World Health Organization
REGIONAL OFFICE FOR Europe

EUROPEAN ENVIRONMENT AND HEALTH PROCESS

UNECE

PROTOCOL ON WATER AND HEALTH

Protocol on Water and Health

Effective approaches to drinking-water quality surveillance

Meeting report

6-7 May 2015
Oslo, Norway

ABSTRACT

The meeting was organized by the WHO European Centre for Environment and Health of the WHO Regional Office for Europe in support to the implementation of the Protocol on Water and Health to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes. The programme of work for 2014-2016 under the Protocol prioritizes supporting cost-effective and risk-based drinking-water quality surveillance approaches. The objectives of the meeting were to introduce key elements of risk-based surveillance, review countries' current approaches, experiences and challenges in water quality surveillance, identify needs to build capacities for strengthening surveillance systems. The meeting recognized the value of and need for risk-based approaches in standard-setting and drinking-water quality surveillance as it leads to targeted and resource-effective approaches and thus to better protection of public health. Regulations need to allow for flexible surveillance schemes that are based on local risk assessments. The outcomes of water safety plans, developed and implemented by water suppliers, inform local decision-making in terms of priority risks and direct the scope of surveillance efforts.

Keywords

DRINKING WATER
QUALITY CONTROL
RISK MANAGEMENT
SURVEILLANCE
WATER QUALITY
WATER SUPPLY

Address requests about publications of the WHO Regional Office for Europe to:
Publications
WHO Regional Office for Europe
UN City, Marmorvej 51
DK-2100 Copenhagen Ø, Denmark
Alternatively, complete an online request form for documentation, health information, or for permission to quote or translate, on the Regional Office website (http://www.euro.who.int/pubrequest).

CONTENTS

Executive summary

Background and meeting objectives

The meeting was organized to support implementation of the Protocol on Water and Health to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes. Articles 6 and 14 of the Protocol state that "Parties shall establish and maintain a legal and institutional framework for monitoring and enforcing standards for the quality of drinking water" and "shall promote operation of effective networks to monitor and assess the provision and quality of water-related services and development of integrated information systems."

At its third session (Oslo, Norway, 25–27 November 2013), the Meeting of the Parties to the Protocol on Water and Health adopted a programme of work for 2014–2016, thematic area 2.3 of which covers supporting cost-effective and risk-based drinking-water quality surveillance (lead Parties: Belarus and Norway).

Under that thematic area, a meeting on effective approaches to drinking-water quality surveillance, organized by the World Health Organization (WHO) European Centre for Environment and Health of the WHO Regional Office for Europe, was held in the Government quarter (*Regjeringskvartalet*), Oslo, Norway, on 6 and 7 May 2015. The meeting, attended by representatives of 29 Member States in the WHO European Region, as well as of other international organizations and partners, was co-chaired by Alena Drazdova (Republican Scientific Practical Center of Hygiene, Belarus) and Susanne Hyllestad (Norwegian Institute of Public Health).

The objectives of the meeting were to:

- introduce elements of risk-based thinking about drinking-water quality surveillance;
- review countries' current approaches to drinking-water quality surveillance, with a specific focus on small-scale water supplies;
- review countries' experiences of and identify challenges related to meeting ongoing regulatory surveillance requirements;
- identify needs to build institutional, human and laboratory capacity for strengthening drinking-water quality surveillance systems; and
- reach consensus on the building blocks of risk-based drinking-water quality surveillance.

Proceedings of the meeting

The meeting was organized in seven technical sessions to achieve the objectives:

- Session 1 focused on public health importance of drinking-water quality surveillance and its approaches in the context of WHO Guidelines for Drinking-water Quality[1].
- Session 2 was devoted to raising awareness on "risk-based" and "cost-effective" drinking-water quality surveillance approaches and how to set priorities for national

[1] Guidelines for drinking-water quality, 4th edition. Geneva: World Health Organization; 2011.

standard setting and what criteria to apply in selecting microbial and chemical monitoring parameters.

- Session 3 addressed water safety plans (WSPs), including auditing of WSPs in the context of surveillance.
- Session 4 and 5 allowed sharing country experiences and good practices in risk-based approaches to drinking-water quality surveillance and identification of key challenges and support needs in setting up effective surveillance systems.
- Session 6 addressed specific challenges of drinking-water quality surveillance in small-scale water supply systems, as well as the application of sanitary inspections and field testing approaches in remote small community settings.
- In session 7, the participants discussed and agreed the main conclusion points and identified next steps.

Summary of conclusions

- Vigilant water quality surveillance (as described in the WHO Guidelines for Drinking-water Quality) is an essential building block in public health protection.
- The Protocol on Water and Health emphasizes the need to establish a legal and institutional framework for monitoring and enforcing standards for the quality of drinking-water.
- There is broad recognition of the value of and need for risk-based approaches in standard-setting and surveillance (as exemplified in the revisions to the annexes of the European Union's (EU) Drinking Water Directive[2]).
- Risk-based thinking leads to targeted and resource-effective surveillance and thus to better protection of public health. Sensible standard-setting is important: priority parameters of public health significance in a country should be carefully selected on the basis of occurrence and health risks.
- Regulations need to allow for flexible surveillance schemes that are based on local risk assessment and endorsed/approved by the health department.
- The WSP approach is the public health benchmark for providing safe drinking-water. WSP outcomes inform local decision-making in terms of priority risks and direct the scope of surveillance efforts.
- WSP uptake requires a phased approach in setting regulations, establishing adequate enforcement mechanisms and changing the role of regulators in auditing WSPs.
- Over-emphasis on compliance monitoring is "too little too late" for protecting public health from microbial risks.
- Vigilant operational monitoring, with a focus on critical events, is important to sustain system safety.
- Programmes targeted on specific parameters or surveillance campaigns have proven to be effective.

[2] Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Official Journal of the European Communities, 41:32-54, 5 December 1998 (L 330).

- Effective data management and functional databases are important, also for identifying priorities. New communication technologies facilitate reporting.
- Meaningful surveillance of small-scale water supply systems is of concern across the Region for a number of reasons, including the remoteness and high number of such supplies, lack of baseline data, low compliance rates and shortages of trained and skilled staff.
- Surveillance officers can play an important supportive and advisory role in improving the management of small-scale water supplies.
- On-site visits/inspections are valuable for supporting risk assessments.
- Rapid assessments help to establish baseline information and map priorities.
- Systematic mapping of available rapid/field test systems is required.

Participants confirmed that the primary benefit of risk-based surveillance is the protection of public health and emphasized the oversight role of the health sector, as well as the need for closer collaboration between different sectors at national and local levels.

Next steps

Participants discussed and proposed the following activities to advance the work on drinking-water quality surveillance under the Protocol on Water and Health:

- Establish an expert group to conceptualize and develop a guidance document setting out:
  - the added value of risk-based approaches;
  - the building blocks of risk-based surveillance;
  - case study examples from regulation and practice; and
  - mapping of existing resources.
- Engage in awareness-raising and capacity-building activities at country and subregional levels.
- Analyse participating country briefs on drinking-water quality surveillance.

The representatives of the Secretariat and of the lead countries of the thematic area under the Protocol on Water and Health committed their support to promoting long-term uptake of risk-based approaches to water quality surveillance among policy-makers at national level.

Резюме

Предпосылки и цели совещания

Совещание было организовано с целью обеспечения поддержки в реализации положений Протокола по проблемам воды и здоровья к Конвенции по охране и использованию трансграничных водотоков и международных озер. В статьях 6 и 14 Протокола предусмотрено, что Стороны "создают и поддерживают правовую и организационную основу для контроля и обеспечения соблюдения стандартов качества питьевой воды" и "содействуют функционированию сетей мониторинга и оценки эффективности и качества работы водохозяйственных служб и развитию комплексных баз данных и информационных систем."

