

# **EFFICIENCIES IN FEACLE SLUDGE EMPTYING USING SEMI TECHNOLOGY TOOLS. The case study of the pitvaq**

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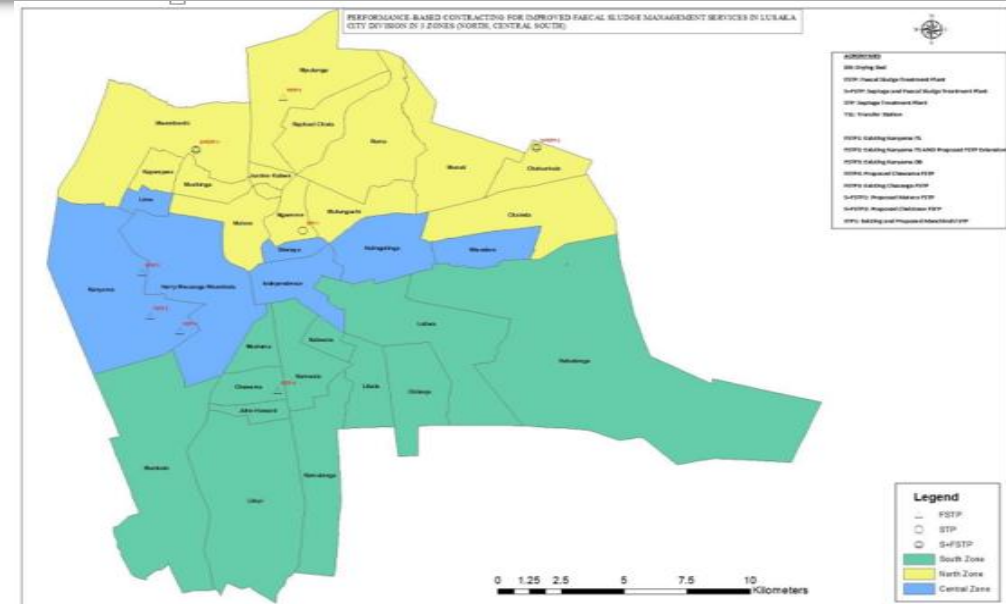


# Presentation outline

1. Background
2. PBCS- 12 emptying teams (private operators and water trusts)
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4. Emptying equipment and containment
5. Addressing solid waste management challenges in Slums
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# 1. Background

- Integration of Faecal Sludge Management (FSM) by LWSC as a utility service for citywide sanitation.
- Focus on both urban and peri-urban non-sewered communities in Lusaka.
- **Objective:** Improve sanitation services, protect underground water, and strengthen LWSC's capacity for onsite sanitation management.
- **Target population:** Lusaka's 2.5 million residents, especially the urban poor in slums.
- Predominant onsite sanitation facilities in peri-urban areas: Pit latrines and cesspits.
- **Challenges in peri-urban sanitation:** Unlined and insecure traditional pit latrines, allowing unauthorized dumping.
- **LWSC's challenge:** Managing unlined pit latrines through manual pit emptying due to the nature of sludge.
- **Identified problem with manual pit emptying:** Ineffectiveness and time-consuming for both service providers and customers.



