



Strengthening rural community water safety planning in Pacific Island countries: evidence and lessons from Solomon Islands, Vanuatu, and Fiji

Regina T. Souter ^{a,*}, Doug Ruuska^a, Sarah Pene^b, Collin Benjamin^c, Sheila Funubo^c, Cara D. Beal ^d, Rosanna Sanderson^a, Suliasi Batikawai^{a,e}, Ana Ravai^b, Tema Antoinette-Wickham^f, Tom Rankin^g, Linda Peter^h, Heather Molitambeⁱ, Gaston Theophileⁱ, Sachita Shrestha^a, Krishna K. Kotra^j, Hugo Bugoro^k, Nixon Panda^c, Vimal Deo^l and Mark Love^a

^a International Water Centre, Griffith University, 170 Kessel Road, Nathan 4111, Australia

^b School of Agriculture, Geography, Environment, Ocean and Natural Science, The University of the South Pacific, Laucala Campus, Suva, Fiji

^c School of Public Health, Solomon Islands National University, Kukum Campus, Honiara, Solomon Islands

^d Cities Research Institute and School of Pharmacy and Medical Sciences, Griffith University, 170 Kessel Road, Nathan 4111, Brisbane, Australia

^e School of Public Health, University of Queensland, Brisbane, Australia

^f Plan International – Pacific, Honiara, Solomon Islands

^g Plan International – Melbourne, Australia

^h Vanuatu Red Cross, Port Vila, Vanuatu

ⁱ School of Agriculture, Geography, Environment, Ocean and Natural Science, The University of the South Pacific, Emalus Campus, Port Vila, Vanuatu

^j Department of Water Resources, Government of Vanuatu, Port Vila, Vanuatu

^k Epidemiology and Research, Solomon Islands National University, Kukum Campus, Honiara, Solomon Islands

^l Ministry of Health and Medical Services, Government of Fiji, Suva, Fiji

*Corresponding author. E-mail: r.souter@griffith.edu.au

 RTS, 0000-0003-3335-5441

ABSTRACT

Pacific Island Countries (PICs) collectively have the lowest rates of access to safely managed or basic drinking water and sanitation globally. They are also the least urbanised, have dynamic socioeconomic and increasing climate-linked challenges. Community-based water managers need to respond to variability in water availability and quality caused by a range of hazards. Water Safety Planning (WSP), a widely adopted approach to assessing water supply, offers a risk-based approach to mitigating both existing and future hazards. WSP is adaptable, and making modifications to prescribed WSP to adapt it to the local context is common practice. Within the Pacific Community Water Management Plus research project, we used formative research and co-development processes to understand existing local modifications, whether further modifications are required, and, to develop additional modifications to WSP in Fiji, Vanuatu and Solomon Islands. The types of additional local modifications we recommend reflect the unique context of PICs, including adjusting for community management of water supplies and required collective action, community governance systems, levels of social cohesion in communities, and preferred adult-learning pedagogies. Incorporating modifications that address these factors into future WSP will improve the likelihood of sustained and safe community water services in Pacific and similar contexts.

Key words: capacity development, collective action, community facilitation, drinking water management, Pacific Island Countries, Water safety planning (WSP)

HIGHLIGHTS

- Rural communities in Pacific Island countries are vulnerable to poorly managed drinking water services.
- Modifications to better localise water safety planning (WSP) were identified for the Solomon Islands, Vanuatu, and Fiji.
- Localising WSP to work with community diversity, governance, social cohesion, and culturally specific ways of learning will substantially improve the likelihood of successful and sustained outcomes.

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GRAPHICAL ABSTRACT



INTRODUCTION

Water safety planning (WSP) is recommended by the World Health Organization WHO (2004) as the most effective way of ensuring the continuous provision of safe drinking water, regardless of the size of the supply or the level of development in a given setting. A key element of WSP's broad relevance is the ability to adapt it to suit different settings. As part of the Pacific Community Water Management Plus Research Project, we sought to identify in what ways WSP has been localised to the specific context of rural communities in select Pacific Island Countries (PICs), to assess if and what kinds of further modifications could strengthen WSP and, where possible, to pilot these modifications and assess their usefulness.

Localisation of WSP to improve outcomes

Since 2004, numerous guidance documents and support tools have been developed globally for WSP, and the approach has evolved to better address water security as a whole (water quality and quantity), social inclusion, and climate change (e.g., GWP UNICEF 2017; WHO 2019). Further place-based modification of WSP to suit local contexts provides facilitators with language and monitoring techniques common to their experience and results in plans that are more aligned to existing government requirements and better able to be integrated with existing programs, leading to more streamlined and less costly implementation (String & Lantagne 2016). The uptake and outcomes of WSP are heavily influenced by the enabling environment, in which regulations, guidelines, tools, and resources are critical (Baum & Bartram 2018). Within this enabling environment context, human capacity (especially capabilities) to undertake locally attuned WSP is essential to progressing SDG6 (Ferrero *et al.* 2019).

WSP has already been adapted to suit the context of rural communities in low- and middle-income countries (LMIC) (e.g., WHO 2014). A key challenge for rural water supplies is that in many contexts, communities bear significant responsibility for managing water systems and thus bear responsibility to implement plans and actions arising from WSP. Specific factors driving localisation of WSP to suit this context include the reliance on undertrained and often unremunerated community members to operate and maintain water supply systems; simpler technologies with less use of piped-to-house systems and a high reliance on container-based transport of water to homes; limited use of treatment within piped systems or at point-of-use; larger geographic spread, with remote and hard to reach communities; and larger *per unit* cost of materials and construction (Mahmud *et al.* 2007; WHO 2010). Furthermore, rural communities in LMIC countries, including PICS, typically have very limited access to skilled technicians able to maintain water systems and have limited surveillance services offered by government/utilities (WHO 1997; Bartram 1999). Modifying WSP so resultant plans are implementable in these rural contexts is an ambitious expectation given the well-documented challenges with community-based water management (e.g., Baumann 2006; Hutchings *et al.* 2015, 2017; World Bank 2017).

A common strategy to localise – adapt to the local context – WSP at a national level has been to develop a national template or draft Water Safety Plan that is transferred to rural community water caretakers (e.g. Mahmud *et al.* 2007). However, more specific localisation to suit both the implementing organisations and the varied community contexts extant across a country is necessary (Mahmud *et al.* 2007). This need for more localised, community-specific WSP was also noted by Khatri *et al.* (2011)

for PICs, where it was stressed that a ‘one-size-fits-all’ approach was not appropriate given the diversity of settings typically present.

Given the intensification of impacts associated with climate change on water safety and security, further modifications to WSP are needed to enable rural communities to adapt to climate change. Examples of recommendations include expanding WSP teams to include government disaster risk reduction or climate change officials and technical expertise, including hydrologists (GWP UNICEF 2017; Rickert *et al.* 2019), and incorporating community knowledge of trends and impacts associated with climate hazards into WSP risk assessments (MoWIE 2015a, 2015b; GWP UNICEF 2017; Rickert *et al.* 2019). The majority of climate change adaptation measures typically included in WSP requires technical support from external stakeholders, even in urban settings where water operators and managers are typically better qualified (Rickert *et al.* 2019), and thus beyond the reach of most rural communities globally.

