



SANITATION EXPERIENCE AND TECHNOLOGIES IN BOTSWANA

AAETI

P.T. ODIRILE,

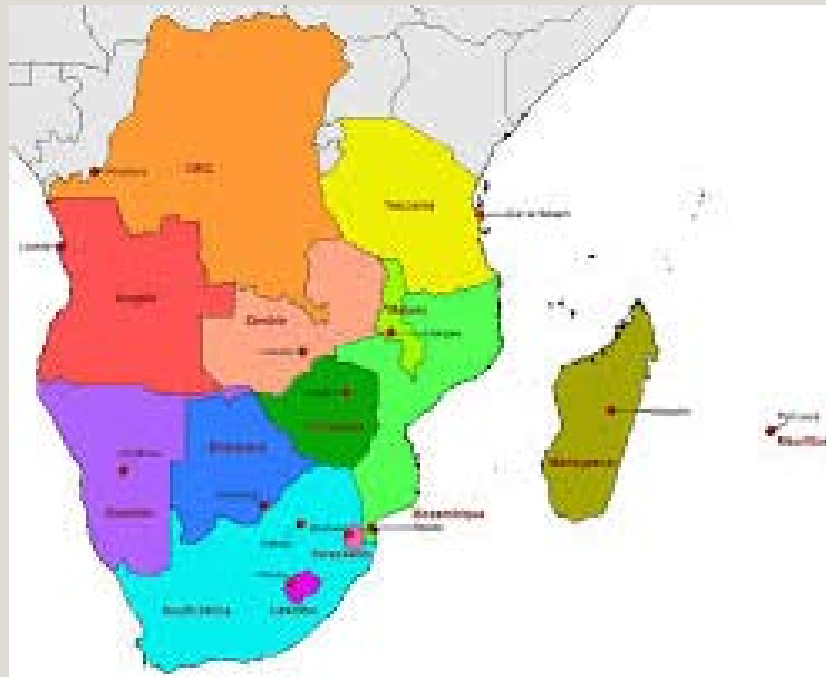
DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING & TECHNOLOGY

UNIVERSITY OF BOTSWANA



LOCATION



Botswana Population =
2,348,343

POPULATION

2018 Population	2,348,343
2018 Growth Rate	<u>1.81%</u>
Density	<u>4.01/km²</u>
Area	<u>582,000 km²</u>
Capital City	<u>Gaborone</u>

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.

