Ending the madness…….
South African (& Other African) Experiences

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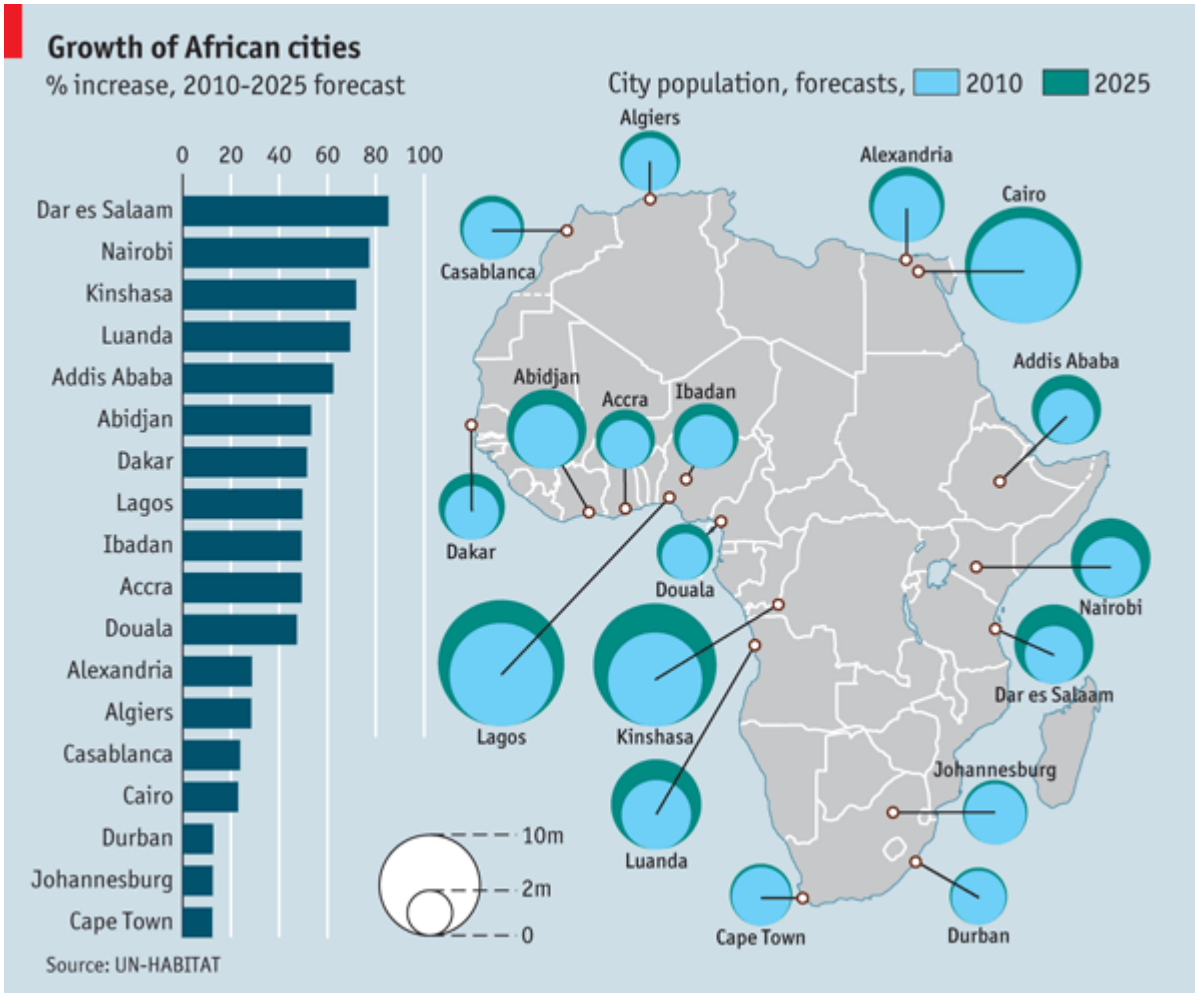
African Cities – The Urbanisation Challenge



- **Increasing urbanisation – highest in the world over last 2 decades**
- **High proportion of slum dwellers in SSA (65%)**
- **Insufficient basic infrastructure**

2008

Image from Mr. Neil MacLeod (former Ethekwini Water & Sanitation)

