Situation assessment of small scale water supply systems in the Dusheti and Marneuli districts of Georgia

Nana Gabriadze, Manana Juruli & Oliver Schmoll
Introduction

• Water resources, including groundwater, are the **main national wealth** of Georgia

• Due to **unequal distribution**, part of the population, especially in East Georgia, has a lack to access to the safe drinking water

• Water safety of **small scale supplies** and associated the negative health outcomes identified as a priority concern in Georgia
Background

• **Disparity** between urban and rural areas for water piped into premises:
  – 92% in urban areas
  – 51% in rural areas

• People **collect water** also from individual wells and from natural springs

• National **non-compliance** for bacteriological for 2009: 52%

• Little **routine monitoring** in rural areas
Water collection
Project objectives

• **Systematic baseline analysis** of situation of small scale water supplies in two exemplary districts - Dusheti and Marneuli
  – Problem sensitization on rural areas
  – Support to Protocol target setting in Georgia
  – Enforcement of water protection zones in rural areas
  – Introduction of water safety plans in the small scale water supply systems
  – Improving health of the local population by bettering water resource management

• **Rapid (one-off) assessment**
Project objectives

• Technical and financial support:
  – Federal Environment Agency (UBA), Germany
  – WHO Regional Office for Europe

• Project stages (2010-2012):
  – Preparatory stage
  – Field activities
  – Analytical work
  – Training workshops for local authorities
  – Outreach programme to the local population
Survey design

• Field work carried out during May and June 2011
• Survey included **water quality testing** and **sanitary inspections**
• **Total sample size** (260) based on resources available
• Population-based **proportional weighing**:
  – Total population Dusheti = 33,800 (= 21 %)  
    → 55 samples
  – Total population Marneuli = 126,300 (= 79 %)  
    → 205 samples
## Summary survey design

<table>
<thead>
<tr>
<th>Technologies covered in survey</th>
<th>Population covered in survey</th>
<th>Samples/inspections included in survey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>No.</strong></td>
<td><strong>%</strong></td>
</tr>
<tr>
<td>Borehole</td>
<td>26</td>
<td>20.6 %</td>
</tr>
<tr>
<td>Spring</td>
<td>23</td>
<td>18.3 %</td>
</tr>
<tr>
<td>Dug well</td>
<td>71</td>
<td>56.3 %</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
<td>4.8 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>126</strong></td>
<td><strong>100 %</strong></td>
</tr>
<tr>
<td>Microbiological parameters</td>
<td>Physico-chemical parameters</td>
<td>Organoleptic/appearance parameters</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Total coliforms</td>
<td>Nitrate ($\text{NO}_3^-$)</td>
<td>Turbidity</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>Ammonia ($\text{NH}_4^+$)</td>
<td>Temperature</td>
</tr>
<tr>
<td>Faecal streptococci</td>
<td>Iron (Fe)</td>
<td>Taste and odour</td>
</tr>
<tr>
<td></td>
<td>Fluoride (F)</td>
<td>Total dissolved solids (TDS)</td>
</tr>
<tr>
<td></td>
<td>Copper (Cu)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free chlorine residual</td>
<td></td>
</tr>
</tbody>
</table>
Sample collection
Sanitary inspections

• Major **sanitary risk factors** identified:
  – Cracks or breaks in the infrastructure
  – Old and leaking pipes (potential for secondary contamination)
  – Unsanitary conditions around the source
  – Latrines / sewers near to source
  – Animal access to source
Compliance with standard for total coliforms

Dusheti district
- Compliance: 32.7%
- Non-compliance: 67.3%

Marneuli district
- Compliance: 27.2%
- Non-compliance: 72.8%
Compliance with standard for *E. coli*

