Improving Service Delivery and Protecting Public Health

Water Safety in Informal Settlements

Water Safety Conference 2012

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Water Supply and Sanitation Services in Kenya

• The need to ensure water safety in the informal settlements cannot be underscored in promotion of public health especially so with rapid urbanization which is currently at 3.2% in Kenya and 4.2% in Nairobi.
• Water safety essentially means provision of adequate quantities of water of adequate quality
• In Kenya, the recommended absolute minimum amount of water for consumption is 10 l/c/day
• Total population in Kenya is 38million. Of this, 30% has access water through pipes with Nairobi leading at 75.7%
• 7.7% of all Kenyan have access to main sewer with Nairobi leading at 47.7%. Septic tanks serve 3.4% and 9.7% for Kenya and Nairobi respectively. The rest of the populations are on-site sanitation

Water Safety in the informal settlements will causes;
• Good health
• Reduction in NRW
• Enhanced Environment

Water and sanitation access and affordability is a basic human need under the New Constitution.

Characteristics of IS

• While water of high quality is produced and distributed in Nairobi, there is high risk of contamination in these settlements due to
• poor sanitation,
• poor solid waste management
• poor drainage.

Other factors leading to poor quality water may be
• High and dense populations whose education levels are usually low.
• High levels of NRW – Non-revenue water
• Poor access
• Insecurity
• Unavailability of land for infrastructural development
• Rocky or black cotton soils
• Inadequate supply of water
• Illegal water connections

Hence disease outbreaks in these areas used to be frequent but recently have been more in control due to a multi-sectorial approach involving the Ministry of Water, Ministry of public Health and Sanitation, Ministry of Health and Ministry of housing.

Informal Settlements in Nairobi

• Out of a population of 3.5million, about 1.4 million live in the informal settlements.
• Nairobi has an area of 696km

2 while the area occupied by the settlements is 12km

2. The population densities are average 2000 persons per hectare.
• While there are 225,000 water account holders, only 4000 accounts are in the informal settlements.
• The company serves 90% of the residents with its water.
• NRW which has averaged 41% for the period 2005/6 – 2010/11. A lot of this is lost in the IS.
• The sewerage system serves about 40% of the population. Only 1% is sewered in the IS.
• In the informal settlements sanitation is provided basically through traditional pit latrines.
• There are some improved pit latrines and ablation blocks sewered and un-sewered.

Application of Water safety Plans (WSP) to the informal settlements

• WSP will go a long way to ensure safety of water in relation to public health.

• Sanitation in informal settlements offers a special challenge especially in the dense populations and institutional set-up

| Potential/Existing Hazard Event | Associated hazard and issues to consider | Hazard Likelihood of occurrence Biologi cal Severe R favability of Ris kar 5 4 20 VH | Biolog ical 5 4 20 VH | Ris kar 5 4 20 VH |
|---------------------------------|------------------------------------------|------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Poor Sanitation 1. Open defecation and flying toilets | Contaminat ion of water in the pipelines and in boreholes near the settlements | 5 4 20 VH | 5 4 20 VH |
| 2. Overflowing traditional pit latrines | | | 2 8 M |
| 3. Overflowing bio- toilets | | | 2 8 M |
| 4. Poor soil conditions – poor absorbency of wastewater | | | 2 8 M |
| Poor solid waste management | | | 2 8 M |
| Open drainage systems | | | 2 8 M |
| Water rationing | | | 2 8 M |
| Pumping of water from the mains | | | 2 8 M |
| Overflowing trunk sewers and storm drains | | | 2 8 M |
### Potential/Existing Hazard Event | Associated Hazard and Issues to consider | Hazard Likelihood | Likelihood of occurrence | Severity | Risk Score | Risk Rating | Basis
--- | --- | --- | --- | --- | --- | --- | ---
Inadequate supply of water 1. Distance to water point is too far | | Biological, Chemical, Physical | 2 4 8 M | Potential for use of unsafe sources and unhygienic practices | | | Inadequate consumption and use of water leading to unhygienic practices and use of unsafe sources
2. Water rationing | Biological, Chemical | 4 2 8 M | | | | No existing
3. Lack of storages | Biological, Chemical, Physical | 4 3 12 VH | | | | Existing
4. lot of water leaks | Biological, Chemical, Physical | 4 4 16 VH | | | | No existing
5. Illegal water closures by competing gangs operating water kiosks | Biological, Chemical, Physical | 4 4 16 VH | | | | No existing
High cost of water 1. Utility cost | Biological, Chemical, Physical | 1 4 4 L | | | | No existing
2.inkle cost | Biological, Chemical, Physical | 3 4 12 M | | | | No existing
Inability to pay for water – poverty | Biological, Chemical, Physical | 2 5 10 H | | | | No existing