На своей третьей сессии (Осло, Норвегия, 25-27 ноября 2013 г.) совещание Сторон Протокола по проблемам воды и здоровья приняло программу работы на 2014-2016 гг., в которой программная область 2.3 предусматривает поддержку мер по организации экономически рентабельной, основанной на анализе рисков системы надзора за качеством питьевой воды (головные Стороны-исполнители – Беларусь и Норвегия).

В рамках этой программной области 6-7 мая 2015 г. в Осло, Норвегия, в Доме государственных учреждений (*Regjeringskvartalet*) состоялось совещание по эффективным подходам к надзору за качеством питьевой воды, которое было организовано Европейским центром ВОЗ по окружающей среде и охране здоровья Европейского регионального бюро Всемирной организации здравоохранения. В совещании приняли участие представители 29 государств-членов в Европейском регионе ВОЗ, а также ряда международных организаций и партнеров. Сопредседателями совещания были избраны Алена Дроздова (Республиканский научно-практический центр гигиены, Беларусь) и Susanne Hyllestad (Норвежский институт общественного здравоохранения).

Цели совещания состояли в следующем:

- представить элементы философии надзора за качеством питьевой воды на основе анализа рисков;
- рассмотреть принятые в настоящее время в странах подходы к надзору за качеством питьевой воды с особым акцентом на маломасштабные системы водоснабжения;
- рассмотреть опыт стран в выполнении имеющихся на сегодняшний день нормативных требований о надзоре и выявить связанные с этим трудности;
- выявить потребности в укреплении институционального, кадрового и лабораторного потенциала для усиления систем надзора за качеством питьевой воды;
- достичь консенсуса в отношении структурных элементов основанного на анализе рисков надзора за качеством питьевой воды.

Работа совещания

Для достижения поставленных целей совещание было организовано в формате семи технических заседаний:

- Заседание 1 было посвящено важности надзора за качеством питьевой воды для общественного здоровья и подходам к надзору в контексте Руководства ВОЗ по обеспечению качества питьевой воды[3].
- Заседание 2 касалось повышения информированности о подходах к надзору за качеством питьевой воды, "основанных на анализе рисков" и "характеризующихся положительным соотношением затрат и эффективности", и вопросов о том, как следует определять приоритеты в деятельности по установлению национальных нормативов и какие критерии должны применяться при выборе микробиологических и химических параметров для мониторинга.
- На заседании 3 рассматривались планы обеспечения безопасности воды (ПОБВ), в том числе вопросы аудита ПОБВ в контексте надзора.
- Заседания 4 и 5 позволили обменяться опытом и передовой практикой стран в их подходах к надзору за качеством питьевой воды на основе анализа рисков и выявить основные трудности и потребности в поддержке при создании полноценных систем надзора.
- На заседании 6 были рассмотрены конкретные трудности осуществления надзора за качеством питьевой воды в маломасштабных системах водоснабжения, а также вопросы применения методов санитарных проверок и проведения анализов качества воды в полевых условиях в небольших отдаленных общинных системах.
- На заседании 7 участники обсудили и согласовали основные пункты выводов и определили дальнейшие действия.

Краткое изложение выводов

- Бдительный надзор за качеством питьевой воды (в том виде, как он описан в Руководстве ВОЗ по обеспечению качества питьевой воды) является одним из жизненно важных структурных элементов в системе охраны общественного здоровья.
- В Протоколе по проблемам воды и здоровья подчеркивается необходимость создания правовой и организационной основы для контроля и обеспечения соблюдения стандартов качества питьевой воды.
- Ценность и необходимость подходов к установлению стандартов и надзору на основе анализа рисков получили повсеместное признание (примером чему являются пересмотры приложений к Директиве Европейского союза (ЕС) по воде[4]).
- Философия, в основе которой лежит анализ рисков, приводит к целенаправленному и эффективному с точки зрения использования ресурсов надзору, а значит и к улучшению охраны общественного здоровья. Важную роль играет установление разумных нормативов: приоритетные параметры, значимые для общественного здоровья в стране, следует тщательно отбирать на основе их распространенности и рисков для здоровья.

---

[3] Руководство по обеспечению качества питьевой воды, 4-е издание (на английском языке). Женева, Всемирная организация здравоохранения, 2011 г.

[4] Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Official Journal of the European Communities, 41:32-54, 5 December 1998 (L 330).

- Нормативные документы должны давать возможность применять гибкие системы надзора, основанные на оценке местных рисков и утвержденные/одобренные управлением здравоохранения.
- Эталоном в области охраны общественного здоровья с точки зрения предоставления потребителю безопасной питьевой воды является методика ПОБВ. Конечные результаты, полученные благодаря применению ПОБВ, используются при принятии решений на местном уровне, поскольку указывают на приоритетные риски и определяют сферу охвата мероприятий по надзору.
- Для внедрения методики ПОБВ требуется поэтапный подход, включающий принятие соответствующих нормативных документов, создание действенных механизмов, обеспечивающих соблюдение нормативов, и изменение роли регулирующих инстанций в проведении аудитов ПОБВ.
- Уделять чрезмерное внимание мониторингу соблюдения нормативов – это "слишком мало и слишком поздно" для защиты здоровья населения от микробных рисков.
- Большое значение для поддержания безопасности систем водоснабжения имеет бдительный оперативный мониторинг, направленный прежде всего на отслеживание критических событий.
- Доказана эффективность программ, направленных на конкретные параметры или на проведение кампаний по надзору.
- Большое значение, в том числе для определения приоритетов, имеют эффективное управление данными и функционирующие базы данных. Отчетность облегчается благодаря новым коммуникационным технологиям.
- Вопрос о полноценном надзоре за маломасштабными системами водоснабжения вызывает озабоченность во всем Регионе по целому ряду причин: это и удаленность и большое число таких систем, и отсутствие данных об исходном состоянии, и низкий уровень соблюдения нормативов, и нехватка подготовленных и квалифицированных кадров.
- Важную роль могут играть сотрудники надзорных органов, которые могут оказывать поддержку и давать советы по улучшению управления маломасштабными системами водоснабжения.
- Большую ценность для оценки рисков имеют посещения/проверки объектов на местах.
- Получить информацию об исходном состоянии и наметить приоритеты помогают экспресс-оценки.
- Требуется систематическое картирование имеющихся систем экспресс-анализов/анализов в полевых условиях.

Участники совещания подтвердили, что главная ценность надзора на основе анализа рисков состоит в том, что он обеспечивает охрану общественного здоровья, и подчеркнули значение контролирующей роли сектора здравоохранения, а также необходимость более тесного сотрудничества между различными секторами на уровне всей страны и на местном уровне.

Дальнейшие действия

Для продолжения работ в области надзора за качеством питьевой воды в соответствии с Протоколом по проблемам воды и здоровья участники совещания обсудили и предложили следующие действия:

- Образовать группу экспертов для выработки концепции и разработки руководящего методического документа, в котором будут изложены:
  - дополнительный положительный эффект от подходов, основанных на анализе рисков;
  - структурные элементы надзора на основе анализа рисков;
  - примеры из практики нормативного регулирования и практической работы;
  - карта имеющихся ресурсов.
- Проводить мероприятия по повышению уровня информированности и укреплению кадрового потенциала на уровне отдельных стран и на субрегиональном уровне.
- Проанализировать краткие сообщения стран, участвовавших в совещании, о проводимом ими надзоре за качеством питьевой воды.

