# POOR WASTE MANAGEMENT PRACTICES AS A MAJOR SOURCE OF WATER POLLUTION AND THREAT TO SUSTAINABLE DEVELOPMENT

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# The problem:
# "Water-borne diseases, infant mortality and loss of biodiversity"

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- South African surface water system under threat while aquatic ecosystem is destroyed
- Cause of water-borne diseases, mortality and Economic losses
- Poor disproportionately affected.
- Underlying causes of poor waste management on the environment not well understood

**Questions**

- How does poor waste management contributes to sustainable development?
- How does water pollution threatens human health and his ecosystem?
- Where are the sources of water pollution?
- What about control or interventions?

# Introduction – background

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- Globally diarrheal diseases claims more than 2195 lives in children below 5 years (WHO, 2012)
- This deaths are most prevalence in developing countries, South Africa in no exception
- 1 in 9 deaths is due to diarrheal diseases which is highly associated with poor sanitation, unsafe drinking water, poor hygiene and poor food safety practices
- For children living with HIV diarrhea is more deadly
- Water-borne related illnesses is the second cause of child mortality in the global rankings

# South African situation

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- Over the last 12 years diarrheal related mortality increased from being the 10 killer now to be the thirds killer in rankings
- This is highly associated with an ever increasing in consumption pattern and waste generation
- Over the past ten years waste generation has doubled while disposal sites are getting smaller
- Despite major efforts and improvements over the years more than 2.11 million people still lacks adequate access to clean portable water supply and 12 million people lacks access to proper sanitation (CSIR, 2005)
- Most of this people reside in informal settlements and rural areas

# Rational: why research on waste and water pollution?

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- Over the years there have been extensive change in demographics and urbanization
- Many lacks proper sanitation which put South African surface water system under threat of feacal contamination
- Forcing people to use contaminated water for recreational, irrigation and drinking
- Many informal settlements are sited on the periphery of surface water stream
- While in Johannesburg CBD the threat of contamination is through storm water drainages which discharge in to the stream (Juskei feeders)

# Methodology

- Minor survey was conducted in Betrams and Alexandra
- Survey was based on people's perception (80 participants)
- Followed by sampling at identified sampling points with the assistance of EHP'S from region F
- 6 sampling points were identified
- 3 samples per/month on each sampling points were collected over a period of three months
- Sampling kid included 500ml sterile bottle, latex gloves(collected from Joubert park clinic), ice pack, labels and a cooler box

# Methodology cont……..

- Sampling points were EC1 (e-goli gas work), UJ1(Upper Juskei: cnr 4th str. and 5th Ave.), UJ3 (along Bezuidenhout valley park), UJ5 (Bruma lake inlet), RPIN( Rhodes park dam inlet) and RPOUT (Rhodes park outlet)
- All samples were delivered to the lab after each sampling day (less than an hour after sampling)
- Samples were analyzed by Johannesburg water laboratory (sydna lab)
- For quality control: all samples were collected in the presence of a qualified Environmental Health Practitioner

# Sampling results

## e-coli count overall results over three months period

| Month | UJ 1 | UJ 3 | UJ 5 | RPIN | RPOUT | EC1 |
|---|---|---|---|---|---|---|
| June | 1 300 000 | 1200 | 140 000 | 120 | 2 500 | 63 |
| | 1 450 000 | 1548 | 198 000 | 140 | 3100 | 2 700 |
| | 1 290 000 | 1298 | 135000 | 170 | 1800 | 40 |
| Average | 1 346 667 | 1 349 | 157 667 | 143 | 2 467 | 934 |
| | **UJ 1( July)** | **UJ 3(July)** | **UJ 5(July)** | **RPIN(July)** | **RPOUT(July)** | **EC1(July)** |
| July | 1 652 000 | 1380 | 158 000 | 120 | 2 720 | 63 |
| | 1 820 000 | 1450 | 166 090 | 136 | 2640 | 68 |
| | 1 782 000 | 1587 | 145002 | 128 | 2540 | 55 |
| Average | 1 751 333 | 1 472 | 156 364 | 128 | 2 633 | 62 |
| | UJ 1 | UJ 3 | UJ 5 | RPIN | RPOUT | EC1 |
| August | 1 980 000 | 1350 | 168 000 | 120 | 2 900 | 2540 |
| | 1 820 000 | 1548 | 198 000 | 140 | 2870 | 2 700 |
| | 1 568 000 | 1298 | 175 000 | 170 | 2556 | 2450 |
| Average | **1 789 333** | **1 399** | **180 333** | **143** | **2 775** | **2 563** |