2013

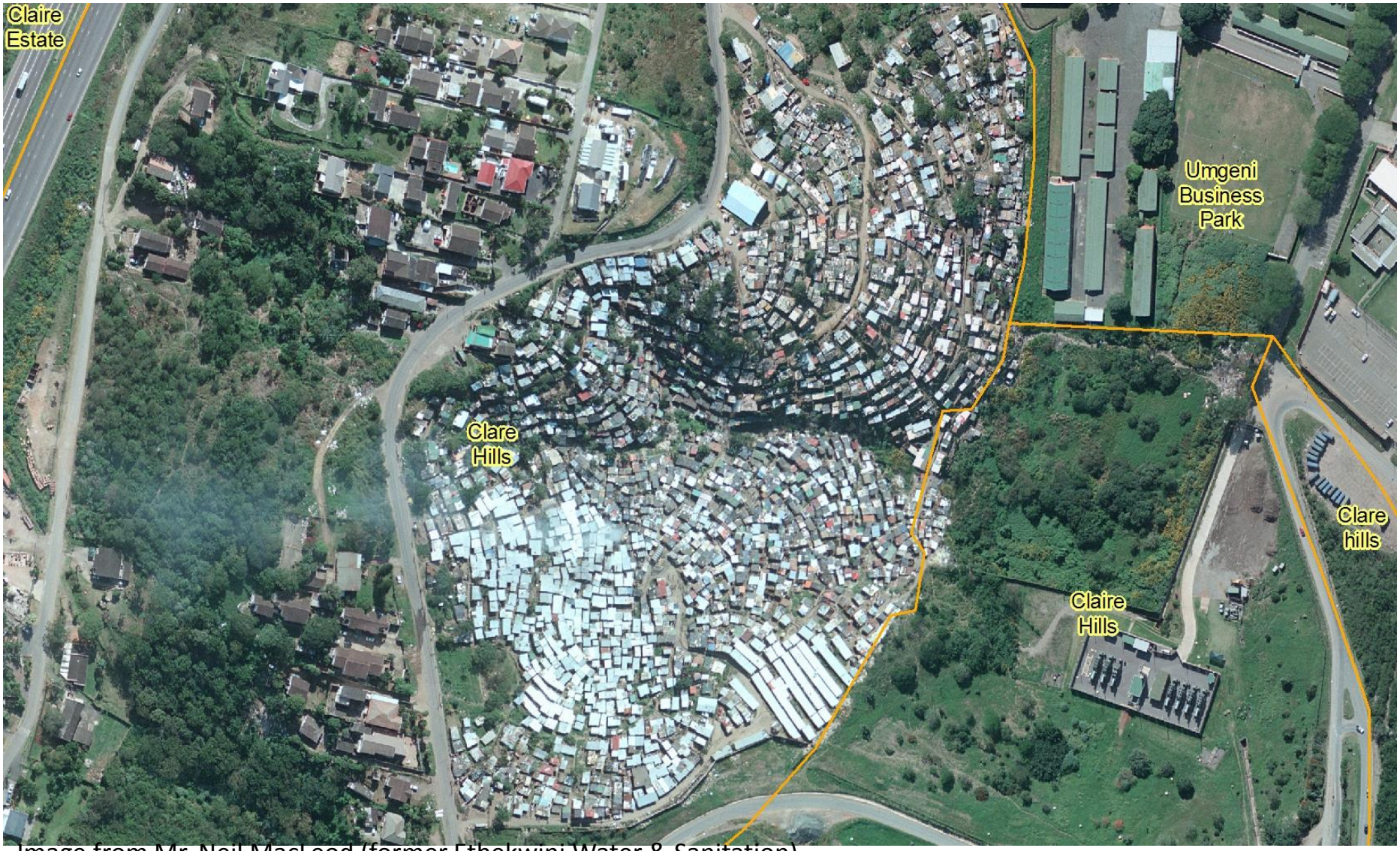


Image from Mr. Neil MacLeod (former Ethekwini Water & Sanitation)

Binary Implementation Model

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Conventional WWTW

- FLUSH-&-FORGET
- Considered "gold standard"
- Resource intensive (Capital, Sewers, Water, Energy, etc.)
- Challenge to meet urbanisation & population growth
- Expensive & beyond reach of developing countries
- Established technologies (discharge regulations, guidelines, policies, etc.)