WSP adoption in Vanuatu, Fiji, and Solomon Islands

WSP was adopted in Vanuatu in 2013 and further localised in 2022, drawing on the Pacific WASH Resilience Guidelines (UNICEF 2018) to better address the country’s high level of exposure to climate change and disasters (Rand *et al.* 2022). This localisation of WSP in Vanuatu adopts a template-based approach to simplify the technical aspects and give specific attention to climate and disaster-related hazards (Rand *et al.* 2022). WSP is implemented by the Department of Water Resources (DoWR) and accredited civil society organisations (CSOs), using their national Drinking Water Safety and Security Planning (DWSSP) guidelines (DoWR undated). These guidelines outline 5 days of training with each community to support the preparation of the improvement plan and establish community management arrangements, with flexibility in the schedule of training activities to suit facilitator/community capacity (DoWR undated). Following the training, the community is expected to implement no- and low-cost actions, after which they are eligible for financial support for larger infrastructure improvements through the government’s Capital Assistance Program, which uses a risk score to identify and prioritise communities most in need (DoWR 2018).

In Fiji, WSP is implemented by the Ministry of Health and Medical Services (MHMS), and Environmental Health Officers using their national Drinking Water Safety and Security Planning guidelines (MHMS, undated). Similar to Vanuatu, the WSP guidelines outline 5 days of training in a single community. Following the development of the improvement plan, the community is expected to implement no- and low-cost actions, while they seek financial and technical support for large infrastructure upgrades through the Department of Water and Sewerage.

A review of the effectiveness of WSP in both Vanuatu and Fiji found that WSP implementation was often incomplete, small improvements in water supply operation were evident, and there were no documented microbiological water quality improvements (String *et al.* 2020). The authors concluded that additional technical and financial resources are necessary to support community-managed WSPs. In Vanuatu, a recent review of 199 DWSSP developed from 2013 to 2019 determined that 22% of communities implemented some no/low-cost actions following DWSSP training (Rand *et al.* 2022). These reviews indicate that there are challenges with the adoption of WSP in PICs.

In the Solomon Islands, WSP has not yet been formally adopted by the government as a suitable approach to rural water safety and security; however, it is identified as a gap to be addressed by the government in the future (SI Gov 2017, 6.1.1).

The PIC context

The drivers for localising WSP to PICs are common in many rural areas of the world, as described earlier. However, there are features of the local context that influence the specific modifications adopted to localise WSP.

Firstly, there is significant ground to be made in universal access of rural populations to even basic water services. Collectively, PICs lag behind the rest of the world in relation to access by their population to safe drinking water and basic sanitation services. As of 2020, only 47% of PIC rural populations have access to basic drinking water sources, 24% have basic sanitation facilities, and 36% have basic hygiene facilities (Oceania region, WHO-UNICEF 2021). And, there is usually limited or no water treatment (Khatri *et al.* 2011). This low rate of access to safe water, sanitation, and hygiene makes WSP more complex, with greater leaps in improvement required, in terms of both access to water and access to sanitation and hygiene so as to address key hazards to water quality.

In addition, although rural water services are transitioning to professionalised services in many regions of the world (World Bank 2017), most PICs continue to rely on the community-based water management model. Following the installation of upgraded water systems, usually with some training or WSP, volunteer-based Water/WASH Committees have full

responsibility for managing their water systems. This requires strong community governance, management, and collective action on water (Hutchings *et al.* 2017; UNICEF 2018); these capabilities are still developing in many rural villages in at least some PICs (e.g., Love *et al.* 2020a, 2020b, 2021, 2023).

Furthermore, the limited feasibility of regular surveillance by governments and other enabling actors (Khatiri *et al.* 2011) places greater importance on WSP as a capacity development process. Managing water systems to sustain water security requires strengthening core competencies, such as problem-solving and critical thinking; these cannot be taught but must be developed through participation, experiential learning, and reflection (UNESCO 2017). Designing WSP to deliver on this capacity development outcome is complicated by the comparatively low education attainment levels in many PICs; completion of secondary school is highly variable between countries, between urban and rural populations (and gender in many cases) (SPC 2021). Locally appropriate learning pedagogies are essential if WSP is to lead to improved water safety and security.

Also important in the context of rural water supplies in PICs is the reliance on multiple water sources, and a mix of self-supply and community/shared supply systems are used by households to meet their needs (Elliott *et al.* 2017; Love *et al.* 2020a, 2020b; Foster *et al.* 2021). This is an important adaptation to local climatic variability, with increasing climate hazards affecting water quality and availability, as well as a raft of other social, environmental, and operational factors affecting the availability of particular supplies (Love *et al.* 2020a, 2020b). Thus, to ensure safe drinking water throughout the year and across the community, WSP needs to be designed to support the assessment of all types of drinking water supplies, without becoming too complex that competencies are not sufficiently developed.

Aims of the research

Given the slow rate of progress towards achieving safe water supplies to rural populations in many PICs and the persistent challenges with WSP, this research sought to identify the ways in which WSP approaches used in Fiji and Vanuatu could be further strengthened and, in the Solomon Islands, to determine whether a locally developed version of WSP would be beneficial.

This article provides a case study on the development and refinement of WSP for small community-managed water supplies in select PICs. Three persistent challenges were identified as especially delimiting WSP outcomes: (i) low capacity to facilitate and undertake WSP; (ii) weak and inactive WASH/water committees and WSP teams, with poor social inclusion, low sustainability, and limited institutional memory; and (iii) low prioritisation of water at household levels with limited collective action. These are consistent with WSP challenges in other rural settings globally. Potential modifications to WSP that may further localise WSP to the context of Solomon Islands, Fiji, and Vanuatu and help to address these challenges were identified and, where possible, piloted.

METHODS

This research was part of the larger Pacific Community Water Management Plus (PaCWaM+) research project, conducted in Solomon Islands and Fiji 2018–2022 and in Vanuatu in 2022. In Solomon Islands and Fiji, an extensive formative research phase of 18 months provided foundational understanding for the WSP-focused research reported here (refer to studies by Love *et al.* 2020a, 2020b).

The WSP research involved three phases, conducted asymmetrically across the three countries.

1. Formative research

Formative research was conducted with ‘facilitators’ – staff of organisations who have or were planning to facilitate WSP with rural communities – and in Vanuatu also with community members that had recently completed DWSSP training.

- In Fiji, a series of individual interviews and workshops were conducted with MHMS Environmental Health officers that facilitate DWSSP and with Habitat for Humanity Fiji (HfHF) community facilitators implementing WSP. These focused on identifying the strengths and weaknesses of existing DWSSP implementation processes.
- In Solomon Islands, formative research was conducted with WASH community facilitators from partnering CSOs (Plan International Australia and Pacific, and Live and Learn Solomon Islands), who were intending to adopt WSP. These focused on discussing features of conventional WSP for small rural communities, and the expected strengths and challenges of such an approach.

- In Vanuatu, a stakeholder workshop was followed by structured interviews with DWSSP facilitators from DoWR and CSOs. In addition, formative research was conducted in five communities that had recently participated in DWSSP training. These focused on identifying the strengths and weaknesses of existing DWSSP implementation processes.

Supplementary Material S1 gives respondent particulars, and Supplementary Material S2 includes maps showing community locations.

All qualitative data were transcribed, translated (when necessary), and entered and coded in NVivo™ to assist with thematic analysis, using a grounded theory methodology (cf. [Strauss & Corbin 1997](#)). Issues with existing WSP processes were identified and summarised as key WSP challenges.