# PBCS- 12 EMPTYING TEAMS (PRIVATE OPERATORS AND WATER TRUSTS)

## Vacuum Tankers



## Mechanical De-sludging Units



## Manual Emptying Units



# The Contracts Lots (Performance Based)

## Area North

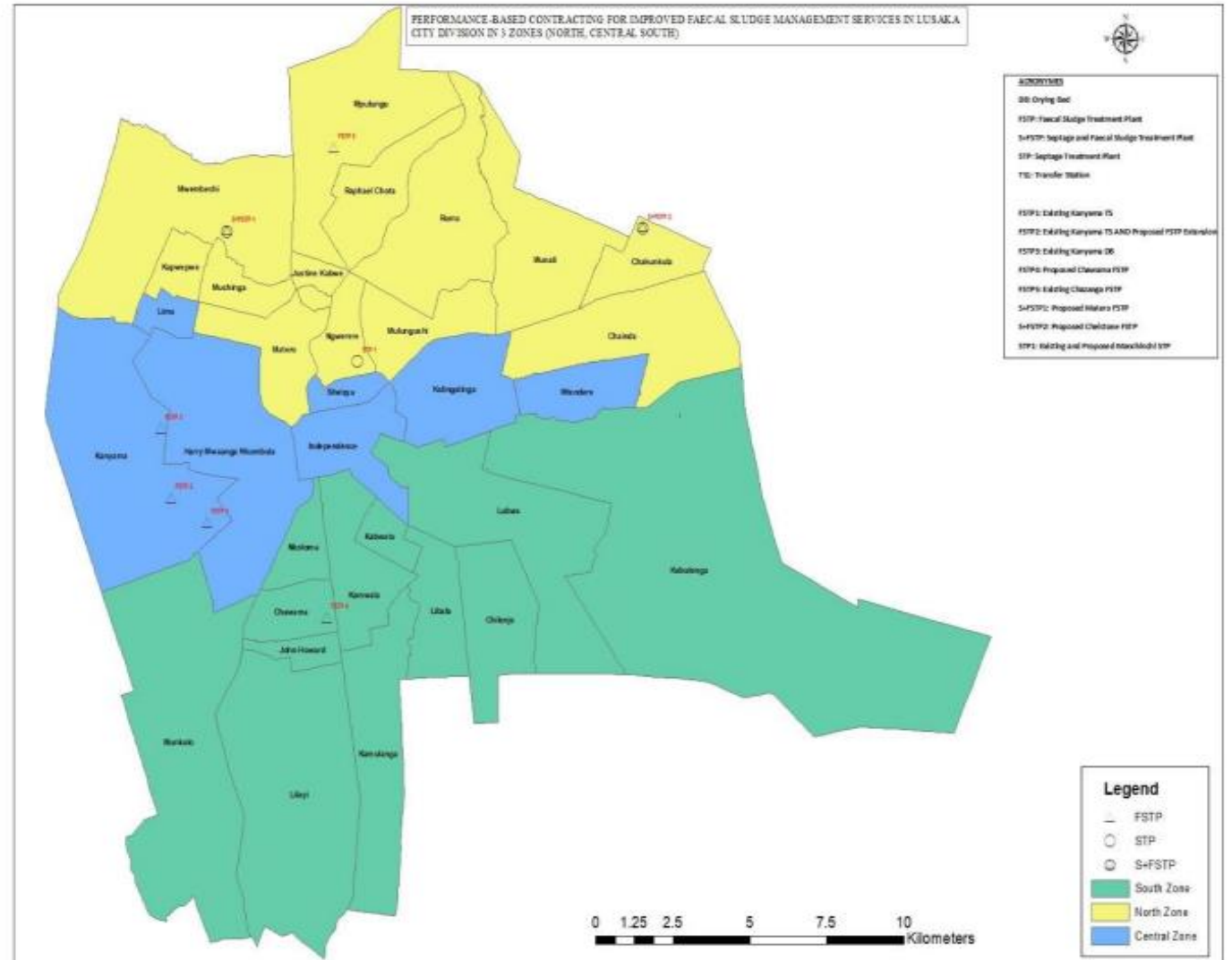
1. Technology neutral contract North 1
2. Technology neutral contract North 2
3. Labor intensive contract North 1
4. Labour intensive contract North 2

## Area Centre

5. Technology neutral contract Centre 1
6. Technology neutral contract Centre 2
7. Labor intensive contract Centre 1
8. Labor intensive contract Centre 2

## Area South

9. Technology neutral contract South 1
10. Technology neutral contract South 2
11. Labor intensive contract South 1
12. Labor intensive contract South 2



# Emptying equipment and containment

- **Conveyance equipment for manual pit emptying:** open truck or push cart
- **Manual pit emptying tools:** barrels, modified shovel, scooper, modified rick
- Process involves transporting fecal sludge from onsite sanitation facilities to the nearest treatment plant
- Sludge is scooped from containment/substructure into 60-liter plastic barrels using a modified scooper
- Majority of pit latrines in Lusaka's peri-urban areas are unsafe and unlined
- Over time, filtration and percolation occur, causing sludge to cake up and combine with the soil
- Modified fork used to stir solid sludge, mix it with water, and extract solid waste
- Sludge scooped from containment using modified scooper and transferred into barrels
- Barrels then transported to the treatment plant for further processing.



