

# **Strategies for the safe management of drinking-water for human consumption**

## **Report by the Secretariat**

1. The quality of drinking-water is a powerful environmental determinant of health. Assurance of drinking-water quality has been a pillar of primary prevention for more than 150 years and continues to be the foundation for the prevention and control of waterborne diseases.
2. Water can and does serve as a medium for disease transmission in countries on all continents; all are affected, from the poorest to the wealthiest. The most predominant waterborne disease, diarrhoea, has an estimated annual incidence of 4600 million episodes and causes just under 2.2 million deaths every year. In terms of global burden of disease, diarrhoea ranks second after respiratory infections. Children under five years of age are most affected: some 1.33 million die each year of diarrhoea, representing 15% of overall mortality in that age group. More than 50 Member States continue to report cases of cholera every year. It is estimated that 50% of cases of malnutrition are associated with repeated episodes of diarrhoea or intestinal helminthiasis. Childhood malnutrition is at the root of 35% of all child mortality.
3. There are several variants of the faecal-oral pathway of waterborne disease transmission. They include contamination of drinking-water catchment areas (by human and animal faeces) and sources (through inadequate disposal of human or animal excreta, or domestic or industrial waste). Transmission can also result from contamination in the distribution system (through “leaky” pipes, obsolete infrastructure, and inadequate treatment and storage) and unhygienic handling of stored household water.
4. Moreover, millions of people are exposed to unsafe concentrations of chemical contaminants in their drinking-water. This contamination may be linked to naturally-occurring inorganic chemicals such as arsenic and fluoride, which cause cancer and tooth and/or skeletal damage, respectively. Alternatively, it may be linked to a lack of proper management of urban and industrial wastewater or agricultural run-off water, with potentially long-term exposure to pollutants, resulting in a range of serious health implications.
5. In addition to quality, access to safe and clean drinking-water and basic sanitation is a crucial determinant of health. Target 7.C of Millennium Development Goal 7 calls for halving by 2015 the proportion of people without sustainable access to safe drinking-water and basic sanitation. Reaching this target implies, among other things, tackling both the following aspects of drinking-water provision: quantity (access, scarcity) and quality (safety).

6. WHO and UNICEF, through their Joint Monitoring Programme for Water Supply and Sanitation, monitor progress towards Target 7.C on a biennial basis against a 1990 baseline. The Programme's update for 2010<sup>1</sup> indicates that in 2008 the world was on track to meet the drinking-water target, with some 884 million people still lacking access to an "improved drinking-water source".<sup>2</sup> The world is, however, seriously off course in its efforts to meet the sanitation target. Based on the status at the end of 2008 and assuming the trend in progress will continue without change, the 2015 target will be missed by 1000 million people and 2700 million people will lack access to "improved sanitation".

7. Important regional and in-country disparities are, however, reported. Africa is home to 40% of all people without access to an improved drinking-water source. The number of people in rural areas living without access to an improved drinking-water source is more than five times greater than that of urban populations. Other disparities are observed, between different socioeconomic strata and, within the group that has access to improved sources of drinking-water, between those with minimum service levels and those receiving piped water on their premises. These disparities are also important in terms of health risks associated with poor water safety and may be further aggravated by the impact of climate change.

8. Countries in Africa south of the Sahara and in southern Asia account for the largest number of people without access to basic sanitation: less than half their population uses improved facilities. Yet, since 1990, the proportion of the world population practising open defecation has declined by almost a third, from 25% to 17% in 2008. Seven out of ten people without access to improved sanitation live in rural areas: an estimated 1856 million compared to 794 million urban dwellers. Progress in the use of improved sanitation is impaired by global population growth.

9. Millennium Development Goal Target 7.C captures the need for access to safe drinking-water and basic sanitation in a broad development framework that also includes public health. Yet, promoting access to safe drinking-water and basic sanitation for large population groups also has a potentially substantial impact on progress towards meeting the targets of the health-related Goals 4 (Reduce child mortality), 5 (Improve maternal health) and 6 (Combat HIV/AIDS, malaria and other diseases). Great improvements can be made in maternal and child health and reduction in child mortality through the provision of safe drinking-water; this conclusion was underscored by the outcome of a literature review and an expert survey, on the basis of which it was estimated that some 10% of the global disease burden could be prevented by improving water supply, sanitation, hygiene and management of water resources. With respect to Goal 6, in many parts of the world there is a clear correlation between storage of household water and breeding of the vectors of malaria and dengue.