2. Co-development of modified WSP

The process to design modifications to address WSP challenges differed in each country, influenced by the level of involvement of WSP facilitators with the research, timing, and nature of COVID-19 restrictions limiting movement, and the nature of the modified tool or guide. Possible modifications were designed to address multiple issues to minimise the total number and scale of modifications required.

- In Fiji, modifications to the existing DWSSP approach were co-developed by the research team (IWC, USP) with MHMS Environmental Health officers and documented in a complimentary guide to the national DWSSP.
- Also in Fiji, the Strong Water Committees tool was developed by the research team (IWC, SINU, USP) and reviewed by (HfHF) staff.
- In the Solomon Islands, a local WSP approach was developed – Community-Based Water Security and Improvement Planning (CWSIP). The CWSIP1 guidelines were co-developed in 2019 by the research team (IWC, SINU) with partnering CSOs (Plan International Australia and Pacific, and Live and Learn Solomon Islands), through a series of face-to-face workshops, and then refined following three review workshops during 2019–2021 while CWSIP1 was implemented. CWSIP2 was co-developed in 2022, to specifically address climate-related hazards, through hybrid (online and face-to-face) workshops.
- In Vanuatu, modifications to the existing DWSSP approach were co-developed by the research team (IWC, USP) with DoWR and Red Cross Vanuatu.

Specific modifications are summarised in the results, and the tools/guides associated with these are listed in Supplementary Material (S3).

3. Testing and assessment of the modified WSP and tools

The opportunity to test the WSP modifications through piloting and associated monitoring differed between countries, as a result of variable COVID-19 restrictions, civil unrest in Solomon Islands, and facilitator capacity.

- In Fiji, the complimentary DWSSP activities could not be piloted due to COVID-19-related restrictions; rather, data were collected from DWSSP facilitators about the modified WSP approaches. Feedback on the modified DWSSP was obtained in both written and oral formats (through key informant interviews, and a workshop with MHMS Environmental Health Officers, and National WASH Coordinator).
- Also in Fiji, the *Strong Water Committees* module was piloted by HfHF as part of their WASH program; post-implementation interviews were conducted with community facilitators that used the approach, as well as with Water Committee members from implementation communities.
- In Vanuatu, the additional DWSSP activities were piloted by Red Cross community facilitators, with Provincial DoWR officer support, in five communities as a structured follow-up to recent (2018–19) DWSSP. This was at the request of DoWR and CSO stakeholders. Post-implementation interviews were conducted with facilitators, and qualitative community data were collected before, during, and after the DWSSP follow-up intervention.
- In the Solomon Islands, the CWSIP1 approach was implemented as part of a larger WASH program (*New Times-New Targets*, Plan International Australia and Pacific, and Live and Learn Solomon Islands) with 50 communities. Baseline and endline community data were collected from five communities participating in the program – these data comprised: key informant interviews with Water Committee members, household survey, sanitary risk inspections, infrastructure functionality inspections, and water quality testing. Process interviews were conducted with CWSIP1 community facilitators several times during CWSIP1 implementation.

- Also in the Solomon Islands, CWSIP2 was implemented by Solomon Islands National University (SINU) and PIP staff in five communities during 2022. Similar to CWSIP1, baseline and endline community monitoring, process monitoring was conducted.

Supplementary Material S1 gives respondent particulars, and Supplementary Material S2 includes maps showing community locations.

Ethics

Free and informed consent of the participants was obtained from all respondents prior to participating in data collection activities. The study protocol received granted approval from the following research institutions and agencies: Griffith University – ref HREC 2018/793, Solomon Island National University – ref SINUREC 02/18, Solomon Islands Ministry of Health – ref HRE037/18, The University of the South Pacific – ref sarahpene/2018, and University of Queensland – ref 2019000441/2018/793.

Limitations

The modifications reported here were piloted in a small number of communities and post-implementation monitoring often occurred soon after implementation. This limits the identification of impacts to immediate rather than sustained changes. Conversely, the maximum potential benefits of the modified approaches were also likely constrained by (i) the location of pilot communities close to urban areas (for research accessibility) and (ii) overly protracted implementation of CWSIP in the Solomon Islands due to unforeseen circumstances.

RESULTS AND DISCUSSION

Through the qualitative data collection, numerous issues with existing WSP facilitation were identified, which were grouped in three themes, representing the key WSP challenges (Table 1). These three themes are (i) capacity for WSP in communities and facilitators; (2) inclusive and active Water Committee and WSP teams; and (3) broader community support and action. For each challenge, several modifications to WSP processes were identified, each with specific expected benefits (Table 1); these are discussed in this section alongside the discussion of each challenge.

Theme 1: Capacity for WSP in communities and facilitators

A fundamental concept in WSP is that of risk-based management. In contexts where Water Committees have responsibility for ongoing management, they need to understand this concept, be able to identify hazards and control measures, and have the proficiency to implement no/low-cost actions. Their capacity needs to be sufficient to continue – after WSP facilitation – to assess and respond to hazards as they emerge over time. Such risk-based management of water systems is also recognised and an appropriate strategy to encourage climate adaptation and resilience. Risk-based management develops skills in identifying and responding to hazards that can be applied to any types of hazards, including new hazards as they emerge.

Community capacity, in particular the low levels of literacy, was persistently highlighted as a challenge for participants in understanding technical concepts embedded in existing WSP facilitation:

[...] most of these communities have a different level of literacy, therefore those who can't read or write properly tend to skip the remaining days of the training while the others really enjoy the training (VAN-Im9).

One thing about DWSSP is it is very technical and the literacy level in a community is somewhat low, hence, we train our employees to break information and instructions down so they can really grasp the concept (VAN-Im1).

Technical content of WSP steps

Facilitators identified challenges related to the technical complexity of some WSP tasks, such as identifying and assessing hazards through sanitary inspection, assessing risk levels, water demand and supply calculations, identifying control points and actions, and in particular in understanding control actions sufficiently to be able to implement them. For example, in Vanuatu:

Table 1 | Summary of key localisation themes, the nature of challenges requiring the localisation, the suggested modifications to WSP, and associated benefits

