Reconsidering Urban Sewer and Treatment Facilities in East Africa as Interplay of Material Flows, Sanitary Networks and Space Demands

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TOWARDS SUSTAINABLE URBAN INFRASTRUCTURE

Introduction

- Traditional patterns of sanitary systems persist despite overt government sewer modernisation programmes.
- About 70% of East Africa city population live in informal/slum settlements beyond the reach of modern sewer networks
- Such settlements are considered traditional within the discourse of urban planning and modernisation
- Improved onsite sanitary systems, are not considered as integrated solutions in urban areas.

Sanitation situation in East African Cities

Sewerage Schemes Kenya	
Treatment capacity	%
Overloaded	40
Not operating	2.5
Below capacity	42

Coverage Kampala	
Sanitation Type	%
Sewers	6.5
Septic tanks	17.5
Unshared pit latrines	32
Shared pit latrines	38
Without	6

T4 technological paradigm shift is needed to meet wastewater treatment and excreta disposal standards

CONCEPTUAL FRAMEWORK

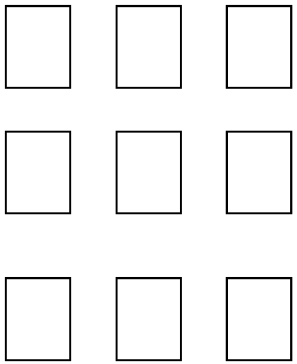
POLICY INSTRUMENTS

FLOWS

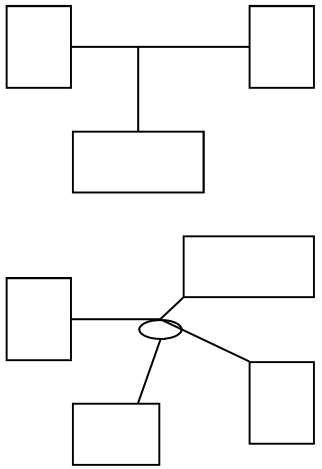
NETWORKS

SPACES

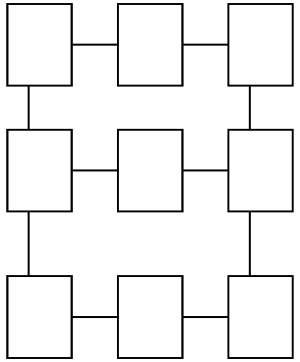
Sanitary Configurations



Latrine/Septic Tanks
- Night soil
- Exhauster services
- Fecal sludge treatment/disposal



Satellite sewers and block sanitation
- Treatment works within urban area
- Shallow sewers
- Minimum standards



Centralized sewer
- Treatment outside urban area
- Extensive pumping and siphons
- Standardized

Sanitary Flows Treatment in Kampala and Kisumu

Sewage Treatment Works	Treatment Concept	Free: PE_{40}	New Treat. Concept
Bugolobi CTW	PS-TF	0	PS-TF
Bugolobi East WSP	F-F	0	F-F
Kyambogo (UPK-IPE)	F-F	0	F-M
Kyambogo (UNISE)	M-M-M	614	F-F-M
Luzira Prison WSP	--	--	F-F-F-F
Naguru Pond WSP	--	--	--
Naalya Pond WSP	F-M-M-M	5,686	A-F-F-F
Namboole Stadium WSP	F-F-F	0	F-F-F
Ntinda WSP	F-M-M	1,700	F-F-M
Kisat CTW	PS-TF	0	PS-TF
Nyalenda WSP	F-F-F-M-M	9,500*	F-F-F-M-M

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TOWARDS SUSTAINABLE URBAN INFRASTRUCTURE DEVELOPMENT

Sub-Catchment	Type of System	Catchment Area [Ha]	[Ha]
KAMPALA			
High Level System			
High Level	**Gravity + Siphon**	**350**	
Kitante West	**Gravity + Siphon**	**250**	**1,265**
Kitante East	**Gravity + Siphon**	**240**	
	Gravity + Siphon	**425**	
Low Level System			
Low Level	**Pumping**	**395**	
Bugolobi	**Pumping**	**290**	**735**
	Pump + Siphon	**50**	
KISUMU			
High Level	**Gravity +Siphon**		
Low-Level System			
Sunset	**Pumping**		**390 Ha**
	Pumping		
	Pumping		
Eastern Sewage T. District			
High Level			**214 Ha**
Western Sewage			
Below Airport	**Onsite system**		**2600Ha**
Molasses plant	**Local sewers**		**--**

Sewers

- Central sewers dismal, Kisumu about 30% pop and 10% area coverage respectively

(i) High operation and maintenance costs

- Local (satellite) sewers in unsewered areas

(i) No operation major and maintenance problems

(ii) No pumping station + short sewer distance

- Onsite varied & widespread 70% city pop

(i) Septage to treatment site dismal

SIPHONS

Has 2-3 parallel pipes,

Duplicated and complicated junctions,

Difficult to attain self cleansing velocities

Have high tendency for blockages made worse by onsite septage leading to extreme solid concentrations in the network

