www.water-alternatives.org Volume 15 | Issue 2

Shields, K.F.+; Barrington,D.J.+; Meo, S.; Sridharan, S.; Saunders, S.G.; Bartram, J. and Souter, R.T. 2022. Achieving development outcomes by building practical authority in WASH participatory collectives in Melanesia. Water Alternatives 15(2): 363-412

Achieving Development Outcomes by Building Practical Authority in WASH Participatory Collectives in Melanesia

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ABSTRACT: The strength of the 'enabling environment' for development is often considered to be one of the key elements in whether development initiatives fail or succeed. Attempts to strengthen the enabling environment have resulted in a series of checklists and frameworks that imagine it largely to be fixed, static, and separated from 'beneficiaries'. In the Water, Sanitation, and Hygiene (WASH) sector, there is a preoccupation with fostering an optimal enabling environment that will result naturally in 'ideal' and formalised user participation, which will in turn lead to universal access to water and sanitation. In this paper, we challenge this simplistic and linear view of an enabling environment that is perpetuated by checklists and frameworks. We conducted a three-and-a-half-year transdisciplinary participatory action research (PAR) project which sought to foster WASH solutions in impoverished informal settlements in Fiji, Solomon Islands and Vanuatu. In a critical reflection on this project, we analyse the ways in which we both perpetuated problematic checklists and worked collaboratively with our participants to reimagine the enabling environment. We show how individuals challenged the expert–beneficiary dichotomy as they built 'practical authority' from their peers through taking action. Our study demonstrates that conceptualising

the enabling environment as a dynamic ecology of actors, relationships and processes that includes the users of WASH as active participants was essential to supporting progress towards universal WASH access. We argue that working within the politics of development rather than seeking to render problems as technical was crucial to fostering WASH improvements that were determined by residents themselves and supported by stakeholders. Such an inclusive approach is essential to fully leveraging the co-productive possibilities of participation. If development practitioners and scholars are to achieve development outcomes in an equitable and participatory manner, they must shift their conceptualisation of the enabling environment as being a checklist of things 'out there' to one where they work to find their place within an ecology of participatory collectives.

KEYWORDS: Participation, participatory action research, Water, Sanitation, and Hygiene (WASH), enabling environment, practical authority, Melanesia

INTRODUCTION

In this paper, we reconsider static views of the enabling environment in favour of a more dynamic formulation. We do so through the process of reflecting on a three-and-a-half-year transdisciplinary participatory action research (PAR) project undertaken in three Melanesian countries. The research was reflexive and iterative in fostering Water, Sanitation and Hygiene (WASH) solutions in impoverished urban and peri-urban informal settlements. Residents identified their WASH priorities and aspirations and worked together, and with outside actors, to address them. The geographical clusters of households participating in the research had insecure land tenure, lived in settlements that were unplanned (by government), and were deficient in basic infrastructure (Asian Development Bank, 2012). We refer to them here as informal settlements as it is at present the most representative term across the three countries; we note, however, that this term has political connotations that are driven by colonial power structures (Day, 2020). Through analysis of data from this project, we show that efforts to achieve universal WASH access would benefit from conceptualising the enabling environment as a dynamic ecology of actors, relationships and processes, that is to say, as 'participatory collectives'. Conceptualising the enabling environment in this way would better prepare enabling actors to anticipate and embrace a more valid and informative view of what constitutes a functioning enabling environment, thereby fostering more diverse means of locally appropriate participation.

Background

In 2020, two billion people still lacked access to safely managed household drinking water and 3.6 billion lacked safely managed household sanitation (WHO/UNICEF, 2021). To address this, United Nations (UN) Sustainable Development Goal (SDG) 6 pursues the "availability and sustainable management of water and sanitation for all" by 2030 (UN General Assembly, 2015: 18). Eight targets underly this goal. Of these, two 'Means of Implementation' (MoI) targets emphasise how the other six should be implemented; this perhaps suggests that process and implementation are as important as content and formulation. Of particular relevance to this article is Target 6B, to "support and strengthen the participation of local communities in improving water and sanitation management" (UN General Assembly, 2015: 19). This reflects a shift in the perception of best practice away from highly technocratic WASH programmes and towards a strong community participation focus (see Bowling and Hall, 2019; Tsekleves et al., 2022). Despite using community-centric language, however, this target's indicator calls for a measure of the "proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management" (UN General Assembly, 2017: 11). In effect, this prioritises a formalised and government-led process for community involvement, which likely has the effect of marginalising alternative localised processes (Guppy et al., 2019). This MoI target does not consider, for example, how end users can be involved in decision-making that affects them (Bartram et al., 2018). External stakeholders who design their programmes to incorporate community

participation based on this indicator – even where requirements around participation may technically have been met – run the risk of perpetuating an ongoing issue in the sector: tokenistic and meaningless engagement (Shields et al., 2021). Recent work on why so many WASH projects in sub-Saharan Africa fail to achieve their desired improvements found that "inadequate community engagement, which was tokenistic, inadequate, or poorly timed, resulted in the implementation of projects that are inappropriate for the context or do not address the priority needs of the community" (Barrington et al., 2021).