Theme of WSP Challenges	WSP Modifications made and expected subsequent benefits
<p>1. <i>Capacity for WSP in communities and facilitator:</i> Existing WSP approaches involve intensive training/engagement with communities. This approach prioritises development of an improvement plan over effective capacity development of communities, despite their responsibility for implementation of actions and ongoing water management.</p>	<ol style="list-style-type: none"> 1. <i>Co-develop WSP modifications alongside facilitators</i>, to match WSP processes and activities to community capacities, and to increase facilitator competencies underlying effective WSP. 2. <i>Addition of a 'water pathways' module</i> focused on strengthening knowledge of water cycles, movement of water moves through ecosystems and infrastructure, interactions of hazards with natural and infrastructure systems (Fiji-DWSSP, Solomon Islands-CWSIP). The water pathways activities were also visually based, involved place-based and incremental drawing of water cycles, systems and hazards. 3. <i>Simplification and localisation</i> of technical steps such as sanitary inspection forms and the risk assessment method (Fiji-DWSSP, Solomon Islands-CWSIP) and removal of volumetric calculations (Solomon Islands-CWSIP) to ensure WSP facilitators and community members can independently perform technical WSP tasks. 4. <i>Use real stories to link theoretical information with community life and culture.</i> Recognising the preference for oral-based sharing of information, story-based activities were incorporated to discuss the importance of WSP, and past experiences and likely future impacts of climate hazards. The <i>Strong Water Committees</i> activity for Fiji used oral stories based on a composite of real case studies from other communities, emphasising proactive planning. CWSIP1-Solomon Islands used video-based stories and CWSIP2 used <i>Tok Stori</i> sessions to enable village elders to share stories of past disasters, climate hazards, impacts to water systems and to people and community life, and the use of video stories to share experiences between communities. 5. <i>Adjust the community engagement schedule and format</i> of Solomon Islands-CWSIP to comprise a protracted series of shorter community visits, rather than a single intensive visit. CWSIP1 involves 6 days of training over 2–3 months, allowing time for participants to digest and discuss learnings. The format also included action learning in which WSP team members were trained and/or supported to take responsibility for most WSP tasks, including household surveys, sanitary inspections, and risk assessments. 6. <i>Add structured follow-up</i> visits following intensive training programs (e.g., Vanuatu-DWSSP) to re-enforce key learnings and messages, and actions required (see also Theme 2 for additional benefits). 7. <i>Cluster WSP training</i> with small numbers (2–4) communities (Fiji-DWSSP) to support peer-to-peer learning and develop an informal inter-community network of water supply managers (as well as support cost-efficiencies for facilitators). 8. <i>Review Water Committee membership</i> (e.g., <i>Strong Water Committees</i> module included in Solomon Islands-CWSIP, Fiji-DWSSP and as a standalone addition to HfHF WASH Programming), to support (i) socially inclusive and diverse representation for better community engagement and action, (ii) inclusion of other influential people (e.g., village leaders and land (water) owners, other community committee representatives, and supportive people (e.g., health workers, teachers), and (iii) a larger committee for redundancy and sustainability.
<p>2. <i>Socially inclusive and active Water Committees and WSP teams</i> Water Committees, who should form the core of the WSP team, are not sustained, and usually newly re-formed for WSP. Membership of Water Committees and participation in WSP teams is not sufficiently diverse, inadequately representing gender, age, faith, family/clan, and geographic diversity. Post-WSP action by Water Committees or WSP teams is typically low.</p>	

(Continued.)

Table 1 | Continued

Theme of WSP Challenges	WSP Modifications made and expected subsequent benefits
<p>3. <i>Mobilising broader community support and collective action</i> Although effective operation and management of a community water supply system requires collective action, many community members do not consistently perform water actions due to competing priorities, or a belief it is the responsibility of Water Committees or others.</p>	<p>9. <i>Engage with Water Committees pre- and post-WSP</i> (e.g., Vanuatu-DWSSP; Fiji-DWSSP) to address outstanding membership/participation issues, and continue to motivate and hold to account Water Committees/WSP teams; this is especially important when WSP training entailed a single intensive engagement.</p> <p>10. <i>Include zone-based representatives in WSP teams</i> (Solomon Islands-CWSIP; Fiji-DWSSP) to improve community representation in WSP, in particular represent different water systems and situations (which vary geographically within a community) and, to communicate, organise, and improve accountability for zone-based WSP actions (see additional benefits of zone representation in Theme 3).</p> <p>11. <i>Use social marketing strategies to influence attitudes about collective water action</i> (e.g., <i>Water is Everyone's Business</i> videos and workshops in Solomon Islands-CWSIP, Talanoa in <i>Strong Water Committees-Fiji</i>; Vanuatu-DWSSP Structured follow-up visit), particularly incorporating stories about real communities and individuals taking collective action, with an emphasis on the benefits rather than educating on how/what actions.</p> <p>12. <i>Encourage Water Committees to engage more effectively with the broader community</i> (e.g., <i>Strong Water Committees</i> in Fiji-DWSSP and Solomon Islands-CWSIP) to support effective two-way communication about water supply situations, Water Committee actions, and actions required of water users.</p> <p>13. <i>Use zones (or other smaller levels of social cohesion) to motivate water collective action</i> (e.g., Solomon Islands-CWSIP, Fiji-DWSSP use of Mataqali) – in addition to supporting more inclusive identification of actions and communicating their required implementation, the existing social cohesion within zones/clans/groups can be leveraged to motivate and promote collective actions – such as through scheduled action days – and support householders that need assistance.</p> <p>14. <i>Encourage regular household visits by Water Committee/WSP teams</i>, such as to conduct a survey or gather information and stories about water situations (e.g., Solomon Islands-CWSIP) can galvanise interest and awareness to support subsequent collective action.</p> <p>15. <i>Include low/no-cost actions at the water user/household level in action plans arising from WSP</i> (e.g., Solomon Islands-CWSIP, Fiji-DWSSP; already present in Vanuatu-DWSSP) to more explicitly raise awareness of the importance of collective actions, and to create an expectation of performance of these.</p> <p>16. <i>Socialise action plans arising from WSP</i> (e.g., Solomon Islands-CWSIP) to raise expectations of performance of both collective actions and Water Committee actions.</p>

... we did not give them [enough] directions on how to carry out their jobs. So, when they stepped into the role, they do not know what to do (VAN-Im7).

In the Solomon Islands, facilitators advised that a training module should be included on understanding the water cycle for community members, before they would be able to effectively assess sanitary risks and other hazards. Consequently, a visual and village-specific activity was included in CWSIP, during which CWSIP facilitators sketched the local water resources and cycle, discussed, and progressively added the existing infrastructure and potential hazards to water quality and quantity. The benefit of creating these sketches *in situ* with community members is they can build progressively from simple to more complex as elements are added, and they encourage interaction and engagement. This approach does require CWSIP facilitators

to be confident in applying a theoretical understanding of water cycles, systems, and hazards to a specific locale, and in the case of the Solomon Islands, they have recommended greater attention to this capacity in future programs. The capacity and technical know-how of WSP facilitators is critical to ensuring the WSP process, and the content is localised to the community's situation (Herschman *et al.* 2020), and as experience and knowledge of WSP is gained, the WSP process can evolve (Barrington *et al.* 2013).

In addition, the hazard identification method in CWSIP was simplified to a list of water quality and quantity hazards typical for commonly used water systems. The subsequent risk-level determination was simplified to a qualitative assessment based on severity ratings standardised to the common types of hazards, and likelihood of exposure based on a qualitative judgement of the probability and the number of people affected by the hazard. To encourage consideration of climate change and population changes, participants were prompted to consider the likelihood of exposure now or in the future. These qualitative assessments were not only based on basic water quality testing and hazard inspections, and surveys of population use of different supplies, but also on the opinions of community members. The results thus have obvious limitations regarding accuracy, but the less-technical approach was adopted to support the primary intentions of building understanding of risk-based management as an approach to managing water supplies and improve community capabilities to apply risk-based thinking and assessments independently.

Locally applicable pedagogies

In addition to the overly technical content, both facilitators and community members identified some aspects of the format of WSP as not well designed to develop community capacity. This echoes findings by others (e.g., Mahmud *et al.* 2007; Herschman *et al.* 2020). In Fiji, it was stressed by numerous MHMS DWSSP facilitators that the delivery of the training needed to suit the learning styles in rural communities with preferred use of hardcopy and visual resources in local languages (e.g., FJ-Im1).

