Awareness, adoption and implementation of the water safety plan methodology: insights from five Latin American and Caribbean experiences

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ABSTRACT

Considerable effort has been made worldwide to disseminate information and provide technical assistance to encourage the adoption and implementation of the water safety plan (WSP) methodology. Described since the third edition of the World Health Organization (WHO) *Guidelines for Drinking-water Quality*, a WSP provides guidance for water utilities to ensure the delivery of safe drinking water and protect health. Attention is now being given to understand the success of efforts to advance adoption of the WSP methodology in the Latin America and Caribbean (LAC) region. More specifically, there is interest in knowing how early adopters developed strategies to implement the WSP methodology and what challenges exist for further implementation. To better understand adoption and implementation trends, key informants from five LAC countries were interviewed and case studies were developed to reveal the diversity of WSP approaches applied in the region. Results indicate that WSP implementation is more widespread than previously reported. Respondents affirmed that the WHO *Guidelines for Drinking-water Quality* are routinely used as a model for country-level drinking-water regulations, which has led to uptake of the WSP methodology. Interview respondents also revealed innovative national strategic approaches for WSP implementation.

Key words | drinking-water regulations, Latin America and Caribbean, preventive risk management, public health, water safety plans, water supply operations and management

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INTRODUCTION

The water safety plan (WSP) methodology is one of the most effective ways to systematically guarantee the safety of drinking water (WHO 2004). The methodology recommends a preventive risk management approach that incorporates system assessment, operational monitoring, and the development of improved management plans. It guides water utilities and partners to focus on all stages of the water supply system – from catchment to the point of use by consumers – instead of only on the operations and infrastructure under the control of the utility company.

The objectives of the WSP methodology are to protect source waters (i.e. watersheds and aquifers); optimize operations to improve the disinfection process; and prevent recontamination during storage, distribution and household management. The WSP approach is based on principles and concepts applied in other risk management systems such as

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the Hazard Analysis and Critical Control Points (HACCP) methodology (Havelaar 1994; Gunnarsdottir & Gissurarson 2008; Jayaratne 2008) applied in the food industry, and the Bonn Charter promoted by the International Water Association (IWA) (2009).

Significant effort has been made globally to promote awareness and encourage adoption of the WSP approach. There is also growing interest to evaluate the variety of potential impacts – increased institutional collaboration, strengthened operational and management capacity, improved level of client satisfaction, cost recovery and better health – that may result from implementation efforts (see, e.g., Gelting *et al.* 2012). In 2007, a survey conducted by the IWA (Zimmer & Hinkfuss 2007) sought to understand the global progress toward WSP adoption and to identify implementation challenges. Results of the survey revealed low rates of adoption and ineffective implementation at the global level. The authors offered a range of explanations for the poor acceptance of WSPs at that time. Notable among the results was the fact that most survey respondents were from developed countries (i.e. North America and Europe) and there was a poor response from the Latin American and Caribbean (LAC) region (e.g. there was only one respondent from South America). Since the 2007 Zimmer and Hinkfuss survey, significant work related to the awareness, implementation and adoption of the WSP methodology has continued to be accomplished in the LAC region. The Centers for Disease Control and Prevention (CDC), Pan American Health Organization (PAHO) and Environmental Protection Agency (EPA) collaborated to support demonstration projects first in Jamaica, and later in Guyana and Brazil (Rinehold *et al.* 2011). Other organizations (i.e. Inter-American Association of Sanitary and Environmental Engineering [AIDIS] and IWA) supported country and regional implementation efforts, and provided technical assistance and funding. PAHO, with support from AIDIS and CDC, has conducted regional training events throughout the LAC region. This paper presents the results of those efforts by examining the experiences of five Latin American countries during WSP implementation, and also summarizes the lessons, recommendations and next steps to expand use of the WSP methodology in the region.

METHODS

To better understand WSP adoption and implementation trends in the LAC region, we gathered information about the WSP/LAC Network – whose goal is to promote the improvement of drinking-water supply systems in the region through the implementation and accelerated development of the WSPs – as well as about WSP implementation in specific countries in the region. We reviewed WSP/LAC Network documents and incorporated historical observations from the network's interactions with country-level WSP activities. We also interviewed key informants from five LAC countries – Jamaica, Brazil, Honduras, Peru and Costa Rica – to reveal the diversity of approaches being applied during WSP implementation in the region. Key informants were chosen based on their

- proven leadership in promoting preventive risk management approaches in their respective countries,
- participation in WSP/LAC Network events, and
- willingness to participate in unstructured interviews.