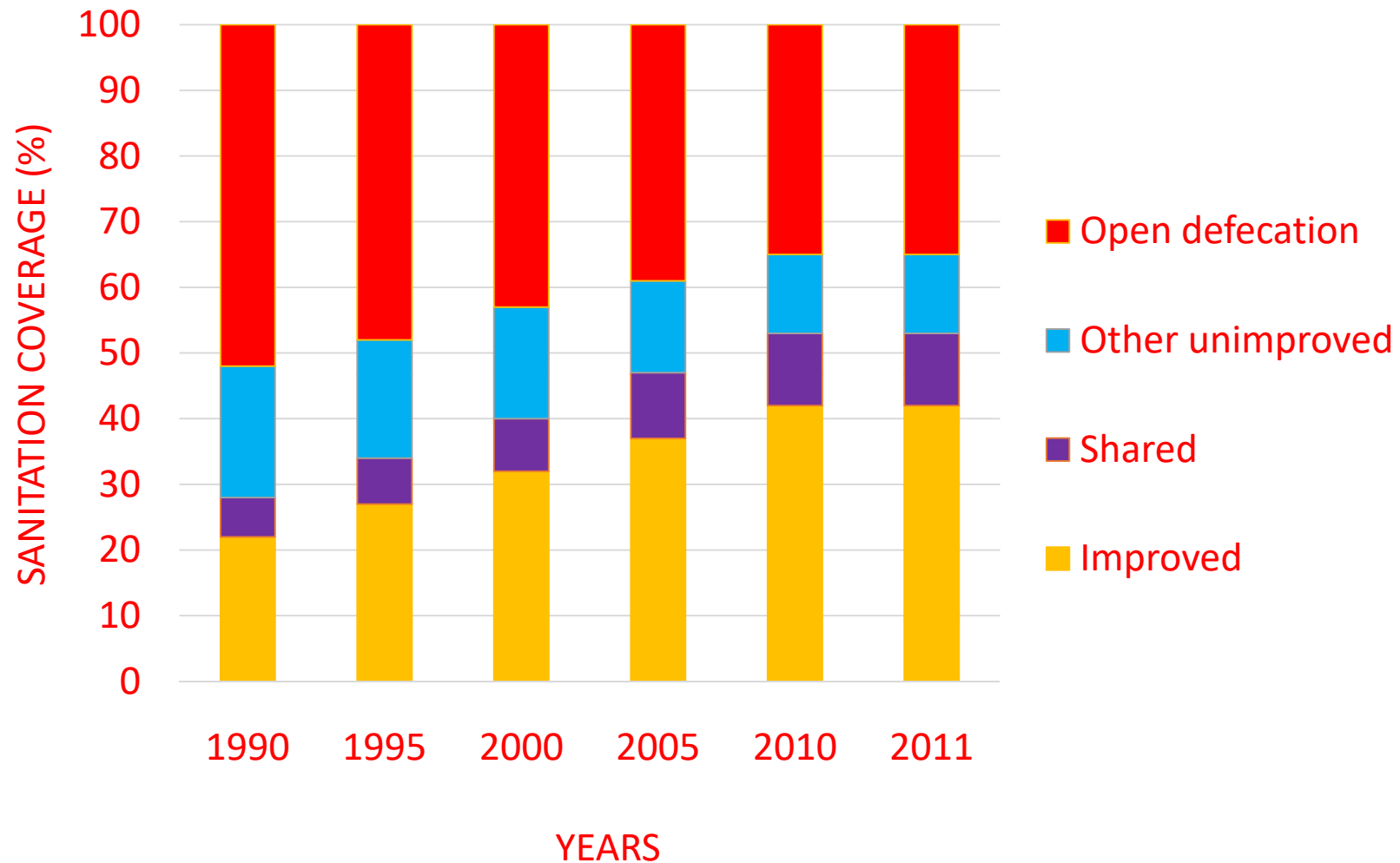
- Botswana's population growth (1.5 percent annually) has put significant pressure on its water resources.
- Demand for drinking water has increased over time due to the increasing rate of urbanization, and some 95 percent of the population is reported to have access to improved drinking water resources.
- 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