On-Site Sanitation

- DROP-&-STORE
- Most prevalent tech in SSA
- Little / no water
- 5-50% cheaper (than activated sludge)
- Can be scaled at urbanisation rates
- Faecal Sludge Management – lack of policies & standards, disposal routes, O&M overlooked.
- Viewed as "temporary" solution

Technological Gap

Photo:
http://www.hazenandsawyer.com/work/projects/biogas-upgrades-cut-energy-costs-in-south-africa/

57% connected to reticulated sewerage

Technology Gap or Trap?

Around 40% of South Africans do not have flush toilet (incl. septic tank)
10% with VIP
20% with pit latrine

The Flushing South African Context

- The strong political drive to provide universal access
- 9 million more people connected to the waterborne network
- Push for technically advanced technologies as the preferred solution to small towns
- WRC study showed that 44% of the 18 WWTW surveyed:
  - Less suitable & expensive choice
  - Insufficient funding for effective operation and maintenance of the technology.

There could >300 WWTW where inappropriate choice has been implemented

Wastewater treatment

options which are not financially or operationally sustainable.

"This blind drive towards achieving uniform compliance for wastewater discharge is not solving the problem, but is fuelling a greater disaster in the making" says Bhagwan.

A call is made to regulators to take a holistic and strategic view of the implementation of the proposed wastewater treatment technologies based on the sustainability of the business of wastewater services, and to adopt design principles appropriate to the rural and/or small municipalities, providing leadership through their sector support and approval units.

"There could be more than 370 wastewater treatment plants in the country where inappropriate technologies have been implemented."

OVER-RELIANCE ON CONSULTANTS

It is recognised that in a complex field, such as municipal wastewater treatment, consultants have an invaluable role and contribution to make as specialists and advisors. While competent municipalities generally use consultants within this context with optimal results, municipalities with little to no technical skills have generally become over-reliant on consultants – often blindingly following their advice. This leaves municipalities vulnerable and at risk of being exploited, thus leading to the implementation of inappropriate (and usually more expensive) technology options.

From the study it has become apparent that in a number of cases, especially in smaller municipalities, the technology decision is driven by the consultant rather than being undertaken jointly by an investigative team of municipal officers and consultants. In some cases, investigations into the range of technologies available are not done at all. As a result of budget constraints or supply-chain management policies within municipalities, competitive tendering is often weighted towards price rather than technical proficiency or experience, often forcing consulting firms to cut price by using existing designs that may not be tailored around the specific municipal circumstance.

This over-reliance on consultants by local authorities is considered unhealthy, especially as these private companies are not held accountable when systems fail (they are only held accountable for the design). "As long as financial instruments, such as the Municipal Infrastructure Grant and other grant programmes, do not tighten performance evaluation criteria, weak municipalities will continue to be exploited by those unscrupulous practitioners who work towards short-term gain rather than long-term sustainable solutions," notes Bhagwan.

The report concludes with specific recommendations assigned to the relevant role-players to work towards a future that embraces and promotes responsible and appropriate technology choices that will sustain service delivery, public health and the environment in the long run. It is hoped that this snapshot view of the issues involved in technology driven and choices will go a long way towards raising awareness in the sector.

Dr Van der Merwe-Botha concludes with a message to local government and wastewater practitioners: "It is important to note that 0.2% of effort and cost go into planning, 19% into construction of the infrastructure and 44% into the maintenance and operation of the chosen technology. Make the 0.2% count in order to give best benefit to the 44%." ❑

To order the report, *Drivers for wastewater technology selection – Assessment of the selection of wastewater treatment technology by municipalities in relation to the management capability and legislative requirements* (Report No. TT 543/12) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.

The Dry South African Context

- Large infrastructure programmes to build VIP latrines outside sewered bounday
- Around 30% of South Africans rely on VIP and derivatives
- Tipping point being reached – pits were filling BUT many municipalities did not O&M budget, policies & procedures for management
- 60% facilities conducting reactive maintenance while 40% had inadequate maintenance capacity.
- Limited technical know to empty & disposal pit contents