Представители Секретариата и головных стран-исполнителей программной области в соответствии с Протоколом по проблемам воды и здоровья выразили готовность поддерживать деятельность по содействию долговременному положительному восприятию лицами, формирующими политику на национальном уровне, подходов к надзору за качеством питьевой воды на основе анализа рисков.

Introduction

A meeting on effective approaches to drinking-water quality surveillance, organized by the WHO European Centre for Environment and Health of the WHO Regional Office for Europe, was held in the Government quarter (Regjeringskvartalet), Oslo, Norway, on 6 and 7 May 2015. The meeting, attended by representatives of 29 Member States in the WHO European Region, as well as of other international organizations and partners, was opened by Kjetil Tveitan, Deputy Director, Nutrition and Food Safety, Ministry of Health and Care Services, Norway. Participants (Annex 1) were welcomed by Cecilie Brein-Karlsen, State Secretary, Health and Care Department, Ministry of Health and Care Services, Norway. Introductory remarks were made by Oliver Schmoll, Programme Manager, Water and Sanitation, WHO Regional Office for Europe, and Nataliya Nikiforova, Environmental Affairs Officer, United Nations Economic Commission for Europe.

Alena Drazdova (Republican Scientific Practical Center of Hygiene, Belarus) and Susanne Hyllestad (Norwegian Institute of Public Health) were chosen as co-Chairpersons of the meeting, and Mr Charles Robson was designated as Rapporteur.

The Ministry of Health and Care Services, Norway, generously provided financial support for the meeting.

Background, objectives and expected outcomes

The meeting was organized to support implementation of the Protocol on Water and Health to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes. The Protocol (to which 26 countries are currently Parties and 36 are signatories) is a key policy instrument in advancing the water- and sanitation-related goal of the Commitment to Act of the Parma Declaration on Environment and Health. Articles 6 and 14 of the Protocol state that "Parties shall establish and maintain a legal and institutional framework for monitoring and enforcing standards for the quality of drinking water" and "shall promote operation of effective networks to monitor and assess the provision and quality of water-related services and development of integrated information systems."

At its third session (Oslo, Norway, 25–27 November 2013), the Meeting of the Parties to the Protocol on Water and Health adopted a programme of work for 2014–2016, thematic area 2.3 of which covers supporting cost-effective drinking-water quality surveillance (lead Parties: Belarus and Norway).

Within that framework, the objectives of the meeting were to:

- introduce elements of risk-based thinking about drinking-water quality surveillance;
- review Member States' current approaches to drinking-water quality surveillance, with a specific focus on small-scale water supplies;
- review Member States' experiences of and identify challenges related to meeting ongoing regulatory surveillance requirements;
- identify needs to build institutional, human and laboratory capacity for strengthening drinking-water quality surveillance systems; and
- reach consensus on the building blocks of risk-based drinking-water quality surveillance.

The expected outcomes of the meeting were a better understanding of approaches to, experience of and best practices in drinking-water quality surveillance in the WHO European Region, as well as of the support required to establish risk-based monitoring approaches. Prior to the meeting, nominated meeting delegates were invited to prepare country briefs on national drinking-water quality surveillance requirements and responses were received from 28 countries. The outcomes of the meeting and the analysis of the country briefs would inform and substantiate the need for, and the contents of, guidance under the Protocol on Water and Health and related capacity-building activities in the Region.

The programme of the meeting is provided in Annex 2.

Session 1: Setting the scene: drinking-water quality surveillance for public health protection

The purpose of the session was to introduce the objectives of and approaches to drinking-water quality surveillance in the context of the WHO Guidelines for Drinking-water Quality and to explain why surveillance of drinking-water is important.

The WHO framework for safe drinking-water[5] consists of three components: health-based targets, set by the national regulatory body; water safety plans, drawn up by the water supplier; and independent surveillance, carried out by a surveillance agency such as the ministry of health. Drinking-water supply surveillance has been defined as "continuous and vigilant public health assessment and review of the safety and acceptability of drinking-water supplies"[6].

The principles of an effective surveillance system include independent oversight of the entire drinking-water system and all supply types, with strong legislation supporting the surveillance agency. In assessing the adequacy of supplies, surveillance agencies should take account of the following considerations: quantity, accessibility, affordability, continuity and quality. With regard to the latter, agencies should assess whether the quality of the water supply is regularly verified and complies with relevant standards; whether compliance or non-compliance with those standards results in an unacceptable public health burden; and whether an approved water safety plan for the supply is in place. The method adopted can entail either direct assessment or an audit-based approach; in either case, it should be adapted to the specific circumstances of the supply (urban areas, small-scale water supplies, household water treatment and storage).

WHO is in the process of updating Volume 3 of the Guidelines for Drinking-water Quality (covering control and surveillance of community supplies) [7] and is developing a supporting document on translating the Guidelines into national standards and regulations. A briefing note on the document was made available on the Sharefile website of the meeting, and participants were urged to provide written feedback and comments to WHO headquarters by email by 27 May 2015.

Drinking-water quality surveillance is important because water-related illnesses and outbreaks are still occurring in the WHO European Region. While regulations and standards are in place in

[5] WHO 2011 op. cit., chapter 2.

[6] Surveillance of drinking-water quality. Geneva: World Health Organization; 1976 (WHO Monograph Series, No. 63).

[7] Guidelines for drinking-water quality, volume 3: Surveillance and control of community supplies, 2nd edition. Geneva: World Health Organization; 1997.

the majority of countries in the Region, too much attention is still focused on end-product testing, which may miss critical events; "over-engineered" requirements in terms of parameters for monitoring water quality do not add substantial value in public health protection and are not resource-effective; and there is a lack of enforcement, particularly in remote settings owing to the large number of small supplies in extensive areas as well as a lack of personnel and financial resources. It is therefore essential to understand the concept of "risk-based surveillance" and how it relates to cost-effectiveness.

Session 2: Risk-based and cost-effective drinking-water quality surveillance

The purpose of the session was to raise awareness of risk-based thinking in standard setting and surveillance and how it relates to cost-effectiveness, and to explain how to prioritize microbial and chemical parameters for surveillance of drinking-water quality.

The aims of national standards for drinking-water quality should be to provide affordable protection of public health, to serve as benchmarks for water supply operators and to give reassurance to consumers. To be effective, standards should reflect the priorities for water quality and public health. They should list only important parameters, chosen on the basis of a substance's risk (presence, significance for public health and acceptability) and relevance in the area. While many chemical substances can theoretically be present, only a very small number are known to cause health effects through exposure from drinking-water. These are particularly inorganic substances, for example arsenic, fluoride, nitrate and lead.

Standards should be tailored to take into account types of supply and available resources. Guideline values need to be considered in relation to affordability: excessive precaution results in additional cost but no additional benefit. Monitoring of compliance with standards is vital but needs to be flexible, resource effective and concentrate on important risks to public health, and to be undertaken at a sensible frequency for a particular supply.

The objectives of surveillance of drinking-water quality are to gain an understanding of hazards, hazardous events and efficacy of control measures throughout the water supply system, from catchment/source through treatment and distribution to the consumer, based on sanitary inspections and drinking-water quality monitoring.

For microbial monitoring, end-product testing for faecal indicator bacteria (*E. coli* or enterococci) alone has been recognized as a case of "too little, too late": it represents a retrospective check, rather than a proactive demonstration of safety, by the time test results are available water will already be consumed, it is not always informative for other important microbial parameters, it provides little information about the system and outbreaks have been reported even though drinking-water was in compliance with standards. Risk-based microbial monitoring requires good understanding of and needs to account for possible hazardous events, such as heavy rainfall and snowmelt.

