GLOBAL STATUS REPORT ON WATER SAFETY PLANS:

A review of proactive risk assessment and risk management practices to ensure the safety of drinking-water

World Health Organization

IWA
the international water association

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International Water Association (IWA)

The International Water Association (IWA), a global network of water professionals, is a nongovernmental organization (NGO) in Official Relations with WHO. WHO's network of NGOs in Official Relations contributes to promote the policies, strategies and programmes derived from the decisions of the Organization's governing bodies. IWA's role as an NGO in Official Relations with WHO focuses on supporting countries to implement intersectoral policies and interventions for protecting health from immediate and longer term environmental threats. A long history of cooperation exits, built on previous joint activities between WHO and IWA's predecessors, the International Water Supply Association and the International Water Quality Association. A key area of cooperation is drinking-water safety.

IWA's Bonn Charter for Safe Drinking Water promotes the application of water safety plans (WSPs) as expressed in the WHO Guidelines for Drinking-water Quality. (Revisions to the WHO Guidelines will be taken as revisions to the Bonn Charter in as much as the Bonn Charter refers to the Guidelines.) IWA promotes WSPs with WHO through collaboration agreements, and through its membership of water utilities, research institutes, industry, and individual professionals. IWA's work spans the continuum between research and practice, covering all facets of the water cycle. IWA is a registered charity in England (Company registered in England No. 3597005 Registered Charity (England) No. 1076690).

Foreword

Millions of people in cities, towns and villages in all regions of the world lack access to safe drinking-water. Without fulfilment of this basic human right, significant public health consequences manifest to impede socioeconomic development and poverty reduction. Through the Sustainable Development Goals (SDGs), countries around the world have expressed strong political will to ensure drinking-water is universally safe.

Measurement of SDG Target 6.1 will be carried out through an indicator "safely managed drinking-water services", which emphasizes the need for structured actions to prevent contamination throughout the water supply system. In addition, and for the first time ever, water quality data will be monitored worldwide through direct measurements of faecal contamination and priority chemicals. This is a dramatic departure from the Millennium Development Goals (MDG) era, during which international monitoring was exclusively focused on access to water and the policy response was to extend water supply to the unserved, but not necessarily to improve water quality among those with service.

SUSTAINABLE DEVELOPMENT GOALS 2015–2030

Goal 6: Ensure the availability and sustainable management of water and sanitation for all.

Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking-water for all.

Priority indicator: Percentage of population using safely managed drinking-water services.

While important gains were made to increase access to improved water supplies during the MDG era, an estimated 663 million people remain without access to an improved source of drinking-water. Many more still lack access to safe drinking-water, with at least 1.8 billion people relying on water sources that are faecally contaminated (WHO, 2017). Increased attention to proactive water supply system management is needed to bridge this gap between improved supplies and safe supplies. Policy and planning action in the SDG period will now have to respond to monitoring data showing unsafe drinking-water. Therefore, now more than ever is the time for policy-makers and practitioners to embrace the concept of water safety planning.

Water safety planning is a comprehensive risk assessment and risk management approach that encompasses all steps in a drinking-water supply chain, from catchment to consumer. The water safety plan (WSP) framework organizes and systematizes a long history of best management practices adopted by water professionals, and it is widely recognized as the most reliable and effective way to manage drinking-water supplies to safeguard public health. Inherently flexible and fully adaptable to local conditions, WSP principles and concepts can be applied to the full range of system types, sizes and resource levels to ensure water safety.

The WSP framework was codified as best practice in 2004 in the third edition of the World Health Organization (WHO) Guidelines for Drinking-water Quality (GDWQ) and the International Water Association (IWA) Bonn Charter for Safe Drinking Water. In the decade since, WHO and IWA have collaborated closely to raise WSP awareness, build capacity and develop guidance materials and practical tools to support successful WSP implementation. To understand WSP progress to date and to inform the future WSP support agenda, WHO and IWA have undertaken a global review of WSP experiences. This report, which summarizes data from a WSP survey instrument and additional sources, provides a picture of WSP uptake globally based on information gathered from 118 countries representing every region of the world. It presents information on WSP implementation and the integration of WSPs into the policy environment. It also explores WSP benefits, challenges and future priorities. We hope this report will serve as a useful resource for policy-makers, practitioners and other stakeholders to inform and strengthen the planning and practice of WSP implementation.

Contents

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Angella Rinehold and Jennifer De France (both WHO) coordinated the development of this report. Strategic direction was provided by Bruce Gordon (WHO) and Tom Williams (IWA).

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Acronyms and abbreviations

ADB	Asian Development Bank
CR	climate-resilient
DFID	Department for International Development (United Kingdom)
DWI	Drinking Water Inspectorate (United Kingdom)
DWSS	Department of Water Supply and Sanitation (Nepal)
EPA	Environmental Protection Agency (United States of America)
EU	European Union
GDWQ	Guidelines for Drinking-water Quality
IA	impact assessment
IWA	International Water Association
MDGs	Millennium Development Goals
NGO	nongovernmental organization
NTDs	neglected tropical diseases
OFID	OPEC Fund for International Development
Ofwat	Water Services Regulation Authority (United Kingdom)
SDGs	Sustainable Development Goals
UBA	Umweltbundesamt (German Environment Agency)
WASH	water, sanitation and hygiene
WHO	World Health Organization
WSP	water safety plan

Key messages

WSPs bring many benefits

Stakeholders report a broad range of benefits associated with WSP implementation, including better system management and improved water quality.

Water safety planning is widely practised globally

WSPs are being implemented to varying degrees in 93 countries[1] representing every region of the world, with 30% of countries at an early adoption stage and others implementing on a national scale.

Implementation is on the rise

WSP implementation has increased markedly over the last decade – a trend expected to continue during the SDG period in response to increased water quality testing and global reporting on the indicator "safely managed drinking-water".

There is strong political support for WSPs

46 countries report having policy or regulatory instruments in place that promote or require WSPs, and another 23 countries report that such instruments are under development.

The approach applies in limited-resource settings

Despite inherent challenges, nearly three quarters of countries implementing WSPs are doing so in rural areas, demonstrating that WSPs can be adapted to reflect the needs and constraints of limited-resource settings.

More focus is needed on WSP elements that support sustainability

Focus on risk assessment and improvement planning should be balanced by greater attention to the ongoing operations, management, monitoring and review aspects of the WSP process that allow integration of a WSP into day-to-day system operations and underpin its sustainability.

WSP audit practice is limited and should be strengthened

Although water quality surveillance agencies are progressively transitioning to an auditing approach, data indicate that the majority of WSP implementing countries do not yet practise regular auditing, highlighting an important opportunity to strengthen WSP impact and sustainability through independent oversight and assessment.

There are financial barriers to overcome

The majority of respondents raised concerns related to financing WSPs, highlighting a need for improved communication of the WSP gains possible at minimal cost as well as greater promotion and funding by governments and external support agencies of risk-based improvement plans developed through the WSP process that help target and sustain financial investments.

[1] Throughout this report, the term "countries" includes the territories of French Polynesia and New Caledonia, as well as the West Bank and Gaza Strip. Australia and Canada are also counted among the "countries", although WSP data provided were subnational (for Victoria and Alberta, respectively).

Introduction

Through Sustainable Development Goal (SDG) Target 6.1, countries around the world have expressed strong political will to ensure drinking-water is universally safe. Measurement of this SDG target will be carried out through an indicator "safely managed drinking-water services", which emphasizes the need for structured actions to prevent contamination throughout the water supply system. Therefore, now more than ever is the time for policy-makers and practitioners to embrace the concept of water safety planning, which is widely considered the most reliable and effective way to manage drinking-water supplies to safeguard public health.

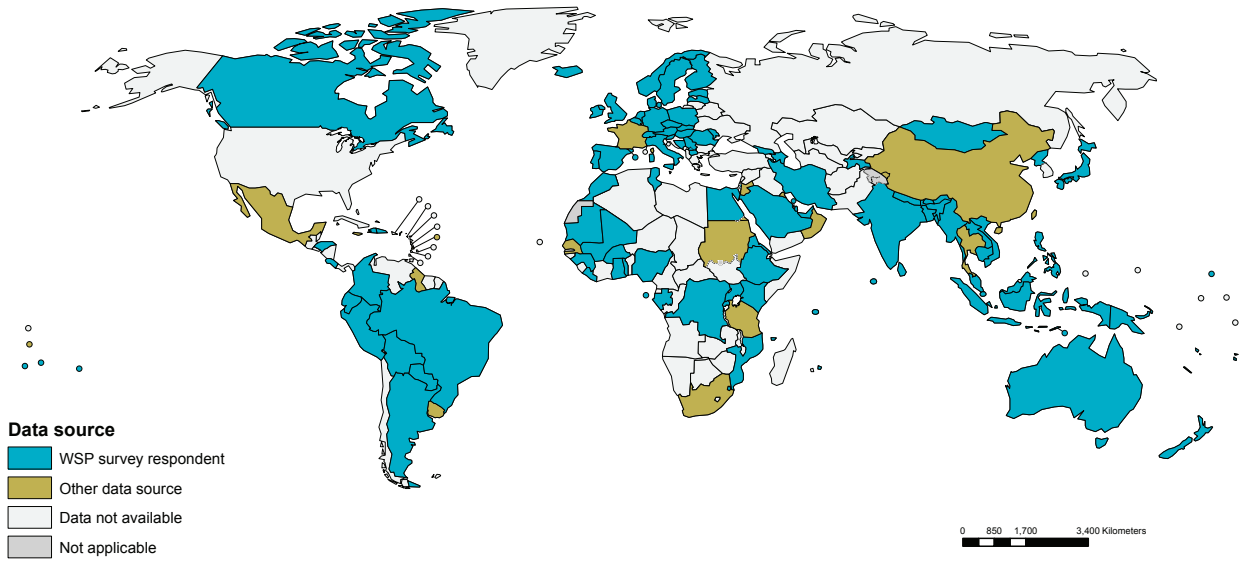
Water safety planning is a comprehensive risk assessment and risk management approach that encompasses all steps in a drinking-water supply chain, from catchment to consumer. The approach is inherently flexible and applicable to systems of all sizes and resource levels.

Since water safety plans (WSPs) were introduced in the third edition of the World Health Organization (WHO) Guidelines for Drinking-water Quality (GDWQ) and the International Water Association (IWA) Bonn Charter for Safe Drinking Water in 2004, an increasing number of water suppliers, governments and other stakeholders have embraced the approach. To better understand the status of WSPs, WHO and IWA have undertaken a review of WSP experiences globally. This report presents information from 118 countries on the status of WSPs, or equivalent risk management approaches that may go by other names but apply the same principles. It provides information on WSP implementation, policies and regulations, benefits, challenges and future priorities. The aim of this report is to present a picture of WSP practice globally to inform and strengthen future water safety planning.

The majority of the information presented in this report was obtained through a WSP survey circulated by WHO and IWA in 2013, and efforts have been made to confirm and update survey data wherever possible. In order to provide a more complete picture of global WSP status, WSP survey data were supplemented by other data sources where available, such as published literature. Annex A provides more detail on the research methodology.

