Wastewater management status in Malawi based on the city of Blantyre as a case study

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Presentation Outline

1. Introduction
2. Methodology
3. Objectives
4. Results and discussion
5. Conclusion
6. Recommendations

1.0 Introduction

What is wastewater?

- Domestic effluent consisting of excreta, urine, faecal sludge; kitchen and bathing used water.
- Used water from commercial establishments and institutions, e.g. hospitals.
- Industrial effluent, storm water and other urban run-off.
- Agricultural effluent, either dissolved or suspended matter (Corconan et al., 2010)

Introduction……

Policy, legal and institutional frameworks guide wastewater management in Malawi:

- Water Pollution Control Regulations (1978).
- National Water Policy (NWP, 2005) – roles of water utilities: to collect, transport, treat and dispose of or recycle and re-use wastewater and promote sanitation services (Part 9.3.3)
- National Sanitation Policy (NSP, 2008) – need for delivery of improved sanitation services in Malawi.

Introduction….

- Water Works Act (1995) - Water Boards may operate sewage system (Part IV,26a)
- Water Resources Act (2013) – prevention and control of water pollution (Part VIII)
- Environmental Management Act (2017) sets standards for effluent discharge into water (38a-b)
- Institutions: Environmental Management Authority (EMA), Malawi Bureau of Standards (MBS) and Department of Environmental Affairs (DEA) collaborate on compliance monitoring.

Introduction....

Previous research studies on wastewater:

- Effluent from WWTPs in the country is of poor quality and their capacity is small - only 23.5% for Blantyre (Chipofya, 2010).
- Untreated industrial effluent is discharged in Mudi, Limbe, Naperi rivers in the city of Blantyre (Kuyeli, 2007)
- Most of the studies concentrated on efficiencies of wastewater treatment plants (WWTPs)

2. Objectives

2.1 General Objective

To understand wastewater management status in Malawi based on Blantyre City as a case study.

2.2 Specific Objectives

- Explore how wastewater is managed in Blantyre City per residential land use category.
- Determine volume of wastewater released per residential land use.
- Assess pollution impact of wastewater treatment facilities in the city by testing BOD_5, COD, TSS, FCB, Pb, Cd and Cr in water from effluent receiving rivers in the city.

3.0 Methodology

3.1 Survey:

Table 3.1.1: Study areas in Blantyre City:

Id	Low density areas	Medium density areas	High density areas	Traditional housing areas (THAs)	Industrial Areas
a)	Nyambadwe	Chinyonga	Mbayani	Ndirande Goliyo	Makata
b)	Namiwawa	Soche East	Nkolokoti	Chilomoni Mthukwa	Ginnery Corner
c)	Sunnyside	Namiyango	Nancholi	Manje	Chirimba
d)	BCA	Manja	Misesa	Chilobwe	Maselema

Methodology…

- Sample size (number of questionnaires), n, estimated using

  Taro Yamane's formula:

$$n = \frac{N}{1+N(e)^2}$$

- Generated dry weather domestic wastewater:

$$Q_{ww} = 10^{-3}kqP$$

Methodology…

3.2 Laboratory experiments

Four water samples were collected from a point upstream and downstream of a WWTP in the following rivers:

- Mudi River
- Naperi River
- Limbe River
- Chirimba River

To test BOD_5, COD, TSS, FCB, Pb, Cd and Cr .