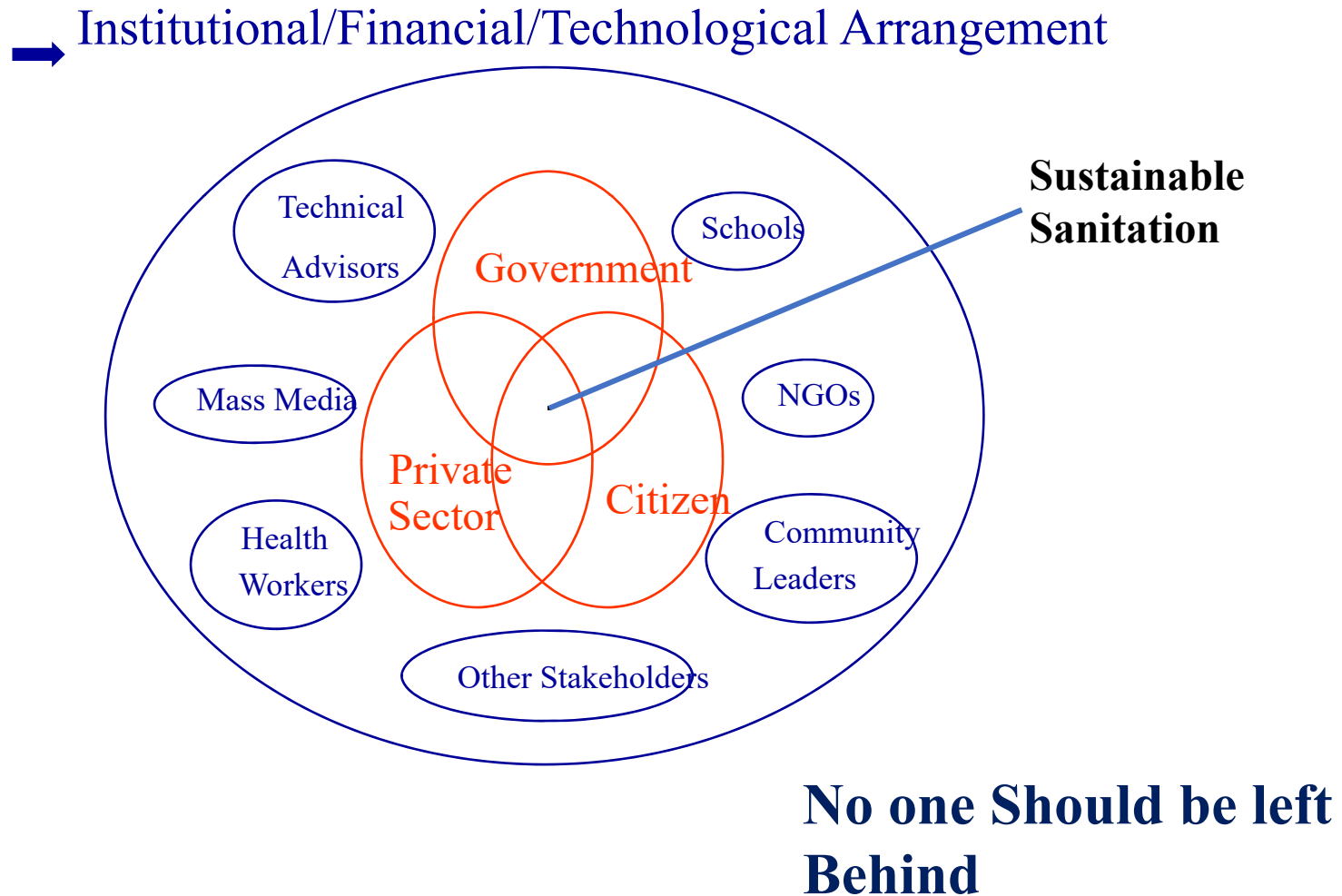
Source: WHO & UNICEF (2013), Progress on Drinking Water and Sanitation. Joint Water Supply and Sanitation Monitoring Programme.