### Potential/Existing Hazard Event | Associated Hazard and Issues to consider | Hazard Likelihood | Likelihood of occurrence | Severity | Risk Score | Risk Rating | Basis
--- | --- | --- | --- | --- | --- | --- | ---
Illegal connections | | Low | 5 2 10 H | Potential for illegal connections | | | Potentially leads to theft of pipes and appurtenances
Poor pipe materials | | High | 5 3 15 H | Potential for quality material for pipes | | | Potentially leads to water leaks
Poor reporting and communication | | Medium | 5 4 20 VH | Potential for poor reporting and communication | | | Potentially leads to lack of maintenance and operation of pipes
Lack of access and way leaves for O&M | Biological, Chemical, Physical, Social | 5 4 20 VH | | | | No existing
Uncertainty and poor revenue collection | Biological, Chemical, Physical, Social | 5 2 10 H | | | | No existing
Construction of shelters on water pipelines | Biological, Chemical, Physical, Social | 2 4 8 M | | | | No existing
Hazardous supply of water | Biological, Chemical, Physical, Social | 2 4 8 M | | | | No existing
Presence of gangs and cartels | Biological, Chemical, Physical, Social | 2 4 8 M | | | | No existing
High cost of laying water pipelines | Biological, Chemical, Physical, Social | 5 3 15 H | | | | No existing
High cost of water connection by Utility | Biological, Chemical, Physical, Social | 3 4 12 H | | | | No existing

### Potential/Existing Hazard Event | Associated Hazard and Issues to consider | Hazard Likelihood | Likelihood of occurrence | Severity | Risk Score | Risk Rating | Basis
--- | --- | --- | --- | --- | --- | --- | ---
Low ownership of services leading to theft of pipes and appurtenances | Biological, Chemical, Physical, Social | 5 4 20 VH | Potential for no service in the community | | | Potential for theft of pipes and appurtenances
Illegal reconnections of water by gangs | Biological, Chemical, Physical, Social | 5 2 10 H | Potential for illegal reconnections of water by gangs | | | Potentially leads to illegal reconnections of water by gangs
No particular government ministry charged with the standardisation, planning, implementation, operation and maintenance of decentralised and low cost sanitation services | Biological, Chemical, Physical, Social | 4 4 16 VH | Potential for no particular government ministry charged with the standardisation, planning, implementation, operation and maintenance of decentralised and low cost sanitation services | | | Potentially leads to no particular government ministry charged with the standardisation, planning, implementation, operation and maintenance of decentralised and low cost sanitation services
Uncoordinated implementation of project by the various stakeholders | Biological, Chemical, Physical, Social | 4 2 8 M | Potential for uncoordinated implementation of project by the various stakeholders | | | Potentially leads to uncoordinated implementation of project by the various stakeholders
Lack of institutional planning of services | Biological, Chemical, Physical, Social | 3 4 12 M | Potential for lack of institutional planning of services | | | Potentially leads to lack of institutional planning of services

### Risk Assessment and control measures

### Potential/Existing Hazard Event | Associated Hazard and Issues to consider | Hazard Likelihood | Likelihood of occurrence | Severity | Risk Score | Risk Rating | Basis
--- | --- | --- | --- | --- | --- | --- | ---
Poor solid waste management | Biological, Chemical, Physical, Social | 4 4 16 M | Community waste collection systems | | | Low with continued community systems
Open drainage systems | Biological, Chemical, Physical, Social | 5 4 10 H | Community Cleaned drainage systems | | | Medium
Overflowing trunk sewers and storm drains | Biological, Chemical, Physical, Social | 4 4 16 VH | Community Cleaned drainage systems Most of the trunk sewers have been decommissioned and rehabilitated | | | Medium
Construction of shelters on waterlines serving lines leading to poor O&M | Biological, Chemical, Physical, Social | 4 3 12 H | A committee has been formed under the provincial administration to deal with this | | | Progress in the informal settlements has been very slow

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**Notes:**
- The table above categorizes potential and existing hazards, their likelihood, impact, and associated issues.
- **Risk Assessment and control measures** section outlines control measures and their effectiveness in managing risks.
- **Basis** column indicates the basis for the risk assessment.