**Dusheti district**
- Compliance: 40.0%
- Non-compliance: 60.0%

**Marneuli district**
- Compliance: 31.5%
- Non-compliance: 68.5%
Distribution of free chlorine concentrations

![Bar chart showing distribution of free chlorine concentrations for Dusheti and Marneuli.](chart.png)
## Compliance levels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dusheti</th>
<th>Marneuli</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microbiological parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total coliforms</td>
<td>32.7 %</td>
<td>27.2 %</td>
</tr>
<tr>
<td>E. coli</td>
<td>40.0 %</td>
<td>31.5 %</td>
</tr>
<tr>
<td>Faecal streptococci</td>
<td>66.0 %</td>
<td>78.8 %</td>
</tr>
<tr>
<td><strong>Physico-chemical and organoleptic parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\text{NO}_3$, $\text{NH}_4$, Fe, Cu, F, Turbidity</td>
<td>100.0 %</td>
<td>100.0 %</td>
</tr>
<tr>
<td>Chlorine residuals</td>
<td>22.2 %</td>
<td>0.0 %</td>
</tr>
<tr>
<td>TDS</td>
<td>98.0 %</td>
<td>91.3 %</td>
</tr>
<tr>
<td><strong>Overall compliance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All parameters</td>
<td>26.0 %</td>
<td>20.1 %</td>
</tr>
</tbody>
</table>
## Comparative risk analysis

### Dusheti

<table>
<thead>
<tr>
<th>E. coli count (1/100 ml)</th>
<th>Sanitary inspection score (SIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-2</td>
</tr>
<tr>
<td>&gt;100</td>
<td>0</td>
</tr>
<tr>
<td>11-100</td>
<td>8</td>
</tr>
<tr>
<td>1-10</td>
<td>10</td>
</tr>
<tr>
<td>&lt;1</td>
<td>10</td>
</tr>
</tbody>
</table>

### Risk level

- **Low**
- **Intermediate**
- **High**
- **Very high**

### Priority action level

- **No action required**
- **Low action priority**
- **Higher action priority**
- **Urgent action required**

### Proportion of samples

- **20.0 %**
- **56.0 %**
- **24.0 %**
- **0.0 %**

---

27-28 May 2013, Tbilisi
## Comparative risk analysis

### Marneuli

<table>
<thead>
<tr>
<th>E. coli count (1/100 ml)</th>
<th>Sanitary inspection score (SIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-2</td>
</tr>
<tr>
<td>&gt;100</td>
<td>2</td>
</tr>
<tr>
<td>11-100</td>
<td>15</td>
</tr>
<tr>
<td>1-10</td>
<td>30</td>
</tr>
<tr>
<td>&lt;1</td>
<td>23</td>
</tr>
</tbody>
</table>

### Risk level

<table>
<thead>
<tr>
<th>Priority action level</th>
<th>Low</th>
<th>Intermediate</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of samples</td>
<td>12.5 %</td>
<td>47.3 %</td>
<td>37.5 %</td>
<td>2.7 %</td>
</tr>
</tbody>
</table>
Conclusions /1

- **Microbial contamination** is significant: high potential for faecal pollution
- **Chemical contamination** is currently not of concern
- **Low overall compliance** with the national standards (26.0 % in Dusheti and 20.1 % in Marneuli)
- **Disinfection** (i.e. chlorination) is absent or, where in place, practices are inadequate
Conclusions /2

• Significant number of **sanitary risk factors** compromise the provision of safe drinking-water

• Significant portion of investigated sites can be categorized as at “**high**” or “**very high**” risk, requiring “**urgent**” attention (40 % in Marneuli and 24 % Dusheti)

• Lack of **routine surveillance** on drinking water quality

• **Limited public awareness** on water hygiene and risk-factors for water-related diseases
Recommendations at national level

- Small-scale water supplies to be considered in national target setting
- Regulatory framework and an effective mechanism for ensuring the protection of water sources
- Promote application of the WSP approach
- Establishment of systematic and routine drinking-water quality surveillance
- Increase number, the knowledge and skills of specialists working in water supply system
- Improve communication to raise public awareness
Final project workshop
Ongoing work on helminths

• Strategic action plan for the elimination of soil-transmitted helminthes (STH) in children

• Country assessment by WHO expert mission (20-24 May 2013, Mr. Peter Steinmann and Ms Margriet Samwel)
Thank you for your attention!