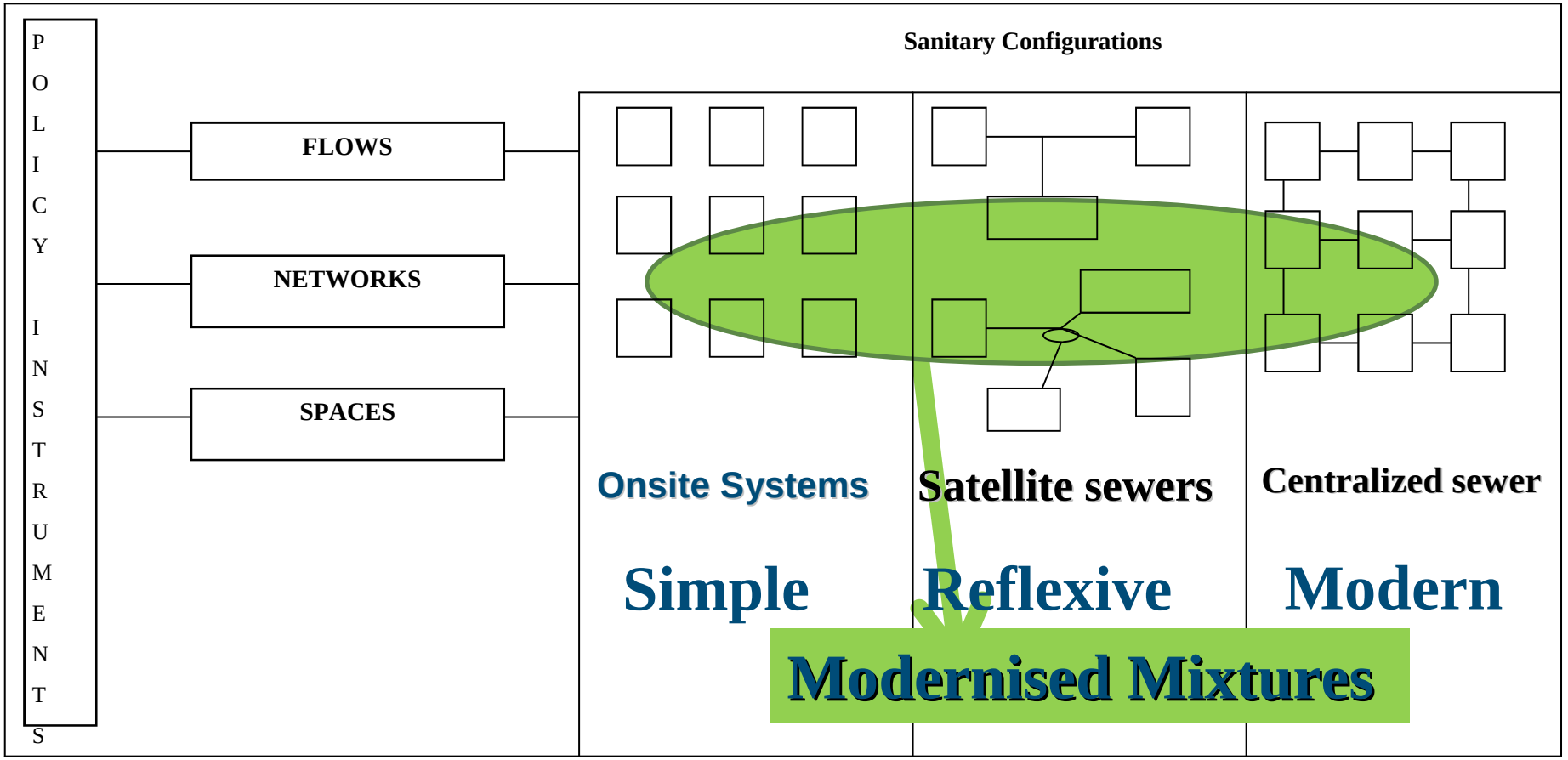
Difficult to maintain

PS Name	Sub-Catchment	Pump head	Average Down-time
Kampala		[m]	[%]
E. Bugolobi	E. Bugolobi	49.5	70
E. Bugolobi	E. Bugolobi	49.5	90
Kibira Road	Bugolobi	12.7	100
Kibira Road	Bugolobi	12.7	20
.Kibira Road	Bugolobi	12.7	20
Low Level	Low Level	12.0	25
Low Level	Low Level	12.0	90
Kisumu			Motor Kw
Mumias Road	Airport and Bandari	10	7.5
Kendu Lane	Railway Station	13	5.5
Sunset Hotel	Sunset/Nyanza	40	18.5

- Pumping Station has two pumps operated manually t4 not operated at night
- Pumps often malfunction with downtime ranging between 20-100%
- Pump failure takes long time before restored
- Electricity bills & fuel costs are huge
- Most pumping stations t4 not operated due to high costs, mechanical failures, high power tariffs & security concerns

Sanitary Space Shifts

- LUP designate sewerage land for sewerage schemes at edge/outside master area with generous buffer zones.
- Fail to designate decentralized fecal sludge treatment and/or disposal sites
- Puritan LUP challenged by satellite sewers
- Onsite systems challenged by small plot sizes or lack of it and high water table
- Shift of onsite systems to below the housing structures i.e. bio-digesters and septic tanks below bio-sanitation towers and blocks
- Decentralised systems buffer zones reduced below 50m


POLICY INSTRUMENTS
FLOWS
NETWORKS
SPACES
Sanitary Configurations
Onsite Systems
Satellite sewers
Centralized sewer
Simple
Reflexive
Modern
Modernised Mixtures

THANK YOU