# Overall results

- Out of the six sampling points only one stream can be tolerable under the surface water quality standards
- However traces of coliform counts were found but they are minimum
- UJ1 reports the highest coliform count compared to the other sampling points
- Interesting observation on UJ1 (Reporting high values than UJ5) whereas UJ1 discharge in to UJ5
- June-August there was not much of rainfall the peaks might be influenced by high amount of concentrated e-coli in stagnant water

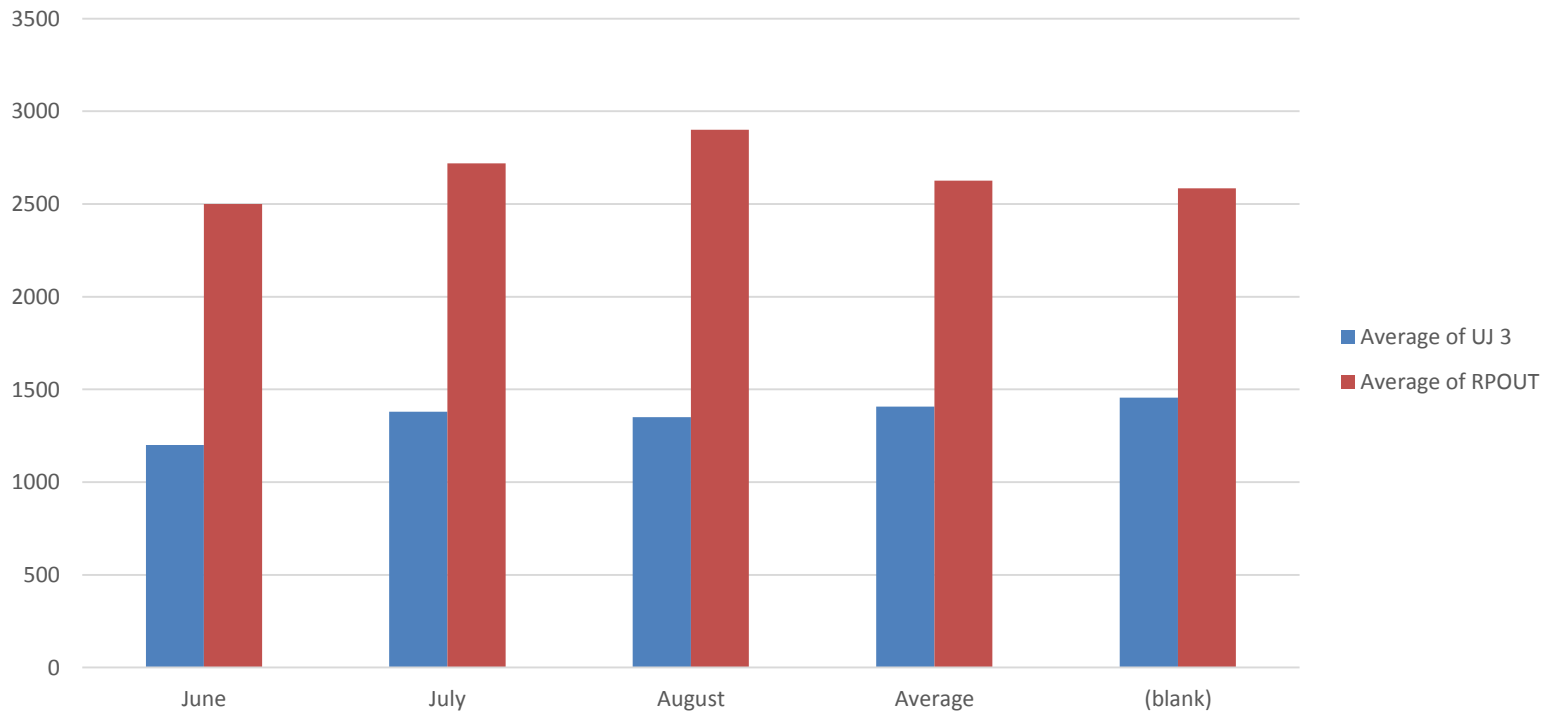
# Results cont'd (Rate of coliform count change)