Key Issues in Sanitation

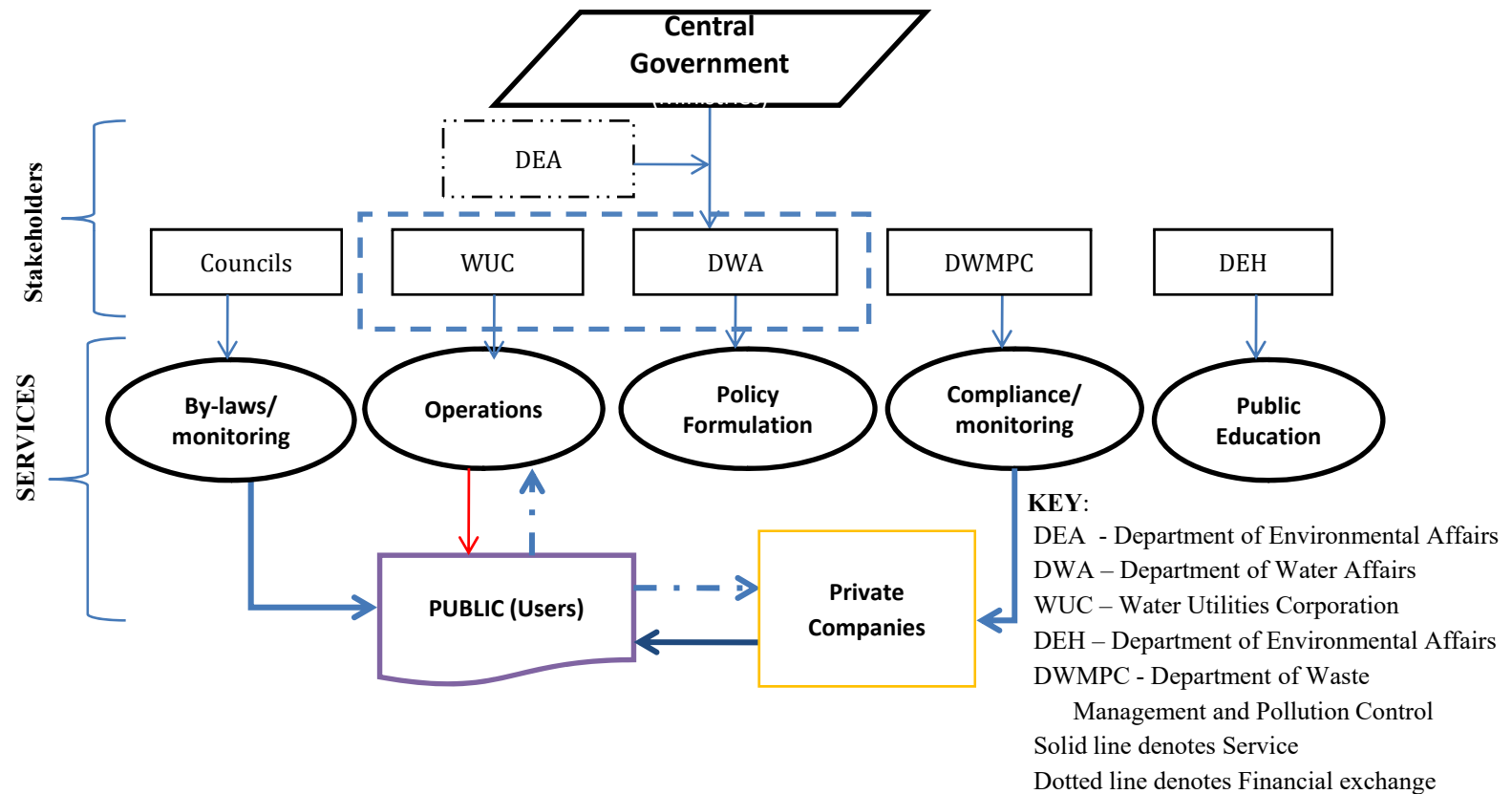
(Sustainable Sanitation)

- **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**

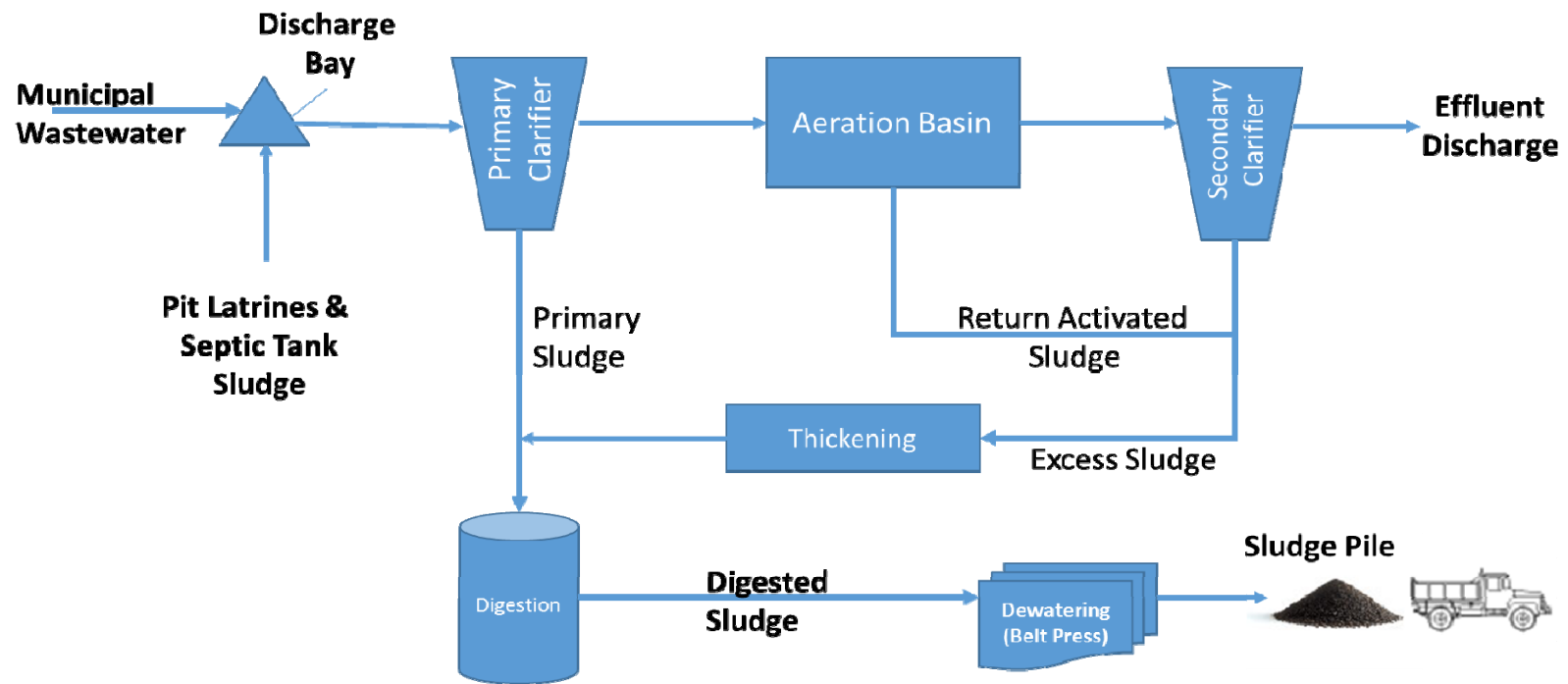
Good Governance and Broad Participation in Sustainable Sanitation