Figure 1 shows countries that responded to the WSP survey, as well as countries for which data were obtained through other sources.

FIGURE 1
Countries included in the report and respective WSP data sources

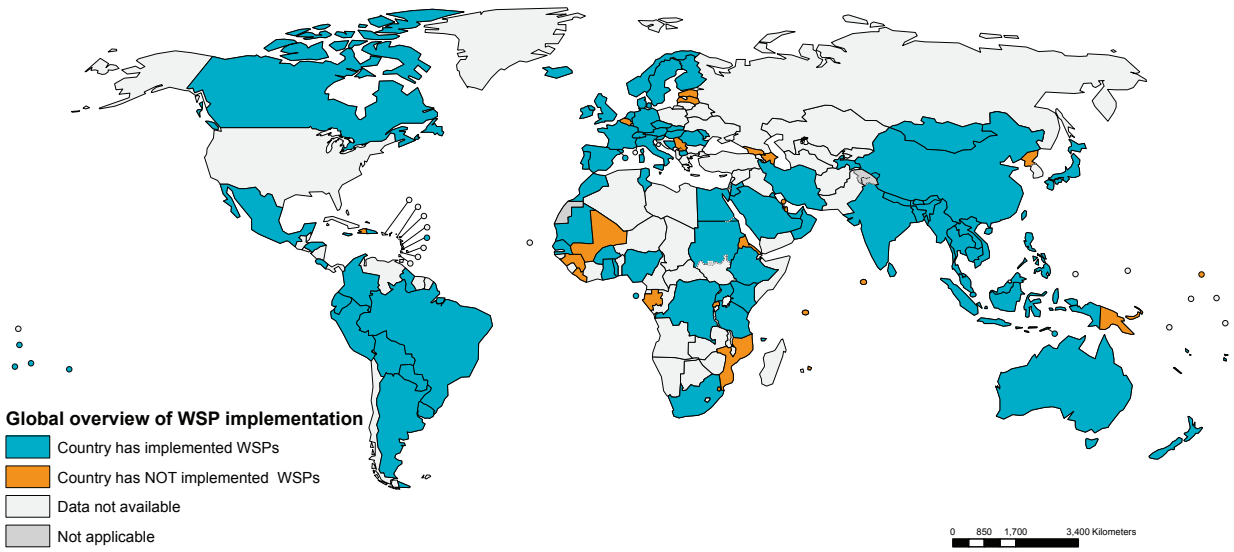


WSP implementation

Implementing countries

WSPs have been implemented[2] in 93 countries, representing every region of the world. This finding demonstrates widespread recognition of the importance of proactive risk assessment and risk management practices to keep drinking-water supplies safe.

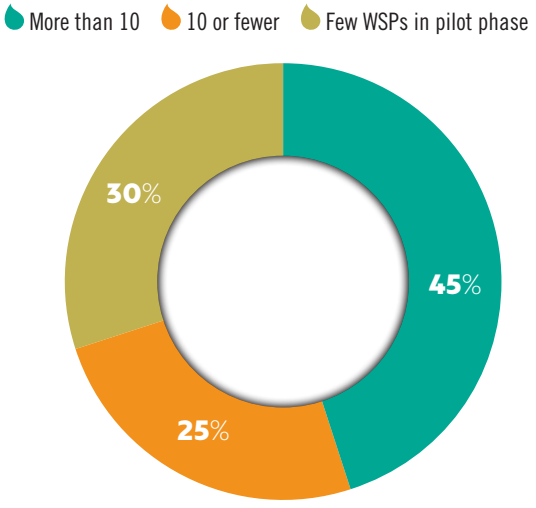
FIGURE 2
WSP implementation status



Scale of implementation

While some countries have implemented only a few WSP pilots, other countries are implementing WSPs on a larger scale. Morocco, for instance, is reported to be at an early stage of WSP implementation (WHO EMRO, 2015), whereas in Iceland, over 80% of the population was receiving drinking-water from utilities with a WSP in 2013 (see *Taking policy action to improve small-scale water supply and sanitation systems: Tools and good practices from the pan-European region* – Annex C). Among countries that provided information on the scale of WSP implementation for urban and/or rural[3] systems (n=76), **45% are considered to be at the scale-up stage[4] of urban and/or rural WSP implementation, while 30% are at the pilot stage**.

FIGURE 3
Scale-up status among countries implementing WSPs (n=76 respondent countries)



[2] The term "implemented" was subject to varying interpretation among WSP survey respondents. For example, survey responses indicate that some countries reported WSP implementation wherever WSPs had been developed, while other countries applied stricter criteria for meaningful WSP implementation in practice to justify a positive response.

[3] Survey respondents were asked to define "small or rural" water supplies according to their local context and to answer questions accordingly. Respondents generally defined "small or rural" water supplies by the population served, quantity of water provided, number of service connections, type of water system/source, or the authority responsible for water system management (e.g. community-based management). In a number of cases, survey respondents noted that no distinction was made between urban and rural supplies.

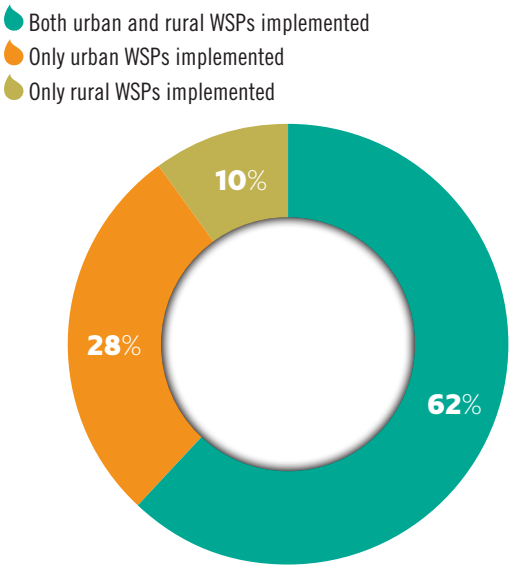
[4] More than 10 urban or rural WSPs implemented is considered to indicate the scale-up stage, as this was the highest category of WSP implementation provided on the WSP survey.

Urban and rural water safety planning

Among countries that provided information on urban versus rural[5] water safety planning (n=76), **62% (47 of 76) reported implementing WSPs in both urban and rural settings**, reaffirming that WSP principles apply across all system types and sizes. In the Philippines, for example, WSPs have been developed for urban water supply systems serving 8 million people and for small community water supply systems serving just 185 people.

That **72% of countries (55 of 76) implementing WSPs are doing so in rural settings** (10% in rural settings only and 62% in both urban and rural settings) demonstrates that the WSP approach can be simplified to suit the needs and constraints of small water supply systems and highlights appreciation for the role of WSPs in improving water safety and health in rural settings.

FIGURE 4
Comparison of urban and rural WSP implementation (n=76 respondent countries)



While WSPs have an important role to play to improve water safety for small systems, small supplies commonly face challenges that affect water safety planning, including issues related to human and financial resources, training, equipment, geographic remoteness and highly variable water supply system types and management arrangements. While valuable resources have been developed to support WSP implementation for small systems (see Annex C), there remains a need to take stock of small system WSP experiences globally to understand common challenges and success factors and to inform the development of additional guidance materials and tools.

WSPs IN SMALL-SCALE WATER SUPPLIES IN EUROPE

Throughout the European region, small-scale water supplies share a number of characteristics, including their high number, geographic spread and remoteness. This presents a demanding situation for independent surveillance, which is often limited for such systems. In these situations, application of risk assessment and risk management approaches by the owners or managers of the small water supplies is essential to complement and support the activities of surveillance agencies. Risk assessment and risk management approaches may range from operators of small systems regularly performing sanitary inspections to the implementation of a full WSP. The outcomes of the risk assessments allow health agencies to prioritize their surveillance activities, especially if resources are limited.

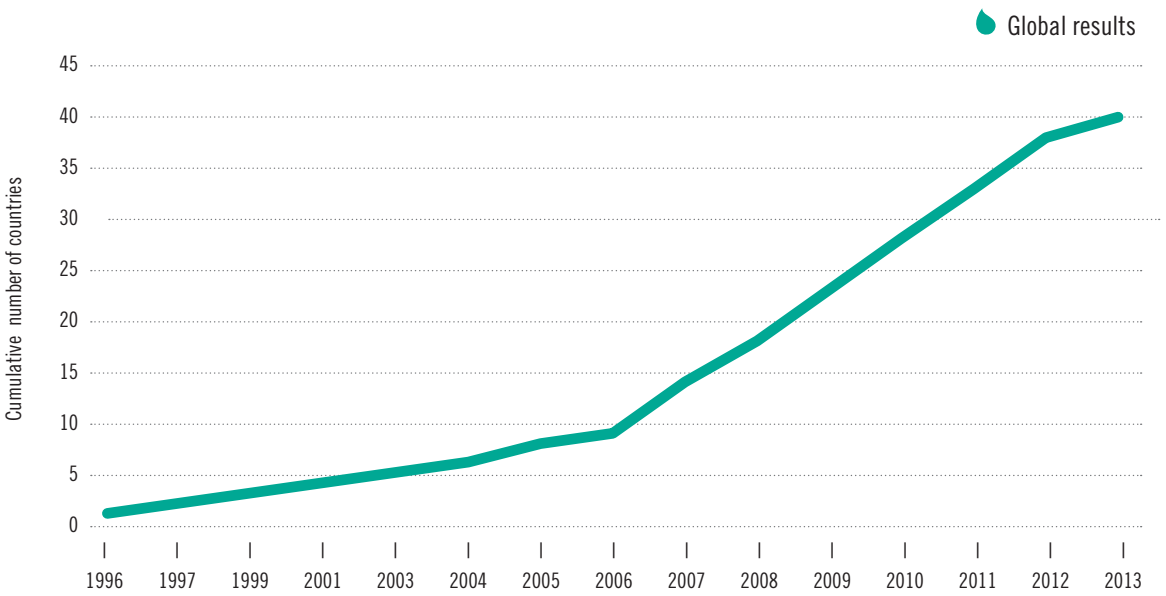
Tools for adapting the WSP approach to best suit the needs and constraints of small systems are increasingly emerging at the national level in Europe, e.g. in Austria, Finland, Germany, Iceland, Ireland, Switzerland and the United Kingdom. In addition, the WSP approach is promoted as a good practice to improve small water supplies in the WHO EURO/UNECE publication *Taking policy action to improve small-scale water supply and sanitation systems: Tools and good practices from the pan-European region* (see Annex C).

[5] See footnote 3 for an explanation of the term "small" or "rural" supplies.

Rate of implementation

Implementation of WSPs has risen sharply over the past decade. 81% (48 of 59) of countries for which relevant data were provided began WSP implementation after 2004. Figure 5 presents data for those countries (40) that provided the specific year of initial WSP implementation,[6] showing a marked increase in implementation rate after 2004.