| e-coli- UJ1 | | e-coli- UJ1 | | e-coli- UJ1 | |
|---|---|---|---|---|---|
| June vs | July | June vs August | | July vs August | |
| 1 300 000 | 1 652 000 | 1 300 000 | 1 980 000 | 1 652 000 | 1 980 000 |
| 1 450 000 | 1 820 000 | 1 450 000 | 1 820 000 | 1 820 000 | 1 820 000 |
| 1 290 000 | 1 782 000 | 1 290 000 | 1 568 000 | 1 782 000 | 1 568 000 |
| 1346667 | 1751333 | 1346667 | 1789333 | 1751333 | 1789333 |
| Ftest | 0.982778997 | | 0.313957427 | Ftest | 0.304948005 |
| Ttest | 0.005067 | Ttest | 0.027548 | 0.785001 | 0.785001 |
| **Sig @ 95%** | **Yes** | **Sig @ 95%** | **Yes** | **Sig @ 95%** | **No** |
| | | | | | |
| e-coli- UJ3 | | e-coli- UJ3 | | e-coli- UJ3 | |
| June | July | June vs August | | July vs August | |
| 1200 | 1380 | 1200 | 1350 | 1380 | 1350 |
| 1548 | 1450 | 1548 | 1548 | 1450 | 1548 |
| 1298 | 1587 | 1298 | 1298 | 1587 | 1298 |
| 1349 | 1472 | 1349 | 1399 | 1472 | 1399 |
| Ftest | 0.512216721 | | 0.701628945 | Ftest | 0.778325123 |
| Ttest | 0.361417 | Ttest | 0.717201 | 0.491746 | 0.491746 |
| **Sig @ 95%** | **No** | **Sig @ 95%** | **No** | **Sig @ 95%** | **No** |

