Small Scale Water Supplies

Oliver Schmoll

Why focus on small supplies?

- **Backbone** of water supply in rural areas

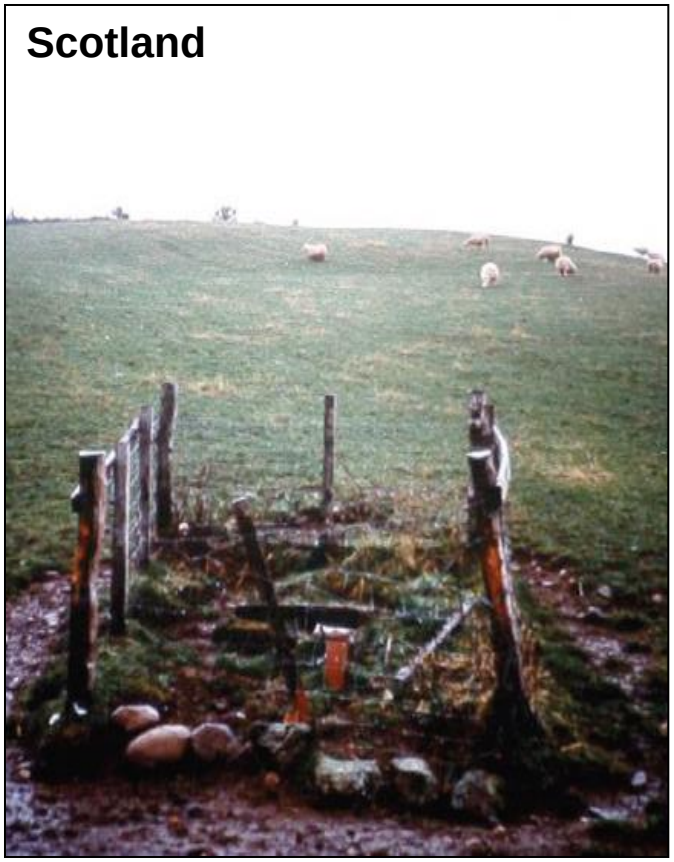
- Need for **decentralised solutions** for technical, economic and hygienic reasons:
  - Often not densely populated areas
  - Widely dispersed over large areas
  - Permanent residents and transient users

What is a “small scale water supply”?

- **Size** of the supply:
  - Widely varying classification schemes
  - Often derived from regulatory definitions
- Varying **organisational set-up**:
  - Community managed
  - Publicly or municipality managed
  - Regional water board associations
  - Privately owned and operated
- **Technical** specification:
  - Centralised vs. non-centralised

Different versions – publicly managed

Different versions – privately managed



Common features and challenges

- Differently or not **regulated**
- Limited technical, personal and financial **resources**
- Involvement of **untrained** and **part-time** staff
- Lack of sense of **responsibility**
- Inaccurate **perception** of water-related health risks
- Lack of access to "**support networks**"
- Poor **compliance**

Critical pollution risk issues

- **Zoonotic diseases**:
  Cattle breeding and wildlife
- Poor **manure** management
- Poor **sanitary** protection
- Inadequate **local sanitation** practices
- **Disrupted** infrastructures and lack of **electricity**

Rainfall: probability of failure rate

Type of source	Groundwater	1.000	9.09E-12
	Surface water	2.347	
	Spring	2.342	
Treatment	Treatment	1.000	3.77E-07
	No treatment	1.781	
Rain on day prior to sample (mm)	0	1.000	0.0016
	1-9	1.325	
	10-99	1.364	
	100-999	1.707	
	1000-9999	2.066	

Source: Hunter et al 2008

Lack of knowledge /1

- **Disease surveillance** in small communities:
  - Largely under-reported
  - Ad-hoc, response-based vs. systematic

- Limited routine and ongoing **water quality surveillance:**
  - Widespread areas
  - Limited manpower to advise, inspect and control
  - One sample per year at best

Lack of knowledge /2

- Little readily available **“hard” data**:
  - Information biased to urban areas
  - High degree of anecdotal evidence (NGO or project-based work)
  - Data often scattered between institutions
  - Outdated

Excurse to Georgia:

Rapid situation assessment

- Water safety of **small scale supplies** and associated health outcomes are of priority concern
- Little **routine monitoring** in rural areas
- **Systematic baseline analysis** in two exemplary districts in 2011 and 2012

Excurse to Georgia:

Summary survey design

Technologies covered in survey			Population covered in survey		Samples/inspections included in survey	
Type	No.	Fraction	No.	Fraction	Location	No.
Borehole	26	21 %	39,000	66 %	Source	122
Spring	23	18 %	10,837	18 %	Storage reservoir	33
Dug well	71	56 %	2,770	5 %	Distribution system	79
Unknown	6	5 %	6,910	12 %	Household container	26
Total	**126**	**100 %**	**59,517**	**100 %**	**Total**	**260**

Excurse to Georgia:

Parameters and sampling

Microbial	Physico-chemical	Organoleptic
Total coliforms	Nitrate (NO_3^-)	Turbidity
Escherichia coli	Ammonia (NH_4^+)	Temperature
Faecal streptococci	Iron (Fe)	Taste and odour
	Fluoride (F)	Total dissolved solids (TDS)
	Copper (Cu)	
	pH	
	Free chlorine residual	

Excurse to Georgia:

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

Excurse to Georgia:

Compliance with standard for *E. coli*

Dusheti district

Marneuli district

Excurse to Georgia:

Compliance levels

Parameter	Dusheti	Marneuli
Microbiological		
Total coliforms	33 %	27 %
Escherichia coli	40 %	32 %
Faecal streptococci	66 %	79 %
Physico-chemical and organoleptic		
NO_3, NH_4, Fe, Cu, F, turbidity	100 %	100 %
Chlorine residuals	22 %	0 %
TDS	98 %	91 %
Overall compliance		
All parameters	26 %	20 %

Excurse to Georgia:

Comparative risk analysis for Marneuli

E. coli count (1/100 ml)	Sanitary inspection score			
	0-2	3-5	6-8	9-10
>100	2	2	1	0
11-100	15	34	8	0
1-10	30	25	9	0
<1	23	32	3	0

Risk level	Low	Intermediate	High	Very high
Priority action level	No action required	Low action priority	Higher action priority	Urgent action required
Proportion	13 %	47 %	38 %	3 %

Excurse to Georgia:

Conclusions

- **Microbial** contamination is significant, **chemical** contamination is currently not of concern
- **Low overall compliance** with the national standards
- **Disinfection** is absent or, where in place, inadequate
- Significant number of **sanitary risk factors**
- Lack of **routine ongoing surveillance**
- **Limited public awareness** on water hygiene

Is it worth to improve?

- Positive **cost-benefit ratio** for reduction of acute diarrhoeal illness likely to be prevented by interventions
  - Costs of legislation and investment in improvement interventions
  - Direct cost of illness (e.g. health care)
  - Indirect cost of illness (e.g. loss of work, loss of schooling)

Subregion	Cost-Benefit-Ratio		
	Mean	L95%CI	U95%CI
Eur-A	2.52	0.78	5.88
Eur-B	21.34	6.64	49.89
Eur-C	3.91	1.22	9.14

Source: Hunter et al 2008

Needs for improvement /1

- Strengthen national **evidence base** for informed decision making
- Targeted **rapid assessments** of drinking water quality
- Develop guidance for establishing **“intelligent” surveillance** strategies:
  - Ongoing drinking-water quality surveillance
  - Disease surveillance
  - Local outbreak detection and response approaches

Needs for improvement /2

- Create **enabling environment**:
  - Resource centers
  - Ongoing capacity building
  - Access to easy-to-understand guidance
  - Partnership arrangements

- Scale-up WHO "**Water Safety Plan**" approach:
  - Viable and applicable in small supplies
  - Develop "demonstration" projects

Awareness raising document

- What are small-scale water supplies?
- Why are they important?
- What are the challenges?
- What is the evidence?
- What are the cost and benefits of interventions?
- How can Water Safety Plans support improvement?
- How can an enabling environment be created?
- Networking and resource materials

What can be done under the Protocol?

- **Target setting**:
  - Regulatory requirements established?
  - Requirements enforced?
  - Water quality status known?
  - Risk factors known?
  - Operators trained?
  - Access to information and guidance provided?
  - Surveillance mechanisms adequately established?
  - …

Programme of work 2014-2016

- Development of **best practice policy guidance**
- Sensitisation and **capacity building**
- Improvement of **evidence base:**
  - Analysis of regional questionnaire
  - Support to national rapid assessments
- Scale-up of **WSP uptake**:
  - WSP field guidance
  - Training of WSP facilitators
  - Demonstration projects

Upcoming event

- Meeting of the WHO *Small Community Water Supply Management Network* on 26–27 June 2014 in Bishkek, Kyrgyzstan
  - Sanitary inspections of small supplies
  - Risk assessment tools
  - Field testing of water quality
  - WSPs for small community supplies
  - WHO guidelines (volume 3) on small community supplies
  - Policy goals versus practical realities faced by small community water supplies

Thank you

Source: Rod Shaw