FIGURE 5
Total number of countries with WSPs implemented (n=40 respondent countries)



The introduction of WSPs in the GDWQ and Bonn Charter in 2004 and the subsequent development of numerous WSP guidance documents and tools to support WSP implementation (see Annex C) has likely contributed to increased global uptake. The trend of increasing WSP implementation is expected to continue during the SDG period in response to increased water quality testing and global reporting on the indicator "safely managed drinking-water".

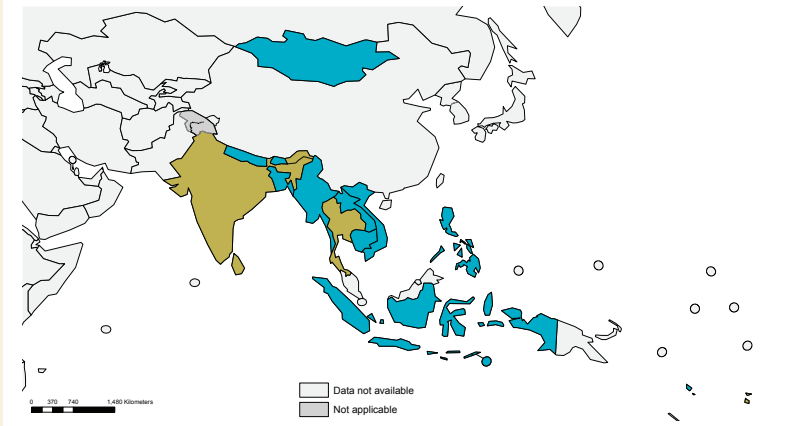
[6] Of the 59 countries that provided data on whether WSPs were first implemented "before 2004" or "after 2004", 40 countries specified the particular year of initial WSP implementation.

Regional uptake and initiatives

Data indicate high levels of WSP implementation in some regions. For example, **in the South-East Asia Region, 82% of countries (9 of 11[7]) have implemented WSPs**, many of which are implementing on a national scale.

WSP MAINSTREAMING IN SOUTH-EAST ASIA AND THE WESTERN PACIFIC REGIONS

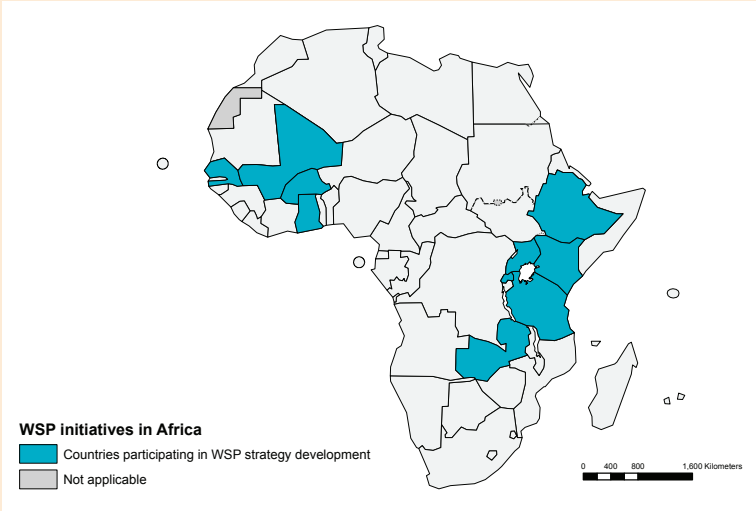
The high rates of WSP implementation in the South-East Asia (82%, or 9 of 11 countries) and Western Pacific (62%, or 18 of 29 countries/territories)[8] regions are due in part to a decade-long initiative in these regions to implement WSPs at a national scale.[9] Participating countries are working to deliver improved drinking-water safety through WSP mainstreaming, including awareness raising, capacity building, guidance material development, WSP implementation, and integration of WSPs into policies and regulations. As of the middle of 2016, the initiative had benefited an estimated 50 million consumers across the two regions through the implementation of nearly 1000 WSPs.



WSP INITIATIVES IN AFRICA

In Ethiopia, an extensive water quality study revealed that only 72% of 1602 samples collected from improved sources complied with microbiological water quality standards, with only 43% of protected springs in compliance as compared with 88% of piped supplies (WHO & UNICEF, 2010). These findings demonstrate the critical distinction between *improved and safe* water supplies and highlight a clear role for WSPs to address this gap. The Government of Ethiopia has responded to these and additional concerns related to climate-related impacts on water systems by launching a climate-resilient (CR) WSP programme. A national framework on CR WSPs has been formally adopted, as have customized national guidance documents CR WSPs for urban and rural systems. Twelve WSPs had been implemented as of the end of 2016, with continued scale-up planned.

Ethiopia is one of 10 countries in sub-Saharan Africa participating in a programme of needs assessment and strategy development for large-scale implementation of WSPs. Despite clear scope for WSP benefits in the region, significant uptake to date has been comparatively low. However, there is currently strong momentum and political commitment in many countries to create an enabling policy and institutional environment, linked to the development of a strong resource base, to support sustainable water safety planning as routine practice. Drawing from a number of regional needs assessment workshops, country-specific WSP scale-up strategies, or "roadmaps", are presently under development.[10]



[7] Findings compare the number of countries that have implemented WSPs (based on the data available, n=118) with the total number of countries in the relevant WHO region.

[8] Two territories in the Western Pacific Region, New Caledonia and French Polynesia, were WSP survey respondents and are included in the findings.

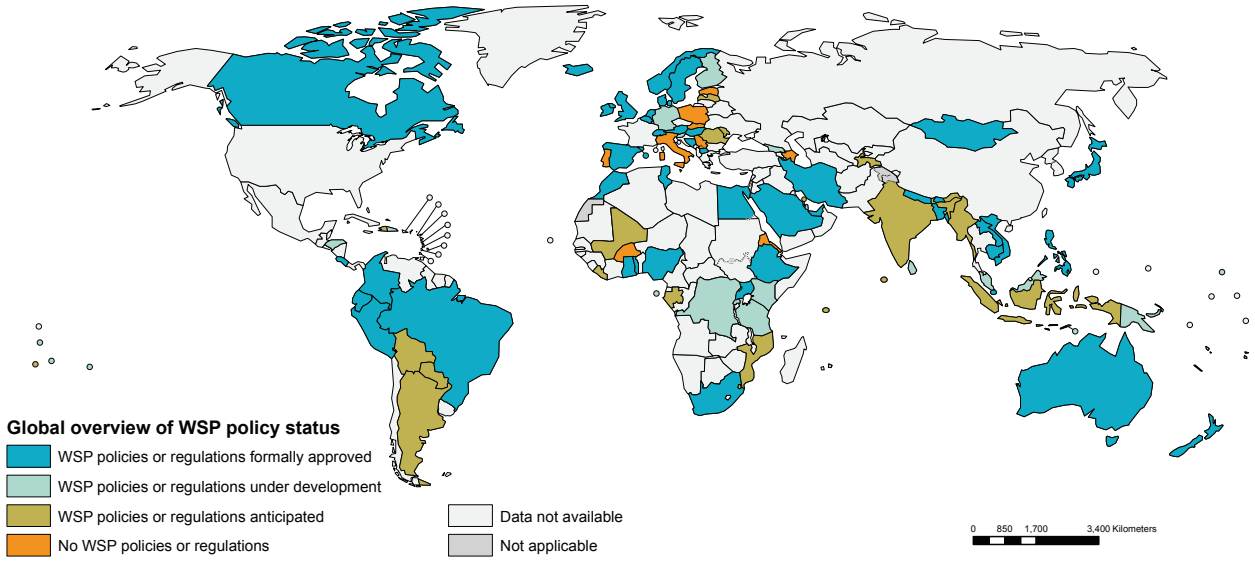
[9] For more information about the work in the South-East Asia Region under this WSP mainstreaming initiative, supported by WHO and Australia's Department of Foreign Affairs and Trade, please see http://www.who.int/water_sanitation_health/water-quality/safety-planning/searo-wsp-brochure.pdf?ua=1

[10] WSP strategy development in the African Region is being supported by IWA, WHO and the United Kingdom's Department for International Development (DFID).

Policies and regulations

Of the 100 countries[11] for which relevant data were available, data indicate that **46 countries have policy or regulatory instruments[12] in place that promote or require WSPs, with such instruments under development in an additional 23 countries**. These policy and regulatory instruments demonstrate strong political support for WSPs and serve as critical drivers for WSP implementation at scale.

FIGURE 6
WSP policy status



FORMAL WSP POLICY DRIVERS IN EUROPE

In the European Union (EU), Directive 2015/1787 of 6 October 2015 amends annexes II and III of the EU Drinking Water Directive, giving EU Member States (amongst others) the option to deviate from the list of drinking-water monitoring parameters and from the stipulated minimum monitoring frequency in case a risk assessment has been implemented as a basis for the deviation (see also http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2015.260.01.0006.01.ENG). This provision is intended to stimulate long-term uptake and increased implementation of risk-based approaches, such as WSPs, in the EU.

The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes provides a legally binding framework for the WHO European Region that requires countries that have become a Party to establish national targets to achieve or maintain a high level of protection from water-related diseases. In this context, several countries have set targets for safe management. For example, **Norway** undertook to have a satisfactory internal control system by 2016 that includes a risk and vulnerability analysis that considers the effects of climate change for all water and sewerage works that serve 50 persons or more. **Serbia** undertook to develop legislation for the implementation of WSPs, and the **Republic of Moldova** endeavoured to have WSPs for all cities by 2015, and for all other settlements serving more than 5000 people by 2020.

[11] In the case of Australia and Canada, data are subnational. Policy results shown are for the state of Victoria, Australia, and the province of Alberta, Canada.

[12] The term "WSP policy or regulatory instruments" was left open to interpretation in the WSP survey, and responses suggest that the general interpretation included formal acts, regulations, standards, policies, frameworks or strategies that explicitly promote or require WSPs or similar risk management approaches.

FORMAL WSP INSTRUMENTS

Examples of the various types of formal instruments promoting or requiring WSP implementation at a national scale include:

ACTS: In **Victoria, Australia**, risk management plans (equivalent to WSPs) are required by the Safe Drinking Water Act 2003.

REGULATIONS: In **Bhutan**, the Regulations to support the Water Act, which took effect in 2015, require WSP implementation for all water supply systems. In **Brazil**, risk management approaches have been explicitly promoted in national drinking-water regulations since 2000, and the present regulation (Ministry of Health Ordinance No. 2914/2011) recommends WSP implementation.

STANDARDS: In the **Lao People's Democratic Republic**, the national drinking-water quality standards (Minister's Decision on Water Quality Standard Management for Drinking and Domestic Use, Ministry of Health, 2014) require WSP implementation for all water supply systems and specify timelines for compliance.

FRAMEWORKS: In **South Africa**, WSPs are promoted through the Drinking Water Quality Framework, released in 2007, and the associated Blue Drop Certification programme – an incentive-based programme encouraging risk-based management of potable water. In **Ghana**, the Ministry of Water Resources, Works and Housing launched the National Drinking Water Quality Management Framework in 2016, which guides all water supply agencies on effective drinking-water quality management and public health protection, and which promotes WSPs nationally.