10. WHO is the implementing agency for the Global Annual Assessment of Sanitation and Drinking-Water, a UN-Water initiative. Its first report indicates that current levels of resources allocated to drinking-water and sanitation are insufficient to meet Target 7.C, especially in regions that are failing to make sufficient progress (sub-Saharan Africa and parts of Asia).

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<sup>1</sup> WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. *Progress on sanitation and drinking-water: 2010 update*. Geneva, World Health Organization, 2010.

<sup>2</sup> An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination. Examples of improved sources include piped water into a dwelling, a protected well, or rainwater.

11. Recently, a Rapid Assessment of Drinking-Water Quality survey was conducted in six countries by the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. The findings suggest that, depending on local conditions, a significant proportion of improved drinking-water sources may in fact be contaminated. Greater efforts are therefore needed to ensure that extending access to water for human consumption goes hand in hand with ensuring the safety of the drinking-water to which people have access. This work will require innovative methods of testing water quality that are rapid, reliable and cheap, and effective and sustainable approaches to point-of-use treatment and storage. An enabling policy and institutional environment for better management of water safety in the context of extending access and services is also needed; water safety plans, discussed below, will be instrumental in creating such an environment. A meeting of the Technical Task Force of the WHO/UNICEF Programme (Villié-Morgon, France 16–18 November 2010) recommended a multipronged approach towards strengthening the global monitoring of drinking-water quality, using new tools in the context of household surveys and censuses, strengthening the Rapid Assessment approach, and selecting and analysing the datasets of national drinking-water quality regulators as appropriate in specific settings.

12. Additional weaknesses in drinking-water quality stem from an over-reliance on end-of-pipe regulation. Drinking-water suppliers are usually required to verify that the water coming out of their taps meets specific numerical standards. Yet, by the time tests are run and results indicate the water is not safe to drink, thousands of people may have consumed the water and become sick. Notifications come too late. Moreover, testing and standards are often too narrow and can be expensive.

## **HEALTH RISK ASSESSMENT AND MANAGEMENT**

13. The *Guidelines for drinking-water quality* is one of WHO's longest-standing publications. They provide an evidence-base for health protection through standard-setting and regulation, and include a framework for the assessment of the health risks presented by the various microbial, chemical, radiological and physical constituents that may be present in drinking-water. They outline the derivation of "guideline values" (maximum concentrations) for these hazardous constituents, where applicable. The fourth edition of the *Guidelines* is scheduled to be launched in July 2011.

14. In the spirit of primary prevention, the guidelines recommend proactive efforts to assess and reduce health risks. Over the past decade they have evolved from a prescriptive document setting international standards for end-of-pipe water quality into a normative best-practice manual on drinking-water management. Emphasis has shifted to promoting a holistic framework for safe drinking-water, which encompasses flexible and locally-relevant health-based targets, a system of integrated risk assessment and incremental risk management in the chain of events from catchment to consumer and independent monitoring and surveillance.

15. Water-safety plans provide the instrument to make the guidelines operational. They focus on catchment initiatives for long-term, sustainable improvements in water quality wherever possible rather than capital-intensive options for treatment with high recurrent costs and large carbon footprints. It is likely that such initiatives will require a longer time to improve quality, but ultimately they will be more effective and sustainable than a treatment-focused approach.

## THE BROADER CONTEXT

16. Safe drinking-water for human consumption cannot be considered in isolation from other issues, of which sanitation is the most important. Microbial contamination of drinking-water has its roots in the fact that, according to the WHO/UNICEF Joint Monitoring Programme, some 2600 million people still lack access to basic sanitation. The use of the so-called sanitation ladder<sup>1</sup> allows analysis of incremental progress even in situations where it is impossible to achieve Target 7.C in full. Higher rungs on this schematic ladder indicate a better starting point for effective management of excreta and wastewater, and the corresponding higher socioeconomic status means a greater capacity to manage excreta and wastewater and to invest in the necessary infrastructure, as a basis for safer drinking-water for consumption.