Criteria for identifying priority microbial parameters were proposed. Microbial monitoring typically includes frequent sampling of faecal indicator bacteria and risk-based testing for pathogens. A range of microbial parameters can be used at different stages in the system (Fig. 1).

Fig. 1. Suitability of microbial parameters

	Catchment survey	Source water	Treatment removal	Treatment disinfection	Distribution ingress	Regrowth
E. coli	S	S	S*	S*	S	N
Thermotolerant coliforms	SA	SA	SA*	SA*	S	N
Enterococci	S	S	S*	S*	S	N
Total coliforms	NR	NR	NR	SA	SA	N
Heterotrophic plate counts	N	N	N	N	N	S**
Total (viable) counts	N	N	N	N	N	S**
Somatic/F+ phages	SA	SA	SA	SA	NR	N
Clostridium spores	NR	NR	SA	SA	NR	N
Enteric viruses/parasites	S	S	S	S	NR	N
Opportunistic pathogens	N	N	N	N	N	S

S Suitable
SA Suitable alternative
N Not suitable
NR Not recommended
* For enteric pathogenic bacteria
** For bacteria groups, not pathogens

Adapted from: WHO/OECD, 2001. Assessing microbial safety of drinking-water.

Priority chemical parameters should be identified on the basis of health concerns. They may include arsenic, fluoride and nitrate in source water (unlikely to change in distribution); manganese and iron in source water (potential problems for distribution); trihalomethanes and cadmium (change in distribution); and lead and copper from pipework in buildings. In addition, indicators of operations and acceptability (turbidity, taste and odour, conductivity and discolouration) should be monitored, as should pH and chlorine residual. The choice of parameters should take account of variations in occurrence and concentration, as well as circumstances such as the use of chlorine and extraction of groundwater or surface water. Frequency of monitoring should reflect the risk of a breach of a standard or guideline value (i.e. a health target). Mitigation may reduce the need for monitoring. All decisions concerning choice of parameters and frequency of monitoring should be justified and documented.

Participants called for further research to be done into the selection of parameters (to take account of emerging chemicals such as endocrine disruptors) and the application of alternative drinking-water treatment techniques to chlorination. Participants also expressed a need for practical guidance on how to interpret instances where limits or standards are exceeded (exceedances), how to prioritize parameters for standard setting and designing resource-effective approaches to water quality surveillance and how to prioritize remedial actions in cases of non-compliance.

Session 3: The role of water safety plans

The purpose of the session was to provide a general introduction to WSPs, to describe the auditing of WSPs in the context of surveillance, to discuss the role of surveillance agencies in the auditing of WSPs and to exchange practical experiences of WSP auditing.

Meeting the requirements of the WHO Guidelines for Drinking-water Quality does not mean only meeting standard values but is much broader, including implementation of the main principles of a WSP. A WSP is a public health benchmark for safe drinking-water. Significant health gains are achieved by making the transition from a basic piped water supply to one that is systematically managed. A WSP is a "way of thinking" and entails an iterative approach to identifying, assessing and managing the risks to a water supply system throughout all steps from catchment to tap. The findings from a WSP, such as the outcomes of hazard analysis and risk assessment, targeted one-off investigations (validation monitoring), routine ongoing process control (operational monitoring) and periodic compliance testing (verification monitoring) can point to water quality events and parameters of concern and direct the necessary attention by surveillance authorities.

The *Road map to support country-level implementation of water safety plans*, published by WHO in 2010, advocates a phased approach to the introduction of WSPs, beginning with strong encouragement of such plans, then building an enabling environment and in time formally including them in legislation or regulations.

A WSP audit is an independent and systematic check of a plan to confirm its completeness, adequate implementation and effectiveness. WSP audits can be either internal, carried out by water supplier staff, or external, conducted by the authority responsible for oversight of the water supply or a qualified independent third party. Informal audits are supportive in nature and are often referred to as an evaluation or assessment, whereas formal audits are carried out to satisfy regulatory requirements. WSP auditing is an integral part of surveillance, it is critical to support the development of risk-based national standards and it informs surveillance priorities. It changes the role of regulators from assessing water quality data to applying a risk-based approach.

The Drinking Water Inspectorate for England and Wales (DWI) is an independent regulator established in 1990 and working for the Department for Environment, Food and Rural Affairs. Risk assessment and risk management are regulatory requirements for water companies (public supplies) and local authorities (private supplies) in England and Wales. In the initial stages, an informal approach was taken to encourage WSP uptake and implementation, but legislation and regulations now clearly specify risk assessment and risk management requirements which, in turn, informs DWI's role in auditing. Water companies are required to report summary information to DWI, which conducts an initial desktop review to assess implementation of the risk assessment/risk management approach. Feedback information is provided to the water company, and any actions identified to deal with unmitigated risks are set out in legally binding documents (notices). Ongoing audit, carried out through DWI's general regulatory activities, focuses on validation of existing control measures and identification of additional risk mitigation. DWI's role with regard to private water supplies is to oversee the risk assessment approach taken and provide technical support, training and advice to local authorities. Generalized information on audit activities is made available to the public in annual reports. Experience in the United Kingdom shows that introduction of WSPs in the legislation lead to improvements in compliance with standards, informs prioritization of attention and prioritization of surveillance activities and WSP outcomes are used to justify investment needs.

Session 4: Country experiences

Participants met in four groups to discuss the following questions:

- challenges/bottlenecks and enabling factors for setting up, implementing and maintaining an effective drinking-water quality surveillance system in each country;
- best practice examples illustrating the key principles of risk-based drinking-water quality surveillance;
- priority needs for support to strengthen drinking-water quality surveillance.

Rapporteurs of the working groups reported back to the meeting in plenary.

Challenges/bottlenecks
In several countries the legal or regulatory framework for drinking-water quality surveillance is lacking or conflicting, with little provision for enforcement of compliance and liability. In some countries there are no legislation on drinking-water and no legal requirements for the application of risk-based approaches, and sanitary regulations are not legally binding. Various ministries or departments are responsible for surveillance of different parts of the water supply system, and there is a lack of coordination and ownership. The legal requirements in the EU Drinking Water Directive are currently not sufficiently flexible and make it difficult to convince suppliers to extend monitoring to those parameters that actually represent a risk to the zone in question. There are shortages of resources (funding, personnel, competencies and laboratory capacity, including field testing) to carry out risk assessments, monitoring and surveillance, particularly of small-scale water supplies. Little specific guidance is available on carrying out risk assessments. Reporting is frequently incomplete, with problems encountered in the sharing of data owing to software incompatibility, leading to a loss of trust in data from water suppliers.

Best practices
Drinking-water supply plans or programmes have been adopted in a number of countries in the Region. Some countries (such as Belarus, Hungary, the Netherlands, the Russian Federation, Switzerland and the United Kingdom) have regulatory requirements for risk assessment, and some are setting requirements for the introduction of WSPs. A risk-based approach is being applied to chemical sampling (for pesticide control in the United Kingdom, for instance) and to the organization of sanitary inspections. Risk-based auditing and sampling of water quality are carried out in a number of countries, including Norway and Switzerland. Several countries shared their experiences for improving the management of small-scale water supplies, including targeted activity on small-scale water supplies in the framework of a national programme in Azerbaijan, tools and check-lists for risk assessment in England, and the use of sanitary inspection in combination with water testing in Georgia. In Germany, a national guidance document has been developed on the actions to be taken in case of non-compliance; the network organizes operators training for its members on various aspects related to operation of water supplies. Best practices in communication and data management include the application of user-friendly software and use of online systems for reporting, which enables data-sharing.