POLICIES: In 2014 and through Administrative Order 2014–0027, the **Philippines** Department of Health declared the development and implementation of WSPs by all water service providers to be national policy.

STRATEGIES: In **Iran (Islamic Republic of)**, WSP implementation is required by the VII national drinking-water quality strategy adopted by the Council of Ministers (Ministry of Health 2011). In **Cambodia**, WSPs are promoted through the National Rural Water Supply and Sanitation Strategy (2011–2025) and the associated National Action Plan for Rural WASH (2015–2018) includes an indicator on WSP development. (WSPs in urban settings are also encouraged in Cambodia's 2014 national drinking-water quality standards.)

WSP REGULATORY INITIATIVES IN THE AMERICAS

In **Peru**, the General Director's Office of Environmental Health promotes WSPs within the national drinking-water regulation, which took effect in 2014. Within the regulation, WSPs are identified as essential components of "quality control plans" (Health Directive No. 058-2014-MINSA/DIGESA) and "health adequacy programmes" (Health Directive No. 055-2014-MINSA/DIGESA), both of which are compulsory for all water utilities. To date, eight WSPs have been approved and 39 are under revision (out of 50 major water utilities). In **Brazil**, WSP implementation is recommended by the Minister of Health through Health Ordinance No. 2.914/2011. More than 10 WSPs have been developed in water utilities and, as a step toward scale-up, Brazil is planning to create "watershed committees" as a strategy to promote WSPs. **Colombia's** current drinking-water regulations require all water utilities to implement "risk mapping" (equivalent to water safety planning) through Health Resolution 4716-2010. **Jamaica** is working to introduce WSPs into regulations through the framework of the National Water Quality and Surveillance Plan.

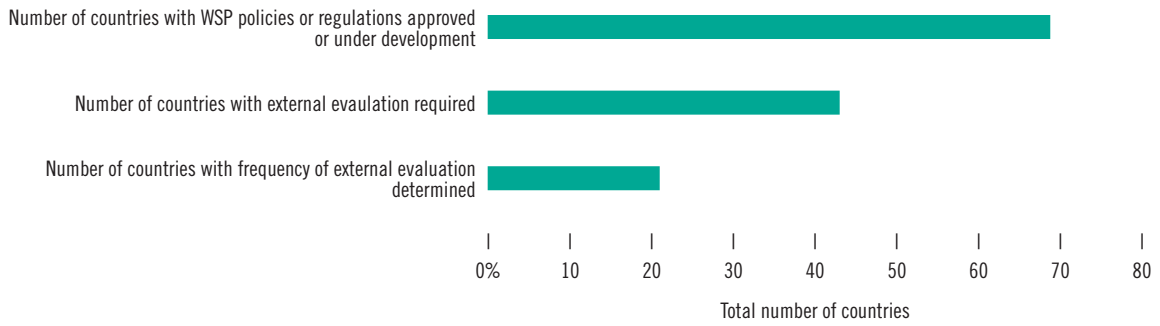
These national WSP regulatory initiatives are complemented by advocacy and support at the regional level. In December 2016, a workshop among **Andean countries** was held to discuss the advantages and disadvantages of a legal and regulatory framework for an intersectoral risk management approach. Representatives from Brazil, Peru, Colombia, Chile, Ecuador and Venezuela participated in the workshop.

To strengthen WSP capacity and support the practical implementation of WSP regulatory requirements, a WSP virtual course in Spanish was launched in May 2016 and has already reached more than 1000 participants from 22 countries in **Latin America and the Caribbean**. Soon the Portuguese and French versions will also be available at https://www.campusvirtualsp.org/?q=en/courses/self-learning.

WSP auditing

Just **62% (43 of 69) of countries with WSP policies or regulations approved or under development reported external[13] evaluation (or audit) requirements**. Further, **only 49% (21 of 43) of countries requiring auditing reported having established an auditing frequency**, suggesting that auditing schemes are at an early stage of implementation in many countries.

FIGURE 7
WSP auditing practice



WHAT IS WSP AUDITING?

WSP auditing is defined as an independent and systematic check of a WSP to confirm its completeness, adequate implementation in practice and effectiveness. It can be internal, external, formal or informal. Auditing supports the continuous improvement of WSPs and provides a system of ongoing support and accountability for WSP implementation. It is a core component of WSP verification and therefore an integral part of any WSP. More information on WSP auditing can be found in *A practical guide to auditing water safety plans* (see Annex C).

Additionally, **46% (27 of 59) of responding countries identified a lack of enforcement of WSPs as a current and/or future challenge to WSP implementation**, supporting the finding that many WSP implementing countries are not actively practising WSP auditing. This highlights an important opportunity to strengthen WSP implementation, impact and sustainability through increased attention to auditing.

[13] "External" was not defined in the WSP survey. However, in the context of WSP audits, "external" refers to audits undertaken by those not employed by or reporting to the water supplier, e.g. a government body or nongovernmental organization (NGO).

EXTERNAL AUDITING TYPES, DRIVERS AND BENEFITS

FORMAL AUDITS: Where WSPs are legally required, external audits (generally formal) are necessary to confirm compliance with relevant WSP requirements. In **England and Wales**, for instance, national drinking-water regulations require water suppliers to implement WSPs, and the Drinking Water Inspectorate (DWI) is charged with WSP auditing as part of enforcement of the regulations. In addition to confirming regulatory compliance, the audit process helps water suppliers to strengthen their WSPs by addressing improvement opportunities identified by DWI auditors.

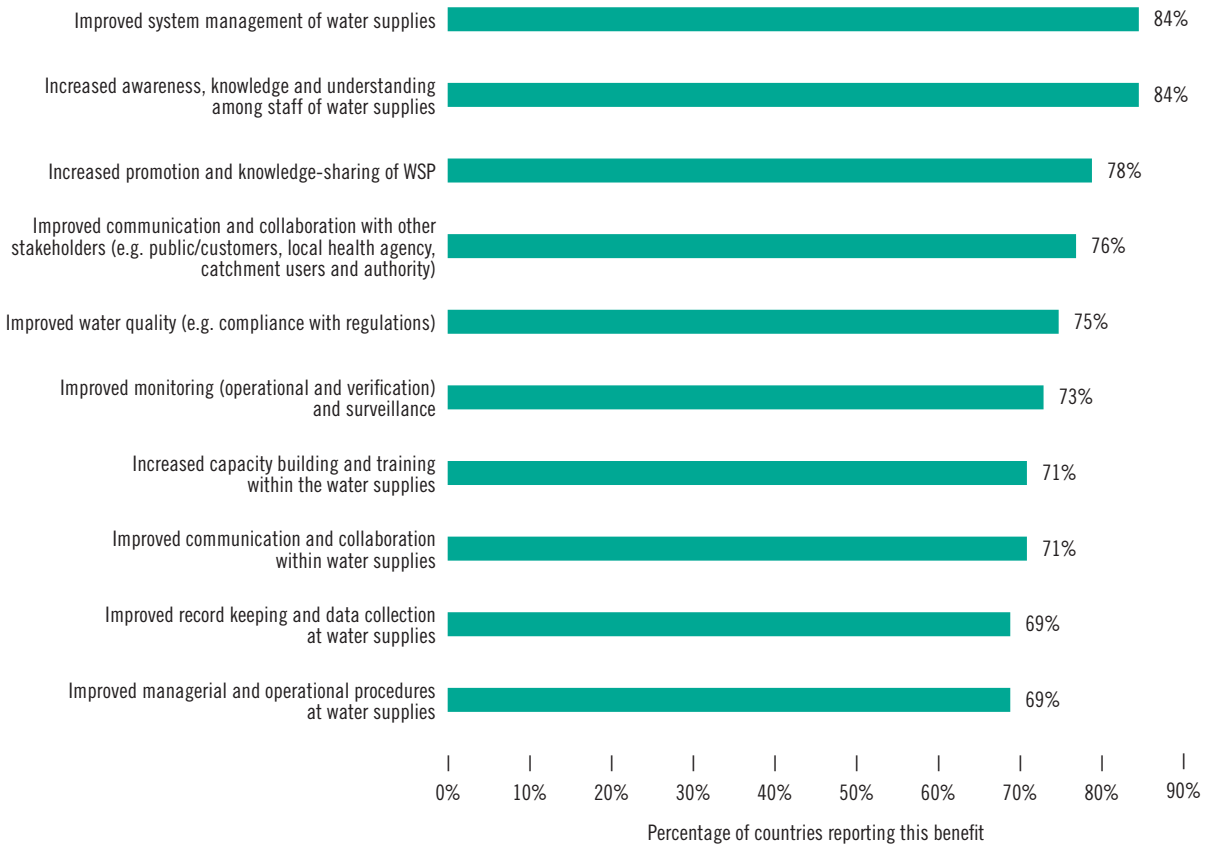
INFORMAL AUDITS: Where WSPs are not legally required and/or where formal WSP audits are not appropriate, informal external audits have an important role to play. In **Nepal**, for example, the Department of Water Supply and Sanitation (DWSS) undertakes informal WSP audits for community-managed water supply systems (among other system types) in order to verify understanding of WSP principles, to discuss any barriers to WSP implementation, and to offer moral and technical support to WSP teams. These informal audits support the ongoing implementation and continuous improvement of WSPs, and they also provide an important feedback mechanism for DWSS on the effectiveness of the national WSP programme. For instance, common issues with WSP understanding or implementation detected during the audits may indicate shortcomings in WSP training programmes or the feasibility of the customized WSP approach. In **Kenya, Uganda** and the **United Republic of Tanzania**, informal WSP audits were carried out[14] at three water utilities (one per country). Results from the audits revealed that 77% of the WSP process was well developed and implemented but gaps remained in operational monitoring and verification that could undermine WSP effectiveness. The audits further provided a mechanism to confirm required upgrades for ageing infrastructure to support the preparation of informed investment plans.

[14] The audits were carried out as part of a United States of America Environmental Protection Agency (EPA) funded programme where IWA facilitated the development and implementation of WSPs from December 2012 to July 2014 in these three utilities.

Benefits

Countries implementing WSPs reported a broad range of benefits, including improvements in operations and management, institutional knowledge and awareness, and water quality. The 10 most commonly reported benefits are shown in Figure 8.

FIGURE 8
10 most commonly reported benefits of WSP implementation (n=51 respondent countries)



These and other WSP benefits have also been reported elsewhere. In Iceland, a significant decrease in the incidence of diarrhoea was detected where WSPs were implemented, with populations served by WSPs determined to be 14% less likely to develop clinical cases of diarrhoea (Gunnarsdottir et al, 2012). In the Philippines, the Manila Water Company's implementation of a WSP led to reduced water quality monitoring requirements and a resulting operational cost savings of approximately 6.4 million Philippine pesos (US$ 128 000) annually. In Bhutan, WSP-related changes to operations and infrastructure resulted in a significant reduction in faecal coliform detections in treated water, as described in the following case study. For more information on the Philippines and Bhutan case studies, see *Operational monitoring plan development: A guide to strengthening operational monitoring practices in small- to medium-sized water supplies* (Annex C).