Improving management and governance in an attempt to effect change is not new to the international development policy agenda. The 1997 High-Level Meeting of the UN Economic and Social Council had the theme of "fostering an enabling environment for development" (Camdessus, 1997). This theme – which is seen in WASH (Harris et al., 2012) – is emblematic of prevailing development ideas where supporting 'good governance' and transferring technology from high income countries are seen as the primary ways to support lower and middle income countries (Mitchell, 2002). This is exemplified in a multitude of recent frameworks concerning the enabling environment for improving access to WASH products and services (Supplementary Information, Table S1). Such frameworks typically view the enabling environment as a set of conditions, people, organisations and institutions, relationships, formal and informal rules, finances, functions (that is, planning, learning and monitoring), and the physical environment (water, toilets, houses and schools). They largely imagine the enabling environment to be a fixed and static set of things (although for an exception see Ojomo, 2016). While static formulations can represent well-honed routines for carrying out established and dependable processes, they cannot describe what happens in response to disruptions, adaptations and the development of new capabilities of all actors, which characterise real-world progress and participation in development initiatives.

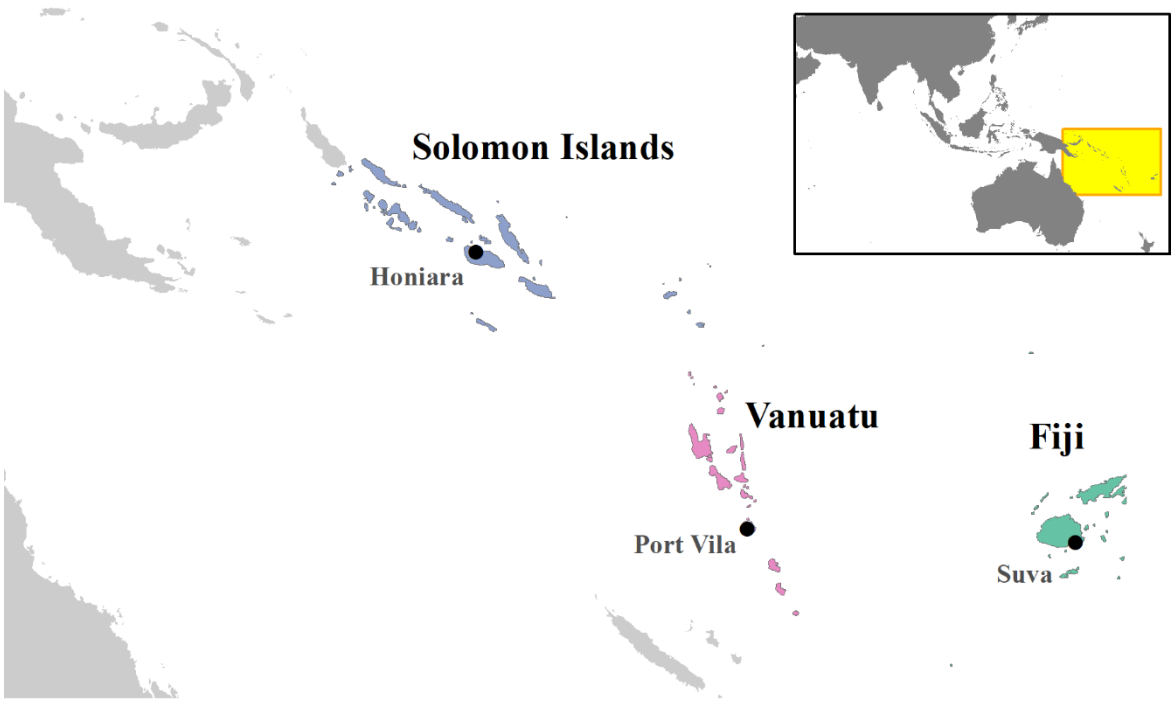
Setting

The project was conducted in three Melanesian countries: Fiji, Vanuatu and Solomon Islands (Figure 1). In 2020, their populations had varied water and sanitation situations; these ranged from 94% basic sanitation and over 99% basic water access in Fiji, to a corresponding 35% and 67% in Solomon Islands (WHO/UNICEF, 2021). In these settings, the responsibility for delivering WASH services is shared across multiple departments of government and with the private sector, civil society, and residents themselves (see Supplementary Information, Table S2 for WASH policies and plans in place during the project, 2013-2016).