Priority support needs
WHO was requested to support countries in raising awareness at the top political level of the need for and importance of drinking-water quality surveillance. Guidance documents need to be provided on: setting responsibilities; coordination between institutions; the introduction of process-oriented surveillance approaches; definitions and a decision-tree tool for risk-based

prioritization of parameters (criteria for inclusion or exclusion of a parameter from a monitoring list); data-sharing; action to be taken in cases of exceedances; and methodological tools/documents on effective surveillance for small-scale water supplies. Participants also expressed the need to translate the WHO Guidelines for Drinking-water Quality into national languages and to document and disseminate available best practices on effective surveillance approaches. Networking, training and capacity-building should be reinforced, especially for small-scale water supply operators. WHO should support further research into the relationship between water quality and health, and the regulation of chemical contaminants.

Session 5: Case examples

The purpose of the session was to exchange experiences and share good practices in risk-based approaches to drinking-water quality surveillance.

In the **European Union**, as provided for by Article 11.2 of the EU Drinking Water Directive, a revised version of Annex II of the Directive (specifying minimum requirements for monitoring programmes) was approved by consensus Committee vote of all EU Member States on 30 April 2015. It will be submitted to the European Parliament and is expected to be adopted in August 2015, with entry into force in October 2015. The revised version states that "Member States may provide for the possibility to derogate from the parameters and sampling frequencies [laid down], provided that a risk assessment is carried out …". The risk assessment has to be based on the general principles set out in relation to international standards, which include the WHO Guidelines for Drinking-water Quality. Risk assessments must be approved by the relevant competent authority, and a summary of the results must be available. Clear guidance is given to EU Member States as to whether and when they may reduce and remove parameters: the frequency of sampling for *E. coli* must not be reduced under any circumstances; the frequency of sampling of other parameters may be reduced provided the results obtained from points representative of the whole supply zone have been less than 60% of the parametric value for at least three years; and a parameter may be removed from the list if the results obtained have been less than 30%. The previous version of Annex II contained 15 fixed monitoring parameters; the revised version includes nine fixed parameters (*E. coli*, coliform bacteria, colony count at 22˚C, colour, turbidity, taste, odour, pH and conductivity), provides a list of optional parameters and gives the flexibility of introducing additional parameters.

In **Belarus**, under the Sanitary/Epidemiological Well-being of the Population Act of 7 January 2012, water supply enterprises or utilities are responsible for supplying the population with water that meets safety requirements; the Ministry of Health has overall responsibility for setting government sanitary and epidemiological standards and for carrying out government sanitary surveillance; and the Ministry of the Environment is responsible for government surveillance of water resources. Government sanitary surveillance takes two forms: preventive (such as when developing new technologies and selecting water sources or water treatment technologies) and ongoing or operational (checking of compliance with sanitary requirements by existing utilities, by means of laboratory tests, inspection visits of source water sites and distribution facilities, and audits of utilities' in-house control programmes). In accordance with a grading scheme, the laboratory service was reorganized in 2012, so that complex tests are carried out at regional and national levels. Lists of parameters and frequencies of testing are determined for each specific water supply system on the basis of the environmental situation, water treatment methods used, etc. Non-compliance with regulations and standards gives rise to the issuance of notices and recommendations to owners of water supply systems. Risk assessment is carried out with regard

to both end products (drinking-water, treatment materials and technologies) and utilities; criteria used in the latter case include the characteristics of the water source and the utility (volume supplied, population served), hazard assessment and critical control points (HACCP) methodology, and findings from previous inspections. Some parameters are obligatory, while others (chemical criteria only) may be waived or dropped, if justified by risk assessment. Guidance documents are available on assessment of health risks, as well as on procedures for monitoring nitrate, persistent organic pollutants, pesticides and halogen-containing compounds.

Sources and treatment of surface water in the **Netherlands** are protected through and subject to quantitative microbiological risk assessment (QMRA), introduced under legislation adopted in 2001. It is carried out using faecal indicators (*E. coli* and enterococci) and index parameters for pathogens (enteroviruses, *Cryptosporidium*, *Giardia*, *Campylobacter*). QMRA tools are available to define the infection risk for each of these index parameters. Data collected on those pathogens, treatment efficiency and consumption of unboiled tap water yield an estimate of the infection risk per index pathogen at each source and treatment plant. Water suppliers have to carry out a QMRA every three years and engage in additional monitoring as required during peak events. QMRA results inform improvements in treatment and investment needs.

A dual system is in place in **Hungary** for monitoring drinking-water quality: self-check sampling by water suppliers at frequencies laid down in Annex II of the EU Drinking Water Directive (with double frequency for microbiological parameters), performed by the supplier's laboratory; and official sampling by local public health offices at least once a year (twice a year for large supplies), with tests carried out by State laboratories. The findings from both self-monitoring and official investigations are fed into a central database, validated by county public health authorities and used as a basis for remedial action, consumer information and trend analysis. National regulations on drinking-water quality provide for additional parameters to be included in monitoring operations as required, and for stricter values to be applied for some parameters. In line with Annex II of the EU Drinking Water Directive, the Office of the Chief Medical Officer can grant a three-year exemption for monitoring selected parameters (provided there is evidence showing the absence of the component in question, and risk assessment proves that non-compliance is unlikely); local public health authorities can allow sampling frequency to be reduced for a period of one year in the case of stable, source-derived parameters. Conversely, increased frequency of monitoring for parameters of concern (nitrite, boron and arsenic, for example) can be applied as required. WSPs were introduced into national regulations in 2009 and approximately 60% of the population are served by suppliers which have a WSP.

Each year water suppliers in **Portugal** have to submit a water quality control plan to the Water and Waste Services Regulatory Authority for approval. The plan includes details of parameters and frequency of sampling, and of sampling points on the network from source to consumer. Once the plan is approved, monitoring data are submitted online and can be inspected by the authorities responsible for food safety and health. If non-compliance is observed, the water supplier has to inform the local public health authority, who carries out a risk assessment to analyse the parameter, exposure time and susceptibility of exposed persons. The authority can restrict water use, make recommendations to the public and call on the water supplier to introduce changes to treatment processes. Health authorities surveyed water supply systems in 2013, with a special focus on small-scale water supplies. The country also has a mandatory disease notification system (including water-related infectious diseases) and a national epidemiological surveillance system. Water safety plans cover 73% of the population (23% from catchment to consumer, 50% from catchment to water treatment plant), and the Regulatory Authority is developing a simple tool to implement WSPs for small-scale water suppliers.

The legislative and regulatory framework for drinking-water in **Norway** includes the Water Resource Act, the Health Preparedness Act, the Public Health Act, the Food Safety Act and the Drinking-Water Regulations. The control regime overseen by the Food Safety Authority comprises annual and five-year inspections, regular auditing and one-off campaigns. A risk-based local water sampling scheme is in place, sampling for *E. coli* is mandatory, and there is a list of minimum parameters. Sampling data on water quality and quantity and pipeline information are reported to the Authority annually using a web-based system, and the information is analysed and made available for multiple uses. Based on risk assessments, the Authority can grant dispensations from meeting the standards laid down in the Regulations. Experience reveals a number of challenges with statistics and national reporting: regular sampling is not always reported; short-term dispensations may not be registered; and samples can be contaminated during sampling. Different checklists are used for large and small supplies, as well as for different treatment methods. The annual reporting template for water suppliers includes information on the supplier's internal control plan and preparedness plan.