Ensuring that content and delivery are appropriate to unique Pasifika ethos and beliefs is paramount to ensure adequate learning and retention (Phan 2007). Activities added to WSP in Vanuatu and Solomon Islands included the use of real stories – delivered orally (as in the *Strong Water Committees* guide by HfHF in Fiji or by CWSIP2 in Solomon Islands-) or via videos as in CWSIP1 and the DWSSP – Vanuatu follow-up activities (see S3). The addition of real stories was designed to both support and motivate collective action (see Theme 3) as well as better reflect local cultural pedagogical traditions of learning and talking (e.g., *talanoa*, *tok stori*, *storian*; Vaka *et al.* 2016; Sanga & Reynolds 2019).

Other feedback related to the intensity of WSP implementation is as follows:

[The information] is given out all at once during that one-week period and it is too much for one person to process all at once and can cause them to forget the most important things about water (VAN-Im7).

These combined challenges point to the importance of scaffolded and progressive learning as an important pedagogy for effective capacity development in PICs (Spiller 2013). Given that WSP is a cycle of repeating activities, it is well placed to adopt scaffolded and progressive learning approaches, in which facilitators gradually decrease their leading of tasks, and the technical complexity of risk-based steps such as identifying hazards and controls is gradually increased, over cycles of WSP. The CWSIP2 (Solomon Islands) approach is precisely designed to build on the fundamental concept of identifying hazards as a basis for risk management developed in CWSIP1, with an increased focus on future hazards relating to climate change (see S3).

The need for follow-up visits to communities to motivate and hold to account Water Committees and WSP teams is addressed in Theme 2, but is also inherently linked to community capacity and scaffolded learning and was repeatedly raised as an issue in both Vanuatu and Fiji:

Those [DWSSP] trainings are helpful but because they no longer do follow up again some of the important things to help maintain our water system have already been forgotten (VAN-V7).

... the water committee decided to rest because they do not know what to do [after facilitation of DWSSP]. It also comes back to us in the Department because we didn't do follow-up ... both sides need to be strengthened (VAN-Im7).

In Fiji, WAF introduced follow-up activities in 2019 specifically to re-engage with communities. It is referred to as 'awareness' and 'enlightening' of communities rather than 'training', and uses worksheets and pamphlets to assist, with the aim being

to clarify roles and responsibilities (e.g., FJ-Im15). The effectiveness of these follow-up visits in contributing to implementation of WSP actions is not known.

Follow-up is a formal part of DoWR's DWSSP strategy in Vanuatu. The review by [Rand et al. \(2022\)](#) found that of 48 DWSSPs conducted by CSOs in 2018, 44% (21/48) of communities had received some sort of follow-up by the facilitators within months (2022:678-9). DoWR now use a DWSSP follow-up checklist and Water Committee functionality checklist, but requested the development of follow-up activities more explicitly structured to reinforce key messages and help develop capacity. This formed the basis of the modification piloted in Vanuatu which was primarily designed to re-engage the broader community on the importance of water (*Water is Everyone's Business*) and encourage the Water Committee to reflect on performance and membership (refer to [Table 1](#) and S3), but also provided Water Committees an opportunity to follow up on technical problems.

In addition to less-intensive training, incorporating story-based sharing of information, and providing more follow-up support, the notion of clustering of WSP facilitation with multiple communities was explored with facilitators. This was discussed as a means to encourage additional story- or experience-based learning, as well as open the door for informal communication and knowledge sharing between Water Committees. This has been used a few times in Fiji and was cited by several facilitators as an approach that could be scaled and mainstreamed, be cost effective, and support community capacity development:

I would say because we're using much of our resources in terms of time, so better cluster the communities together and run one training. Like 2 or 3 communities together..... Also, it makes the training interesting when you get the people from different communities, and they get to exchange ideas when they're doing group work. They get to ask each other how things are done in their villages (FJ-Im3).

Theme 2: Socially inclusive and active water committees and WSP teams

A review of 'success factors' for WSP identified community engagement as one of the top three factors contributing to successful WSP especially for rural and small community water supplies in LMICs ([Herschan et al. 2020](#)). Engaging communities in the development of their specific plans was described as necessary to understand the community's culture and practices, thus ensuring actions are appropriate, and for communities to see the value in WSP and have the drive to implement agreed improvement actions ([Herschan et al. 2020](#); see also [Mahmud et al. 2007](#)).

Given their ongoing role in managing water systems, Water Committees play a critical role in WSP. As identified by our past research in Fiji and Solomon Islands ([Love et al. 2020a, 2020b](#)), and reaffirmed with formative research in Vanuatu, Water Committees typically need to be reactivated after a period of inactivity, or newly created, for the purposes of WSP. A lack of sustainability of Water Committees was widely noted. For example:

When we came in to work with the committees these are the actual challenges that we've identified, one, the committee [...] they exist not more than six months. That's average, not more than six months, it can be less than, but most of the time, they don't exist after six months (FJ-Im13).

Usually, the water committees, because they keep changing the members [...] some of the new members don't know how to operate or maintain the water systems (FJ-im14).

In addition, membership of Water Committees is problematic. Men dominate water committee membership, roles, and decision-making in Fiji ([Love et al. 2021](#); [Nelson et al. 2021](#)), Vanuatu (e.g., [Mommen et al. 2017](#)), and Solomon Islands (e.g., [UNICEF 2019](#); [Love et al. 2021](#)). There are mandates regarding the membership of women in Water Committees, for example in Vanuatu, at least 40% of members are meant to be women. In practice, however, this is rarely the case and women remain grossly under-represented in Water Committees (e.g., Solomon Islands – [Love et al. 2020a](#); Fiji – [Love et al. 2021b](#)). Facilitators identified that women members are valuable not only in terms of improving general Water Committee performance (cf. [Mommen et al. 2017](#)) but also in terms of ensuring DWSSP actions and reporting are conducted following implementation:

When a woman is chairperson, Water Committees are more effective. When women look after money there is proper recording and reports [...] women are very good [referring to one particular village in Pentecost] the system might not work good, but the Water Committee chairlady always sends reports to us (VAN-Im1).

... what we are encouraging now is gender equality – involving women in the WC. Having women on the WC we can tell that they push for everything to be done (FJ-Im2).

In addition to a lack of representation of genders, Water Committees generally poorly represent other forms of diversity, such as age, faith, or ethnic groups (e.g., [Love et al. 2021](#)). WSP may present an opportunity to improve social inclusion in Water Committee and community water management more broadly. Facilitators identified that participation in WSP should not be limited to Water Committee members. In Vanuatu and Fiji, the DWSSP guidance is that members of the Water Committee, usually established as part of the DWSSP intervention, should form the core of the WSP team, but anyone who may be useful in developing and implementing a DWSSP can be involved. This includes the community health worker in Fiji. In Vanuatu, the leader of the DWSSP team is advised to come from the Water Committee, but if absent, then a representative from the chiefs' council can assume the role, and the team should include people from not only the Water Committee but also representatives from women's, men's, youth, and church groups ([DoWR Gov 2018:12](#)). One facilitator noted:

It is important to choose the right people [for the training] so they can influence. For example, if you elect chiefs and decision makers of the community, when they come together things happen. However, when you select random people things will not work (VAN-Im1).

The benefits of involving other influential people, including those outside the community, were also identified as important because some WSP actions are difficult to implement without their support. For example, landowners who do not reside in the community but whose water resources are used or impacted by the community's water supplies:

One reason some people did not want to raise funds or give money is that the catchment area of the source is on other people's land, disputes can arise and sometimes water can be turned off. It happened once, the landowners cut off the pipes at the dam simply because water was not connected to their household (SI-V32).