Key informant interviews were conducted with representatives from universities, national water and sanitation utilities, national water agencies and national water committees. The key informant interviews were conducted individually and focused on the following topics:

Awareness:

- How respondents and their agencies were exposed to information about the WSP methodology and the WSP/LAC Network.

Implementation and Adoption Strategies:

- Whether the WSP methodology had been adopted (and if so, what were the strategies to include the methodology in drinking-water regulations and implementation).
- What difficulties and barriers were encountered in adoption and implementation of the WSP methodology.

Lessons learned, recommendations and next steps:

- What are the important lessons, recommendations, and next steps for the WSP/LAC Network and others to encourage dissemination, adoption, and implementation.

RESULTS: FINDINGS FROM THE WSP/LAC CASE STUDIES

Awareness

Many countries in the LAC region first became aware of the WSP methodology from the World Health Organization's (WHO's) *Drinking-water Guidelines*, which water regulators in countries such as Jamaica, Brazil, Honduras and Costa Rica were already using to update their own national water regulations. Once aware of the preventive risk management approach outlined in the WHO *Guidelines*, these countries began incorporating the approach into their own national drinking-water policies. In some cases – such as Brazil – the WSP process was identified as a practical way to apply these preventive concepts. Another country – Peru – officially mandated the preventive risk management approach in their national guidelines but did not explicitly require use of WSPs.

The CDC/EPA/PAHO partnership was an early source of information and support for the WSP methodology, and exposed various LAC countries to the WSP process. In the case of Jamaica, representatives from the Ministry of Health and the Jamaican National Water Commission attended a WSP workshop in Buenos Aires, Argentina, in 2005, in which the CDC, EPA and PAHO introduced the WSP methodology to potential pilot project participants from ten countries in the LAC region. Resulting from the workshop, Spanish Town, Jamaica, was selected as the initial WSP pilot project for the LAC region.

Another example of a country's increased exposure to the WSP methodology occurred in Peru, where advocacy efforts by the WSP/LAC network led to the signing of a one-year agreement in 2009 with the General Environmental Health Directorate of Peru (Spanish acronym: DIGESA) to allow the network to conduct activities from DIGESA offices in Lima, Peru. Peruvian officials received a great deal of information from the WSP/LAC network during this time, which later informed their revision of the national drinking-water regulations. Moreover, advocacy efforts by the WSP/LAC Network in their DIGESA headquarters led to the signing of an agreement with the United Nations Human Settlements Programme (UN HABITAT) and initiated a partnership with the Inter-American Association of Waterworks Sector Regulators (Spanish acronym: ADERASA) to disseminate information about the WSP methodology.

Implementation and adoption strategies

For some countries, implementing the WSP methodology did not require a complete overhaul of existing activities, but only an integration of new concepts from the WHO guidelines and an adjustment to the country's context. For example, when Jamaica initiated the WSP pilot project in Spanish Town in July 2006 with training and technical assistance from CDC, EPA and PAHO, it became clear that fundamental elements of the WSP process were already being used by Jamaican practitioners. A similar case was found in Costa Rica, where authorities simultaneously promoted WSP implementation and worked on changing national policy related to drinking water. In May 2009, the Costa Rican Ministry of Health enacted a resolution that encouraged implementation of the WSP methodology at the national level. This resolution was carried out by integrating the WSP methodology into the Costa Rican Sanitary Quality Reward Program, an existing country-wide initiative that already included many fundamental aspects of preventive risk management. Because such an established program already existed, adoption of preventive practices had already occurred in water utilities throughout Costa Rica, and integrating improvements recommended in the WSP approach was less difficult than if such practices were not widespread. By 2010, the methodology was gaining steady acceptance – a total of five sites had started implementation – and was being considered by a growing number of Costa Rican organizations with a role in the water sector.

Another common factor among several LAC countries implementing WSPs is the level of increased institutional collaboration. Multiple partners at the international, national and municipal levels carried out the Spanish Town, Jamaica, WSP pilot. Like Jamaica, Brazil carried out its WSP pilot project in the city of Viçosa with local partners and financial support and technical assistance from the CDC/EPA/PAHO partnership. The Viçosa site is actually two WSPs: one conducted for the water system of the Federal University of Viçosa and one for the municipal water system in the city of Viçosa. The Viçosa WSP efforts have been iterative and continue to be an educational environment for university engineering students to learn and work

alongside engineers at the municipal water utility. In addition, the Viçosa water utility is a member and leader of a regional association of about 15 water utilities. Benefits and best practices emerging from the Viçosa experiences are expected to inform subsequent WSP implementation within that association.