# Results cont….(Rate of coliform count change)

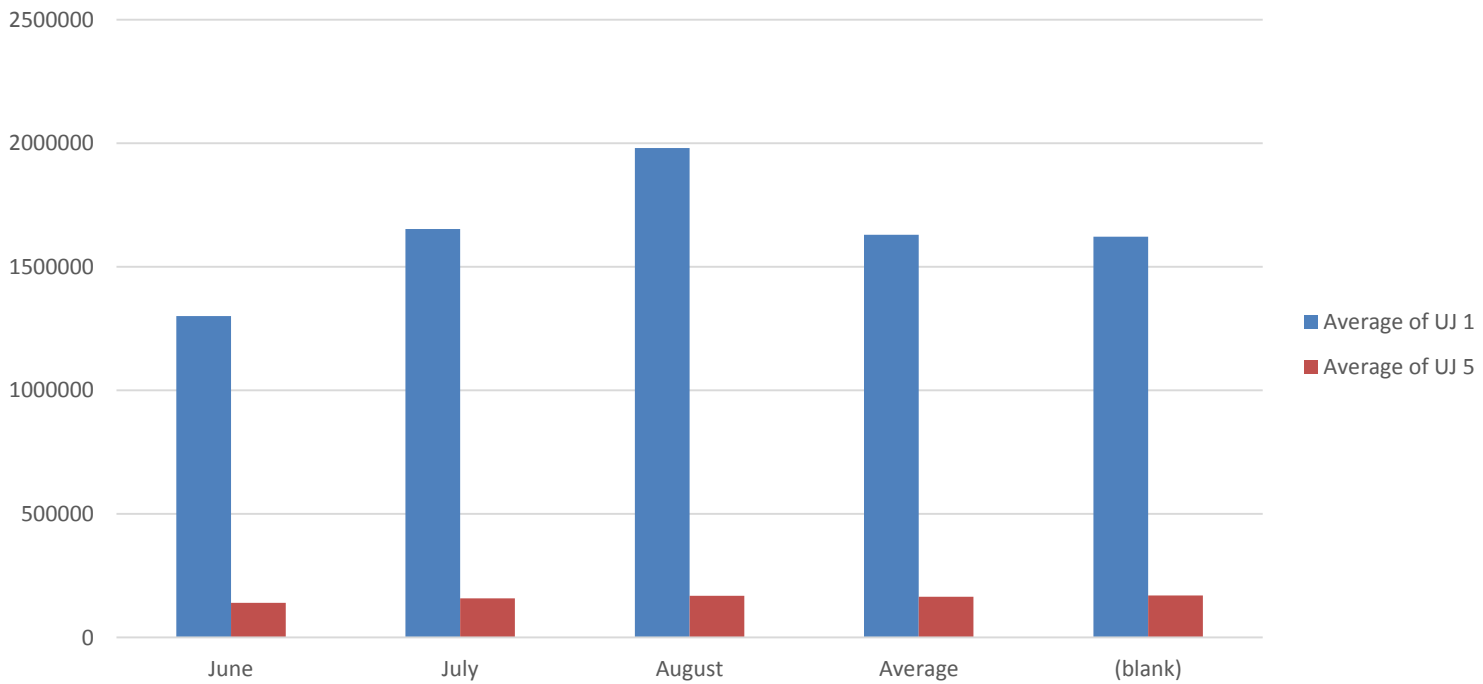
| e-coli- UJ5 | Column1 | e-coli- UJ52 | Column3 | e-coli- UJ54 | Column5 |
|---|---|---|---|---|---|
| June vs | July | June vs | august | July vs | august |
| 140 000 | 158 000 | 140 000 | 168 000 | 158 000 | 168 000 |
| 198 000 | 166 090 | 198 000 | 198 000 | 166 090 | 198 000 |
| 135000 | 145002 | 135000 | 175 000 | 145002 | 175 000 |
| 157667 | 156364 | 157667 | 180333 | 156364 | 180333 |
| F-test | 0.168991268 | | 0.334540516 | F-test | 0.629641552 |
| T-test | 0.953800 | Ttest | 0.364120 | 0.093738 | 0.093738 |
| **Sig @ 95%** | **No** | **Sig @ 95%** | **No** | **Sig @ 95%** | **No** |
| | | | | | |
| e-coli- RPOUT | | e-coli- RPOUT | | e-coli- RPOUT | |
| June vs | July | June vs | August | July vs | August |
| 2 500 | 2 720 | 2 500 | 2 900 | 2 720 | 2 900 |
| 3100 | 2640 | 3100 | 2870 | 2640 | 2870 |
| 1800 | 2540 | 1800 | 2556 | 2540 | 2556 |
| 2467 | 2633 | 2467 | 2775 | 2633 | 2775 |
| Ftest | 0.037700865 | | 0.157973365 | F-test | 0.366047586 |
| Ttest | 0.683016 | T-test | 0.474470 | 0.308135 | 0.308135 |
| **Sig @ 95%** | **No** | **Sig @ 95%** | **No** | **Sig @ 95%** | **No** |

# E-coli charts for RPOUT and UJ3




Both streams follow the same trend with RPOUT reporting High peak in August (concentrated e-coli in stagnant water) UJ3 reporting low concentration compared to RPOUT

# UJ1(UJ5 Feeder) and UJ5(Bruma lake inlet)




Interesting to note low e-coli on UJ5 but high value at upper Stream UJ1

This is factored by wetland: most of the feacal content were Absorbed by the wetland

# Recommendation

- A source based intensive investigation research is required
- Further annual water quality monitoring data is needed for constructive reporting
- Municipality to develop water quality monitoring program which will feed into national plan
- Further research on intervention based to be done

# Conclusion

- Based on the research finding the natural use of surface water in Juskei river is altered
- There is a high need to develop alternative strategies which will be incorporated with current interventions to prevent surface water pollution
- Unfortunately single approach intervention will not solve water pollution challenges but a need for multi-disciplinary approach is needed
- Educational campaign and intensive law enforcement needs to be strengthened
- Continuous engagement in research were all stakeholders are involved is much needed

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# Thank you

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