Interestingly, in Fiji, *mataqali* (clan) chiefs were not recommended to be part of the DWSSP training as *'he will just end up looking down on the committee members'* ([FJ-Im2](#)). This regional differentiation highlights the importance of context and need for country specific guidance.

In addition, the WSP team, including the Water Committee, experience a flux in membership due to migration in-and-out of communities and due to multiple other commitments ([Love et al. 2020a, 2020b](#)), which makes building and retaining sufficient capacity difficult. Information has not always been passed on between those who attended DWSSP training. For example, in Lelepa, past Water Committee members who undertook the DWSSP activity have been replaced by a new membership, but no information was passed on to any of the new members (VAN-V14).

After the structured follow-up visit in Vanuatu, in which the *Strong Water Committee* module was conducted (refer to [Table 1](#) for details of modifications), two of the five Water Committees (Sunai and Taloa) broadened their membership to include more women and youth, and the three other villages expressed an intention to change membership in the near future. One of the facilitators of the modified follow-up visit stated:

What I noticed after the activities is that the committee have come to realise the importance of having women and young women in the water committee (VAN-Im10).

In Fiji, the use of the *Strong Water Committee* module by HfHF in their WASH program communities highlighted the importance to the community facilitators of the importance to address inadequate Water Committee membership:

These [committees] are a very important component of any WASH training... That activity is really helpful because it actually helps the committee members to identify the element of success for having a strong committee. It is really helpful because they actually read the story and identify what the strengths and weaknesses of the two villages/two communities – community one and community two were. And at the same time, they are able to reflect that on their own communities. ... I must say that the communities [that didn't have] the youth, they ... actually make changes and invite youth [and] the

participation of women. Those are the changes that we also witnessed in communities that [didn't] have women on the on the committee (FJ-Im13).

The concept of leveraging geographic zones that already exist within communities arose during earlier formative research (Love *et al.* 2021) and was a key design feature of CWSIP (Solomon Islands). In both Solomon Islands and Vanuatu, most villages are demarcated by zones or groups (often with their own name or number, e.g., Raki, Liah, or zone 1, 2, 3), and such groupings are often informally used for fundraising and community work. In many contexts, this practice has its antecedents in the colonial era and in some contexts follows tribal affiliation. The benefits of considering zone representation in WSP are that there is already existing social cohesion and collective action at this more micro-proximal level, there is greater potential for agency among individuals, and we observed that levels of water system service differ within a village, typically in alignment with zones/areas and their proximity to water sources.

The CWSIP facilitators found zones not only a useful way to break down community-wide WSP processes and required actions (see mobilising committee action below for more details) but also an effective mechanism to raise awareness among whole Water Committees (and WSP teams) about different experiences with the water supply system across a community. For example, in the Solomon Islands, the sharing of zone-based household surveys and stories with the CWSIP team provided the residents of an outer area of one village the opportunity to draw attention to their lack of access to water for the most part of most days due to low water pressure; other members of the CWSIP team, including Water Committee and Village Leaders, openly reflected their lack of awareness of this water problem because there was no pre-existing mechanism for those community members to raise this problem (CWSIP-1 review, 12 November 2019). This example highlights one of the most significant benefits of zones – social inclusion in governance and planning; because zones exist in large part because they are clusters of socially connected households, voices that are often marginalised in larger forums, such as community meetings, are more empowered to raise issues with zone members.

Having both a Water Committee and a similar but slightly different WSP team can be problematic. A review of the DWSSP Action Plans in the five formative research case studies in Vanuatu, and further supported by facilitator interviews, identified some confusion, duplication, and challenges between the roles and responsibilities of the Water Committee and DWSSP team. This issue needs further attention in future modifications to localise WSP.

Mobilising action by the water committee or WSP team

WSP is intended to be a proactive management tool, requiring regular action, such as monitoring of hazards, by the nominated group – Water Committee or WSP team. It becomes of little value if action reverts to responding to water problems. Thus, engaging with Water Committees and WSP teams before and after WSPs is important to mobilising and sustaining action.

UNICEF's Pacific WASH resilience guidelines (2018) recommend pre-DWSSP engagement as critical to raising awareness about water and health and WSP, and the importance of the Water Committee. In Fiji, this recommendation has been adopted:

Before we carry out the training, we try to attend their village meeting to present to them the importance of having this training. That's the only time we get to encourage them and when we have the [WSP] consultation that's when we see if the message got across to them during the village meeting or not. We also present some of the projects from the other villages who have improved their water sources, during the village meeting just to encourage them (FJ-Im2).

Water Committees often do not sustain activity beyond the WSP training, with variable rates of implementation of low- and no-cost actions by communities (see also Rand *et al.* 2022).

The common challenge in a community is that not many communities will actually carry out the activity once we leave them after the training. Out of 100 communities, less than 10 will actually take up ownership and stick to their plans (VAN-Im4).

While it is recognised that auditing WSPs can provide an important advisory role to Water Committees to guide and support the implementation of improvement plans and actions (WHO 2015), it is not often done. Post-WSP follow-up visits with Water Committees (or WSP teams) were identified as a critical requirement during the formative research:

I think it's just the part at the end of the training – after establishing the DWSSP process it becomes the community's responsibilities and how they respond to what they have learnt. Once the training is done – it's entirely up to the community on when to implement....I think the main [challenge] is the monitoring from our side because the more we monitor their effectiveness in the community that's how they are going to be effective, if not they'll slack down and lose interest (FJ-Im2).

As noted earlier, the formative workshop with DWSSP facilitators in Vanuatu identified a structured follow-up visit as the most useful modification to DWSSP that the research could develop and test. After adding this to the DWSSP approach (refer to [Table 1](#), modifications), increased actions were observed by Water Committee. For example, within 3 weeks, the Water Committee in Lelepa installed an additional planned tap stand as agreed in their WSP action plan, and in Mangaliliu, they had maintained (cleaned) the primary water supply dam.

In the Solomon Islands, CWSIP was intentionally designed to involve a more protracted, rather than intensive engagement with the WSP team, which although primarily intended to benefit capacity development it was also hoped that longer engagement might also build a higher level of commitment and accountability to implementing WSP actions. A second feature of CWSIP that also aimed to increase commitment and accountability was to disaggregate planning decisions and implement actions to representatives of geographic zones within the community, due to the stronger levels of social cohesion at this more proximal social level (described earlier). Following its piloting in communities, both facilitators and community members reported that zones were often an effective strategy to mobilise implementation of agreed actions (e.g., SI-2V53, SI-2V55). For example, during endline monitoring, a member of a Water Committee and village elder in Tuvu stated that

... the zone reps are the ones who usually went around to check the water system. So, our zone reps are the acting maintenance team and they are the ones to identify the water pathway that has leakages (SI-2V8).

The zone approach is also suited to the Vanuatu context. In Vanuatu, 94% of respondents from the pilot communities reported raising funds at the zone level ($n = 31$). While none of our pilot communities used zones for water management or WSP purposes, there are reportedly some communities in Malampa and Tafea Provinces 'that are really undertaking these responsibilities for raising funds for their water systems and also delegated responsibilities for managing their systems [at the zone level]' (VAN-Im9).