Stakeholder Arrangement for Faecal Sludge Management.



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



Sludge Disposal

- 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 . .



by Johanna Norup & Ellen Åberg

Impacts on Clarifyer



Criteria for On-Site Sanitation Technology Selection

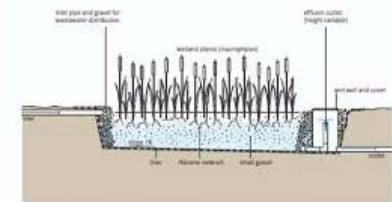
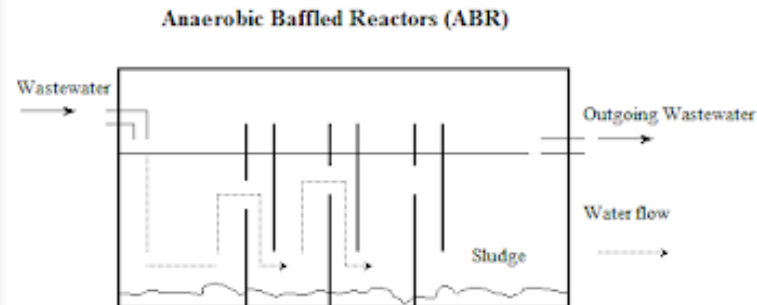
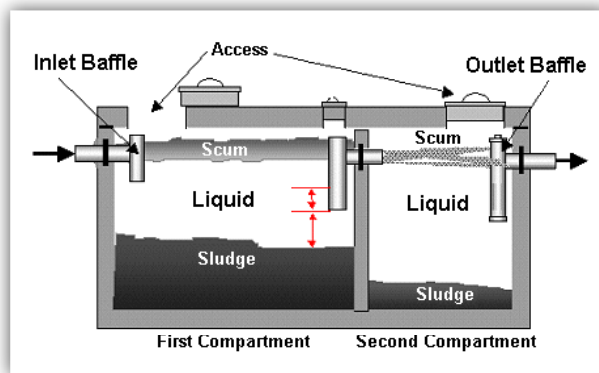
National Policy on Wastewater and Sanitation (2001), which recommends that on-site sanitation technologies used, should satisfy the following criteria:

- 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

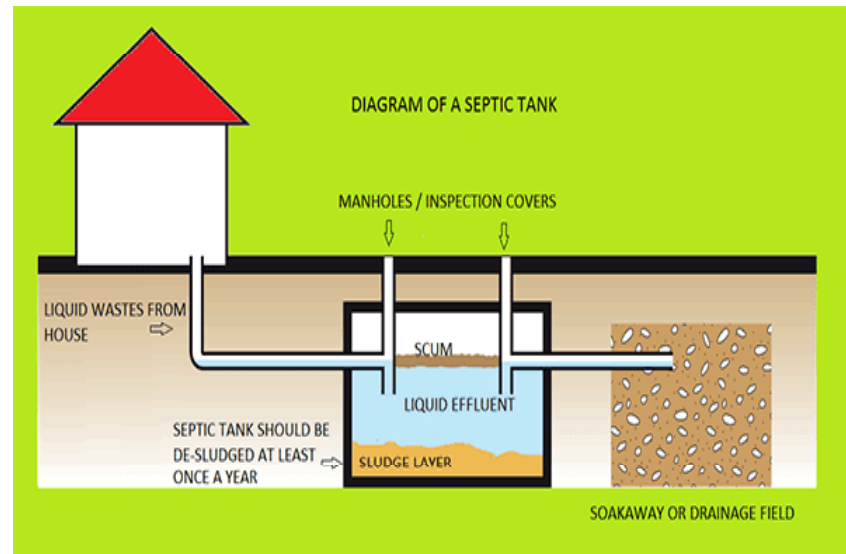
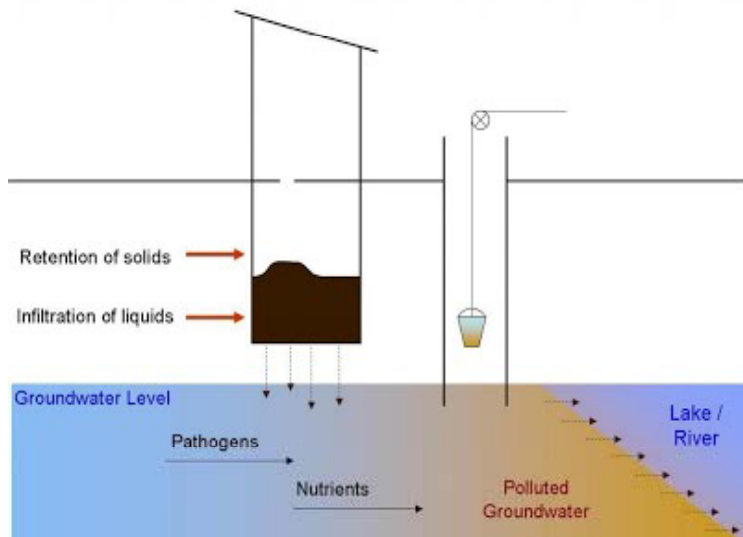
Sanitation and Waste Water Management

- 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

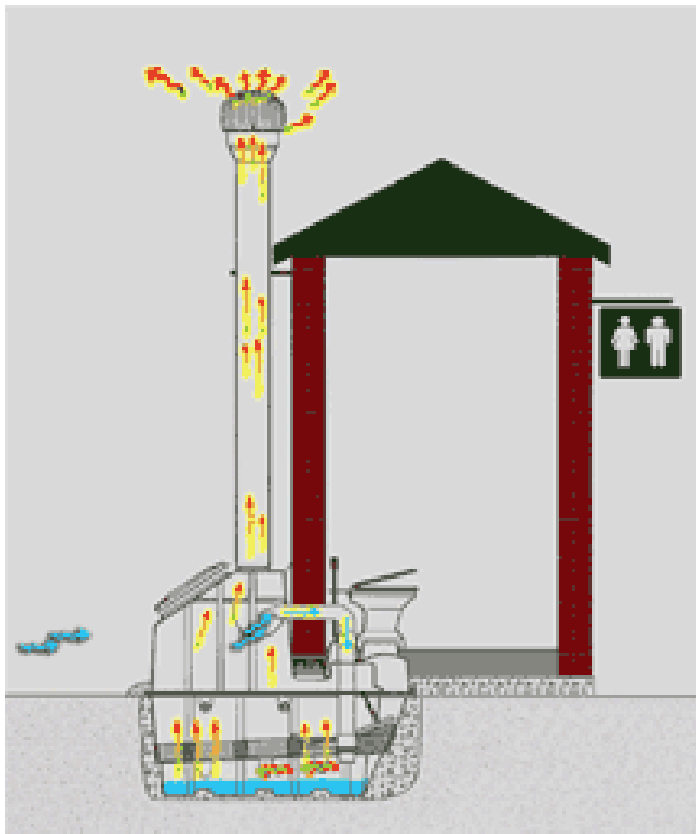


- Used mainly for households without connection to the sewerage system.
- Challenge: Nitrate pollution of Groundwater Resources

