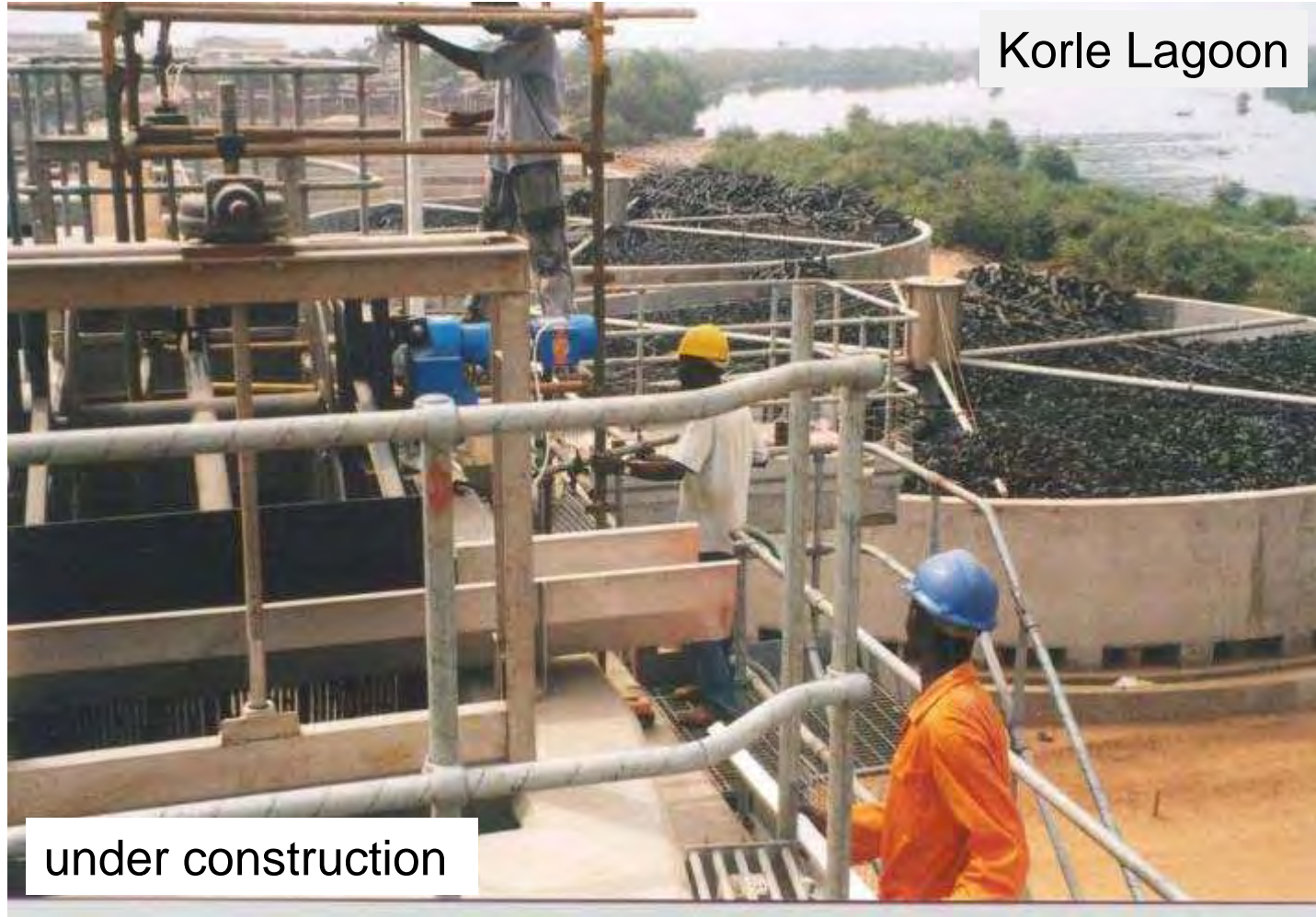
Parameter	Max. limit (mg/L)
Temperature	35°C
pH	6-9
Biochemical Oxygen Demand (BOD)	60
Chemical Oxygen Demand (COD) – Dichromate*	80
Chemical Oxygen Demand (COD) - Permanganate	40
Dissolved Oxygen	≥ 4
Oil & Grease	10
Dissolved solids	2000
Suspended solids	50
Coloured substances	Free of colour
Sulphide	1
Nitrate	5
Total Heavy Metals	1
All pesticides	nil
Total Coliforms	5000
*common method	