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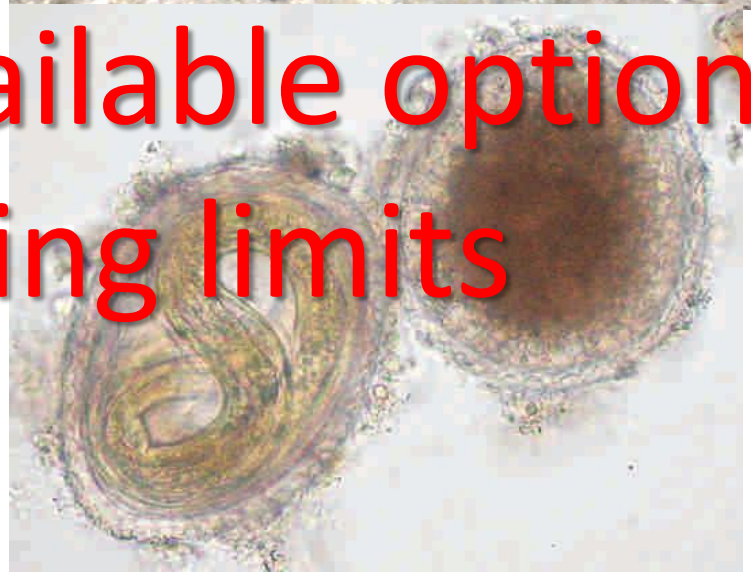
Dry Sanitation

1 pit = 1 m^3

3 million pits = problem

Landfill is only available option but we reaching limits



Disposal can be a problem!

Access can be a problem!

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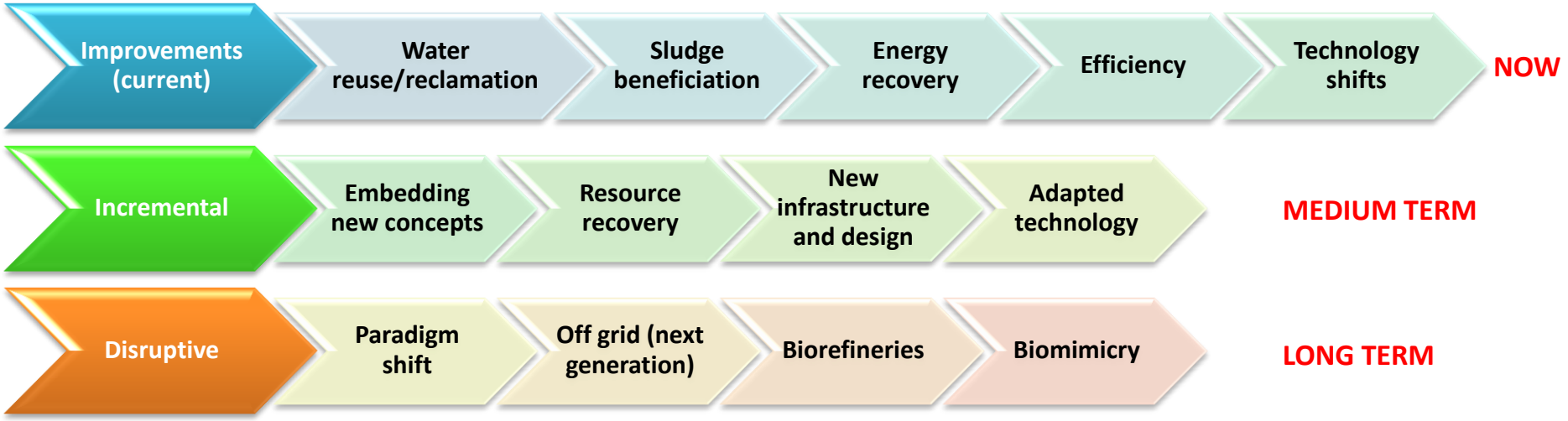
Research Strategy



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New Thinking for Existing Flush Toilets

Explored the concepts of :

1. Sustainability
2. Low-cost treatment
3. Limited skill set
4. Low O&M
5. Integration
6. Beneficiation
7. Social upliftment

Small Wastewater Options (<100 m^3/d)