While WSPs have, in some cases, been formally promoted at the national policy level, the WSP methodology has been carried out in less formalized ways as well. As of 2010, the WSP methodology had not been integrated into the Honduran national legislation, but the WSP was still widely encouraged in practice. Implementers in Honduras used a decentralized approach to conduct WSPs and, as of 2010, 25 WSPs had been completed nationally. In Peru, regulators did not formally endorse WSPs as an exclusive method for water-quality protection, but still incorporated the WSP principles and practices into the national drinking-water regulations. These new policies designated the Peruvian agencies that were responsible for managing water supply systems (this corresponds directly to Module 1: Assembling a WSP Team, in the WSP Manual) and detailed how those agencies should collaborate when responding to incidents and deficiencies in the water-supply system; the regional Ministry of Health agencies were designated as the lead (DIGESA 2011). Before full approval of the new drinking-water regulations, a plan was implemented to provide training on these principles and practices, and WSP manuals were disseminated to 35 areas throughout the country in anticipation of the new policies. In this way, Peru formally adopted the principles reflected in the WSP methodology, and informally promoted WSPs as an optional method for implementation.

Several countries in the LAC region encountered challenges and barriers while carrying out WSPs. Facilitators in Jamaica and Honduras reported that solutions required institutional collaboration because sometimes the lead institution in the WSP process did not have the regulatory mandate to address identified issues. For example, the Jamaican National Environment and Planning Agency (NEPA) only has authority to regulate point source pollution. However, non-point source pollution affecting the watershed (e.g. agricultural practices and erosion, pesticide use and location of informal settlements) is complicated by land tenure issues and the fact that NEPA has no regulatory authority in these matters. The Spanish Town WSP process led to better collaboration between partners to address non-point sources of pollution by addressing the land tenure issues. The local municipality of Spanish Town, the Social Development Commission (a government agency within the Office of the Prime Minister that works with informal settlements) and NEPA worked together to reduce contamination of water entering the intake to the Spanish Town treatment plant.

In the case of Honduras, efforts by the National Autonomous Water and Sewerage Service (Spanish acronym: SANAA) to formally integrate the WSP methodology into the national drinking-water legislation were hampered by limited epidemiological support and lack of evidence base to define health impact. Sweeping political changes filtering down through the health sector made it difficult to incorporate and maintain the epidemiological expertise for WSP activities throughout the country. Representatives of SANAA had hoped they could produce the required health impact evidence for legislative documentation – a necessary step for adoption of new water policy – by October 2010, but without epidemiological personnel to work on the health impact, the documentation was not completed.

In other settings, namely Brazil, Costa Rica and Honduras, facilitators felt that existing guidance documents for WSP implementation contained language that was often unclear for water utility staff and consequently led to an incomplete understanding of WSP principles. In Brazil, for example, those involved in the Viçosa WSPs found the language in the WHO *Guidelines for Drinking-water Quality* to be overly theoretical and without practical advice for utilities unfamiliar with the preventive risk management approach. Brazilian water utilities accustomed to relying only on verification of finished (e.g. treated) water were not familiar with the ways in which operational monitoring could minimize risk and provide additional barriers against contamination. Implementers in Costa Rica, like in Brazil, encountered a similar challenge in the language used in the WHO *Guidelines*. The National Water Laboratory (Spanish Acronym: LNA), a strong proponent of the WSP methodology, reported that water utilities lacked an understanding of the important role laboratories play in improved operational monitoring (e.g. measuring turbidity, pH and other water quality parameters to assure proper treatment) and this was a barrier to WSP implementation. The failure to consistently measure water quality throughout

the water supply system and rely solely on verification of treated water weakened the preventive risk approach encouraged in the WSP methodology. In Honduras implementers felt that the language of WSP resources applied only to large-scale municipal systems. This resource gap was addressed when the Water and Sanitation Network of Honduras, in partnership with SANAA, developed the *Guide for the Implementation of Water Safety Plans in the Rural Sector of Honduras* (RASHON 2009). This document offers an important model for WSP implementation in rural and poor areas where community members (i.e. local water and sanitation committees) are responsible for managing small water supply systems.

