

# **TREATMENT EFFICACY OF KAUMA WASTEWATER TREATMENT WORKS IN LILONGWE, MALAWI FOR POLLUTION CONTROL AND WASTEWATER REUSE**

**Principal Mdolo  
(NRC)**

# INTRODUCTION

Wastewater management is a challenge facing city authorities



Blantyre (Mdolo 2013)



Lilongwe (Mdolo 2017)



Mdolo 2014

Discharge of poor quality effluent causes pollution

Surface water is a source of domestic water supply and irrigation for low income communities

Discharge of poor quality effluent negatively impacts on their livelihoods

Climate change has increased the pressure on s/waters by reducing its quality and quantity

**Properly treated wastewater could be used for irrigation and other purposes**

This would reduce the pressure on fresh water resources

- This paper evaluated the performance of Kauma wastewater treatment works by determining the performance of the respective treatment units through assessment of physico-chemical characteristics of influent and effluent wastewater.
- This approach is important in determining the pollutant load in the next process



# METHODOLOGY

The system has 15 ponds as follow;

Pond system	No of ponds	Perimeter (m)	Depth (m)	DT (days)	BOD loading (g/m <sup>3</sup> )
Anaerobic	3	62 X 54	4	2.1	160
Facultative	4	105 X 144	1.5	16.7	192
Maturation	6	71 X 94	2	3	-
Septage	2	28.2 X 42.2	3	2	-

- Four sampling stations were identified
- One grab sample was collected in a 1 liter bottle
- Samples were analyzed for BOD<sub>5</sub>, COD and TSS using standard methods (APHA)
- A questionnaire was used to collect data on O & M activities
- MS Excel 2016 and SAS were used for statistical analysis

# RESULTS AND DISCUSSION

## Influent and effluent wastewater quality characteristics at Kauma

Treatment pond	BOD <sub>5</sub> (mg/L)	COD (mg/L)	TSS (mg/L)
Anaerobic pond influent	117	432	133
Anaerobic pond effluent	49	110	45
Facultative pond effluent	23	98	66
Maturation pond effluent	17	87	58

- Wastewater received at Kauma is of low strength with respect to BOD<sub>5</sub>
- It is of low to medium strength with respect to COD and TSS
- TSS increased in the facultative pond effluent

## Final effluent concentration of BOD<sub>5</sub>, COD and TSS compared against WHO and Malawi standards

Parameter	BOD <sub>5</sub>	COD	TSS
UQ	19	97	84
Median	15	67	58
LQ	13	39	21
<b>Mean</b>	<b>16</b>	<b>87</b>	<b>58</b>
CV	39	76	65
<b>MBS</b>	<b>20</b>	<b>60</b>	<b>30</b>
<b>WHO</b>	<b>20</b>	<b>60</b>	<b>30</b>

- COD and TSS of 75% of the data (UQ) was above the standard
- Discharge of such effluent can cause pollution in Lilongwe river
- High variability in effluent COD could be a result of mixing of the effluent of AP and SP

## Performance efficiency (%) of Kauma WWTP

Parameter/Treatment process	Anaerobic pond (%)	Facultative pond (%)	Maturation pond (%)
BOD <sub>5</sub>	52	47	2
COD	33	-77	
TSS	50	13	11

- The efficiency of anaerobic and facultative ponds in BOD<sub>5</sub> and TSS removal is lower than design (60% and 80%)
- Low efficiencies could be a result of the low strength influent wastewater
- Mixing of septage pond and anaerobic pond effluent could also impact on biological treatment in facultative ponds
- Further, low biodegradability index (0.3) signaled presence of inorganics in influent wastewater



# Operation and Maintenance Works at Kauma



- Inspection of the whole sewer line and cleaning of bar screens were adequately carried
- Grit chambers and distribution chambers were cleaned less frequently than desired
- Effluent discharge pipes were not cleaned at all
- Greasing of gate valves and movable weir spindle shafts was not done
- Monitoring of effluent quality was not done

Maintenance of pond embankments, cutting of grass on site, clearing roads and footpaths were done as required



- Desludging of anaerobic ponds was done once every two years
- Filling of a pond maintenance record sheet was not done
- Equipment and materials for O & M works were reported not working
- Lack of resources was reported as the main cause for not carrying out some O & M activities

# CONCLUSION/RECOMMENDATIONS

- Effluent discharged at Kauma is of poor quality
- The efficiency of the pond system is poor in removing pollutants
- The effluent can impact negatively on public health and the environment
- O & M works at Kauma are inadequate
- Therefore, further treatment is required to make the effluent reusable



**It is therefore recommended that;**

- All broken and blocked pipes be repaired
- Effluent quality be monitored regularly
- An O & M plan be developed and followed
- Records of all O & M activities be maintained

A training plan for staff be developed and implemented

