



Framework for Sanitation system risk assessment and its application in Maputo, Mozambique

The Convening Power of Risk:
**A Community of Practice event on Urban
Sanitation and Sanitation Safety Planning**

15 October 2013

09:30 - 11:00

Jonathan Parkinson
Programme Manager
IWA Urban Sanitation Initiative



Project purpose and aims



Sustainable and resilient sanitation service chains in Maputo province, Mozambique

Action research and piloting for the benefit of the urban poor



Purpose : Contribute towards the development of long-term strategies to mitigate environmental health risks related to sanitation and promote the development of sustainable sanitation service delivery.

Aim : The project aims to develop a methodology to reduce vulnerability for urban populations from sanitation related hazards via the :

- development and application of risk-based systems analysis;
- identification of resilient sanitation technologies and development of strategies for their implementation;
- capacity development of stakeholders to collectively enhance sustainability of sanitation services.



Household domain – disease transmission related to toilet facilities, water supply and hygiene behaviour (WASH)

Public domain – disease transmission related to environmental sanitation (excreta and wastewater management, solid waste collection and drainage)



Disease transmission routes associated with sanitation



Disease transmission related to contamination of water supply systems, and water bodies used as sources of drinking water, other domestic, and recreational uses

Disease transmission related to 'wastewater' reuse leading to microbial contamination of the food cycle



Sanitation Safety Planning Manual

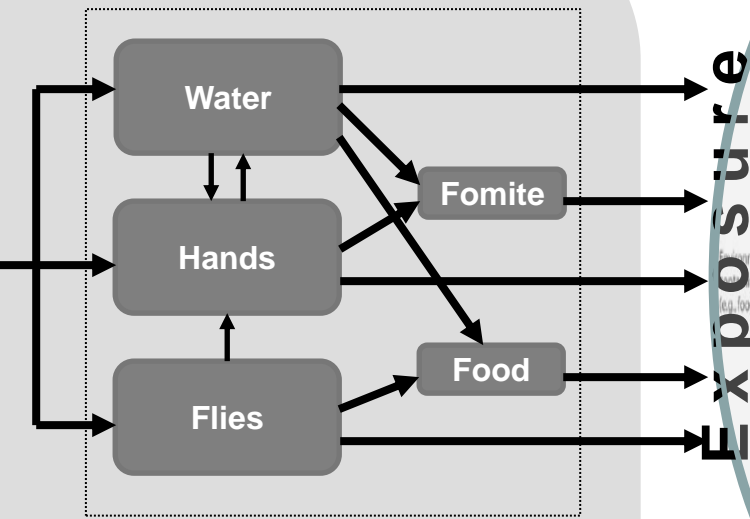
Step-by-step risk management for safe reuse and disposal of wastewater, greywater and excreta