IMPROVED WATER QUALITY IN BHUTAN

A water supplier in Bhutan serving approximately 6000 consumers had long struggled with a number of issues related to insufficient treatment works, lack of water quality monitoring equipment, undertrained system operators, limited staff numbers and many competing responsibilities on staff time. A review of all water quality data available from 2012 and 2013 revealed that none of the samples (n=94) in two years complied with the national faecal coliform target of 0 CFU/100mL, i.e. 0% compliance. After risks related to infrastructure, operations and staff capacity were systematically identified, prioritized and addressed through the WSP process, water quality improved markedly. Following major WSP interventions in May 2014, 57% of all samples collected through July 2015 (n=104) were found to be in compliance with faecal coliform target. As the WSP team continues to implement its WSP, including securing financial support for additional infrastructure needs, continued water quality improvement is expected.

Inspecting improvements made through the WSP to reduce risk and improve water quality.

Year	Number of samples	% of complying samples (faecal coliform =0 CFU/100mL)
2012	36	0%
2013	58	0%
2014 (after May)	37	41%
2015 (through July)	67	66%

Photo © Angella Rinehold/WHO

While there are a number of documented cases of WSP benefits, there remains an important opportunity for greater systematic assessment of the impacts of WSP implementation to strengthen the WSP evidence base and to support advocacy. The following text box provides an example of a multi-country WSP impact assessment in the Asia Pacific region, highlighting resources under development to support future assessments.

SYSTEMATIC ASSESSMENT OF WSP IMPACTS

To support the systematic assessment of WSP impacts, WHO developed a set of impact assessment (IA) indicators. The IA indicators, based on the United States of America Centers for Disease Control and Prevention's *A Conceptual Framework to Evaluate the Impacts of Water Safety Plans* (Gelting et al, 2012), reflect a wide range of potential WSP benefits, including water quality and health impacts as well as financial, operational, institutional and policy outcomes. Data collection tools providing tips for fieldworkers were also developed, as were WSP audit tools to gauge WSP quality and implementation in practice in order to provide context for IA findings.

The WSP IA tools were used to assess WSP impact across 99 sites in 12 countries[15] in the South-East Asia and Western Pacific regions (see box on page 5), with participating water supply systems ranging in size from just 22 people served to nearly 9 million people served. The study found that WSP implementation was linked to statistically significant improvements in operations and management practices, non-revenue water, the number of water safety-related meetings, water quality testing activities and monitoring of consumer satisfaction. Additionally, approximately half of the sites reported infrastructure improvements directly resulting from WSP implementation, and approximately one quarter of sites reported that WSP implementation served to leverage financial support from donors or NGOs.

Study results are expected to be published by the end of 2017. The IA indicators and associated guidance and tools are being revised to reflect lessons learned through the study. Study results are expected to be published by the end of 2017.

[15] Bangladesh, Bhutan, Cambodia, Cook Islands, Lao People's Democratic Republic, Mongolia, Nepal, Philippines, Samoa, Sri Lanka, Timor-Leste and Vanuatu.

Challenges and opportunities

WSP review and revision

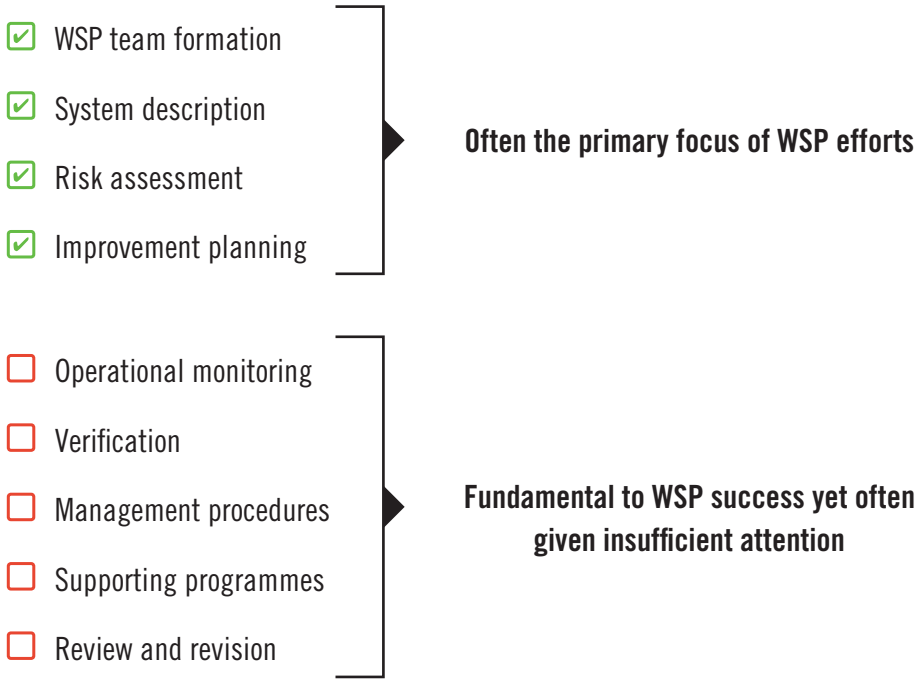
Only 45% (31 of 69) of the countries applying WSP policies or regulations identified regular review to be a required WSP element, suggesting a shorter term approach to WSPs. This finding reinforces an important distinction between WSP development and active, sustained WSP implementation in practice, as exemplified in the South African case study.

ACTIVE WSP IMPLEMENTATION IN SOUTH AFRICA

In 2013, South Africa's Department of Water and Sanitation conducted an assessment of more than 1000 water supply systems. While 65% of these water suppliers had documented WSPs, only 13% were found to have reviewed their risks within the previous 12 months. Therefore, while many systems had developed WSPs, only a small minority of systems were considered to be actively implementing and maintaining their WSPs.

The limited focus on WSP review is consistent with a challenge commonly encountered in WSP practice: WSPs often focus primarily on hazard identification, risk assessment and improvement planning rather than also giving due attention to the ongoing operations, management, monitoring and review aspects that are fundamental to a WSP and underpin its long-term success. A WSP is most effective and sustainable where it is approached as a holistic management plan to be integrated into routine system operations and kept current and relevant through regular review and revision. Maximum WSP benefits are realized when balanced attention is given to both the "front end" and the "back end" of the WSP process (see Figure 9).

FIGURE 9
Imbalanced attention to WSP "front end" and "back end" as observed in practice



Financing

80% (47 of 59) of countries raised concerns related to financing WSPs, including covering costs associated with WSP development and the implementation of improvement plans. These findings indicate that financial barriers, both real and perceived, pose an important hurdle to water safety planning.

Field experience has shown that overcoming financial barriers to water safety planning often involves dispelling misconceptions about cost implications. For an individual water supplier, WSP development and implementation does not necessarily involve significant costs. Many elements of a WSP will be practised by well-managed water supplies as a matter of course, with the WSP process helping water suppliers systematize existing good practice and fill gaps where needed. Water safety planning should therefore not be considered an additional workload, but rather part of water system operations and management. Further, WSPs often bring benefits with minimal financial inputs and can result in greater cost effectiveness, as demonstrated in the case studies below.

LOW-COST IMPROVEMENTS TO WATER QUALITY IN PERU

Detection of arsenic in excess of acceptable levels in the water source for the city of Tacna, Peru, triggered the development of a WSP. Technical specialists were engaged through the WSP process to assess the degree of arsenic contamination and to recommend necessary improvements. While treated water samples from the Tacna water treatment plant indeed revealed arsenic concentrations in excess of the acceptable limit of 0.01mg/L, the technical specialists determined that arsenic could be reduced to acceptable levels through modified operation of existing treatment processes (e.g. chemical dosing). The WSP therefore identified an important opportunity to improve water quality with minor financial inputs required.

IMPROVED COST-EFFECTIVENESS IN PORTUGAL

Prior to WSP implementation, Portugal's Águas do Algarve faced challenges with its system of online monitoring for chlorine, pH, turbidity and conductivity. Operators lacked confidence in the equipment readings and relied on manual sampling and laboratory testing to back up online monitoring results. Through the WSP process, the WSP team focused on increasing the quality of data generated by the online instrumentation through improved calibration and maintenance, which resulted in greater confidence in readings and reduced reliance on laboratory testing. In addition, the WSP risk assessment process revealed that some online instrumentation was unnecessary and could be removed from service, and the frequency of laboratory testing for other parameters (i.e. microbiological parameters) was reduced based on the outcomes of the risk assessment and prioritization. The WSP process thereby resulted in considerable improvements in monitoring efficiency and cost-effectiveness. For further details see *Strengthening operations and maintenance through water safety planning: A collection of case studies* (Annex C).

Where the WSP process reveals that costlier system improvements are needed, such as additional treatment works, WSPs support investment planning and can help to leverage funds. Because WSP improvement needs are identified through a systematic process of risk assessment and prioritization, WSPs can help to validate requests for financial support, such as annual budget requests to government, requests to financial regulators to raise tariffs where necessary, or proposals for loans or grants from banks and donors. WSPs serve to increase confidence among water suppliers and financing institutions that funds are utilized most effectively, and WSPs contribute to the sustainability of improvement works through their focus on ongoing operational monitoring and management. The following case studies illustrate the value of WSPs in helping water suppliers prioritize investment needs and leverage financial resources.

WSPS INFORM TARIFF SETTING IN THE UNITED KINGDOM

In England and Wales, the tariffs charged to consumers by drinking-water suppliers are regulated by the Water Services Regulation Authority (Ofwat) and are determined in part by each supplier's five-year business plan. The business plans include action plans for addressing water quality improvement needs, which are evaluated by the DWI, a government body providing independent assurance that public water supplies are safe and drinking-water quality is acceptable to consumers. Where DWI confirms that a proposed improvement is necessary for the supplier to meet water quality standards and to protect public health, the improvement is approved for inclusion in the business plan and Ofwat may allow the supplier to raise tariffs as required to cover the essential costs. For the business plan review completed in 2014, all water quality improvement scheme proposals (121) were informed by the WSP process. In 84 cases, the improvements were approved for inclusion in the business plans and Ofwat allowed water suppliers to raise tariffs as needed to cover the costs of the work.

DONOR-FINANCED WSP IMPROVEMENTS IN WEST AFRICA

In 2014, the OPEC Fund for International Development (OFID) signed an agreement with IWA to implement WSPs and low-cost interventions to improve the safety of water supplies and the health of communities in six west African secondary towns in the countries of Burkina Faso, Ghana, Guinea, Liberia, Senegal and Sierra Leone. The funds were directed into establishing a water safety planning development and implementation process in each of the respective water utilities through training and capacity development, and into directly improving the selected water supply systems through prioritized low-cost interventions as per the recommendations of the developed WSPs. The approach helped water suppliers secure support for necessary improvement works while also allowing OFID to maximize the effectiveness and sustainability of sponsored interventions. WSP trainings were completed for all the utilities, and the implementation of the prioritized low-cost interventions is in progress in Burkina Faso, Guinea and Senegal.

