SANITATION EXPERIENCE AND TECHNOLOGIES IN BOTSWANA

P.T. ODIRILE,
DEPARTMENT OF CIVIL ENGINEERING
FACULTY OF ENGINEERING & TECHNOLOGY
UNIVERSITY OF BOTSWANA
Botswana Population = 2,348,343
### POPULATION

<table>
<thead>
<tr>
<th>2018 Population</th>
<th>2,348,343</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018 Growth Rate</td>
<td>1.81%</td>
</tr>
<tr>
<td>Density</td>
<td>4.01/km²</td>
</tr>
<tr>
<td>Area</td>
<td>582,000 km²</td>
</tr>
<tr>
<td>Capital City</td>
<td>Gaborone</td>
</tr>
</tbody>
</table>
INTRODUCTION

• Botswana has scarce water resources compared to countries occupying similar climatic zones.

• The renewable water resource per capita is estimated at about 6,819 cubic meters (m$^3$), below the Sub-Saharan African average of 7,000 m$^3$ per year.

• Rainfall levels vary considerably across regions and during the course of the year, averaging a low 416mm annually.
• Botswana’s population growth (1.5 percent annually) has put significant pressure on its water resources.

• Demand for drinking water has increased over time due to the increasing rate of urbanization, and some 95 percent of the population is reported to have access to improved drinking water resources.

• Domestic use accounts for 34 percent of water withdrawals.

• Need for agricultural production adds to the stress.

• Irrigation and livestock account for 47
The search for alternative sanitation technologies

• A priority since NDP 8 era was to “adopt” technologies that would minimise if not eliminate pollution.

• Infrastructure development through the provision of waste treatment facilities to the Local Authorities.

• This is to ensure that all facilities adhere to the set environmental standards so that the waste is adequately treated before disposal into the environment.
Sanitation Provision Trends in Rural Botswana

Key Issues in Sanitation
(Sustainable Sanitation)

• Planning at country level to achieve the target
  • Ownership and governance / Promotion of political will

• Providing safe drinking water supply
  • Full use of traditional system and site-specific technologies

• Maintenance of existing systems
  • Rehabilitation and improved operation and maintenance of existing systems

• Faecal Sludge Management
Good Governance and Broad Participation in Sustainable Sanitation

Institutional/Financial/Technological Arrangement

Government

Private Sector

Citizen

Technical Advisors

Mass Media

Health Workers

Other Stakeholders

Schools

NGOs

Community Leaders

No one Should be left Behind
Stakeholder Arrangement for Faecal Sludge Management.

KEY:
- DEA - Department of Environmental Affairs
- DWA – Department of Water Affairs
- WUC – Water Utilities Corporation
- DEH – Department of Environmental Affairs
- DWMPC - Department of Waste Management and Pollution Control

Solid line denotes Service
Dotted line denotes Financial exchange
Pit latrine and Septic Tank Sludge Mixed with Municipal Wastewater and co-treated through Activation Sludge Process in Gaborone
Vacuum Tankers Discharging at the Bay
In the past, sewage sludge has been disposed to landfill.

- Stored in sludge hips for reuse.
- More recently, beneficial uses for dried sludge have been developed.

The more advanced methods of sludge disposal are usually targeting to reuse the composted or digested sludge in agriculture as a fertiliser or in landscaping, or reuse phosphorus and/or nitrogen in agriculture as an additional fertiliser.
astewater treatment ludge at . .
Impacts on Clarifier
Criteria for On-Site Sanitation Technology Selection

National Policy on Wastewater and Sanitation (2001), which recommends that on-site sanitation technologies used, should satisfy the following criteria:

- Operational effectiveness and reliability
- Minimal public health risks to the users
- Cultural and social acceptance
- Affordability
- Free from offensive smell and unsightly conditions
- Inability to attract flies and other insects
- Minimal groundwater pollution risks
- Minimal water usage
- Easy maintenance by the user
Sanitation and Waste Water Management

- There are two types of sanitation methods adopted for the disposal of human wastes and these are on-site sanitation and off-site sanitation.
  - **On-site sanitation**
    - This is designed to dispose of the liquid part of wastewater to surrounding soil such as pit latrines, septic tanks.
  - **Off-site sanitation**
    - It involves wastewater conveyed to municipal wastewater treatment facilities for treatment before discharge into the river courses or the environment.
Decentralised Systems
Onsite Sanitation Systems

- Used mainly for households without connection to the sewerage system.
- Challenge: Nitrate pollution of Groundwater Resources
Sanitation practices in Botswana

• Sanitation practices promoted today are either based on hiding human excreta in deep pits (‘drop-and-store’) or on flushing them away (‘flush-and-discharge’).

• The type of the technology to be provided depends on many factors including Groundwater status.
ENVIRO TOILET SYSTEMS

Waterless composting toilet system
Calcammite
Gendarme Toilet

Anaerobic Digestors, Non-Flush Anaerobic Toilets, Sanitation Systems, Waste Disposal, Water Saving and Purification

- The Gendarme Toilet System is designed to look just like a conventional flushing toilet.
- Gendarme fosters sustainable water resource usage due to the fact that the toilet systems are not able to pollute ground water sources.
- The only water used by the Gendarme system is when it is filled on installation. It never has to be topped up or changed. This system treats human waste effectively and reliably without compromising hygiene standards.

www.gendarme.co.za
Plastic tanks used as substructure for the toilet system

- Units are usually 500 or 1000 litres in capacity
- Made of heavy-duty plastic (polyethylene) with reinforced lids.
- They are light, quick and easy to install and can be put into existing buildings or above ground.

Anaerobic Digestors, Non-Flush Anaerobic Toilets, Sanitation Systems, Waste Disposal, Water Saving and Purification
Flush Unit

• The functions of the flush unit are to:
  • Move the waste from your sight (flush)
  • Breakdown the solids through flush pressure
  • Agitates the contents in the digester tank to prevent settlement
Polyrib Septic Tank

[Diagram showing cross-section of Polyrib Septic Tank with labels for Secondary Tank and Primary Tank.]
TECHNOLOGY FAILURE

- Most of the Technologies failed above failed
- Some LA feel that, new concept, are imposed on them by DWMP without fully understanding the basic principles involved and how they relate to their local conditions.
- The potential advantages of ecological sanitation can only be realized as long as the system functions properly.
- The suppliers don’t provide enough training to the users (private and institutional).
- Some times the suppliers don’t supply all components of the facility resulting in the facility failing.
- Eco-san systems have failed due to ignorance and lack of experience.
- Perception that some facilities do not require maintenance.
The LaDePa Machine
ECO

“With Whitener”
Proposed Sludge Management Model

- Pit Sludge Generation
- Sludge Emptying and Transport
  By Private Company or council
- LaDePa
  Operated by Private Company or Council
- Packaging of Pelleted Sludge
  - Horticultural Farms
  - Agri Shops
  - Commercial Farmers
  - Selling of Sludge
THANK
YOU