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**Risk Assessment and control measures**

- **Poor solid waste management**
  - **Control measure:** Community waste collection systems
  - **Risk rating:** Low with continued community systems

- **Open drainage systems**
  - **Control measure:** Community Cleaned drainage systems
  - **Risk rating:** Medium since the slum once more when there is no routine preventive maintenance

- **Overflowing trunk sewers and storm drains**
  - **Control measure:** Community Cleaned drainage systems
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- **Construction of shelters on waterlines serving lines leading to poor O&M**
  - **Control measure:** A committee has been formed under the provincial administration to deal with this
  - **Risk rating:** Progress in the informal settlements has been very slow

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**3-12-2012**

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**2**
### Inadequate supply of water due to:

<table>
<thead>
<tr>
<th>Hazard Event</th>
<th>Likelihood</th>
<th>Impact</th>
<th>Control Measure</th>
<th>Validation of Control Measure</th>
<th>Reassessment of risk post-control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kiosk cost</td>
<td>4 4 12</td>
<td>H</td>
<td>Many water kiosks have been constructed to increase supply</td>
<td>Prices are relatively lower</td>
<td>High in some areas that do not have adequate supply</td>
</tr>
<tr>
<td>2. Water rationing</td>
<td>4 4 16</td>
<td>VH</td>
<td>Water tanks have been issued to communities</td>
<td>Medium since there are more water tanks available</td>
<td>Low as the water tariffs for informal settlements are very low.</td>
</tr>
<tr>
<td>3. Inadequate planning</td>
<td>4 4 16</td>
<td>VH</td>
<td>The constitution of the district has not been adjusted to the rate of urbanisation</td>
<td>Medium since infrastructure is still very high. Urbanisation in Nairobi is very high.</td>
<td></td>
</tr>
</tbody>
</table>

### High cost of water due to:

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Utility cost</td>
<td>1 4 4</td>
<td>L</td>
<td>A socio-connection policy has been initiated by the GO. Infrastructure is constructed through the public utilities to reduce costs.</td>
<td>Low in some areas that do not have adequate supply</td>
<td></td>
</tr>
<tr>
<td>2. High cost of water pipelines</td>
<td>3 4 12</td>
<td>H</td>
<td>Pipes have been purchased by the company and its partners to provide water to open for the area.</td>
<td>The progress has been good</td>
<td></td>
</tr>
</tbody>
</table>

### Preparation and existence of services

<table>
<thead>
<tr>
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### Control measure

<table>
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<th>Reassessment of risk post-control</th>
</tr>
</thead>
<tbody>
<tr>
<td>More water kiosks have been constructed in the last 4 years</td>
<td>Medium since infrastructure is still very high. Urbanisation in Nairobi is very high.</td>
<td></td>
</tr>
<tr>
<td>More water available for use</td>
<td>Medium since there are more water tanks available</td>
<td></td>
</tr>
<tr>
<td>There is relatively less theft of pipes and fittings</td>
<td>Medium since there are more water tanks available</td>
<td></td>
</tr>
<tr>
<td>More water is provided to the cartels</td>
<td>High as the need is still high</td>
<td></td>
</tr>
<tr>
<td>Better pipes</td>
<td>High as the need is still high</td>
<td></td>
</tr>
<tr>
<td>Better pipes are in place</td>
<td>High as a lot of work needs to be done in the water and communication area</td>
<td></td>
</tr>
<tr>
<td>Progress has been slow but sure</td>
<td>High as 40% of the population live in this settlements</td>
<td></td>
</tr>
<tr>
<td>The constitution states that water and sanitation are basic human rights. We are expecting that the necessary acts will be adjusted to adequately provide the service.</td>
<td>Medium as this is a critical step in success of provision of water and sanitation services</td>
<td></td>
</tr>
<tr>
<td>The progress has been slow but a lot of output is expected from this cooperation</td>
<td>Medium since the cooperation has been minimal</td>
<td></td>
</tr>
<tr>
<td>A department has been formed to deal with services in the informal settlements</td>
<td>Medium as the rate of development of water services in</td>
<td></td>
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</tbody>
</table>