ASIAN DEVELOPMENT BANK (ADB) SUPPORT FOR WSPs

"Good practice in any urban water project involves having a system in place to ensure that the water supply remains at the desired quality beyond the initial construction of the capital infrastructure. An important management system approach to help achieve this longer-term goal is the WSP. It is a valuable tool to assist water suppliers and other stakeholders to systematically identify and prioritize system needs, from low-cost operational and management solutions to more capital-intensive infrastructure improvements. Furthermore, where infrastructure improvements are necessary for the provision of safe drinking-water, WSPs serve to maximize the effectiveness and sustainability of those improvements by ensuring that appropriate operations and management systems are in place to support the water supply system over the long term."

Water safety planning for urban water utilities: Practical guide for ADB staff (see Annex C)

Where national or subnational governments promote WSP implementation at scale, e.g. through regulatory requirements for WSPs, there are important cost implications. For example, there are costs associated with delivering WSP training to water suppliers, as well as supporting and sustaining WSP implementation through ongoing external auditing. For water supply systems with sufficient revenue streams, it may be feasible to expect suppliers to bear these costs. Where revenues are insufficient, as is the case for many small systems, other funding sources will be needed. In the Victoria, Australia, WSP programme costs are borne by the water suppliers. In New Zealand, on the other hand, WSP training and auditing expenses are covered by government budgets. For many countries, sustainable mechanisms to finance WSP programmes have yet to be identified.

Priorities looking forward

Just over a decade after the introduction of WSPs in the WHO GDWQ and the IWA Bonn Charter, there is clear evidence of strong global support for WSPs among policy-makers and practitioners alike. With increasing rates of WSP uptake and with the SDG agenda creating additional impetus for WSP implementation, particularly as the new focus on water quality monitoring for SDG Target 6.1 draws increased attention to problems posed by inadequate management of drinking-water supplies, it is an opportune time to reflect on lessons learned and implications for future water safety planning. Priorities looking forward include:

Introducing and/or scaling-up WSPs

For countries not yet implementing WSPs and for the 30% of countries that have not yet moved from the early adoption stage to wider implementation, there is scope to strengthen the enabling environment for WSPs. This includes effective advocacy, creating policy or regulatory drivers for WSPs, establishing institutional arrangements supportive of WSPs, and investing in WSP education/training for water suppliers. In many countries, the process of establishing national SDG targets, indicators and action plans – particularly where shortcomings are identified in drinking-water quality – presents a timely opportunity to promote or strengthen WSP implementation on a national scale to improve water quality and services. (Annex C includes a guidance document on creating an enabling environment for national-level scale-up of WSPs.)

Strengthening the evidence base

Understanding and sharing WSP benefits is essential to creating support for WSP implementation. While there is a growing body of evidence of WSP benefits, there is an opportunity to increase the systematic assessment and sharing of the broad range of WSP benefits.

Integrating WSPs into day-to-day operations

There is a clear opportunity to strengthen water safety planning through increased attention to the WSP elements related to ongoing operations, management, monitoring and review, as this broader management planning underpins a WSP's long-term success. WSP implementers, trainers and auditors can strengthen WSP outcomes in the future by aiming for WSPs that guide day-to-day system operations and serve as practical management tools rather than WSPs that focus on one-off improvement needs.

Supporting WSP auditing

WSP auditing provides a system of ongoing support and accountability for WSP implementation, drives continuous WSP improvement, and allows confirmation of compliance where WSP requirements are in place. However, WSP audit practice is limited in many WSP implementing countries. There is therefore a need to further strengthen WSP audit programmes, e.g. as part of water quality surveillance systems, including building audit capacity and establishing sustainable audit financing. (Annex C includes a guidance document on developing and implementing WSP audit schemes.)

Informing and sustaining investments through WSPs

WSPs guide water suppliers through the systematic prioritization of improvement needs and the development of management plans to support and sustain those improvements over the long term. Governments and external support agencies investing in water supply systems should optimize the effectiveness and sustainability of investments by promoting and funding risk-based improvement plans developed through the WSP process and by supporting related WSP training and auditing.

Supporting WSPs for small systems

WSPs have an important role to play in improving water safety and health for those served by small water supply systems. Due to the particular challenges impacting small-scale water supply systems and associated WSPs, there is a need to review small system WSP experiences to date to understand common challenges and success factors and to identify additional support needs.

Recognizing linkages with related water, sanitation and hygiene (WASH) initiatives

Water safety planning provides a valuable framework for addressing WASH priorities that extend beyond the standard interpretation of drinking-water safety. For example, CR WSPs, which identify and address climate-related risks to drinking-water supply systems, have been implemented in several countries and incorporated into national strategies as a practical tool to build climate resilience. WSPs can also help to strengthen equity in WASH through the systematic inclusion of equity considerations throughout the WSP process. The WSP framework has also been used to improve WASH in health-care facilities, to address neglected tropical diseases (NTDs), and to improve sanitation safety. Recognizing and promoting the linkages between WSPs and related initiatives serves to increase support for water safety planning while providing a tool to address other WASH priorities. (Annex C includes resources on applying the WSP framework to support various WASH priorities, including climate resilience, WASH in health-care facilities, equity and sanitation safety.)

Annex A: Methodology

WSP survey data collection and validation

The majority of data presented in this report were obtained through a WSP survey circulated in 2013. The survey instrument was designed by WHO, IWA and UBA to collect data on WSPs (or equivalent risk assessment and risk management approaches), including information on WSP implementation, policies and regulations, external evaluation (or audit), benefits and challenges. The online[16] survey, administered using DataCol, was sent to selected WHO country offices and to contacts at all six WHO regional offices,[17] who in turn invited WHO country offices and/or government bodies to collaborate with relevant stakeholders as needed to submit one survey per country. The survey was also distributed through IWA's networks.

WSP survey responses were primarily received between August and December 2013 and were most commonly submitted by officials at different levels of government (municipal, state and national). Other surveys were submitted by WHO representatives at country and regional levels. Survey responses were received from 108 countries, translated into English, and subjected to a process of data validation and updating.

The WSP survey data validation and updating process was carried out between 2014 and 2016 and involved:

- **Data reviewed for inconsistencies:** Data were reviewed for mutually exclusive or otherwise inconsistent responses. Inconsistencies were flagged for follow-up.
- **Data compared with other survey reports:** Data were compared with responses from other surveys containing questions on WSPs, namely the EMRO survey (WHO EMRO, 2015), and inconsistencies were flagged for follow-up.
- **Data clarification requested:** Key informants – including WHO/IWA regional and country office contacts, development partners active in the countries of interest and selected survey respondents – were asked to review survey data and provide clarification on the inconsistencies noted.
- **Updated data requested:** Given the time required for validation and the dynamic nature of WSP experiences in a country, all key informants were also invited to provide data updates wherever possible.

Through this data validation process, data were clarified or updated for numerous countries, and abridged WSP surveys were submitted for an additional five countries, bringing the total number of countries for which WSP survey data were provided to 113.

Where attempts to obtain clarification through the validation process were unsuccessful, data considered unreliable were excluded from the analysis. In some cases, all data from a particular country were considered unreliable, in which case the country was removed from the analysis and ultimately counted among the non-responding countries (see Figure 1). Through this process, 11 countries were removed from the analysis, with 102 (of 113) survey responding countries remaining for inclusion in the analysis (see Figure 1).

[16] Countries had the option of completing a version of the questionnaire in hard copy if required.

[17] The six WHO regions are: African Region, Eastern Mediterranean Region, European Region, Region of the Americas, South-East Asia Region and Western Pacific Region.

Other data collection and validation

In order to provide a more complete picture of global WSP status, WSP survey data from the 102 countries referenced above were supplemented by other available data sources, such as published and grey literature. Supplementary data sources were reviewed between 2014 and 2016 and provided WSP data for an additional 16 countries (see Figure 1). The source of data for each country included in this report is noted in Annex B.

Wherever possible, supplementary data collected were clarified, confirmed and/or updated by key informants, including publication authors and stakeholders with relevant first-hand experience.

Final data review

Following all data collection and subsequent data validation and updating (2013–2016), data were sent to WHO and IWA headquarters, all six WHO regional offices and select IWA regional contacts for final review.

Data limitations

While all reasonable attempts were made to ensure that recent and reliable data have been presented and while data updates were received for numerous countries between 2014 and 2016, much of the data reflect the country situation as reported on the 2013 WSP survey and may not include more recent WSP progress.

Annex B: WSP data by country

Notes: AFRO: African Region; AMRO: Region of the Americas; EMRO: Eastern Mediterranean Region; EURO: European Region; SEARO: South-East Asia Region; WPRO: Western Pacific Region; na: not applicable; —: missing.

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Andorra	EURO	WSP survey	yes	—	—	Formally approved	Urban + rural	yes	Once a year
Argentina	AMRO	WSP survey	yes	—	—	Anticipated	na	na	na
Australia	WPRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Between once a year to once every two years
Austria	EURO	WSP survey (abridged version 2015/2016)	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Once a year
Azerbaijan	EURO	WSP survey	no	na	na	WSPs not required	na	na	na
Bahrain	EMRO	WSP survey	no	na	na	Anticipated	na	na	na
Bangladesh	SEARO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Once a year
Belgium	EURO	WSP survey	no	na	na	Formally approved	Urban + rural	yes	Frequency has not yet been established
Bhutan	SEARO	WSP survey	yes	Few in pilot phase	More than 10 implemented	Formally approved	—	yes	Frequency has not yet been established
Bolivia (Plurinational State of)	AMRO	WSP survey	yes	10 or fewer implemented	—	Anticipated	na	na	na
Bosnia and Herzegovina	EURO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Formally approved	—	yes	Frequency has not yet been established

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Brazil	AMRO	WSP survey (abridged version 2015/2016)	yes	More than 10 implemented	None	Formally approved	Urban + rural	yes	Frequency has not yet been established
Burkina Faso	AFRO	WSP survey	yes	Few in pilot phase	Few in pilot phase	WSPs not required	na	na	na
Cambodia	WPRO	WSP survey	yes	Few in pilot phase	More than 10 implemented	Formally approved	—	na	na
Canada	AMRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Between once a year to once every two years
China	WPRO	Other (ADB, 2014)	yes	na	na	na	na	na	na
Colombia	AMRO	WSP survey (abridged version 2015/2016)	yes	10 or fewer implemented	10 or fewer implemented	Formally approved	—	yes	Once a year
Comoros	AFRO	WSP survey	yes	10 or fewer implemented	10 or fewer implemented	—	na	na	na
Cook Islands	WPRO	WSP survey	yes	None	10 or fewer implemented	Under development	—	yes	Every two years or less often
Costa Rica	AMRO	WSP survey	yes	—	More than 10 implemented	Formally approved	—	yes	Once a year
Czech Republic	EURO	WSP survey	yes	Few in pilot phase	10 or fewer implemented	—	na	na	na
Democratic People's Republic of Korea	WPRO	WSP survey	no	na	na	—	na	na	na
Democratic Republic of the Congo	AFRO	WSP survey	yes	Few in pilot phase	More than 10 implemented	Under development	—	yes	Frequency has not yet been established