17. The use of wastewater, excreta and grey water for agriculture and aquaculture is an expanding practice in many water-scarce rural and periurban areas. Wastewater has become an important source of livelihoods for such communities, and its impact on drinking-water safety is ambiguous. Using wastewater for agricultural production reduces risks of drinking-water contamination downstream from the main sources of that contamination (mainly cities). Risks related to drinking-water in the farming communities may be heightened, but these may be masked by risks related to farmers' direct contact with water and to consumption of contaminated produce.

18. The *Guidelines for the safe use of wastewater, excreta and grey water* (volumes 1–4, third edition 2006), relating to agriculture and aquaculture, and the *Guidelines for safe recreational waters* (volumes 1, 2003, and 2, 2010) follow the same framework of integrated risk assessment and incremental risk management (known as the “WHO Stockholm Framework”) as the drinking-water quality guidelines. At a joint meeting on a strategy for water quality and health (Tokyo, 7–9 December 2010), members of the expert groups for WHO's three sets of guidelines agreed on the formulation of a single strategy and the integration of the expert groups.

19. In July 2010, the United Nations General Assembly, in resolution 64/292, recognized the right to safe and clean drinking-water and sanitation as a human right essential to the full enjoyment of life and all other human rights. Subsequently, the United Nations Human Rights Council, in resolution 15/9 adopted at its fifteenth session in September 2010, affirmed that the human right to safe drinking-water and sanitation is derived from the right to an adequate standard of living. Human rights principles define various characteristics against which the enjoyment of the right can be assessed, namely: availability, safety (with reference to the *Guidelines on drinking-water quality*), acceptability, accessibility, affordability, participation, non-discrimination and accountability.

20. The management of water resources is critical for the sustained supply of safe drinking-water. The value of ecosystem services at the catchment level in ensuring safe and reliable water resources cannot be overestimated. The integrated approach to water resources management aims to ensure equitable distribution of limited water resources among user groups. In terms of quantity, agriculture is the biggest user of water worldwide, accounting for up to 80%. For drinking-water, in most parts of

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<sup>1</sup> The concept of drinking-water and sanitation ladders was introduced in the 2008 report of the WHO/UNICEF Joint Monitoring Programme (*Progress on drinking-water and sanitation: special focus on sanitation*. UNICEF, New York, and WHO, Geneva, 2008) as a clear depiction of trends over time in disaggregated data on access. The ladders provide a model for options for advancement not as giant leaps but as incremental steps. For government decision-makers they are an instrument to identify optimal opportunities for progress; for communities they support a reflection of where they are positioned on the ladder and where they may aspire to be.

the world quality continues to be the top priority and policies on integrated management should ensure that water resources earmarked for drinking-water are maintained at the highest level of quality.

21. Health-impact assessment can play a major role in ensuring that communities in rapidly developing areas continue to have access to safe drinking-water, that water resources development in particular considers affected communities in terms of their needs for access to safe drinking-water, and that in the selection of drinking-water sources possible risks (such as high concentrations of arsenic or fluoride in groundwater) are identified at early stages.

22. In addition, health-impact assessment provides the basis for a careful consideration of all health implications, be they adverse effects or opportunities, of projects for developing water resources such as dams, irrigation schemes, flood-control projects and port constructions. Early attention to health in the planning of such projects allows the incorporation of health safeguards in their design and operations, avoids the transfer of hidden costs of development to the health sector, permits the selection of the most cost-effective options, facilitates a focus on vulnerable groups, and is in line with the principles of good governance. The formulation of a public health management plan for water resources development allows for optimal targeting of activities for strengthening health services in order to complement the preventive measures proposed.

### **PROMOTING EFFECTIVE DRINKING-WATER QUALITY MANAGEMENT: OPPORTUNITIES FOR ACTION**

23. Efforts to improve water supply, sanitation, hygiene and water-resources management as a substantial contribution to reducing the global disease burden are constrained by inadequate policy and regulatory frameworks, a fragmented institutional infrastructure often with weak components, limited human resources with insufficient funding to perform essential functions, and the lack of new tools. Existing methods need to be strengthened. From this analysis several strategic priorities flow.