Lessons learned, recommendations and next steps

For the five case study countries in the LAC region, the lessons learned, recommendations and anticipated next steps are nuanced because each country's experience with WSP implementation was unique. In Jamaica, implementers found that the Spanish Town WSP process led to better collaboration between partners at the national and municipal levels to address non-point sources of pollution and to reduce contamination at the treatment plant water intake. A broader outcome of increased collaboration during the Spanish Town experience has been a proposal to develop a framework for land use. Jamaican representatives recommended that future WSP facilitators take advantage of these non-traditional collaborations to address contamination in watersheds. Despite the outcomes in Spanish Town, by 2010, some WSP team members mentioned that maintaining stakeholder participation was difficult and that disinterest had led to the dissolution of the WSP team (IWA 2010).

The Brazilian experience of adopting a preventive risk management approach and implementing the WSP methodology has resulted in important lessons and legislative changes. In the broader context of the WSP/LAC Network, it was suggested that strengthening linkages between Brazilian utilities in the region through IWA's Water Operators Partnership program would result in positive impacts. Specific ideas for interchange and linkages included sharing documentation procedures and encouraging visits between national utilities that have successfully implemented WSPs (e.g. Jamaica, Malaysia and Portugal).

Water utilities in Brazil have traditionally followed the lead of the Ministry of Health when implementing new drinking-water guidelines. Utilities interested in carrying out WSPs have expressed the need for one single guideline to ensure there is uniformity during implementation. Expectations were high in Brazilian water utility associations that the Ministry of Health would incorporate best practices from pilot project results into new directives that would describe a national approach for WSP implementation. In fact, on December 12, 2011, the WSP methodology was accepted into national legislation defined by ordinance N° 2914, and many of the recommendations and efforts of pilots and workgroups were instrumental in helping to define this legislative objective.

In Honduras, where new WSP policies have not yet been adopted, best practices are needed to help WSP teams overcome unintended political barriers (e.g. extensive administrative changes following elections) that obstruct WSP implementation. An important role for the WSP/LAC Network, according to Honduran representatives, is to continue advocacy efforts and to disseminate resources and model best practices. Honduran representatives from SANAA mentioned that case studies from Colombia and Costa Rica, shared during WSP/LAC Network sponsored events, revealed useful insights from WSP implementation in those country settings. WSP implementation experiences from Costa Rica addressing the intangible (e.g. administrative) risks were particularly useful for Honduran representatives. Additionally, Honduran implementers from SANAA find great merit in the innovative strategy Costa Rica used to incorporate the WSP methodology into the Sanitary Quality Reward Program.

In Peru, there is general recognition that the WSP manual is the appropriate tool to guide water utility operators to comply with the new Peruvian drinking-water regulations. Peruvian authorities believe that continued technical assistance from members of the WSP/LAC Network will help to disseminate the WSP methodology (i.e. by sharing WSP manuals and other resources) and organize training sessions for the regionally decentralized Ministry of Health agencies – known as DIRESAs in Peru. Additionally, greater collaboration between the health and housing sectors (i.e. the Ministry of Housing, Construction and Sanitation) could serve to improve application of the WSP methodology for newly constructed water supply systems.

In addition to lessons learned from individual countries, there are also some key themes shared by several countries, particularly in regards to recommended future actions for the WSP/LAC network and other WSP proponents. For example, in Brazil and Costa Rica, implementers felt that guidance documents – in particular the WHO *Drinking-water Guidelines* – used language that was too theoretical, while Costa Rican and Honduran representatives believed the WSP materials referred only to the context of large-scale water utilities without being relevant for smaller supply systems (e.g. rural small water supply systems and household water treatment systems). To address this need for clearer and more relevant guidance, several key informants specifically mentioned having expectations that the subsequent version of the WHO *Drinking-water Guidelines* would be less theoretical, offer more practical guidance for WSP implementation and build on worldwide WSP implementation experiences.

DISCUSSION

WSP experiences in the LAC region are not limited to the five countries presented in this paper as case studies. Additional implementation activities have taken place in Argentina, Bolivia, Colombia, Guyana, St Lucia, Uruguay and along the Peru-Ecuador border. In Cali, Colombia, a WSP experience being led by Valle University and the Cali water utility will provide a model for other interested municipalities – Manizales and Zipaquira – in the country. In Mexico, the National Water Commission has indicated that the WSP serves as the applicable methodology for utility companies and is highlighted in the operational regulations of the National Clean Water Program. Starting in 2011, the WSP methodology was being promoted with greater intensity at the national level in Mexico, and state and municipal authorities are now able to apply for federal subsidies to develop WSP training programs.