# Addressing solid waste management challenges in Slums

- Importance of behavior change in addressing solid waste in onsite facilities
- Lack of awareness and hygiene practices in peri-urban areas
- Disposal of undesirable items into pit latrines due to a lack of proper waste management education
- Challenges of access in peri-urban areas, especially during the rainy season
- Difficulty for vacuum trucks to reach sanitation facilities in certain locations
- Introduction and formalization of manual pit emptying by the utility
- Manual pit emptying as a solution for pit latrine sludge that cannot be handled by ordinary vacuum trucks
- Need for alternative approaches in areas with limited accessibility
- Emphasis on the importance of addressing unique challenges in peri-urban sanitation.

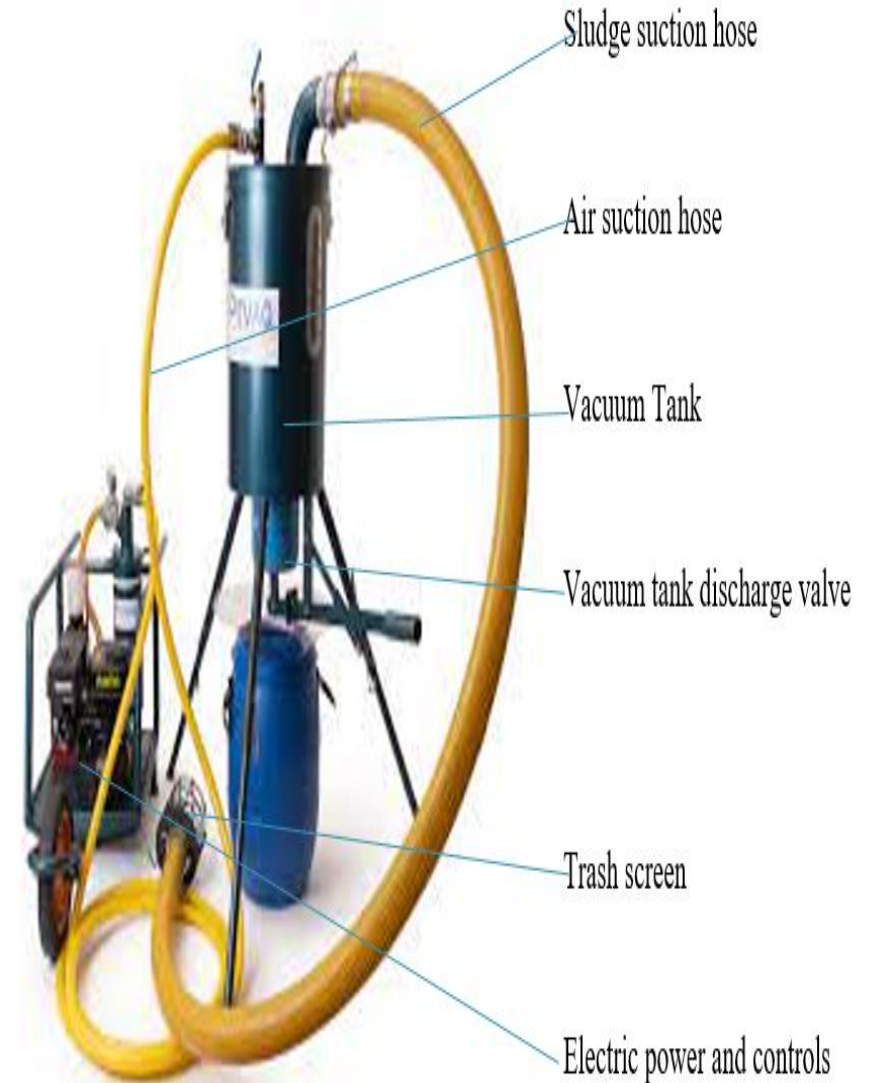
# Effects of sludge consistency on desludging methods

	Very wet sludge – mostly water Use free flow method		
	Wet sludge – watery with high suspended solids	5- 10lts/s	
	Thin sludge – Flows well	Rate of emptying	
	Thick sludge- very slow flow	<50l/min	
	Dry sludge- does not flow	Not Suitable	