Current assignment concludes the RVO consultancy assignment “Rural Sanitation in the Nile Delta, Egypt”

Prof.Dr. J.B.van Lier,
Head Section Sanitary Engineering, Delft University of Technology, Delft, the Netherlands

February 10, 2016

Accra, Ghana: 6500 m³ UASB for Municipal Sewage: a white elephant?



Accra, Ghana: 6500 m³ UASB for Municipal Sewage: Job well done!!

In full operation: 2002/2003



Accra, Ghana: 6500 m³ UASB Municipal Sewage: Results Start-Up (mg/L)

Parameter	Influent	Influent Peak values	Effluent UASB	Effluent Trickling Filter	Clarifier
COD	1,610 ± 625	16,000	520 ± 300	140 ± 30	126 ± 35
BOD	1,050 ± 430	3,100	185 ± 115	170 ± 125	25 ± 12
TSS	860 ± 375	22,000	235 ± 220	230 ± 195	30 ± 10
VSS	735 ± 340	20,500	185 ± 135	175 ± 145	n.a.

pH: 5 – 12 !!

COD efficiency (entire plant): 92%
BOD / TSS efficiency: 98%
HRT: 20-24 h
OLR: 1.6 (0.3 – 6.1) kg/m³/d

33rd WEDC International Conference, Accra, Ghana, 2008

ACCESS TO SANITATION AND SAFE WATER:
GLOBAL PARTNERSHIPS AND LOCAL ACTIONS

Performance evaluation of the UASB sewage treatment plant at James Town (Mudor), Accra

E. Awuah & K. A. Abrokwa, Ghana

The UASB Sewage Treatment Plant at James Town, Accra, is used for domestic sewage treatment to remove organic material from the wastewater. To achieve higher removal efficiencies, Trickling Filters, Settling Tanks and other treatment units were used as post treatment. This study analysed the physical, chemical and biological parameters of the influent (raw sewage) as well as the effluent from the plant. The result indicated that the total removal efficiencies were 94.4%, 98.1%, 68.8%, 17.4%, 78.3% and 99.97% for COD, BOD, TS, TKN, PO4-P and Faecal coliform respectively. The overall performance of the plant was generally satisfactory. The study further revealed that Turbidity, Ammonia-nitrogen and Nitrate-nitrogen of the effluents exceeded the EPA guidelines however; the total nitrogen and phosphate-phosphorus of the final effluent could be discharged into the Korle-Lagoon without causing eutrophication or health risk. On the other hand, the current management practices may cause the plant to work inefficiently..

Invest in people! Most rewarding..!

- Teachers of the new generation!
- Make a huge difference when knowledge/awareness is lacking!
- Ownership: technology adoption to local conditions.
- Colleagues for life..!

Example of rewarding project:

Capacity Building on Wastewater Valorisation for Agricultural Production in the Middle East Area by Using Low-cost Treatment Technologies (WASTEVAL I + II, 1997-2004, WUR)

1. University of Jordan, Amman, Jordan
2. Birzeit University (BZU), Westbank, Palestine
3. National Research Center (NRC), Cairo, Egypt



Wasteval project activities



1. Improving infrastructure (research facilities, teaching facilities)
2. Raising of awareness by organization of specialized courses
3. **Staff development (upgrading to PhD): Dr. Nidal Mahmoud, Dr. Maha Halalsheh, Dr. Ghada Kassab, Dr. Mohammed Duqqah, Dr. Ahmed Tawfik, Dr. Saber El Shaffai**
4. Organisation of regional workshops (promoting south-south cooperation)
5. Strengthening of curriculum (research and teaching)
6. Exchange of students / research assistants

Combining scientific research with actual implementation / business:

Separate collection of faecal matter & urine for off-site treatment



PhD project Joy Riungu (defence 21 January 2021):
Sanitising faecal sludge by co-digestion with market waste:

- Acid pre-treatment
- Methanogenic stage

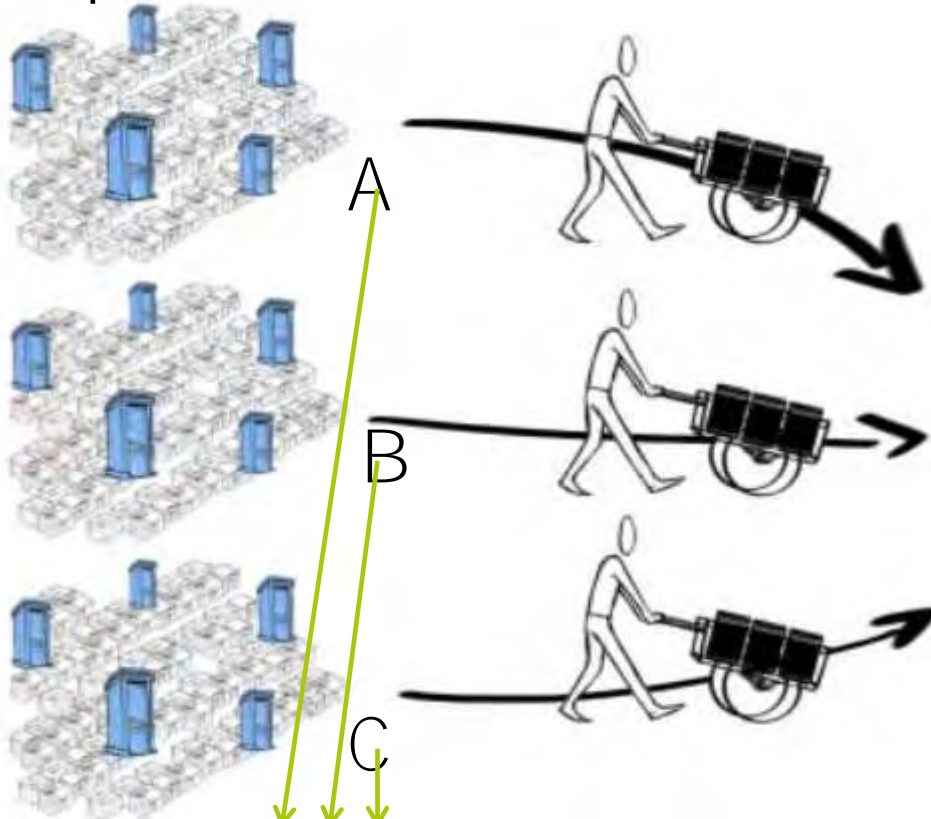
In cooperation with:
Sanergy

Sanergy Business Approach:

Informal slum settlements sanitation improvement

Low cost transportation

SANERGY:
Central collection and treatment site



Every day:

- 4 tones UDDT faeces
- 2.5 tones urine

Faecal matter as resource?

- Pathogen level
- Organic matter content

Decentralized collection points

Telling & Selling the story:



- <https://www.youtube.com/watch?v=vX6B2M7zJb0>
- <https://sanitationeducation.org/stories/2372-2/>
- <https://www.newtonfund.ac.uk/news/blog/from-waste-to-health-and-wealth-transforming-sanitation-in-kenya/>
- <https://www.youtube.com/watch?v=3DQ7cxIEB4g>
- <https://www.forbes.com/sites/christinero/2019/07/06/from-feces-to-flies-to-feed-innovating-the-lifecycle-of-human-waste/#6f19241113a6>
- <https://www.must.ac.ke/newton-fund-award/>

And the private sector?



AD course, Belo Horizonte Brazil, December 2019 (Coca cola case)

AD projects abroad:

- Choose the 'right' partner
 - Invest in people
 - Take personal demands seriously
 - Manage expectations (convey the entire story)
 - Adopt technology to local circumstances
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- **Public Sector: can be a 'swamp'..**
 - Private Sector: more easy to cooperate