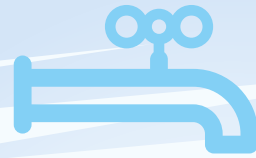


Improving drinking-water supply in rural areas of Serbia



From advancing the evidence base towards informed policy-making

Access to safe and sustainable drinking-water and sanitation services is vital for a healthy and dignified life. People living in rural areas are typically reliant on small-scale water supply and sanitation systems. They have the right to the same level of health protection as others, but often receive lower levels of service and are thus more vulnerable to environmental health risks.

Protocol on Water and Health: a tool for national target setting and action planning for improved rural water supply

The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes is a legally binding instrument originating from the European Environment and Health Process. The Protocol presents an effective policy instrument to support countries in pursuing their national water, sanitation and health agendas. The Republic of Serbia ratified the Protocol in 2013, and in 2015 set national targets which aim at achieving or maintaining a high level of protection against water-related disease (1).

Implementation of the Protocol in Serbia started with a systematic baseline analysis of the prevailing water, sanitation and health situation in the country (2). The process specifically included an in-depth analysis of the water supply situation in rural areas in which 40% of the Serbian population lives (3). This analysis revealed significant knowledge gaps that hamper not only comprehensive understanding and systematic assessment of rural water supplies and sanitation, but also effective planning and implementation of improvement measures at national and local levels. Furthermore, Serbia's participation in the UN-Water Global Analysis and Assessment of Sanitation and Drinking-water (GLAAS) 2014 reporting cycle indicated the existence of urban and rural disparities in the provision of water, sanitation and hygiene services due to lack of specific plans to sustain rural water supply services, regular surveillance, human resource strategies and financing (4).

To close the identified knowledge gaps, improve the evidence base on rural water supply and enable informed decision-making, Serbia's national targets set under the Protocol include a specific target on undertaking a systematic assessment of the prevailing conditions in rural water supplies.

Prioritizing rural water supply and sanitation in national target setting under the Protocol fully aligns with the targets of the Sustainable Development Goals (SDGs), particularly SDG 3.3 to combat waterborne diseases; SDG 3.9 to reduce the number of deaths and illnesses from water contamination; and SDG 6.1 to achieve universal and equitable access to safe and affordable drinking-water for all (5). The Serbian Protocol targets also support the objectives and priorities of the European health policy framework, Health 2020 – ensuring that all people have access to safe and sustainable water and sanitation services forms the basis for reducing health inequalities and creating resilient communities and supportive environments (6).

Why focus on small-scale water supplies in rural areas of Serbia?

Small-scale systems in rural areas of Serbia face a wide range of challenges to the provision of safe and sustainable drinking-water supply services. Registered water-related outbreaks in the past decade were mostly attributed to small-scale water supplies, indicating that these systems represent a potential health risk. Contributory factors include:

- lack of information on precise numbers and coverage of small-scale systems;
- weak enforcement and/or inadequate coverage of drinking-water quality surveillance resulting in a lack of data on water quality and prevailing sanitary conditions, including individual supplies (private wells);
- absence of a legal entity and/or unknown or unresolved ownership of the facilities leading to lack of responsibility for management, maintenance and monitoring of facilities;
- insufficient and/or irregular water treatment and disinfection;
- lack of necessary technical approvals and sanitary protection zones;
- outdated and disrupted infrastructures, poor construction and maintenance, leading to unsatisfactory sanitary conditions;
- dual water supply in some households (i.e. parallel connections to a piped system and an individual supply) and illegal connections which increase the risk of water contamination; and
- drinking-water shortages in periods of drought.

Why undertake a systematic situation assessment? What were the main findings?

A national-level systematic survey was undertaken to gain better insight on how the aforementioned particularities and challenges of small-scale systems may affect the quality of drinking-water supplied to rural populations. The objectives, scope and main findings of the survey are summarized in Boxes 1–5.

Box 1. What were the objectives of the survey?