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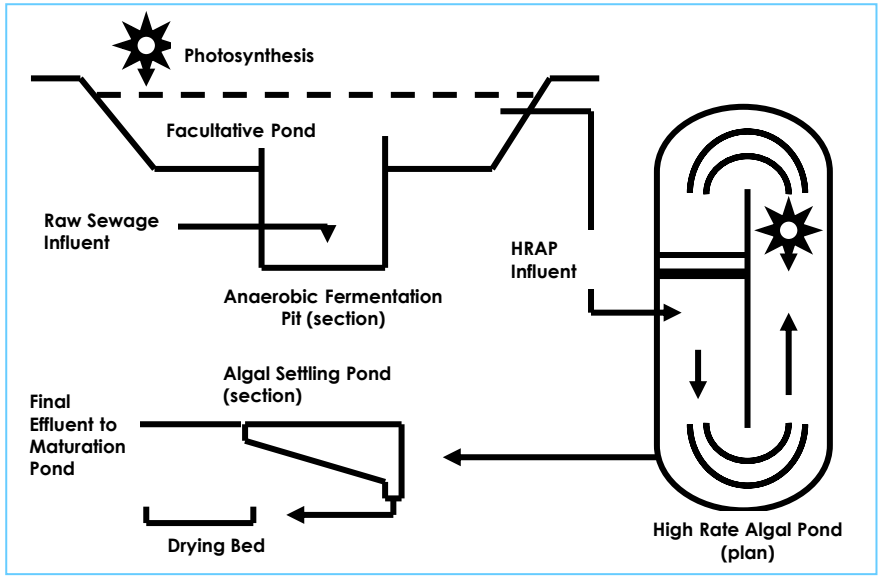
Integrated Algal Ponds Systems

- IAPS commissioned in Belmont WWTW 75m^3/d
- In-pond digester, an advanced facultative pond, two high-rate oxidation ponds and two algal settling ponds connected in series
- Energy requirement low
- Algae generated envisaged as fertiliser substitute



RHODES UNIVERSITY
Where leaders learn

Performance

- Verge of meeting the stricter compliance standards for water discharge
- System not operated at its optimum and with no tertiary polishing step
- Average Effluent Conc.:
  - COD = 94 mg/l
  - NH_4-N = 2 mg/l
  - PO_4-P = 4 mg/l
  - TSS = 31 mg/l
- With maturation ponds and slow sand filtration, water discharge standards could be achieved.

Microalgae Biomass as Organic Fertiliser

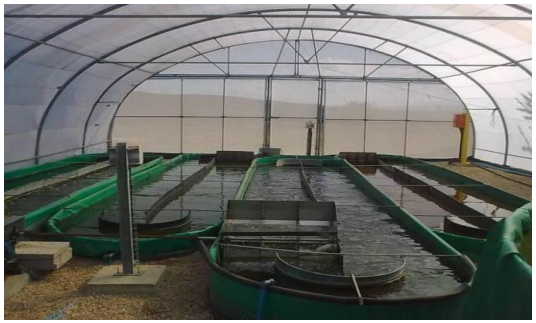
Industrial Water: Reuse of Brewery Effluent : algal ponds, wetlands, hydroponics and aquaculture

Source Separation: don't send to sewer

Technology Integration Approach

Brewery effluent (AD)

High Rate Algal Ponds



Aquaculture (ornamental fish)

hydroponics

Opportunity: Urban Agriculture

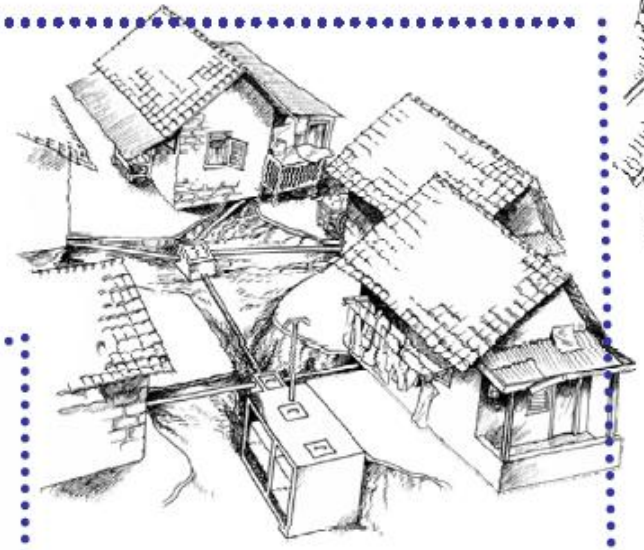
DEWATS Process

- **Pioneered by BORDA in developing world**
- **Suitable in SA for high-density communities not connected to sewered network**
  - **RDP houses**
  - **Communal Ablution Facilities**
- **Design Considerations**
  - **No pre-existing sewerage network**
  - **Semi-pressurised roof tanks**
  - **Water available for flushing**
  - **No sensitive catchments near discharge point**
  - **Dense housing arrangements not suitable for septic tanks**
    - Septic tanks designed for toilet water not for laundry, washing, etc.
    - Space limited for evapotransipration areas