### Potential/Existing Hazard Event

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<tr>
<td>1. Inadequate supply of water due to:</td>
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<tr>
<td>4. Inadequate supply of water due to:</td>
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<tr>
<td>5. High cost of water</td>
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<td></td>
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<tr>
<td>6. Preparation and existence of services</td>
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<td></td>
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</tr>
</tbody>
</table>

### Upgrade Plan

- **Objective:** The objective is to improve the water supply and sanitation services in the informal settlements.
- **Actions:**
  - Increase the number of water kiosks available in the area.
  - Implement water rationing to ensure sustainable water use.
  - Improve the planning and execution of water services in the informal settlements.
  - Enhance cooperation between government agencies and the informal settlements.
- **Expected Outcomes:**
  - Improved water supply and sanitation services.
  - Reduced economic losses due to water theft.
  - Increased public satisfaction with water services.

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**Risk Score Calculation:**

- **Likelihood:** 1 (High), 2 (Medium), 3 (Low)
- **Impact:** 1 (Critical), 2 (Severe), 3 (Moderate), 4 (Mild)
- **Risk Score:** Likelihood x Impact

**Risk Assessment:**

- **High Risk:** Likelihood 4, Impact 4
- **Medium Risk:** Likelihood 3, Impact 2
- **Low Risk:** Likelihood 1, Impact 1

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**Date:** 3-12-2012

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**Additional Notes:**

- The water authorities have been working with NGOs and local communities to improve water supply and sanitation services.
- There is a need for increased investment in water infrastructure to sustain the services.
- Community participation is crucial in the planning and execution of water services in the informal settlements.
<table>
<thead>
<tr>
<th>No</th>
<th>Action</th>
<th>Arising from</th>
<th>Identified specific Improvement Plan</th>
<th>Accountability Entities</th>
<th>Due</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce pollution from overflowing sewers</td>
<td>The areas seems to be very vulnerable to pollution due to the poor sanitation</td>
<td>Identify areas that specifically need to be monitored for water pollution and have a monitoring plan</td>
<td>SM and DAM</td>
<td>July</td>
<td>Continuous</td>
</tr>
<tr>
<td>2</td>
<td>Reduce pollution from poor sanitation</td>
<td>There is still evidence of open defecation as well as overflowing latrines</td>
<td>Construction of Sewered ablation blocks 1. Ventilated Improved Pit Latrines 2. Bio toilets 3. Public health education</td>
<td>NWCSC and its partners</td>
<td>Yearly</td>
<td>Continuous</td>
</tr>
<tr>
<td>3</td>
<td>Reduce pollution from overflowing sewers</td>
<td>There is evidence of pumps in the distribution system</td>
<td>Provision of tanks to the informal settlement</td>
<td>NWCSC and Partners</td>
<td>Yearly</td>
<td>Continuous</td>
</tr>
<tr>
<td>4</td>
<td>Reduce pollution from overflowing sewers</td>
<td>There is evidence of trunks running through the settlements</td>
<td>Have a plan for preventative maintenance of trunks sewers</td>
<td>NWCSC and Partners</td>
<td>Yearly</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

### Monitoring of Control Measures

- Identification of specific water kiosks for routine monitoring of water quality
- Infrastructure development
- Use of facilities
- Meter reading and revenue collection
- Monitoring of the implementation of the upgrade plan
- Others, etc.

The plan will be reviewed as the Total WSP of the Company is reviewed.

### Supporting programs

- Improvement of Sanitation
- Enhance joint research programs with the universities
- Benchmarking activities with international and local water service providers
- School programs – Hygiene management. Liaise with Ministry of Public Health
- Capacity building
Recommendations

• Entry through the upgrade plan for planned sectoral development with the development partners and other stakeholders

• Multi-sectoral approach is recommended with clear defined leadership

• A system of implementation, operations and maintenance with emphasis on preventive maintenance is recommended.

• WSP when part of this system will go a long way to bring effectiveness into these systems.
THANK YOU