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Denmark	EURO	WSP survey	yes	—	—	Formally approved	Urban + rural	no	na
Dominican Republic	AMRO	WSP survey	yes	None	Few in pilot phase	Under development	—	no	na
Ecuador	AMRO	WSP survey	yes	Few in pilot phase	10 or fewer implemented	Formally approved	Urban + rural	yes	Between once a year to once every two years
Egypt	EMRO	WSP survey (abridged version 2015/2016)	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
Eritrea	AFRO	WSP survey	no	na	na	WSPs not required	na	na	na
Estonia	EURO	WSP survey	no	na	na	WSPs not required	na	na	na
Ethiopia	AFRO	WSP survey	yes	10 or fewer implemented	10 or fewer implemented	Formally approved	Urban + rural	yes	—
Fiji	WPRO	WSP survey	yes	Few in pilot phase	None	Formally approved	Urban	yes	Frequency has not yet been established
Finland	EURO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Under development	—	yes	Once a year
France	EURO	Other (WHO & UNICEF, 2013)	yes	na	na	na	na	na	na
French Polynesia	WPRO	WSP survey	no	na	na	Under development	—	na	na
Gabon	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Georgia	EURO	WSP survey	no	na	na	Under development	—	na	na
Germany	EURO	WSP survey	yes	10 or fewer implemented	Few in pilot phase	Under development	—	na	na

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Ghana	AFRO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Formally approved	Urban + rural	yes	Frequency has not yet been established
Guinea	AFRO	WSP survey	no	na	na	—	na	na	na
Guyana	AMRO	Other (Rinehold et al, 2011; WHO & UNICEF, 2013)	yes	na	na	na	na	na	na
Haiti	AMRO	WSP survey	no	na	na	Anticipated	na	na	na
Honduras	AMRO	WSP survey	yes	10 or fewer implemented	Few in pilot phase	Under development	—	no	na
Hungary	EURO	WSP survey	yes	More than 10 implemented	10 or fewer implemented	Formally approved	Urban	yes	Every two years or less often
Iceland	EURO	WSP survey	yes	More than 10 implemented	10 or fewer implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
India	SEARO	WSP survey	yes	Few in pilot phase	None	Anticipated	na	na	na
Indonesia	SEARO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Anticipated	na	na	na
Iran (Islamic Republic of)	EMRO	WSP survey	yes	Few in pilot phase	None	Formally approved	—	yes	Frequency has not yet been established
Ireland	EURO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	—	no	na
Italy	EURO	WSP survey	yes	Few in pilot phase	Few in pilot phase	WSPs not required	na	na	na
Jamaica	AMRO	Other (Rinehold et al, 2011; WHO & UNICEF, 2013)	yes	na	na	na	na	na	na
Japan	WPRO	WSP survey	yes	More than 10 implemented	10 or fewer implemented	Formally approved	Urban	no	na

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Jordan	EMRO	Other (MDG-F Secretariat, 2013; WHO EMRO, 2015)	yes	na	na	na	na	na	na
Kenya	AFRO	WSP survey	yes	More than 10 implemented	—	Under development	—	—	na
Kuwait	EMRO	Other (WHO EMRO, 2015)	yes	na	na	na	na	na	na
Lao People's Democratic Republic	WPRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
Latvia	EURO	WSP survey	no	na	na	Anticipated	na	na	na
Liberia	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Malaysia	WPRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Under development	Urban	yes	Between once a year to once every two years
Maldives	SEARO	WSP survey	no	na	na	Anticipated	na	na	na
Mali	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Marshall Islands	WPRO	WSP survey	no	na	na	Under development	—	—	na
Mauritania	AFRO	WSP survey	yes	More than 10 implemented	10 or fewer implemented	—	na	na	na
Mauritius	AFRO	WSP survey	no	na	na	Under development	Urban	no	na
Mexico	AMRO	Other (Hubbard et al, 2013)	yes	na	na	na	na	na	na
Mongolia	WPRO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Formally approved	—	yes	Once a year

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Morocco	EMRO	WSP survey	yes	Few in pilot phase	None	Formally approved	Urban + rural	yes	Frequency has not yet been established
Mozambique	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Myanmar	SEARO	WSP survey	yes	None	10 or fewer implemented	Anticipated	na	na	na
Nepal	SEARO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
Netherlands	EURO	WSP survey	yes	Few in pilot phase	None	Formally approved	—	no	na
New Caledonia	WPRO	WSP survey	yes	None	—	Anticipated	na	na	na
New Zealand	WPRO	WSP survey (abridged version 2015/2016)	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Every two years or less often
Nigeria	AFRO	WSP survey	yes	—	—	Formally approved	Urban	yes	—
Niue	WPRO	WSP survey	yes	None	Few in pilot phase	Under development	Rural	yes	Every two years or less often
Norway	EURO	WSP survey	yes	More than 10 implemented	None	Formally approved	Urban	no	na
Oman	EMRO	Other (WHO & IWA, 2010)	yes	na	na	na	na	na	na
Papua New Guinea	WPRO	WSP survey	no	na	na	Under development	Urban + rural	yes	—
Paraguay	AMRO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Anticipated	na	na	na
Peru	AMRO	WSP survey	yes	Few in pilot phase	None	Formally approved	Urban + rural	no	na

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Philippines	WPRO	WSP survey	yes	10 or fewer implemented	None	Formally approved	—	yes	Frequency has not yet been established
Poland	EURO	WSP survey	—	na	na	WSPs not required	na	na	na
Portugal	EURO	WSP survey	yes	10 or fewer implemented	More than 10 implemented	WSPs not required	na	na	na
Qatar	EMRO	WSP survey	no	na	na	Under development	—	yes	Frequency has not yet been established
Republic of Moldova	EURO	WSP survey	yes	10 or fewer implemented	None	Anticipated	na	na	na
Romania	EURO	WSP survey	yes	10 or fewer implemented	None	Anticipated	na	na	na
Rwanda	AFRO	WSP survey	no	na	na	Under development	—	—	na
Samoa	WPRO	Other (WHO, 2016)	yes	Few in pilot phase	Few in pilot phase	Under development	Urban + rural	no	na
Sao Tome and Principe	AFRO	WSP survey	yes	10 or fewer implemented	None	Under development	—	no	na
Saudi Arabia	EMRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
Senegal	AFRO	Other (WHO & IWA, 2016a)	yes	na	na	na	na	na	na
Serbia	EURO	WSP survey	no	na	na	WSPs not required	na	na	na
Seychelles	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Singapore	WPRO	WSP survey	yes	10 or fewer implemented	10 or fewer implemented	Formally approved	Urban + rural	yes	Once a year

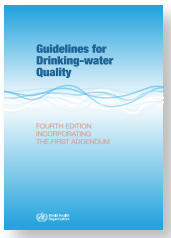
Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Slovakia	EURO	WSP survey	yes	Few in pilot phase	None	WSPs not required	na	na	na
Slovenia	EURO	WSP survey	yes	More than 10 implemented	None	Under development	Urban	yes	Between once a year to once every two years
South Africa	AFRO	Other (WHO & IWA, 2016b)	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Between once a year to once every two years
Spain	EURO	WSP survey	yes	More than 10 implemented	Few in pilot phase	Formally approved	Urban + rural	no	na
Sri Lanka	SEARO	WSP survey	yes	10 or fewer implemented	None	Under development	Urban	—	na
St Lucia	AMRO	Other (Hubbard et al, 2013)	yes	na	na	na	na	na	na
Sudan	EMRO	Other (WHO EMRO, 2015)	yes	na	na	na	na	na	na
Swaziland	AFRO	WSP survey	no	na	na	Anticipated	na	na	na
Sweden	EURO	WSP survey	yes	More than 10 implemented	Few in pilot phase	Formally approved	Urban + rural	yes	Frequency has not yet been established
Switzerland	EURO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	no	na
Tajikistan	EURO	WSP survey	yes	None	More than 10 implemented	Anticipated	na	na	na
Thailand	SEARO	Other (WHO SEARO, 2016)	yes	More than 10 implemented	—	—	na	na	na
The former Yugoslav Republic of Macedonia	EURO	WSP survey	yes	10 or fewer implemented	None	Formally approved	Urban	yes	Once a year
Timor-Leste	SEARO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Under development	Urban + rural	—	na

Country	WHO region	Source of data	Have WSPs been implemented in the country?	If WSPs have been implemented, how many *urban* WSPs have been implemented by water suppliers?	If WSPs have been implemented, how many *small/rural* WSPs have been implemented?	Please indicate the status of any WSP policy or regulatory instruments in your country	If WSP policies are approved or under development, are WSPs required in urban/rural supplies?	If WSP policies or regulations are approved or under development, is external evaluation required?	If external evaluation is required, how often are external evaluations carried out?
Togo	AFRO	WSP survey	yes	Few in pilot phase	More than 10 implemented	Formally approved	Urban + rural	no	na
Tonga	WPRO	WSP survey	yes	None	Few in pilot phase	Anticipated	na	na	na
Tunisia	EMRO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	yes	Frequency has not yet been established
Uganda	AFRO	WSP survey	yes	10 or fewer implemented	Few in pilot phase	Formally approved	Urban	yes	Frequency has not yet been established
United Arab Emirates	EMRO	WSP survey	yes	More than 10 implemented	—	Formally approved	Urban + rural	yes	Once a year
United Kingdom of Great Britain and Northern Ireland	EURO	WSP survey	yes	More than 10 implemented	More than 10 implemented	Formally approved	Urban + rural	no	na
United Republic of Tanzania	AFRO	Other (WHO & IWA, 2016c)	yes	Few in pilot phase	None	Under development	—	—	na
Uruguay	AMRO	Other (Hubbard et al, 2013; WHO & UNICEF, 2013)	yes	na	na	na	na	na	na
Vanuatu	WPRO	WSP survey	yes	10 or fewer implemented	Few in pilot phase	Under development	Urban + rural	no	na
Viet Nam	WPRO	WSP survey	yes	Few in pilot phase	Few in pilot phase	Formally approved	Urban	yes	Once a year
West Bank and Gaza Strip	EMRO	WSP survey	yes	—	Few in pilot phase	Anticipated	na	na	na

Annex C: WSP resource roadmap

The following publications by WHO and partners, including IWA, provide guidance on various aspects of water safety planning, such as WSP development, implementation, training, advocacy and auditing. Many of these resources are available in multiple languages – see the links provided. These and other WSP materials can be found on the global WSP online forum, Water Safety Portal (www.wsportal.org).

GUIDANCE ON WSP DEVELOPMENT AND IMPLEMENTATION



Guidelines for drinking-water quality (fourth edition incorporating the first addendum)

WHO (2017)

http://www.who.int/water_sanitation_health/publications/drinking-water-quality-guidelines-4-including-1st-addendum/en/

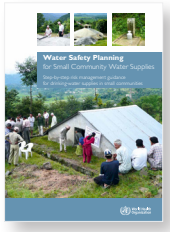
The global reference on drinking-water safety and good practice, the guidelines position WSPs as a core element of WHO's framework for safe drinking-water and outline the principles and key elements of a WSP for policy-makers.