24. Harmonization of sectoral policies and strengthening of institutional arrangements are fundamental to reducing the incidence of cholera, typhoid, dysentery and other diarrhoeal diseases. Internationally, the outcomes of various meetings support these processes, including the WHO/UNEP Libreville Declaration on Health and Environment (2008), the African Ministers' Council on Water and the various regional Sanitation Conferences.

25. As the options for the types of water resources used for drinking-water continue to evolve with changing circumstances, with an increasing reliance on groundwater and, under the influence of climate change, greater fluctuations in harvested rainwater, it will be crucial to improve the mapping and monitoring of these resources, including their quality.

26. Opportunities for sustainable improvements exist and major achievements can be made through preventive risk management, embedded in policies and regulations, and cost-effective interventions at urban, rural and household levels.

27. At national levels, the preparation and implementation of water safety plans will lead to consolidation of policy frameworks, strengthening of institutions and institutional arrangements, and formulation of specific actions for assessment and management of health risks in rural and urban water-supply systems. WHO, in partnership with bilateral donors and international nongovernmental organizations, will continue to promote the preparation and implementation of such plans in all its regions.

28. The capacity to regulate drinking-water quality lies at the core of water-safety procedures in the industrialized countries, but needs strengthening in many developing countries. WHO hosts the International Network of Drinking-water Regulators which was established in 2008 in order to promote best practices in regulating water-quality management, to offer a forum for exchanges of information and good practices, and to guide and share experiences on the role of regulators in support of implementation of water safety plans within a water-safety framework. The WHO Secretariat supports the improvement of drinking-water regulators' capacities to set water safety plans in regulations, including those for certification or audit. A quality assurance tool for water safety plans is currently being piloted in 11 countries.

29. In industrialized and developing countries alike, small community water supplies are most vulnerable to contamination and breakdown. Hence they consistently pose a health risk throughout the world. The International Small Community Water Supply Management Network, established in 2005, provides a platform for stimulating and sharing the results of innovative research, good practices and advocacy tools. Its members collaborate on identifying common management and technical issues in relation to small community supplies, and finding workable solutions for different geographical and cultural contexts.

30. The high initial capital costs and long time frame associated with implementing centralized treatment and distribution of drinking-water may exclude many communities, particularly in poor rural areas, from the health benefits of a piped water source in the immediate future. Household-level water treatment and safe storage are additional steps that can be taken immediately where and when "improved" water sources do not deliver consistently safe water or where safe water is available only intermittently. Together they form one component of a seven-point plan, jointly agreed by WHO/UNICEF, to reduce diarrhoeal disease mortality. Working with partners, including with the WHO International Network to Promote Household Water Treatment and Safe Storage, established in 2003, the WHO Secretariat encourages correct and sustained application of household water treatment and safe storage where water is not reliably safe. The Secretariat provides support to countries in formulating policies and devising programmes on household water management and establishing criteria for the evaluation of technologies for treatment of household water so that implementers, donors and users can select appropriate and effective methods.

31. Recent events in Chile and Haiti have re-emphasized the need for an immediate response to natural disasters and humanitarian emergencies that focuses on drinking-water supplies and sanitation. The Secretariat will refine its guidance in this respect. It will also continue to provide technical support for furthering the application of recently developed minimum environmental standards (including water-safety standards) for health-care facilities and schools.

32. Experience with capacity building for health-impact assessment of water resources development in Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam has demonstrated that an approach aimed at creating a conducive policy framework, establishing effective institutional arrangements and developing the knowledge and skills of a human resource base across sectors, provides the essential package to ensure that health safeguards, mitigating measures and health promotion are optimally introduced in water resources development and management.

33. An earlier version of this document was noted by the Executive Board at its 127th session in May 2010.<sup>1</sup> At its 128th session in January 2011, the Board, in adopting its agenda, accepted the

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<sup>1</sup> See document EB127/2010/REC/1, summary record of the second meeting, section 1.

recommendation of the officers of the Board that the subject should be included on the provisional agenda of the Sixty-fourth World Health Assembly.

**ACTION BY THE HEALTH ASSEMBLY**

34. The Health Assembly is invited to note this report.

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