These countries are rapidly urbanising and there has been a proliferation of impoverished informal settlements that accommodate up to half of the population of urban and peri-urban areas (Asian Development Bank, 2012). Scholarly work on the urban political ecology of Melanesia is sparse (although, for an exception, see McDonnell et al., 2017), with most focus still on rural areas. This may be partly due to the perception that these countries are still regarded as "simply rural" (Mecartney and Connell, 2017). Here we briefly describe how urbanisation processes and informal settlements in Honiara, Port Vila and Suva have been shaped by legacies of colonialism, imperialism and development, environmental change, and historical and present-day land tenure.

Interactions with Europeans in Melanesia date back to the late 17th century, and Fiji, Solomon Islands and Vanuatu were formally brought under European (British and/or French) rule between 1874 and 1906. Missionaries to the three countries, often used by colonial powers in their purported "spread of civilization" (MacDonald, 2006: 3), converted much of the Indigenous population to different denominations of Christianity. Individual villages or rural areas would convert to the sect of Christianity to which the mission assigned to that area belonged. The British also brought to Fiji over 60,000 indentured, mostly Hindu, labourers from the Indian subcontinent to work on the sugarcane plantations (Gillion, 1962). The descendants of these workers (as well as free migrants from India) now make up Fiji's Indo – Fijian population (Voigt-Graf, 2008).

Figure 1. Map of study countries.



Source: Map by K. F. Shields, made with Natural Earth.
Note: Research was undertaken with residents of informal settlements in or surrounding Honiara, Port Vila and Suva.

Because of this history, waves of rural-to-urban migration have led to informal settlements that often consist of residents of mixed ethnic, cultural and religious backgrounds. In Suva, the capital city of Fiji, informal settlements tend to be majority i-Taukei (Indigenous Fijian), with a significant proportion of Indo – Fijians and some households from other Polynesian groups (Foster, 2001). In the informal settlements of, and surrounding, Honiara, the capital city of the Solomon Islands, residents from the province of Malaita are predominant, with other provinces represented to a varying degree. Foukona and Allen (2017) attribute this demographic feature to the migration of Malaitans who worked on development projects in Honiara and the surrounding area. In Port Vila, the capital city of Vanuatu, residents of informal settlements have relocated from many provinces (Mecartney and Connell, 2017). Within informal settlements there are often sub-communities of different Christian denominations. Such mixed groupings mean that there is often tension and sometimes unrest between different religious denominations and ethnic groups within informal settlements (Craney, 2021). These tensions also appear at the country level, reinforced by, and providing justification for, neocolonialist development projects (Ahluwalia and Miller, 2021). After a period of ethnic tension ('The Tensions') from 1998 to 2003, for example, the Australian-led Regional Assistance Mission to Solomon Islands (RAMSI) dominated governance of the country; its presence there extended from 2003 until its conclusion in 2017. While RAMSI was often lauded as a successful exercise in state-building, its implementation has been criticised for neglecting non-state sources of power in the Solomon Islands (Morgan and McLeod, 2006). Hameiri (2009: 49) argues that RAMSI should not be seen as a state-building exercise, but rather as a "politically driven regime of state transformation (…) [that] sought to narrow the political choices available to Solomon Islanders (…) [which] has ended up undermining the capacity of the state to absorb social and political conflict in a non-coercive fashion". On a practical level, the influx of expatriates that accompanied RAMSI drove up the cost of living in Honiara.

Environmental change also shapes informal settlements in Melanesia. As in many parts of the world, informal settlements in Melanesia are pushed into marginal lands such as tidal zones. In Fiji, settlements are often built alongside mangrove systems, and thus experience tidal inundation. This has been exacerbated by mangrove habitat loss due to tropical cyclones, small-scale forestry and (sometimes illegal) commercial land development (Cameron et al., 2021). In Honiara, in order to make claims to the marginal land on which they live, settlers are invoking the colonial idea of non-productive land or "wasteland" (Foukona and Allen, 2017). As sea levels rise and extreme weather events become more common due to climate change, life in these marginal areas becomes ever more challenging. During our project, for example, Honiara was inundated by flash floods in 2014, Vanuatu was battered by Tropical Cyclone Pam in 2015, and Fiji experienced Tropical Cyclone Winston in 2016. These events led to the destruction of houses, crops and public infrastructure such as roads and bridges, and required many residents of settlements to completely rebuild their houses and other infrastructure such as toilets.