# Pit Vaq: semi-mechanized solution for FSM in RBFS Projects

- Pumping of pit latrine sludge under the Results Based Financing Scheme for Faecal Sludge Management (RBFS) project
- Technologically neutral approach in the project
- Job requisition initiated by the service provider for pit latrine assessment and measurement
- Selection of technology based on sludge composition in each specific facility
- Introduction of the Pit vaq as a semi-mechanized tool for accessing challenging locations
- **Components of the Pit vaq:** gasoline engine, small vacuum pump, and a 75-liter vacuum tank
- **Three main parts:** pump assembly, suction hose, and vacuum tank
- **Designed for portability,** with each component carried by one or two people
- Vacuum force produced by the Pit vaq equivalent to that of large motorized vacuum pumps
- Controls, engine/motor, vane pump, oil reservoir, and moisture trap mounted on a trolley frame with one wheel in front
- Purposeful use of a small vacuum to ensure quick development and portability over any terrain



# Operational efficiencies of the pit vaq machine

- Measuring efficiency in fecal sludge emptying involves specific metric tracking.
- Utilizing pit vaq machines optimizes time, personnel, containment type, and money.
  - Pit emptying services are crucial for an affordable, efficient, and hygienic service chain.
  - Challenges with current methods using modified garden tools result in difficulties, health risks, and contamination.
- The process is time-consuming, costly, and requires repairs post-emptying.
  - Emptiers spend 3-5% of the charge on repairs on average.
- Improved pit emptying methods are needed, utilizing hygienic, effective, and efficient technologies.
- Technologies should handle various sanitation facilities and manage fecal sludge, organic, and inorganic waste.

VERIFIABLE INDICATOR		MACHINESED TOOL	MANUAL EMPTYING	EFFICIENCIES
Site Preparation	Time	7 minutes	10 minutes	Reduction on time
	<u>Labour</u> required	Job done by a minimum of two people	Job done by a minimum of three people	Reduction on <u>labour</u> cost
	Energy cost	7 minutes/ 2 workers	10minutes/ 3 workers	Reduction on time and <u>labour</u> cost
Emptying a one <u>barriel</u> of faecal sludge	Time	✓ 1.5minuties	✓ 4.5minuties	✓ Reduction on time
	<u>Labour</u> required	Job done by a minimum of two people	Job done by a minimum of three people.	Reduction of <u>labour</u> cost
	Energy cost	1.5 min/ 2 worker	4.5 min/ 3 <u>workes</u>	Reduction on time and <u>labour</u> cost
Worksite cleaning	Time	3 minutes	1 minute	Increase on time
	<u>Labour</u> required	Job done by a minimum of two people	Job done by a minimum of one person	Increase on <u>labour</u> cost
	Energy cost	3min/2 workers	1min/1 worker	Increase on time and <u>labour</u> cost

## Recommendation.

- Peri-urban areas face significant challenges in solid waste management.
  - Advocacy for the use of semi-machined equipment is crucial in addressing the issue.
  - Emphasis on managing solid waste and educating community members about the risks of improper waste disposal.
  - Utility's role in discouraging the use of unsecure and unlined pit latrines.
  - Urgent need for a business model to discourage dumping solid waste in pit latrines, potentially including penalties.
  - Encouraging the construction of lined containment structures to promote the use of semi-machined tools.
  - Prevention of contamination of underground water through infiltration and percolation is a key goal
- se keep your presentation to 12-15 slides only.



# Conclusion

- Faecal sludge management, particularly pit emptying, historically neglected and performed informally at night.
- Expanded utility mandate prompts the formalization of pit latrine emptying through the LWSC/FSM business model.
- Public Private Partnerships established with private companies and community-based organizations for sanitation and faecal sludge management.
- Article aims to highlight gaps and challenges in the current manual pit emptying process in slums.
- Key goals include addressing challenges, ensuring customer satisfaction, worker safety, and proper site preparation during emptying.
- Introduction of the pit vac as an intervention to improve conditions for Community Based Enterprise and pit emptiers.
- Urgent need to enhance onsite facilities for the adoption of machined tools in the emptying process.
- Overall objective is to improve the efficiency, safety, and satisfaction in the faecal sludge management process.

# Thank You



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