- To undertake a systematic assessment of the situation of small-scale water supplies in rural areas of Serbia.
- To establish a baseline analysis of drinking-water quality and the prevailing sanitary conditions of small-scale water supply systems.
- To inform programming of improvement interventions and further policy development in the water and health domain.

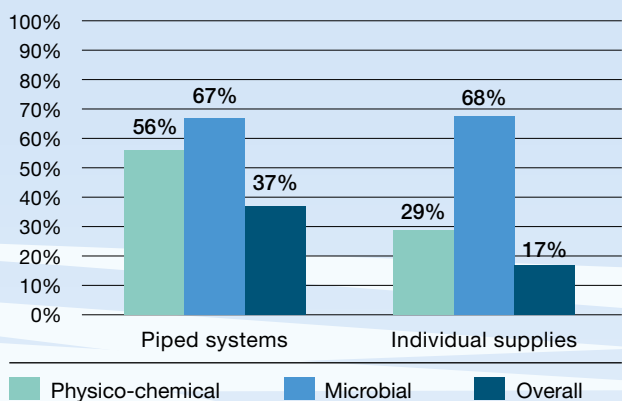
Box 2. How was the survey conducted?

- National and regional public health institutes carried out the national survey in rural areas of Serbia in 2016.
- Based on a rapid assessment methodology developed by WHO (7), the survey provides a statistically representative snapshot of the prevailing conditions of rural water supply in Serbia.
- Two types of water supply technologies were investigated: (i) small piped systems serving up to 10 000 people; and (ii) individual supplies which, according to national standards, comprise systems serving less than five households or 20 inhabitants.
- A total of 1136 piped systems and 182 individual supplies were investigated by means of water quality analysis and standardized sanitary inspections.
- A total of 1350 water quality samples were taken and analysed for one microbiological parameter (i.e. *Escherichia coli* – *E.coli*) and 10 physico-chemical parameters (i.e. ammonia, arsenic, chlorine residual, colour, electrical conductivity, hydrogen ions – pH, manganese, nitrate, odour and turbidity).

Box 3. What did the analysis of drinking water quality show?

- Only 67% of water samples from piped systems and 68% from individual supplies complied with the national standard for microbiological characteristics (Fig. 1). For comparison: in 2016, urban water supply systems showed a compliance of 96% for microbiological parameters (8).
- Only 56% of water samples from piped systems and 29% from individual supplies complied with national standards for physico-chemical characteristics (Fig. 1). For comparison: in 2016, urban water supply systems showed a compliance of 90% for physico-chemical parameters (8).
- Overall compliance (microbiological plus physico-chemical) was only 37% for piped systems and 17% for individual supplies (Fig. 1).

Fig. 1. Microbial, physico-chemical and overall compliance with national water quality standards in piped systems and individual supplies in Serbia



How did the survey help prioritization of improvements?

Combined analysis of sanitary inspection and water quality data is a powerful tool to identify the most important causes of contamination and necessary improvement interventions (9). Risk-priority matrices, as shown in Box 6, provide a simple grading system that is particularly useful in small-scale systems where the frequency of testing is low and reliance on analytical results alone is especially inappropriate. Risk-priority matrices can assist local authorities in effective and rational decision-making, specifically in drawing up a list of required priority interventions to improve sanitary conditions and water quality and to estimate investment requirements. They can also help to guide public health authorities to establish surveillance priorities by identifying systems that require increased attention and guidance.

Box 6. What priorities for improvement interventions did the survey reveal?

- Only 28% of piped systems and 23% of individual supplies do not require improvement action (low risk level; Fig. 2).
- About 42% of piped systems and 36% of individual supplies were found to be in need of some improvements (intermediate risk level; Fig. 2).
- About 29% of piped systems and 41% of individual supplies show higher or urgent priority for improvement actions in order to prevent water contamination and thus protect public health (high and very high risk level; Fig. 2).

Box 4. What were the dominant sanitary risks in the inspected systems?