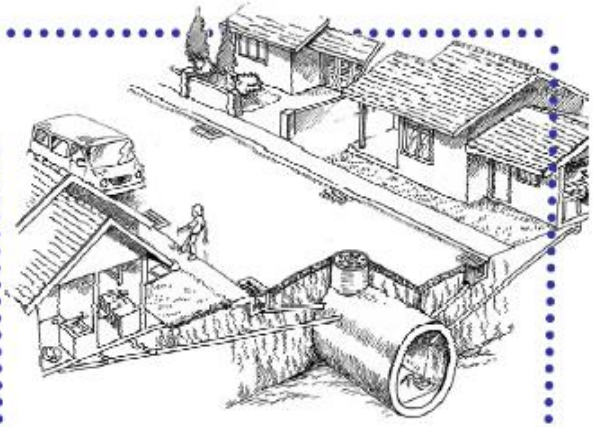
BORDA

CONVENIENCE

Common on-site systems



DEWATS Approach



Conventional centralized systems

Costs

WRC funded R&D from Pilot to Technical Demonstration

Waste to Agriculture

- Integrating agriculture into design of on-site sanitation
- Effect of wastewater / sludge on soil chemical properties
- Different soils + crops + treatments
- Crop modelling

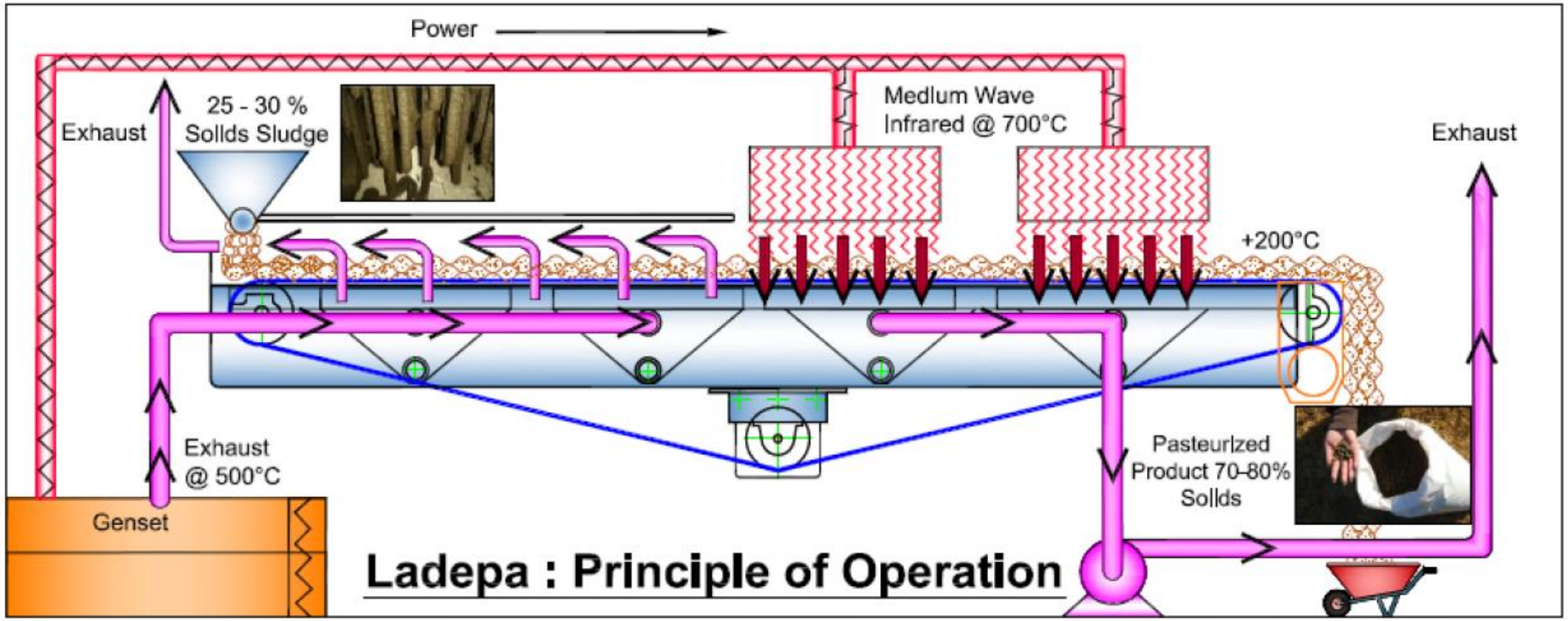
On-Site Systems Part of Sanitation System