In **Kazakhstan**, 20% of the population use drinking-water that does not meet the requirements laid down in sanitary norms and rules (as measured by 30 compulsory indicators). That situation is a result of high levels of pollution of water sources and ineffective water treatment technologies. The Sanitary and Epidemiological Surveillance Service implements monitoring measures, carries out regular and one-off inspections, and conducts environmental impact assessments of new and modernized water supply facilities. Samples are analysed by the Laboratory Service. Adoption of a sectoral programme on drinking water for 2012–2020 is leading to improvements in water supply, but sanitary protection zones are not respected, water treatment and disinfection plants do not operate correctly, and the small quantities of water supplied per inhabitant in rural areas make it difficult to comply with elementary hygiene procedures. The poor technical condition of the water distribution system and a lack of resources and competencies have resulted in more than 31 outbreaks of acute intestinal infections in the past ten years, affecting over 4500 people. Analysis of monitoring data has revealed a quantitative relationship between the condition of the water supply system, microbiological pollution and disease incidence.

In **Estonia** the Water and Health Information System was launched in 2012. Each year, over 140 water suppliers provide some 70 000 analyses of drinking-water from 1085 waterworks directly to a centralized database. That yields benefits for the Health Board (ease of overview and production of annual reports), water suppliers (ease of sharing of data, all analyses accessible in one database) and consumers (availability of information). The system has led to improved efficiency of work by saving time and staff costs, and thereby giving more time to address key issues such as focusing on problematic cases and raising public awareness. The online database has resulted in a significant reduction in instances of non-compliance with indicator parameters. It has also enabled targeted action to reduce the number of water supply zones with high levels of fluoride (non-compliance reduced from 127 water supplies in 2012 to 14 in 2015).

Session 6: Drinking-water quality surveillance in small-scale water supply areas

The purpose of the session was to:

- address the challenges and importance of drinking-water quality surveillance in small-scale water supplies in rural and sometimes remote areas, and share practical experiences;

– introduce sanitary inspections and field testing approaches and explain their role in the context of surveillance, especially in remote small community settings.

About one quarter of the population in the Region rely on small-scale water supply systems, which indicates the need for increased attention to be paid to their management and surveillance. A questionnaire survey has been made of small-scale water supplies in the **WHO European Region**. Information on both small public supplies and private wells was received from 43 of the 53 countries in the Region, and preliminary results were presented at the meeting (Fig. 2).

Fig. 2. Surveillance requirements in small-scale water supply systems in the WHO European Region

Surveillance requirements in small systems		Proportion (%)
Regular independent drinking-water quality monitoring and/or sanitary inspection	**Regular self-checking by operators**	
Yes	Yes	43
Yes	No	14
No	Yes	11
No	**No**	**5**

The majority of responding countries (68%) has established surveillance requirements that apply to all small-scale water supply systems by stipulating regular drinking-water quality monitoring by independent authorities and/or self-checking by operators; in 5% of the countries there are none of such requirements in place. In 27% of cases, surveillance requirements apply only to certain categories of small systems. Regular reporting of drinking-water quality is required in 78% of responding countries, while 22% of respondents said that there is no obligation. At national level, sufficient data are typically not available to enable easy comparison of parameters and compliance in water supply systems of different sizes. To support effective policy action and promote good practices, a guidance document is being drafted that will provide examples of proven instruments from the Region. A section of the document will focus on surveillance for small-scale systems. Measures to be advocated include sanitary inspections by operators or community members, self-checking and reporting of results, use of mobile laboratories and field testing kits, use of communications technologies to overcome challenges caused by remoteness, and adoption of risk-based approaches such as WSPs or sanitary inspections.

Requirements for monitoring the quality of drinking-water in **Germany** vary, depending on the size of the water supply. Minimum requirements for private wells are to carry out at least annual analysis of five compulsory microbiological parameters, with additional parameters selected on the basis of assessment by local authorities, who have to be notified in case of non-compliance. Challenges to surveillance in small-scale systems include lack of political attention at local level, low levels of awareness of potential risks, lack of personnel with specialized knowledge, and the desire of operators to remain independent of larger water suppliers. Best practices include the formation of network of water supply operators, especially for small community supplies, and the establishment of a joint inter-institutional working group (on small water supplies and private wells) which brings together representatives of the 16 federal states and several national authorities, who have issued guidance documents and recommendations for water operators and local health authorities.

Local authorities in **England and Wales** are responsible for implementing the Private Water Supplies Regulations 2009. Their regulatory duties include risk assessment for each supply in their area (primarily through on-site visits), monitoring each supply for compliance with drinking-water standards, and investigating and taking enforcement action where a risk to human health is identified or non-compliance is found. Risk assessments are reviewed if new information becomes available (but at least once every five years). The role of the Drinking-Water Inspectorate is to provide guidance and training, respond to enquiries and compile an annual report of the quality of private water supplies. A risk assessment tool for local authorities has been developed, and the DWI website includes a specific section on small private supplies. Case studies were presented showing the positive effects of carrying out risk assessments following introduction of the 2009 Regulations.

A rapid assessment of drinking-water quality has been made in two rural districts of **Georgia** (Marneuli and Dusheti). The survey methodology included water quality testing and sanitary inspection. It was found that microbial contamination was significant, there was low overall compliance with national standards (26% in Dusheti, 20% in Marneuli), and disinfection was absent or inadequately practised. A significant proportion of the sites investigated (40% in Marneuli, 24% in Dusheti) could be categorized as “high” or “very high” risk, requiring urgent attention. There was a lack of routine surveillance of drinking-water quality, and limited public awareness of water hygiene and risk factors. Recommendations at national level include: giving consideration to small-scale water supplies in national target setting; introducing a systematic drinking-water surveillance programme; promoting application of the WSP approach; increasing the knowledge and skills of water supply specialists; and improving communication to raise public awareness. The assessment findings led to enhanced awareness of drinking-water quality issues at all levels and initiated discussions on introducing a systematic drinking-water surveillance programme. One of the short-term outcomes was increased budget allocation for water quality testing. (A short video film[8] was shown.)

Sanitary inspections are a vital element of drinking-water quality surveillance, particularly for small-scale water supplies. Water quality analysis provides a “snapshot” reactive view and limited information about causes of contamination, whereas sanitary inspection identifies, evaluates and records risk factors that threaten drinking-water supply and quality. On-site fact-finding enhances knowledge of supply system conditions and enables prediction of future water quality changes. Use of standardized forms allows for rapid assessment of risk factors in point sources, service reservoirs, households, catchment areas and distribution systems. Data can be aggregated and combined with microbial water analysis for regional ranking of risk factors and prioritization of surveillance efforts and interventions. Sanitary inspection is a simple, but powerful tool that supports drinking-water quality surveillance and implementation of WSPs. Examples of sanitary inspection forms (to be updated) are contained in Annex 2 to Volume 3 of the WHO Guidelines for Drinking-water Quality[9].

A review was presented of **field testing methods** for the microbiological analysis of remote small water supplies. Due account should be taken of a number of considerations (e.g. scope of testing, personnel skills, cost and transportation) when selecting monitoring approaches and deciding whether to use laboratory-based or field testing methods. A wide range of parameters can be measured in the field using simple kits and meters, including thermotolerant (faecal

[8] Contaminated water, villages’ last resort (https://www.youtube.com/watch?v=VcLJhHi8WbM).

[9] WHO 2011 op. cit.

coliform) bacteria or *E. coli*, turbidity, free chlorine, pH, conductivity, and chemicals of health concern. Field test kits offer a cost-effective, reliable and robust method of analysis in situations where infrastructure and resources are limited, and may in fact be the only viable option for testing in those circumstances. They can be used to extend sampling rounds in remote locations. However, quality assurance and quality control can be difficult, which may place some limitations on their use for compliance monitoring. All methods (laboratory-based and field testing) need to be validated in the setting where they will be performed.