- 73% were not subject to regular water chlorination;
- 73% were unfenced, allowing animals to access the source;
- 66% were managed by unqualified personnel;
- 64% were exposed to possible contamination from latrines, sewers, animal breeding, cultivation, roads, industry, rubbish and other sources of pollution placed nearby; and
- 55% had unsatisfactory technical conditions, such as absent or non-functional diversion ditches (63%), inadequately sealed walls (55%), absent or non-functional drainage channels (55%).

Box 5. How do ownership and management reflect on drinking-water quality?

- Only 12% of all investigated piped systems are managed by legal entities such as public utilities.
- Water samples from piped systems which met national standards showed significantly lower numbers in supplies with unresolved ownership and inadequate management arrangements as compared to the average:
 - 3% for *E.coli* (versus 67%; see Fig. 1);
 - 26% for physico-chemical parameters (versus 56%; see Fig.1); and
 - 20% for overall water quality (versus 37%; see Fig.1).

Fig. 2. Risk-priority matrix for piped systems (individual supplies) in Serbia

<i>E. coli</i> count (CFU/100 ml)	Sanitary inspection score			
	0-2	3-5	6-8	9-10
<1	28.4% (23.1%)			
1-10		42.0% (36.3%)		
11-100			23.2% (33.5%)	
>100				6.4% (7.1%)

Risk level	Action level
Low	No action required
Intermediate	Low action priority
High	Higher action priority
Very high	Urgent action priority

What were the strengths of the survey?

- This is the very first systematic investigation of small-scale water supplies, especially individual supplies, covering all rural districts in Serbia. The survey findings clearly show a significant water-quality gap between urban and rural areas.
- For the first time, the rural population has been able to find out about the quality of drinking-water in their homes. The survey makes a strong contribution for designing further education programmes in hygiene and sanitation.
- Users of piped water supplies have been informed about their rights to petition local communities to take over management of these supplies, in accordance with the national regulation.
- By engaging its capacities to perform the survey, the network of public health institutes has proved its core role and function in the Serbian public health system.
- This survey has helped the public health institutes to establish systematic baseline information on small-scale systems in their area of responsibility, increase attention to the challenges related to such systems, and leverage local action towards their improvement.

What are the policy implications of the survey?

The survey findings point to shortcomings in the provision of rural water supply services. Compliance with drinking-water quality standards is significantly lower than for urban systems, indicating compromised water safety and hence public health protection issues for rural population groups.

The survey has induced policy actions and measures for the improvement of rural water supplies. These are directed at amendment and enforcement of existing legislation and programmes, as well as development of new regulations. The problems identified in drinking-water quality and sanitary conditions in small-scale water supplies clearly indicate the necessity to introduce and implement risk-based management, the principles of which are contained in the water safety planning (WSP) approach, a core pillar of the WHO Guidelines for drinking-water quality (9). In accordance with SDG target 6.1, the WSP approach is internationally recognized as a public health benchmark for the delivery of safely managed drinking-water supply services.

Two key interventions towards improving small-scale water supplies have already been taken. Firstly, a new provision in the draft law on water intended for human consumption stipulates the introduction and implementation of mandatory WSP to ensure safe drinking-water supply management. Secondly, regulation on the foundation and ownership of water supply systems (regardless of their size) is being increasingly enforced. Management of piped small-scale water supplies by authorized legal entities (e.g. public utilities) is essential to establish regular drinking-water quality monitoring and sanitary surveillance; implementation of the national legislation in the water domain; sustainable financing; and investment in the improvement of small-scale systems.

It is also critical to develop national and local action plans for improving small-scale systems serving rural populations. These should include provisions for the protection of water sources; technical improvements; water disinfection; regular drinking-water quality monitoring and sanitary inspection by mandated health authorities; and increased awareness-raising among local populations and relevant authorities. The survey findings point to the need to establish a national inventory of small-scale systems that would provide a systematic overview of water supplies in rural areas and effectively support programming of improvement interventions.

Finally, the results of the assessment fill a critical knowledge gap identified through baseline analysis, ensuring a good basis for reviewing and revising Serbian national targets set under the Protocol. Progressing from targets to policy action, Serbia has proved that the Protocol's target-setting framework is an efficient instrument for achieving positive results in the improvement of water and health.



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