How to Beneficiate Sludge

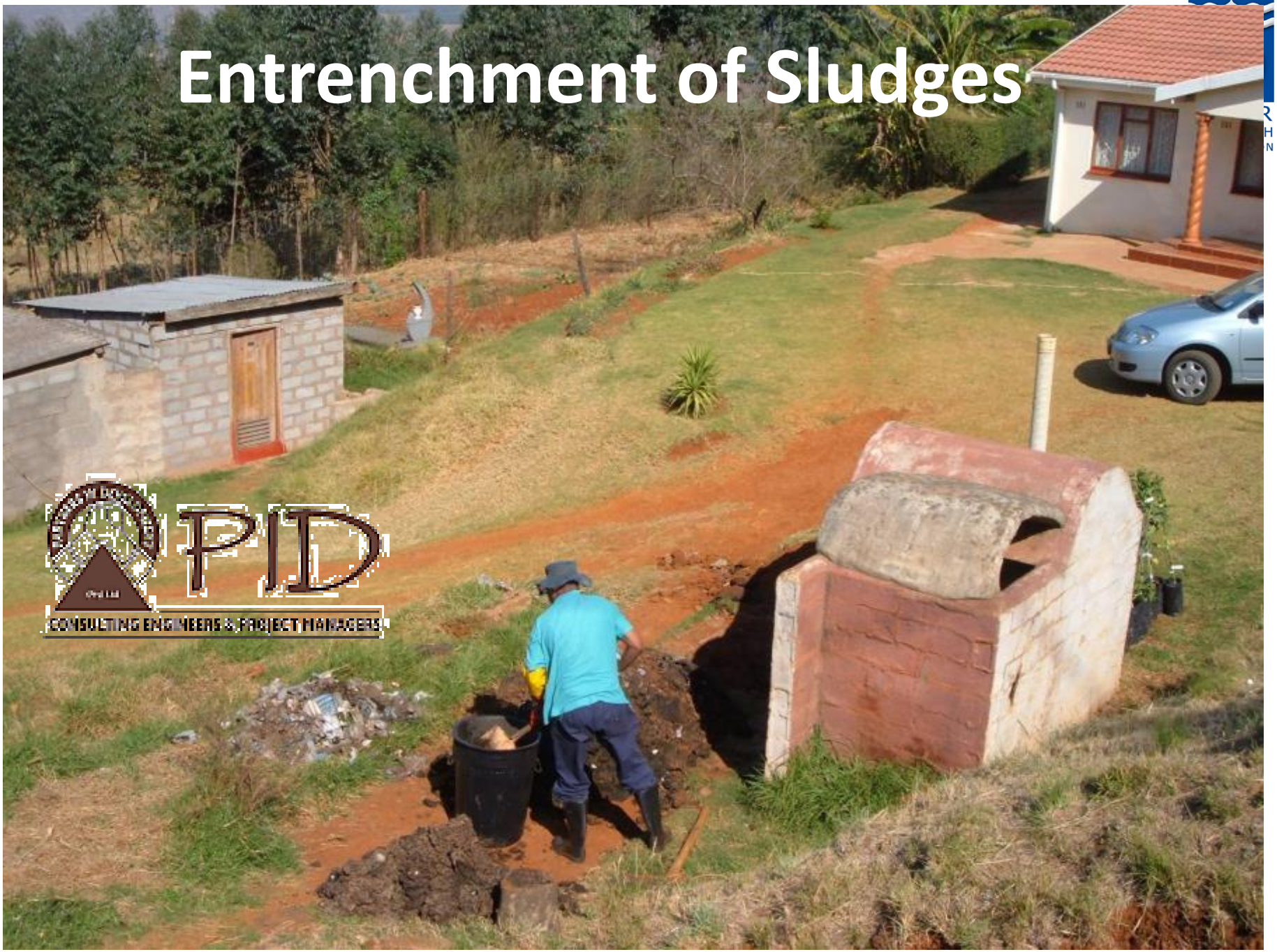
Innovations - Beneficiation

Latrine Dehydration Pasteurisation

LaDePa Process



Entrenchment of Sludges



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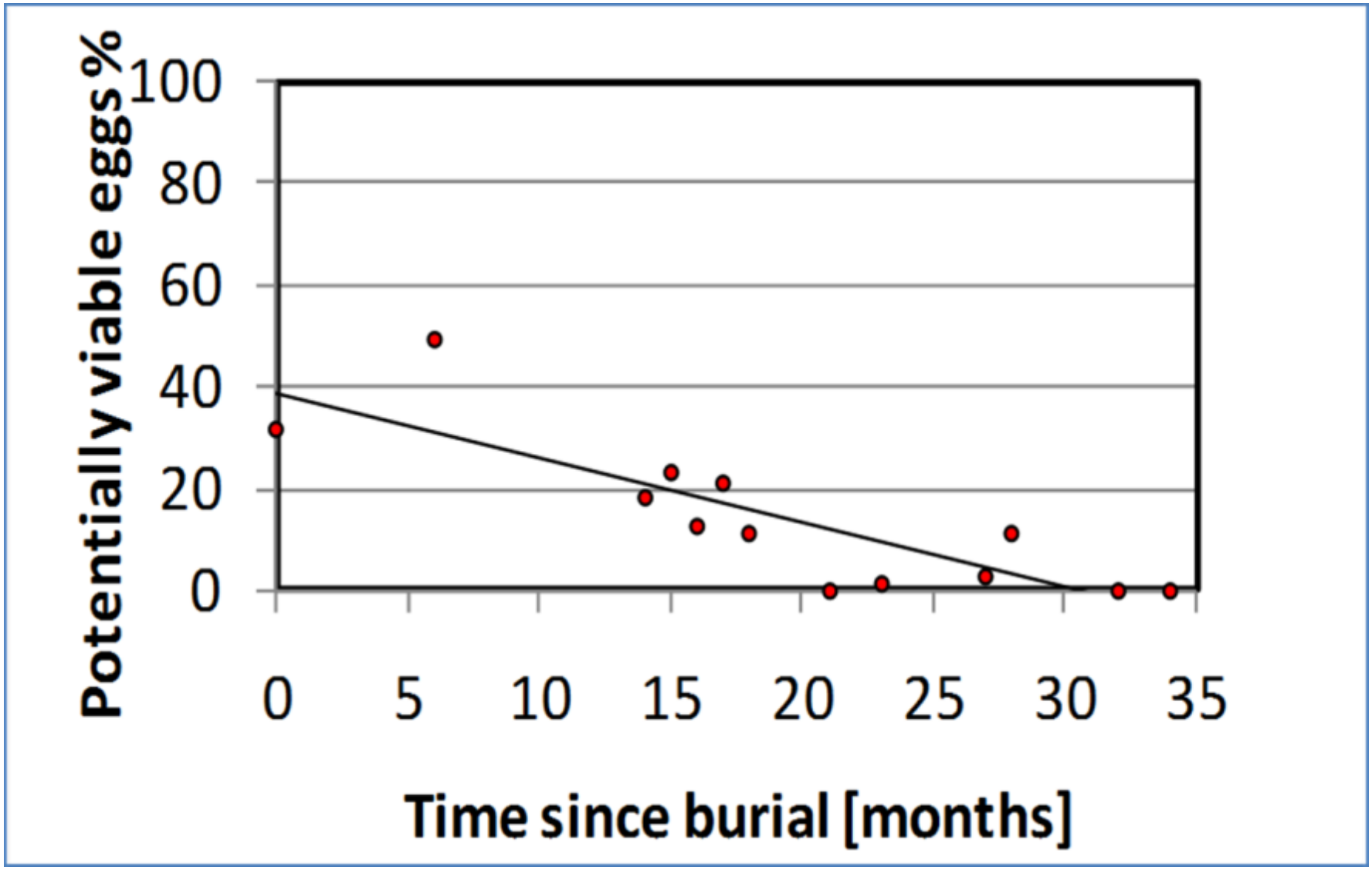
Sludge burial research site - Umlazi


Umlazi Trial – sludge burial Jan 2009


Sludge January 2013



Fate of pathogens after burial

DeFAST – Decentralised Sludge Treatment

Sludge Made into Fuel Products


CHAMPION

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