Session 7: Conclusions and recommendations

The main conclusion points of the meeting, as well as challenges/bottlenecks and country support needs in setting up and implementing an effective drinking-water quality surveillance system, are summarized below.

Main conclusions

- Vigilant water quality surveillance (as described in the WHO Guidelines for Drinking-water Quality) is an essential building block in public health protection.
- The Protocol on Water and Health emphasizes the need to establish a legal and institutional framework for monitoring and enforcing standards for the quality of drinking-water.
- There is broad recognition of the value of and need for risk-based approaches in standard-setting and surveillance (as exemplified in the revisions to the annexes of the EU Drinking Water Directive).
- Risk-based thinking leads to targeted and resource-effective surveillance and thus to better protection of public health. Sensible standard-setting is important: priority parameters of public health significance in a country should be carefully selected on the basis of occurrence and health risks.
- Regulations need to allow for flexible surveillance schemes that are based on local risk assessment and endorsed/approved by the health department.
- The WSP approach is the public health benchmark for providing safe drinking-water. WSP outcomes inform local decision-making in terms of priority risks and direct the scope of surveillance efforts.
- WSP uptake requires a phased approach in setting regulations, establishing adequate enforcement mechanisms and changing the role of regulators in auditing WSPs.
- Over-emphasis on compliance monitoring is “too little too late” for protecting public health from microbial risks.
- Vigilant operational monitoring, with a focus on critical events, is important to sustain system safety.
- Programmes targeted on specific parameters or surveillance campaigns have proven to be effective.
- Effective data management and functional databases are important, also for identifying priorities. New communication technologies facilitate reporting.
- Meaningful surveillance of small-scale water supply systems is of concern across the Region for a number of reasons, including the remoteness and high number of such

supplies, lack of baseline data, low compliance rates and shortages of trained and skilled staff.

- Surveillance officers can play an important supportive and advisory role in improving the management of small-scale water supplies.
- On-site visits/inspections are valuable for supporting risk assessments.
- Rapid assessments help to establish baseline information and map priorities.
- Systematic mapping of available rapid/field test systems is required.

Challenges/bottlenecks (selected)

- Surveillance is not always a policy priority.
- There is a lack of legal requirements stipulating risk-based approaches.
- Ministries and departments have competing requirements and mixed responsibilities, with a lack of coordination and data-sharing, notably between the sectors responsible for drinking-water and sanitation.
- Small systems are frequently neglected owing to a lack of resources (laboratory, human, logistic, financial).
- There is a lack of skilled personnel (in health offices, water suppliers), especially in remote rural areas.

Support needs (selected)

- Advocacy for strengthening drinking-water surveillance functions (using the Protocol on Water and Health platform).
- Development of practical guidance documents addressing:
  - definitions of “risk-based surveillance” and “resource–effective surveillance”;
  - roles and responsibilities of different agencies;
  - key building blocks of risk-based surveillance;
  - criteria for risk-based prioritization of parameters (“decision trees”); and
  - actions to be taken in response to exceedances.
- Collate and disseminate models (good practice case examples) of how to incorporate risk-based provisions in regulations.
- Capacity-building at all levels.
- Provision of guidance in local languages.

Suggested next steps under the Protocol on Water and Health

- Establish an expert group to conceptualize and develop a guidance document setting out:
  - the added value of risk-based approaches;
  - the building blocks of risk-based surveillance;
  - case study examples from regulation and practice; and
  - mapping of existing resources.

- Engage in awareness-raising and capacity-building activities at country and subregional levels.
- Analyse participating country briefs on drinking-water quality surveillance.

In a concluding round-table discussion, based on the assumption that a risk-based approach was "the way to go", participants were asked how they could "make it happen" in their country, and what they could do to facilitate its long-term uptake.

Participants agreed to work on revising their national legislation and regulations to incorporate WSPs and risk-based surveillance approaches. Many countries were already adopting a phased approach, especially for small-scale drinking water supply systems, with priority given to microbiological parameters. It was stressed that having the legislation and/or regulations on application of the risk-based approach is an important step, but enforcement needs to be strengthened, in particular in small systems. Addressing problems faced by small water supplies requires substantial efforts, and support would be required in the development of specific regulation on small systems, establishing WSPs and training or retraining of water supply personnel. Standardized checklists for auditing of WSPs and guidance on remedial action would be useful.

The Task Force on Target Setting and Reporting under the Protocol on Water and Health should adopt new concepts such as WSPs and incorporate targets on them, as well as reflect them in the revision of the reporting template.

EU Member States and countries with association agreements with the EU would continue to harmonize their legislation and regulations with the updated Drinking Water Directive.

Participants confirmed that the primary benefit of risk-based surveillance is the protection of public health and emphasized the oversight role of the health sector, as well as the need for closer collaboration between different sectors at national and local levels.

The representatives of the Secretariat and of the lead countries of the thematic area under the Protocol on Water and Health committed their support to promoting long-term uptake of risk-based approaches to water quality surveillance among policy-makers at national level.

Annex 1 - List of participants

Albania
Zhaneta Miska
Ministry of Health of Albania
Health Care Department
Tirana

Armenia
Nune Bakunts
National Center of Disease Control and Prevention
Yerevan

Azerbaijan
Eldar Abdullayev
Republican Center of Hygiene and Epidemiology
Communal Hygiene Department
Baku

Belarus
Alena Drazdova
Scientific Practical Center of Hygiene
Minsk

Bosnia and Herzegovina
Vesna Rudic Grujic
Public Health Institute Republic of Srpska
Department of Hygiene and Human Ecology
Banja Luka

Bulgaria
Ivo Atanasov
Ministry of Health
Sofia

Croatia
Krunoslav Capak
Croation National Institute of Public Health
Environmental Health Department
Zagreb

Estonia
Knut Tamm
Estonian Health Board
Department of Environmental Health
Tallinn

Germany
Marion Scharte
Bavarian Ministry of Health and Care
Environmental Medicine Department
Munich

Georgia
Nana Gabriadze
National Center for Disease Control & Public Health
Tbilisi

Hungary
Márta Vargha
National Institute for Environmental Health
Department of Water Hygiene
Budapest

Kazakhstan
Rabiga Milibayeva
Ministry of National Economy
Committee of Consumers Rights Protection
Astana

Kyrgyzstan
Gulnara Saryeva
State Sanitary Epidemiological Control Service
Department of Prevention of Diseases
Bishkek

Latvia
Madara Vegnere
Health Inspectorate
Public Health Division
Riga

Lithuania
Vilija Galdikiene
State Food and Veterinary Service
Food Division
Vilnius

Montenegro
Dijana Đurović
Institute of Public Health of Montenegro
Montenegro

Norway
Lisbeth Brynildsen
Ministry of Health and Care Services
Oslo

Wenche Fohnan
Norwegian Institute of Public Health
Oslo

Bernardo Guzman Herrador
Norwegian Institute of Public Health
Department of Infectious Disease Epidemiology
Oslo

Anita Johansen Klem
Ministry of Health and Care Services
Oslo

Solveig Eik Helle
Ministry of Health and Care Services
Oslo

Susanne Hyllestad
Norwegian Institute of Public Health
Department of Food, Water and Cosmetics
Oslo

Morten Nicholls
Norwegian Food Safety Authority
Brumunddal

Karin Nygård
Norwegian Institute of Public Health
Department of Infectious Disease Epidemiology
Oslo