Finally, land ownership in and surrounding urban areas in these countries is complicated, particularly for informal settlements. Land is sometimes owned by the government and sometimes owned privately by individuals or groups (for example, customary land); some land is formally leased from landowners or the government by individuals or groups, with varying levels of legality (Mecartney and Connell, 2017). Sometimes approval to reside on the land requires the building of a home to a certain code and sometimes the status of the land is unclear and/or contested. In Honiara, for example, the location of the city boundary in some areas was so contentious that it was impossible to clearly demarcate it on the ground (Personal communication, government representative, 15 June 2015). As land on the edges of the city becomes more valuable, claims to it become more contested (Mecartney and Connell, 2017). For our project, this contested boundary led to uncertainty in one informal settlement where we worked of which dwellings were on city land and which were in the neighbouring province. It was also not clear which households had formal approval to reside there, and this uncertainty could not be addressed by the external actors involved in our project since they too were trying to navigate the complexity of land tenure. Such disputes and uncertainties can have negative impacts whereby households are advised or mandated to relocate, but they can also allow residents of informal settlements to stay in place. Such "fuzzy boundaries" (Hall et al., 2011) can also allow government agencies to disclaim responsibility for informal settlements, which can result in these settlements falling through the cracks in terms of the provision of necessary services and infrastructure. We observed this in Solomon Islands, where the members of the governance structures of Honiara City and Guadalcanal Province disputed who was responsible for providing infrastructure to some informal settlements, rendering residents unserved by either.

Globally, residents with uncertain land tenure, particularly those living on marginal lands, are often hesitant to invest in WASH infrastructure (Scott et al., 2013; Awunyo-Akaba et al., 2016). This was the case for some residents in our project who had repeatedly been told, formally or informally, that they would be moved off of the land in coming years. Many residents of informal settlements want to invest in formal WASH infrastructure even so, but are not allowed. We were told repeatedly by the water utility in the Solomon Islands, for example, that no residents of one of the informal settlements we worked with were allowed a formal water connection; residents, as a result, used a variety of approaches to meet their WASH needs, including informally accessing formal infrastructure. For example, despite the water utility in Solomon Islands claiming that formal water connections were not allowed, at least three households within that informal settlement had connections to the water mains, which had been organised for them by their local member of parliament. People's eligibility for WASH may be determined by technical guidelines or checklists, but these may also be ignored. Policy and strategy documents often exclude these culturally, ethnically and religiously diverse informal settlements that are located in areas of environmental challenges and change; they are particularly likely to be overlooked when their land tenure is unclear and insecure. They are seen by government, development, and civil society organisations as being too difficult to engage. As Mecartney and Connell (2017: 64) highlight, "In a form

of wishful thinking, residents of informal settlements are often perceived as temporary and/or not really belonging to the city, and thus unworthy of rights and services".