Water safety plan manual: Step-by-step risk management for drinking-water suppliers

WHO & IWA (2009)

http://www.who.int/water_sanitation_health/publications/publication_9789241562638/en/

Provides detailed guidance for practitioners on developing and implementing a WSP, particularly for organized drinking-water supplies managed by a water utility or similar entity.



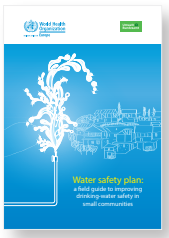
Water safety planning for small community water supplies: Step-by-step risk management guidance for drinking-water supplies in small communities

WHO (2012)

http://www.who.int/water_sanitation_health/publications/small-comm-water_supplies/en/

Provides detailed guidance on developing and implementing a simplified WSP for a small community water supply; primarily directed at government officials or NGOs supporting drinking-water activities.

Water safety plan: A field guide to improving drinking-water safety in small communities

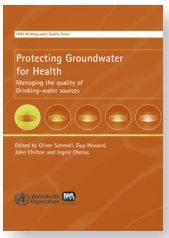


WHO (2014)

http://www.euro.who.int/en/publications/abstracts/water-safety-plan-a-field-guide-to-improving-drinking-water-safety-in-small-communities

A complement to the guidance document *Water safety planning for small community water supplies*, this field guide provides templates and tools to assist in the practical development of WSPs by local institutions working directly in drinking-water supply in small communities.

GUIDANCE ON RISK MANAGEMENT AT SPECIFIC POINTS IN THE WATER SUPPLY SYSTEM



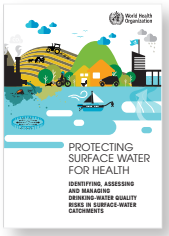
Protecting groundwater for health: Managing the quality of drinking-water sources

WHO (2006)

http://www.who.int/water_sanitation_health/publications/protecting_groundwater/en/

Provides guidance for health, environment and water sector professionals on the application of risk management approaches to protect groundwater sources of drinking-water, presenting a structured approach to analysing hazards to groundwater quality, assessing and prioritizing the risks they pose, and developing management strategies for their control.

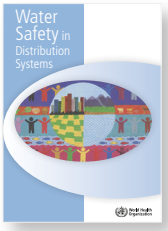
Protecting surface water for health: Identifying, assessing and managing drinking-water quality risks in surface-water catchments



WHO (2016)

http://www.who.int/water_sanitation_health/publications/pswh/en/

The partner publication to *Protecting groundwater for health*, this document provides practical guidance for health, environment and water sector professionals on the application of water safety planning to protect surface water sources of drinking-water.



Water safety in distribution systems

WHO (2014)

http://www.who.int/water_sanitation_health/publications/water-safety-in-distribution-system/en/

Provides guidance for water suppliers and regulators on applying the WSP approach to enhance risk management and investment planning in distribution systems.

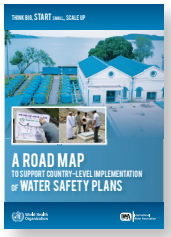
Water safety in buildings

WHO (2011)

http://www.who.int/water_sanitation_health/publications/2011/9789241548106/en/

Provides guidance for those responsible for managing water supply systems in buildings on applying the WSP approach to improve risk management and ensure water safety is maintained within the building (e.g. hospitals, schools, child- and aged-care facilities, hotels, apartment blocks).

POLICY GUIDANCE



Think big start small scale up: A road map to support country-level implementation of water safety plans

WHO & IWA (2010)

http://www.who.int/water_sanitation_health/publications/thinkbig-startsmall/en/

Provides guidance on introducing and scaling up WSPs nationally, outlining steps to building an enabling environment to support and sustain WSPs; primarily directed at government entities tasked with developing or revising drinking-water quality policies, programmes and regulations.

Taking policy action to improve small-scale water supply and sanitation systems: Tools and good practices from the pan-European region

WHO (2016)

http://www.euro.who.int/en/publications/abstracts/taking-policy-action-to-improve-small-scale-water-supply-and-sanitation-systems.-tools-and-good-practices-from-the-pan-european-region-2016

Presents policy-makers with a range of regulatory, planning, financial and educational instruments to support effective policy and promote good practice (including water safety planning) to improve small-scale water supply and sanitation systems.

AUDIT/ASSESSMENT GUIDANCE AND TOOLS

A practical guide to auditing water safety plans

WHO & IWA (2016)

http://www.who.int/water_sanitation_health/publications/auditing-water-safety-plans/en/

Provides practical guidance and tools for water suppliers and surveillance authorities on the development and implementation WSP auditing schemes to support the continuous improvement and sustainability of WSPs.

Water safety plan quality assurance tool

WHO & IWA (2013)

http://www.who.int/water_sanitation_health/publications/water-safety-quality-assurance/en/

A tool designed to guide organized drinking-water supplies through a WSP self-assessment to determine the WSP's completeness and the effectiveness of its implementation.

TRAINING MATERIALS

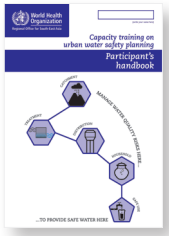
Water safety plan training package

WHO & IWA (2012)

http://www.who.int/water_sanitation_health/publications/wsp_training_package/en/

A training package comprising a facilitator handbook, participant workbook and accompanying PowerPoint slides, aligned with the *Water safety plan manual* and designed to facilitate delivery of a five-day WSP training event.

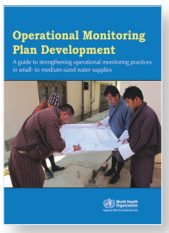
Capacity training on urban water safety planning – training modules



WHO (2016)

http://www.searo.who.int/entity/water_sanitation/documents/WSP_Training_Modules/en/

A detailed training package to facilitate delivery of a three- or five-day WSP training event, drawing on the *Water safety plan training package* and field experiences from numerous South-East Asian and Western Pacific countries. The package comprises a presenter's guide, participant handbook, PowerPoint slides with slide notes and various activities and worksheets for participants.



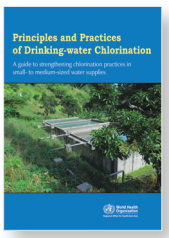
Operational monitoring plan development: A guide to strengthening operational monitoring practices in small- to medium-sized water supplies

WHO (2017)

http://www.searo.who.int/entity/water_sanitation/documents/guide_watersupplies

Practical guidance and training materials for small- and medium-sized water suppliers, and for those providing training and support to these suppliers, on strengthening operational monitoring practices – a core element of water safety planning. Training materials include a facilitator's guide and PowerPoint slides.

Principles and practices of drinking-water chlorination: A guide to strengthening chlorination practices in small- to medium-sized water supplies



WHO (2017)

http://www.searo.who.int/entity/water_sanitation/documents/Drinking_Water_Chlorination/en/

Practical guidance and training materials for small- and medium-sized water supplies, and for those providing training and support to these suppliers, on strengthening chlorination practices – a common improvement need identified through the WSP process in the South-East Asia and Western Pacific regions. Training materials include a facilitator's guide and PowerPoint slides and are based on training programmes delivered in the regions.

WSP IMPACT AND ADVOCACY DOCUMENTS

Water safety plans: Managing drinking-water quality for public health

WHO (2010)

http://www.who.int/water_sanitation_health/water-quality/safety-planning/WHS_WWD2010_advocacy_2010_2_en.pdf?ua=1

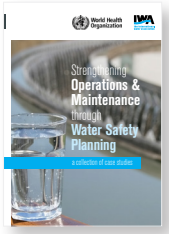
A brief note on the rationale for the WSP approach, the potential benefits for various stakeholder groups, and the value of incorporating WSPs into policies and regulations.

COMING SOON

Strengthening operations and maintenance through water safety planning: A collection of case studies

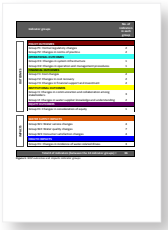
WHO & IWA, forthcoming, expected June 2017

http://www.who.int/water_sanitation_health/publications/en/



A collection of case studies from around the world demonstrating various operations and maintenance benefits realized through the implementation of WSPs.

IN PROGRESS



Water safety plan impact assessment guidance note

WHO, under development

A practical tool to facilitate the assessment of outcomes and impacts from WSP implementation, including an indicator framework and data collection forms for field workers.

WSP NETWORK

Water Safety Portal

WHO & IWA (website)

http://www.wsportal.org/

An online global forum for all WSP stakeholders to find resources, share experiences and keep up-to-date on WSP news and events.

WSP LINKAGES TO OTHER INITIATIVES

Water and sanitation for health facility improvement tool (WASH FIT): A practical guide for improving quality of care through water, sanitation and hygiene in health-care facilities

WHO & UNICEF (2017)

http://www.who.int/water_sanitation_health/publications/water-and-sanitation-for-health-facility-improvement-tool/en/

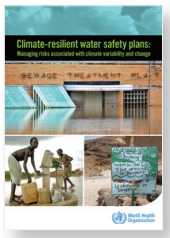
Based on the WSP approach, WASH FIT provides practical guidance and tools for health sector professionals and supporting partners in low- and middle-income countries to help improve WASH services and related cleanliness and safety aspects in a health-care facility.

COMING SOON

Climate-resilient water safety plans: Managing risks associated with climate variability and change

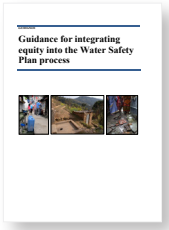
WHO, forthcoming, expected July 2017

http://www.who.int/water_sanitation_health/publications/en/



Provides guidance to WSP teams and other stakeholders on strengthening the climate resilience of water supply systems by applying the WSP approach to identify and manage risks that climate change poses to water quality and quantity.

IN PROGRESS



Safe drinking-water for all: Improving equity through water safety planning

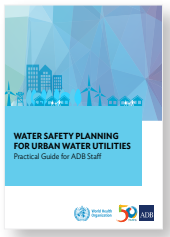
WHO, under development

The draft version of a guidance document currently under development to support WSP teams and WSP coordinators in improving equity outcomes through the explicit and systematic inclusion of equity considerations through the WSP process.

Water safety planning for urban water utilities: Practical guide for ADB staff

ADB & WHO (2017)

https://www.adb.org/documents/urban-water-safety-planning-guide



Practical guidance to ADB project officers on systematically integrating WSP development and implementation into the project cycle for projects that directly influence drinking-water safety.

Sanitation safety planning: Manual for safe use and disposal of wastewater, greywater and excreta

WHO (2016)

http://www.who.int/water_sanitation_health/publications/ssp-manual/en/

Based on WSP principles, the manual provides step-by-step guidance for various stakeholder groups on effective risk management to ensure the safe use and disposal of human waste. Sanitation safety plans can support WSPs by managing sanitation-related risks impacting the drinking-water supply.

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