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

Calcamite

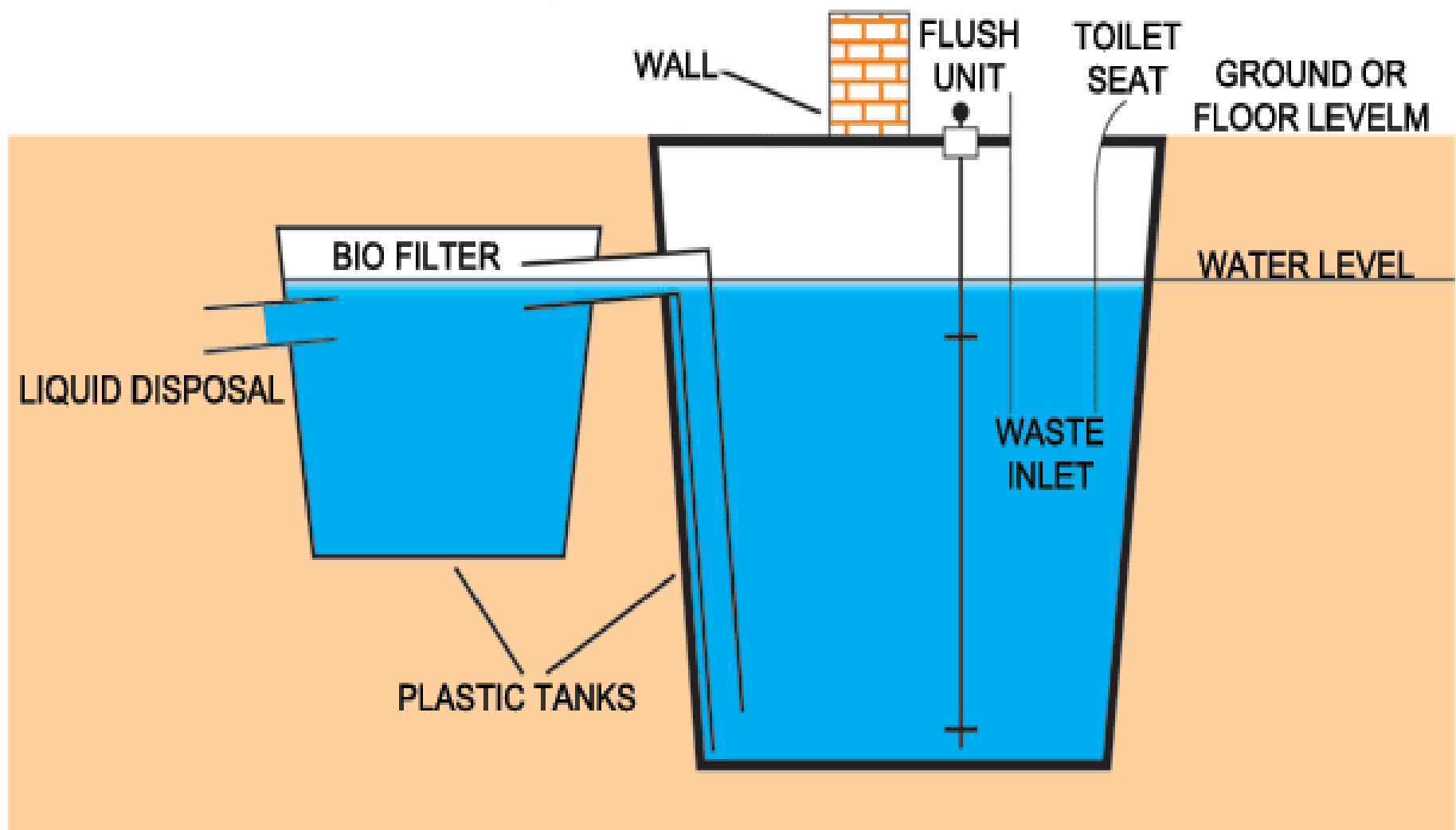


Gendarme Toilet

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.