A zone-based planning approach appears beneficial to mobilising actions by WSP teams, particularly for actions relating to water systems accessible within their own zones. It was noted in the Solomon Islands that zone representatives were sometimes less motivated to participate in actions relating to water systems if their zone did not have access to that system (e.g., SI-V46, SI-2V53). So while zone representation may be useful for assessing and monitoring systems, identifying, implementing, and reporting actions, community-wide planning, and management activities will remain important for recognising and managing connections such as hazards across zones.

This observation further reinforces the limitations of the scope of WSP to the planning and monitoring of actions; WSP is not intended to address management needs, such as governance arrangements, securing funds, and community communications. Community Water Management involves a broad range of tasks and skills to address water issues (e.g., [Love et al. 2020a](#), [2020b](#)), as well as locating water issues within broader community priorities. One DWSSP facilitator in Fiji identified this as a key challenge:

Actually, I would say the management [is a major challenge following DWSSP]. Usually communities are able to do fund-raising for so many other things but it's just the prioritization and management of what is important and what needs to be addressed first [FJ-Im3].

A key addition to UNICEF Pacific-focused version of WSP was an additional step focused on establishing community water management arrangements, which has an emphasis on ensuring that communities understand that they are the managers of their water and waste systems ([UNICEF 2018](#)). However, this is scheduled as a one-off, half-day activity (although facilitators can adapt the timing) and is hinged on an informational/educational pedagogical approach alone. We suggest supporting effective Community Water Management as a whole is beyond the scope of WSP training but could be integrated with a more comprehensive follow-up program.

Theme 3: Mobilising broader community support and collective action

In WSP guidance for use in small, rural communities with community-managed water systems, WHO emphasized that small and simple improvements are better than none – small wins are important for community empowerment (WHO 2014). Most often, these small wins entail low- and no-cost actions. But achieving these requires collective action – actions taken by individuals in a group of people whose goal is to achieve a common water management objective (Love *et al.* 2020a, 2020b). Such low and no-cost collective actions include water conservation behaviours, minor maintenance, agreed water operating practices (e.g., scheduled use timetables), and paying of water fees.

Our past research (Love *et al.* 2020a, 2020b) indicates that collective water action is not strong in many communities. This was reinforced through the formative research with facilitators specifically focused on WSP. For example:

Most of the time, a lot of people they sort of don't participate in the activities of the water committee because they (community) don't see (that) the (Water Committee) need the support of the community as a whole...[they think] ... it's the Water Committee's job to do everything concerning water (FJ-Im3).

Research by others has also observed low rates of implementation of low- and no-cost DWSSP actions in Vanuatu (Rand *et al.* 2022).

Low collective water action is influenced by many factors. Facilitators noted a reliance on government and other outside actors to provide community water needs and a reluctance to participate in unpaid 'work':

...villagers have high expectation. They are totally dependent on the government or other agencies (VAN-Im6).

...money is a set-back on peoples' mindset, no voluntary work; I work you have to pay me. Even though it is for the community, but I will have to benefit from it as well. It is because many NGOs give or support people who are doing the work by giving money that is why they have that sort of mindset (VAN-Im4).

There is a latent understanding of the importance of water, and in many cases of the actions required, and thus the lack of action may be more reflective of attitudes about the need to act. Relative to other community issues and institutions, such as obligations and responsibilities to family, church and village councils, securing livelihoods, and land and chiefly title disputes, even though water is regarded as important, it is not always prioritised (Love *et al.* 2020a, 2020b).

DWSSP is not the only training in these communities. We also conduct Wellness training. A similar concept where at the end of the training, a development plan is prepared by the community. Water and sanitation is part of this. So, there are things like doing a paved footpath, building a community hall, opening a cooperative store, etc. in the plan and these things take priority over water upgrade project or sanitation upgrade (FJ-Im3).

...there are many contributions asked from that same household so it's not working (SI-FGD).

The modifications presented an opportunity to expand beyond education-based communication resources, to include a broader approach that includes the use of social marketing strategies to influence attitudes, such as is common in water supply, sanitation, and hygiene (WASH) behaviour change programs. Here, video and oral stories combining education with non-educational messages are used. For example, *The Water is Everyone's Business* videos captured stories from community members of their perceived benefits of taking positive actions on water. These videos stimulated discussion about a lack of cooperation and the desire to be more self-reliant.

A Water Committee member from Taloa stated:

As mentioned in the video 'water is everyone's business' and not just the responsibility of the water committee. Women, children or youths, they all have a role to play. If it was entirely for the water committee to look after, it is too much of burden (VAN-V27).

Fundraising was subsequently initiated and/or continued in most of the communities to help with water system maintenance and repairs. Community members' attitudes to fundraising were largely positive:

Fundraising is a better option. At least we have finance to begin the work before we asked others to support us. You know, we cannot rely on government for everything (SI-V25).

Fundraising via household contribution had started and everybody are aware and have been contributing. The amount is \$10 per month. If you missed a month, the amount will be double and so forth. Money raised will go toward our future development like maintenances and building the dam. We must act ahead to have our own resources (KH-EL-F1).

The money that we save up is intended to maintain our water supply. Like in the future if there is a landslide that destroyed our water system, we would already have money to do repair on our water system (KH-EL-M1).

In the absence of video stories specific to Vanuatu, their stakeholders requested to piloting of the Solomon Islands Water is Everyone's Business videos, as part of the DWSSP structured follow-up visit. The video stories translated well from Solomon Islands to Vanuatu – they animated discussion and contributed to some changes (see Theme 2, membership re-structures) and helped stimulate people's intention to do things. This echoed our experiences from the Solomon Islands.

The videos promoted interest in the participants, and we should do more of these types of activities. It also gives awareness about the importance of water and from that it can help them sustain their water system and sustain activities regarding water because people understand the importance of water. These little things are overlooked; little actions can lead to great outcomes and I think with the videos that there can be some impacts and some things might happen for some of the communities (VAN-Im7).

... another observation too is that although they are not part of the water committee, they came to realize after the video that they have failed in a lot of things and that kept them interested in learning more (VAN-Im10).

The use of zone-based assessments and action planning also helped to motivate collective action among all community members, in addition to the actions of zone reps (see Theme 2). For example:

They clean the water outlet, around the access point and cover some of the exposed PVC. I assist them with burying of the pipes, which I am happy to do. I am glad to see these changes and I knew straight away that these are the impacts of the workshop (IS-EL-F2).

[After CWSIP-II workshop] 'I see the people in zone 3 always keeps their water point clean' (SI-2V55).

A post-implementation visit was recommended by several facilitators in Fiji as a way to properly socialise action plans with the whole community, to give credibility to the Water Committee/WSP team, and to ensure that everyone, including those who attended the training, are aware of what actions are required and who is responsible:

I've realized that just like how I start the process where I am in one of their village meetings to try and convince them to agree to having DWSSP – I should do the same when the training ends, which should be part of Task 5 – going back to one of their village meetings and we can show them the result from the training. Because I feel like if they hear it from the facilitators then they would believe the Water Committee. I definitely think that could be a way forward for us. That would definitely be better when I have the Water Committee and they can present what all they learnt from the training, and I can be there to assist on any further clarification from the implementation planning (FJ-Im1).

Key strategies and principles underlying the modifications to WSP

The modifications described earlier respond to challenges that are not necessarily unique to the PICs, as noted in the Introduction section. The specific modifications – solutions to these challenges – were designed to suit the local context and may not be transferable to other settings, although the key strategies underpinning them may well be useful, which are listed as follows:

- Improving community participation and collective action
- Incorporating social marketing concepts to complement education-based strategies
- Providing ongoing and structured follow-up/mentoring for continued technical know-how, motivation, agency, and accountability

- Representation in Water/WASH Committees and WSP teams by socially cohesive sub-community networks/zones
- Adoption of locally effective adult-learning pedagogies, which in this case involved less-intensive, hands-on, community-led, and story-based activities, with some clustering of some training among communities.