Jens Erik Pettersen
Norwegian Institute of Public Health
Division of Environmental Medicine
Nydalen

Kjetil Tveitan
Ministry of Health and Care Services
Oslo

Stig Atle Vange
Ministry of Health and Care Services
Oslo

Netherlands

Ans Versteegh
National Institute for Public Health and the Environment
Center for Sustainability, Environment and Health
Bilthoven

Portugal
Paulo Diegues
Directorate-General of Health
Division of Environmental and Occupational Health
Lisbon

Republic of Moldova
Valeriu Goncear
Ministry of Health of the Republic of Moldova
Chisinau

Romania
Ioana-Rodica Lupsa
National Institute of Public Health
Regional Public Health Center Timisoara
Timisoar

Russian Federation
Yury Rakhmanin
A.N. Sysin Research Institute of Human Ecology and Environmental Health
Moscow

Serbia
Ljiljana Jovanović
Ministry of Health
Belgrade

Slovakia
Eva Kaňková
Public Health Authority of the Slovak Republic
Department of Living Environment Hygiene
Bratislava

Switzerland
Pierre Studer
Federal Food Safety and Veterinary Office
Bern

Tajikistan
Kolmakhmad Nazarov
State Sanitary Epidemiological Surveillance Service
Dushanbe

The former Yugoslav Republic of Macedonia
Mihail Kochubovski
National Institute of Public Health
Skopje

Turkmenistan
Bashim Myradov
Sanitary Epidemiological Service
Ashgabat

Ukraine
Nadiia Polka
National Academy of Medical Sciences of Ukraine
O. M. Marzeiev Institute for Hygiene and Medical Ecology
Kiev

Temporary Advisers

John Fawell
Bourne End, United Kingdom

Gertjan Medema
KWR Watercycle Research Institute
Nieuwegen, Netherlands

Steve Pedley
University of Surrey
Robens Centre for Public and Environmental Health
Guildford, United Kingdom

Claire Pollard
Drinking Water Inspectorate
London, United Kingdom

Bettina Rickert
Federal Environment Agency
Department Drinking Water and Swimming Pool Water Hygiene
Bad Elster, Germany

Other international organizations

Christof Mainz
European Commission
DG Environment, Directorate C
Brussels, Belgium

Nataliya Nikiforova
United Nations Economic Commission for Europe
Geneva, Switzerland

World Health Organization

Headquarters
Jennifer de France
Water, Sanitation and Hygiene (WSH)
Geneva, Switzerland

Regional Office for Europe
Oliver Schmoll
WHO European Centre for Environment and Health
Water and Sanitation Programme (WSN)
Bonn, Germany

Enkhtsetseg Shinee
WHO European Centre for Environment and Health
Water and Sanitation Programme (WSN)
Bonn, Germany

Précis-Writing

Charles Robson

Interpreters

Elena Frolova

Alexander Reshetov

Annex 2 - Programme

Wednesday, 6 May 2015

08.45-09.30 Registration of participants

09.30-09.40 Welcome and opening

Cecilie Brein-Karlsen (State Secretary, Royal Norwegian Ministry of Health and Care Services)

Oliver Schmoll (Programme Manager, WHO Regional Office for Europe)

Nataliya Nikiforova (United Nations Economic Commission for Europe)

09.40-10:00 Introduction to the workshop: background, objectives and expected outcomes *(Oliver Schmoll)*

10.00-10.15 Election of meeting officers and introduction of participants

10.15-11.00 **Session 1: Setting the scene - drinking-water quality surveillance for public health protection**

Surveillance in the context of the WHO framework for safe drinking-water *(Jennifer de France)*

Problem statement: Why are we concerned of water quality surveillance? (*Enkhtsetseg Shinee and Oliver Schmoll)*

Question and answers

11.00-11.30 Morning break

11.30-12.45 **Session 2: Risk-based and cost effective drinking-water quality surveillance**

What does prioritization in national standard setting mean and what is a "risk-based" and "cost effective" approach to water quality surveillance? *(John Fawell)*

Criteria for identifying microbial priority parameters and frequencies for routine monitoring of drinking-water quality *(Gertjan Medema)*

Criteria for identifying priority chemical parameters and frequencies for routine monitoring of drinking-water quality *(John Fawell)*

Question and answers

12.45-14.00 Lunch break

14.00-15.00 **Session 3: The role of water safety plans**

Brief introduction to the water safety plan approach *(Oliver Schmoll)*

Auditing of water safety plans *(Jennifer de France)*

Water safety plan auditing in England and Wales *(Claire Pollard)*

Question and answers

15.00-17.45 **Session 4: Country experiences**

Introduction to the group work

Group work on key challenges/bottlenecks and enablers to effective surveillance, support needs to strengthen drinking-water quality surveillance, as well as success stories and best practice examples in setting up effective surveillance systems

Afternoon break

Presentation of group work outputs to the plenary

Question and answers

18.30 Social dinner

Thursday, 7 May 2015

09.00-10.30 **Session 5: Case examples**

Risk based approach in the context of the EU Drinking Water Directive *(Christof Mainz)*

Risk based approach to drinking water surveillance: experience of Belarus *(Alena Drazdova)*

Dutch experience on risk-based water quality surveillance/monitoring regulations *(Ans Versteegh)*

Drinking-water quality surveillance in Hungary: implementation of specific programmes for priority parameters *(Marta Vargha)*

Drinking-water regulation and surveillance in Portugal *(Paulo Diegues)*

Question and answers

10.30-11.00 Morning break

11.00-12.00 **Session 5 (continued)**

Official control of water works in Norway *(Morten Nicholls)*

Surveillance of drinking-water quality in Kazakhstan *(Rabiga Milibayeva)*

Estonian water and health safety information system *(Knut Tamm)*

Question and answers

12.00-13.15 Lunch break

13.15-15.00 **Session 6: Drinking-water quality surveillance in small-scale water supply areas**

Small-scale water supply systems in the pan-European region: analysis of surveillance related issues and collection of good practices (*Bettina Rickert*)

Surveillance of drinking-water quality in small scale systems in Germany (*Marion Scharte)*

UK approach to surveillance of small water supplies (*Claire Pollard)*

The role of sanitary inspections in drinking-water quality surveillance *(Oliver Schmoll)*

Outcomes of application of the rapid assessment of drinking water quality in rural Georgia *(Nana Gabriadze)*

Review of field testing methods for the microbiological analysis of remote small water supplies (*Steve Pedley)*

Question and answers

15.00-15.30 Afternoon break

15.30-16.30 **Session 7: Building blocks of risk-based drinking-water quality surveillance**

Introduction of the objective and questions for moderated round table discussion

Round-table discussion on the building blocks of the risk-based drinking-water quality surveillance and the required guidance tools

16.30-17.00 **Session 8: Concluding session**

Presentation of the draft conclusions of the meeting and recommendations for follow up actions

17.00 Closure of the meeting

The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

Member States

Albania
Andorra
Armenia
Austria
Azerbaijan
Belarus
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxembourg
Malta
Monaco
Montenegro
Netherlands
Norway
Poland
Portugal
Republic of Moldova
Romania
Russian Federation
San Marino
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
The former Yugoslav Republic of Macedonia
Turkey
Turkmenistan
Ukraine
United Kingdom
Uzbekistan

World Health Organization
Regional Office for Europe
UN City, Marmorvej 51, DK-2100 Copenhagen Ø, Denmark
Tel.: +45 45 33 70 00 | Fax: +45 45 33 70 01
Email: postmaster@euro.who.int
Website: www.euro.who.int