Hazardous events

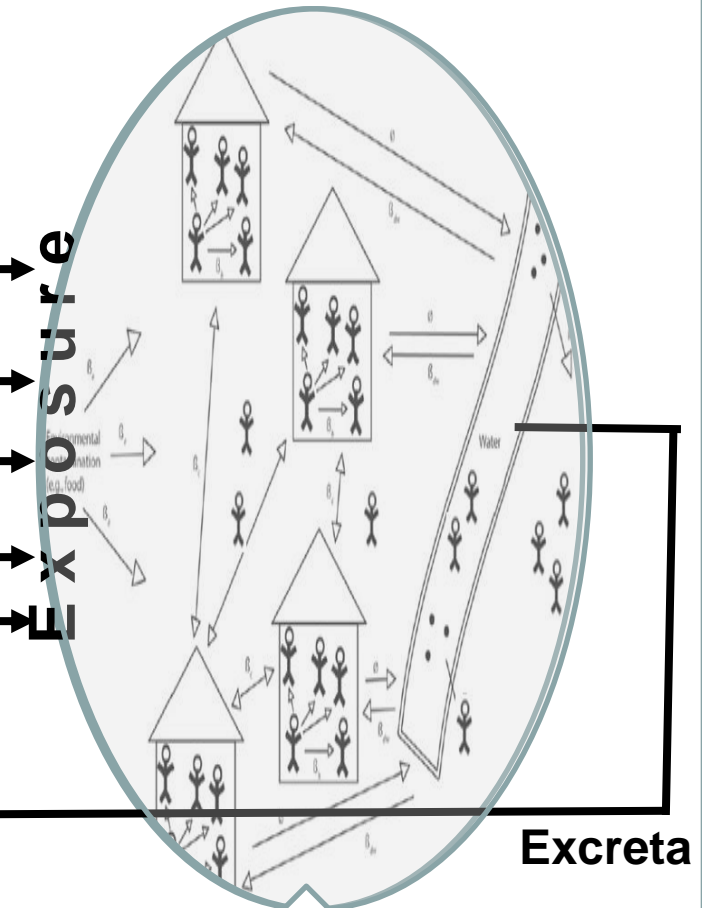


Transmission routes



Lack of adequate sanitation

Exacerbating factors
influencing frequency, intensity
and exposure to hazardous
events



Vulnerability
Relating to age, poverty and other
socio-economic exacerbating factors
that increase susceptibility to
disease and exacerbate the impacts
of illness

Triangular model of risk



Reference : Crichton, 1999

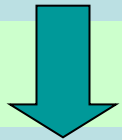


Overview of risk assessment process

Sanitation system assessment

Sanitation facilities and management arrangements

Operational performance / system failure



Environmental health hazards



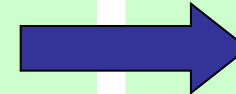
Impact assessment

Who is exposed to these hazards, how often and what are the consequences of exposure ?

Exposure assessment



Vulnerability assessment



Risk mitigation

Development of strategies for risk mitigation

Assess risk reduction strategies



Capacity building requirements



Principles of risk assessment methodology

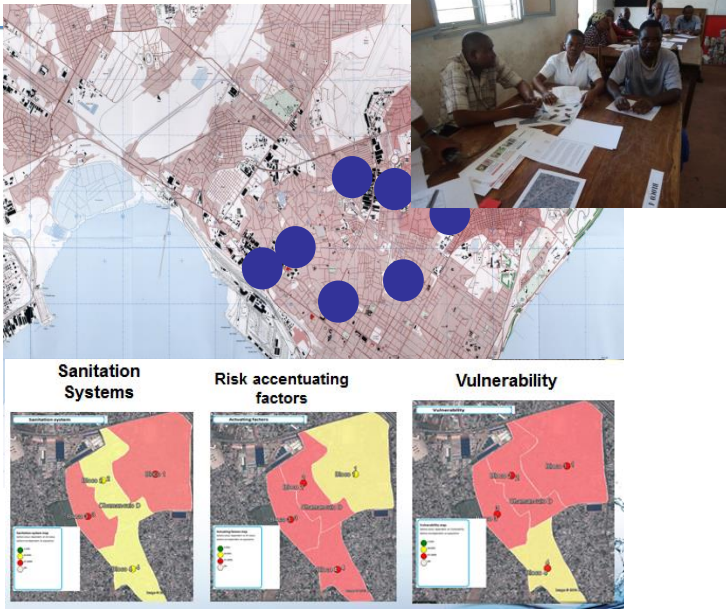


1. **Participatory** – to engage with stakeholders at different levels
2. **Simple** – to ensure that stakeholders understand the process
3. **Holistic** – to take into account the full sanitation service delivery chain
4. **Resource efficient** - to be independent on expensive equipment or specialist expertise
5. **Rapid** – to be applied at city-scale



Community level risk assessment

1



2

Municipal system risk assessment



3

Diagnosis of causes and proposed solutions for risk reduction

4

Municipal workshop to discuss institutional roles and responsibilities



Community level risk assessment



Community level risk assessment

Risk indicators

Sanitation systems: coverage and quality

Toilet/latrines
Desludging
Wastewater (Black and grey) disposal
Solid waste collection

X

Exacerbating factors

Water supply
Flooding
Hygiene (handwashing)
Flooring in housing
Groundwater level
Settlement density
Domestic livestock
Reuse

X

Vulnerability

Number of children per family.
Type of housing



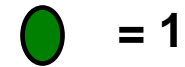
Community level risk assessment

Risk scoring – “Traffic light” system

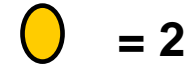
Risk score 1



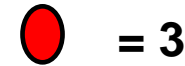
Risk score 2



= 1



= 2



= 3

Risk Score 3



Community level risk assessment

Community workshops to score indicators



	Block 1	Block 2	Block 3	Block 4
Sanitation	2.00	1.60	1.95	1.33
Exacerbating factors	2.31	2.03	2.13	1.94
Vulnerability	2.65	1.90	2.35	1.90
Overall	2.32	1.84	2.14	1.72