These strategies reinforce two key principles central to our efforts to localise WSP to PICs.

1. Work with the grain: social cohesion, local pedagogies, and social marketing to support effective communication

The collective action required to implement and sustain community WSP plans may be easier to achieve when Water Committee membership, WSP processes, and implementation of actions better reflect and leverage existing levels of social cohesion and cooperation, than simply working at the ‘whole’ village/community level. In some PICs, the notion of the ‘village-as-community’ is a relatively recent phenomenon and does not represent socio-historical reality and therefore also not the strongest levels of social cooperation (cf. [Aswani et al. 2017](#)).

Modifying pedagogies to suit local ways of learning – such as being discursive and collaborative and taking a scaffolded approach to learning ([Hargraves 2022](#)) – was especially important for the more technical steps of WSP. The concept of risk-based management, or even proactive maintenance, was rarely well known or used by Water Committees. Adapting WSP facilitation to ensure this core concept was well understood and embedded in the thinking about managing the water system became a primary objective. The hazard identification and risk assessment protocols were simplified, focusing on the locally common water quality and quantity hazards, and current-day hazards, with no quantitative assessment of supply or demand. Similarly, the step to identify and agree controls preferred effective controls that community members identified themselves, or controls that were well understood and implementable. The adopted scaffolded approach, of building on and extending existing knowledge, meant different communities completed these steps with differing degrees of complexity.

Furthermore, WSPs that build on local interests and practices garner more interest and support. Sharing stories about community life and water situations encourages exchange of ideas and demonstrates motivation and progress, and utilising social marketing strategies more effectively communicates these messages. This is likely to be the case in other contexts outside the Pacific Islands, especially where literacy is low and oral traditions are the norm.

2. Ongoing community engagement to reinforce capacities, motivation, and accountability

Given the dynamic and often weak character of Water Committee membership ([Love et al. 2021](#)), capacity needs to be regularly re-enforced with post-installation visits more akin to support than auditing visits ([WHO & IWA 2015](#)). Facilitation of WSP should therefore be embedded in a program of ongoing engagement with communities before and after WSP, in order to be effective; as a standalone training or plan-development process, WSP is unlikely to be effective in improving water quality or security, at least in the Pacific Islands context.

In a global review of challenges associated with WSPs, an absence of community readiness was found to be a critical problem, leading to only symbolic adoption of WSP plans ([Kot et al. 2015](#)). Pre-WSP engagement should include assessing awareness of water safety and overall readiness, such as existing water management efforts, leadership, attitudes, and knowledge relating to water safety, as well as people’s interest, availability, and financial resources ([Kot et al. 2015](#); [UNICEF 2018](#)).

In addition, a greater emphasis on implementation of WSP actions is required. In particular, not only focusing on the status of action plans and technical know-how but also focusing on the human resources is required for WSP to work in practice – skills, diversity, motivation, and accountability of both Water Committees and communities more broadly. Similar observations have been made of sanitation programmatic approaches, such as Community-led Total Sanitation, where regular follow-up visits are required for the sustainability of sanitation outcomes (e.g., [Clarke et al. 2021](#)). Moreover, it must be accepted that these rural communities will always be prone to dynamism and flux in membership, and thus, recurrent capacity development and mobilisation are required.

Country-wide implementation of WSP in its current form is already a challenge in most contexts globally, given its intensive resource requirements ([Herschman et al. 2020](#)). Adding regular follow-up visits to WSP facilitation could, if not streamlined, significantly add to this resource challenge. Nevertheless, without additional follow-up visits, existing investments in WSP are more than likely not realising any benefits (e.g. [String et al. 2020](#)).

Implications for national-level coordination of WSP facilitation, monitoring and surveillance

The types of local modifications described here to improve local effectiveness of WSP reinforce the need for National Water Safety Planning Committees in PICs, as previously recommended (Khatri *et al.* 2011). Such committees would develop national strategies to monitor progress against targets and oversee surveillance, which currently do not exist. Embedding WSP within an ongoing program of community engagement, as outlined earlier, would provide a mechanism for both the necessary monitoring of WSP facilitation and surveillance of water quality and quantity, and at the same time present opportunities to mentor, motivate, and support Water Committees.

National WSP Committees could also review additional localisations of WSP likely to occur in the course of WSP facilitation by local actors, to ensure WSP remains effective. Supporting active communities of practice, either nationally or regionally, for rural WSP would present opportunities to further build the WSP capacities of facilitators, co-develop guidelines, share lessons learned, and provide foundational training in water and health, water cycles, and water management. Importantly, these forums would be well-placed to develop strategies to address persistent challenges in scaling up WSP, most notably, how to provide effective support to develop, implement, and monitor community WSPs in the PICs context.

Water quality is also likely to remain a significant and ongoing challenge until sanitation and hygiene are addressed and water access is progressed to household-level access; thus, WSP needs to be better integrated with sanitation and hygiene programs – an issue that active national committees or communities of practice would be best placed to address.

CONCLUSIONS

Three persistent challenges were identified as especially delimiting WSP outcomes: (i) low capacity to facilitate and participate in WSP amongst community members, and in some cases among facilitators; (ii) weak and inactive Water Committees and WSP teams, with poor social inclusion, low sustainability, and insufficient post-WSP action; and (iii) low community interest in, and collective action on, water issues, thus limiting compliance with community-wide actions and controls. These challenges are not unique to the Pacific, aligning with challenges identified for similar contexts in which communities have a responsibility to implement WSP actions.

The modifications to WSP described here, co-designed with WSP facilitators, go some way to addressing these persistent challenges. These modifications included better accommodating, and leveraging, the particulars of formal and informal governance currently in place in rural communities – which differed between the study countries of Solomon Islands, Fiji, and Vanuatu. The specific patterns and levels of social diversity and cohesion in rural villages were also considered in developing modifications, especially regarding participation in WSP teams, and spatial levels used in assessing hazards, risks, and identifying controls. Finally, modifying the pedagogy to suit culturally specific ways of learning and literacy levels, to improve capacity development outcomes, was fundamental given the relative independence with which communities need to implement and maintain WSP actions. Although these locally based modifications addressed issues common to many rural village settings globally, the transferability of the specific modifications to other locales outside the Pacific would need testing.

The end goal of WSP is neither a static action or control plan, nor the installation of additional infrastructure or capital improvements; the goal is full implementation of a set of actions and processes, with ongoing revision and updating of the associated plan, which then enables a sustainable supply of safe water to households (Khatri *et al.* 2011). Given the exposure of PICs to existing and future climate-based hazards, localised and contextualised WSP is a relevant adaptation approach. Resource constraints in PICs delimit frequent monitoring and follow-up by government and other enabling actors, so it is the community – and primarily the Water/WASH Committee – that are ultimately responsible for ensuring WSP actions are implemented. This places greater importance on WSP facilitation being effective and leading to durable community capacity. Localisation of WSP therefore needs careful development. Co-development with WSP facilitators and assessment of localisations through pilot implementation is recommended to maximise WSP effectiveness against existing and future hazards.

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DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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