An important factor affecting WSP implementation in some of the LAC countries has been the substantial support in resources from the Spanish Cooperation Fund for water and sanitation to meet the Millennium Development Goals. The fund is managed by the Inter-American Development Bank and disseminated through United Nations Development Programme efforts to strengthen public institutions in the water and sanitation sector. Particular emphasis has been placed on improving drinking-water quality, and the WSP has increasingly become recognized as the tool of choice to achieve water quality assurance in public water supply systems. Honduras, one of the five case studies presented here, is an example of WSP implementation that received resources from the Spanish Cooperation Fund. Other countries working to strengthen water quality programs with support from this fund include Paraguay, Mexico and Panama.

Information gathered from participant dialogue in LAC WSP trainings and during key informant interviews indicates that most agencies (e.g. public health authorities and water utilities) considering implementation already understand the potential benefits of a WSP. However, many entities remain divided on the most effective way to initiate the WSP process and how to integrate the water sector stakeholders as recommended in Module I (i.e. assemble a WSP team) of the WSP Manual. Without fail these questions always arise: 'Who should lead the WSP technical team?' and 'How should the WSP technical team approach implementation?' Anecdotal experience from the field and gathered during these five key informant interviews shows that advances in WSP implementation have been most effective when the public health authority (e.g. Ministry of Health) initiates and catalyses the WSP process in close coordination with the water utility that is responsible for day-to-day water supply operations. This approach was clearly evident from experiences in Peru, Costa Rica, Jamaica and Brazil. In contrast, it was evident how intermittent involvement by the public health authority detracted from SANNAA's efforts to introduce the WSP methodology into national legislation.

The public health authority most often assumes the role of WSP catalyst because of its enforcement capacity, convening power and knowledge of the risks that most significantly affect drinking-water quality and human health. Similarly, some (Summerill *et al.* 2010) have argued that public health advocacy is an essential component of WSP implementation success. Others (Jalba *et al.* 2010) specifically indicate that before applying a methodology, such as the WSP, public health authority-water utility partnerships must first come together and define what

effectiveness means for the partnership. Once defined, the public health authority-water utility partnership needs to determine indicators to measure their agreed-upon definition of effectiveness regarding the collaboration.

Adoption of the WSP methodology in these five countries demonstrates how modules and components of the WSP methodology have been incorporated into existing national drinking-water guidelines or established in practice. More specifically, integration of the WSP methodology has generated innovative adaptations for small water systems (as in Honduras) or a thoughtful, long-term readjustment of drinking-water regulations and alignment of water sector actors (as in Peru). Summerill *et al.* (2010) propose that the WSP methodology has arrived at a semi-institutionalization stage; knowledge of the methodology is widespread but institutionalization is not permanent. It now appears that the WSP methodology is more than a passing trend in the LAC region. However, widespread scaling up of national WSP efforts has been hindered by

- different methodological approaches used at the utility level,
- lack of tools – educational, monitoring, surveillance and research – to facilitate implementation efforts and
- infrequent reliance on indicators and benchmarks to monitor performance improvements and make obvious the value of implementation.

WSP champions in LAC countries describe similar constraints and have emphasized the need for defining country-level strategic approaches so that implementation proceeds more uniformly. Examples of country-level strategies for rolling out the WSP methodology do exist; an example is the approach (Veira 2011) proposed for WSP development in Portugal, and a WHO-IWA publication to support country-level implementation (WHO/IWA 2010b). Likewise, inventive and emerging approaches have been described here in the five case studies.

CONCLUSION

To strengthen emerging WSP efforts, proponents (e.g. donors, professional WSP networks, Ministries of Health, water utilities, laboratories and others) have the challenge of working together collaboratively and with local implementation partners to disseminate information about successful strategic implementation frameworks and to strengthen such frameworks with current research and support programs (e.g. WSP facilitation guidance, operator training, development of reliable indicators and benchmarks and technical assistance). Although several case study countries share the expectation that future versions of the WHO *Guidelines for Drinking-water Quality* will be less theoretical and offer more practical advice on WSP implementation, it is more likely that practical guidance will continue to come from other sources. Some tools and strategies already exist to help support these efforts such as the WHO/IWA Water Safety Plan Quality Assurance Tool (WHO/IWA 2010a), WHO's Water Safety Planning for Small Community Water Supplies (WHO 2012) and the CDC framework for evaluating the outcomes and impacts of WSPs (Gelting *et al.* 2012). More tools will become available as WSP implementation becomes more widespread.

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