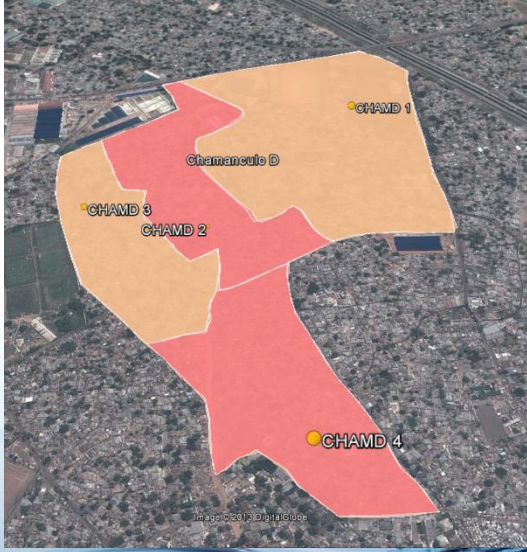
Sanitation Systems



Exacerbating Factors



Vulnerability



Municipal system risk assessment

Household domain – disease transmission related to toilet facilities, water supply and hygiene behaviour (WASH)



Disease transmission related to contamination of water supply systems, and water bodies used as sources of drinking water, other domestic, and recreational uses

Public domain – disease transmission related to environmental sanitation (excreta and wastewater management, solid waste collection and drainage)



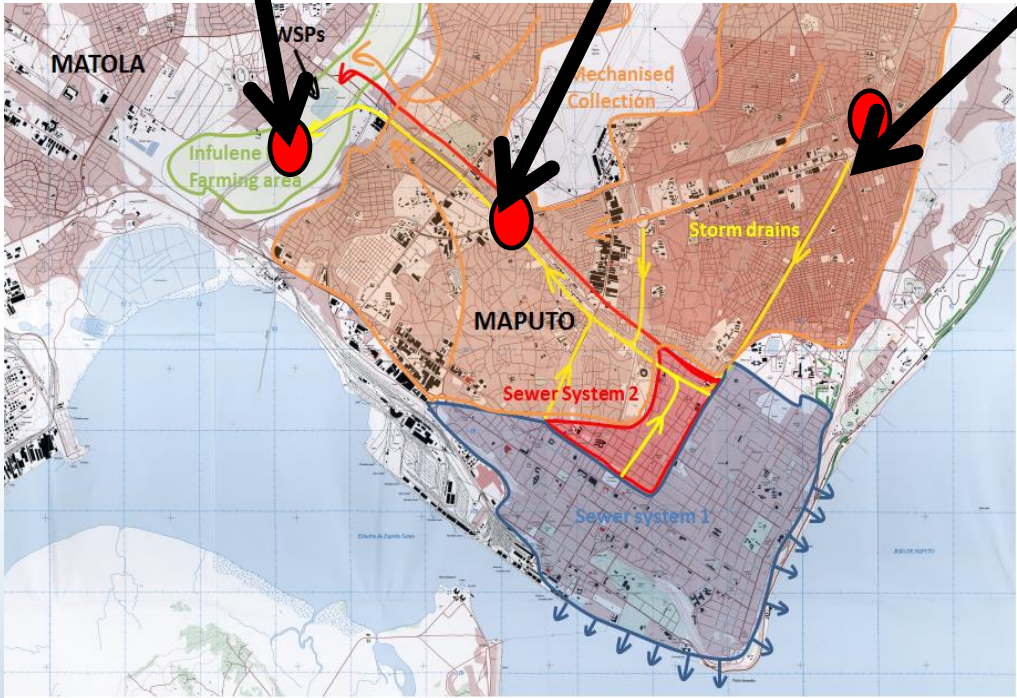
Disease transmission related to 'wastewater' reuse leading to microbial contamination of the food cycle

Disease transmission routes associated with sanitation



Municipal system risk assessment

Mapping of systems and hazards



	Transport	Treatment	Reuse
Vacutug	No risks	People entering ETAR	People downstream of ETAR Consumers of produce
Trucks	No risks	People entering ETAR	People downstream of ETAR Consumers of produce
SSI	Overflow Cross contamination	No treatment	No reuse
SS II	Storm water overflow Waste water overflow Cross contamination	People entering ETAR	People downstream of ETAR Consumers of produce