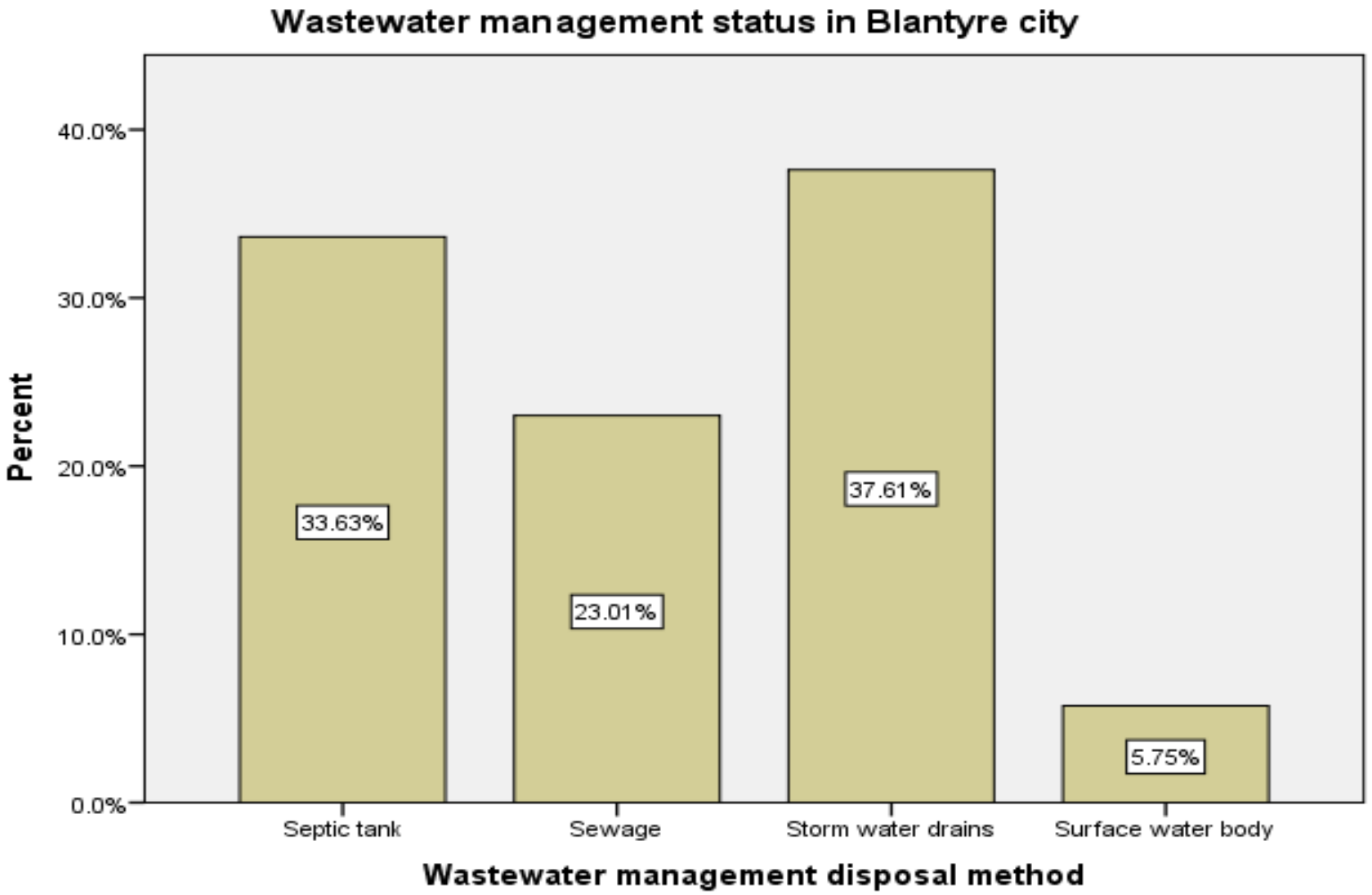
4.0 Results and discussion

4.1 Wastewater management status in the city:

Table 4.1.1: Wastewater management status in city

Wastewater management aspect	Count N (How many times was aspect mentioned)	Column response % (Percentage based on answers)
Septic tank	76	33.6%
Sewage	52	23.0%
Storm water drains	85	37.6%
Water bodies	13	5.8%
Total	183	100.0%

Figure 1: Bar graph on wastewater management status in Blantyre City



4.2 Determining volume of wastewater released per residential land use category

Table 4.2.1 : Mean water consumption and wastewater generated per capita per residential land use