Plastic tanks used as substructure for the toilet system

- Units are usually 500 or 1000



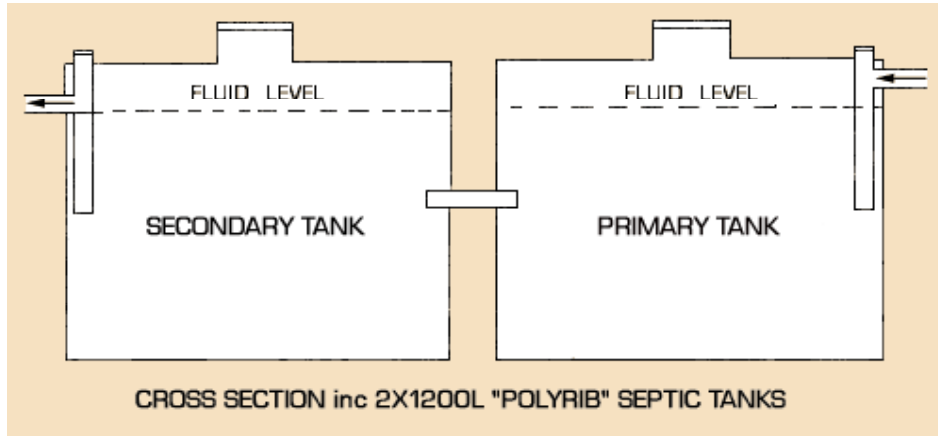
Anaerobic Digestors, Non-Flush Anaerobic Toilets, Sanitation Systems, Waste Disposal, Water Saving and Purification

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



TECHNOLOGY FAILURE

- Most of the Technologies failed above failed
- Some LA feel that, new concept, are imposed on them by DWMPC 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

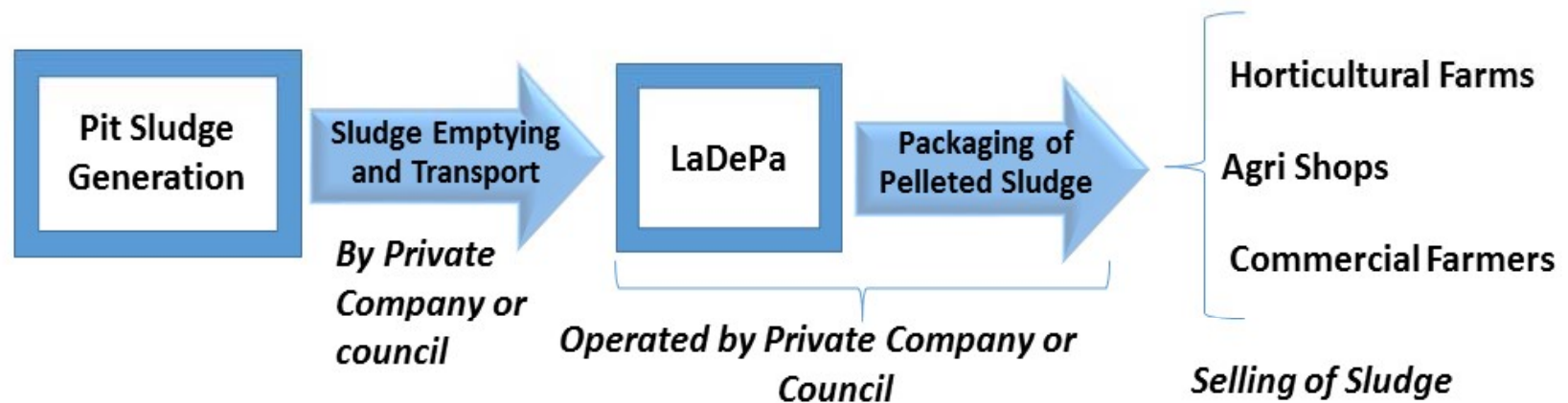


ECO



“With Whitener”

Proposed Sludge Management Model



THANK

YOU