Municipal system risk assessment

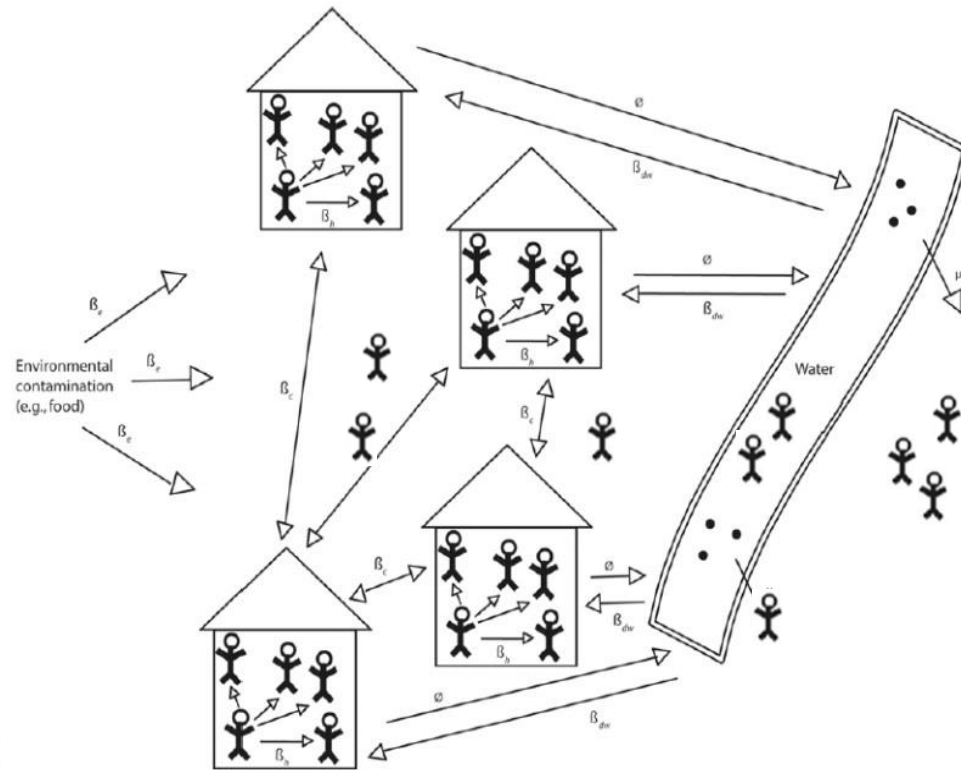
Exposure and vulnerability

Exposure =

No. of people
exposed to a
hazardous event

Frequency of
exposure

Type of exposure



Vulnerability
factors

(Social risk
exacerbators)

age,
poverty



Municipal system risk assessment

System diagnostic

System condition / performance				
Question	1	2	3	Score
Is solid waste accumulating into the system ?	No	A little	A lot	3
What is the maximize size of solid waste in the system ?	Plastic bags and wrappng	Small bottles	Large containers	3
Velocity of wastewater flow reaches self cleansing	Regularly	Infrequently		
Sewers are in poor structural condition and need replacing	No	Some		

Agg

Exacerbating factors				
Question	1	2	3	Score
Describe the system for maintenance	Proactive	Reactive	Non-existent	2
The maintenance team has what sort of equipment	Jetting	Mechanized rods	Manual rodding	2
How often can a problem not be solved by use of equipment ?	Rarely	Sometimes	Frequently	1
How often is lack of maintenance staff an issue ?	Rarely	Sometimes	Frequently	2
Are there increasing connections that are making the problems worse ?	No	In some cases	Yes	2
Is the maintenance team sufficiently trained ?	Yes	Enough	No	2

Total 11
Max 18

Aggregate d score	0.611
--------------------------	-------

Why is this methodology important ?



How does this work contribute to the body of existing knowledge ?

- Emphasizes the public health dimension of sanitation
- Provides a systematic and objective assessment of risk
- Highlights vulnerable communities who are most at risk

Who is it important to? Who will use this knowledge?

- Local authorities – policy and planning/prioritization
- Environmental health offices – regulatory function
- Utilities/service providers – improved service provision