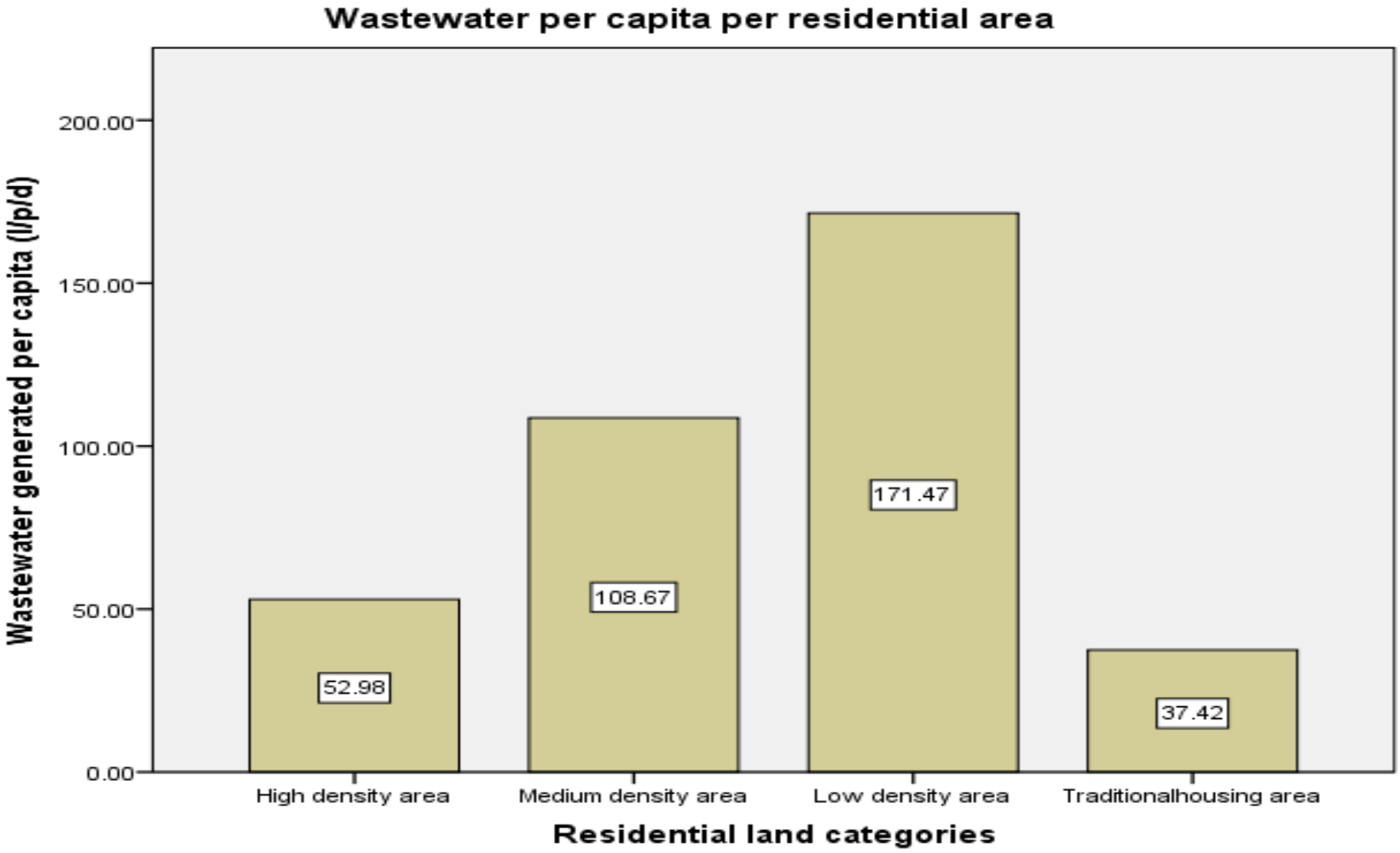
Residential land use type	Mean water consumption per person per day (litres)	Mean wastewater generated per person per day (litres)
High density	58.86	52.98
Medium density	120.75	108.67
Low density	190.52	171.47
Traditional housing area (THA)	41.58	37.42
Total	109.70	92.63

Determining volume of wastewater released per residential land use category….

Table 4.2.2: Volume of wastewater generated per day

Residential land use type	Mean wastewater released percapita (l/p/d)	Population percentage based on respondents (Column N %)	Projected 2018 population per residential land use	Domestic wastewater generated per residential type (m^3/day)
High density	52.98	25.4	273,212	14,475
Medium density	108.67	21.3	229,110	24,897
Low density	171.47	23.7	254,926	43,712
Traditional housing area	37.42	23.1	248,472	9,298
Other		6.5		
Total	92.60	100		92,382

Figure 2: Bar graph on wastewater generated per capita per residential land use



4.3 Laboratory tests results on water samples for BOD_5, COD, TSS, FCB, Pb, Cd and Cr.

- The laboratory test results for BOD_5, COD, TSS, FCB, Pb, Cd and Cr in the water samples from the four rivers under study were higher than WHO and MBS guiding limits.

- Laboratory test results for water samples from Mudi, Naperi, Limbe and Chirimba Rivers

5.0 Conclusion

- Wastewater management in Malawi is getting out of control despite having very good policies and legislation on prevention and control of water pollution.

- Surface water in the urban areas in Malawi is polluted with wastewater and remains a healthy hazard to users.

6.0 Recommendation

- Wastewater is a water source Government must promote water recycling and re-use.
- Enhance capacity of compliance monitoring institutions – that’s where problems are.
- Government must upgrade capacity of WWTPs in our cities.

End of presentation

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