METHODS

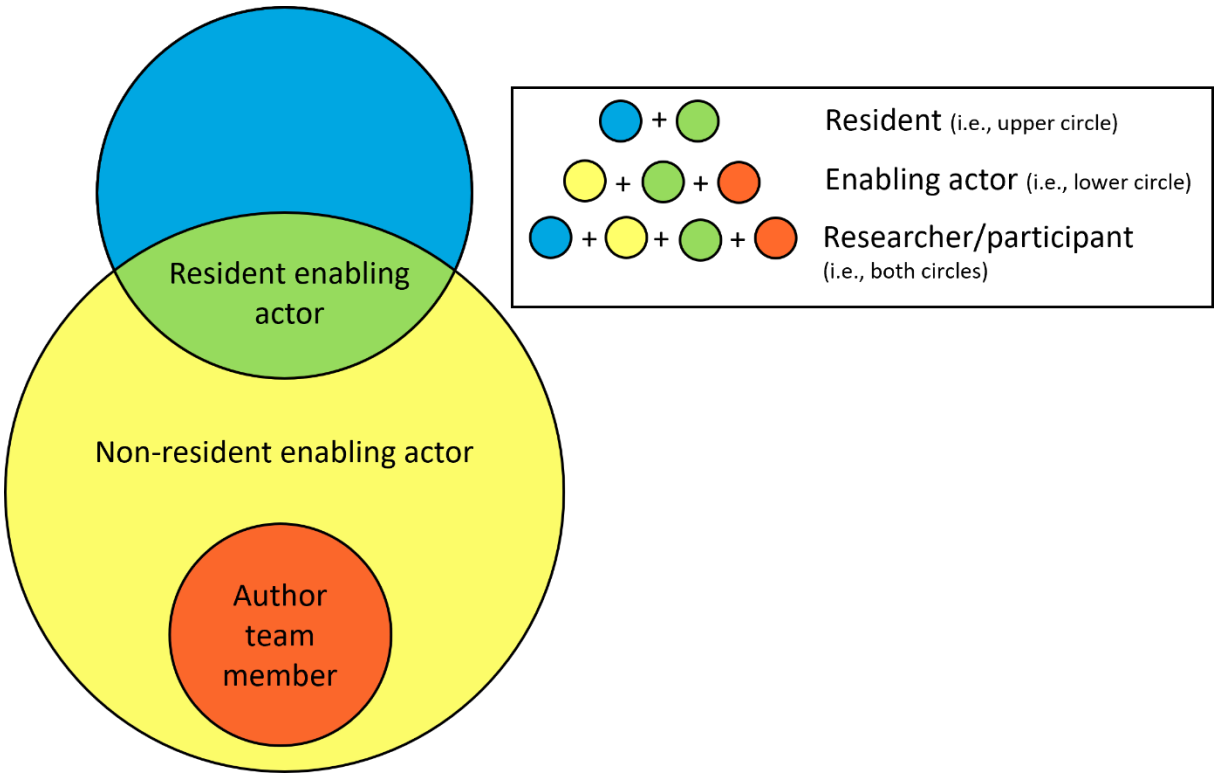
A note on process and terms

The participatory action research (PAR) philosophy triggered frequent reassessment of our processes and language. There were shifts, and sometimes transformations, in how we conceptualised the enabling environment, who we viewed as stakeholders, how we tried to foster participation, and how we ourselves participated (for example, Barrington et al., 2017a: 93-96). These shifts were possible because all who were involved in the project worked through self-organising and spontaneous processes with minimal adherence to preconceived plans (Corning, 2002). As Klenk and Meehan (2017: 19) describe:

> Taking the subjectivity of stakeholders seriously – in its enduring form – requires that we come to terms with the obligations they pose; that we accommodate who stakeholders are and become (and who becomes stakeholders) in the process; and that we learn how to inherit their histories, and in turn, that we avoid imposing compliance in what we seek to understand or elicit from them.

Regarding language, we re-evaluated our title as 'the researchers', recognising we impacted not only the research processes but also the outcomes (Bradbury-Jones, 2007), and that we and the participants were, in fact, co-researchers (Figure 2). To maintain distinctions between the processes on the ground and the analysis and writing of this manuscript, we refer to ourselves throughout as the 'author team'.

Figure 2. Researchers/participants used in this manuscript: relationships and definition.



The author team discussed how to identify and think about the 'enabling actors'. By most definitions, these are individuals and organisations that are influential in what happens and how; they generally are defined as external to communities, for example, individuals who are part of the government, UN agencies, non-governmental organisations (NGOs), and academics, including ourselves. It became evident that enabling actors were not necessarily external, as residents with formal or informal leadership roles in settlements are influential in enabling WASH actions. We thus refer to enabling actors who are neither part of the author team nor reside within informal settlements as 'non-resident enabling actors', and those who influence WASH within the settlement where they live as 'resident enabling actors' (Figure 2). The term 'enabling' is not meant to exclusively connote something positive; indeed, throughout the project, there remained some enabling actors, both residential and non-residential, who were actively impeding efforts to improve WASH.

This paper discusses a three-and-a-half-year transdisciplinary PAR project in which enabling actors and residents of six informal settlements collaborated (Table 1). Each informal settlement had communicated to a partner NGO their desire to improve their WASH situation. Two overarching objectives applied: (1) to understand, deliberate upon, and progress towards workable solutions to local WASH problems; and (2) to develop local community capabilities (Sen, 2001; Minkler and Wallerstein, 2008; Ozanne and Saatcioglu, 2008). The PAR approach facilitated this by requiring sustained effort to develop and maintain high quality relationships with individuals and organisations (Chambers, 2008). In technical terms, this is referred to as developing social capital between participants (Narayan, 1999; Bisung et al., 2014). We used a suite of flexible participatory methods (Chambers, 2008), employing an open-ended informal conversational approach throughout (Turner, 2010). It is not common in WASH projects for non-resident enabling actors and residents to come together in a forum where they are able to be heard by one another and, when projects 'fail', to engage in a sustained discourse that goes beyond finger pointing (Barrington et al., 2021). The methodology of our project allowed us to facilitate an environment where residents and enabling actors had a voice, were able to engage in constructive discussions around WASH responsibilities and actions, and could build the social capital to make change. Table S3 in Supplementary Information briefly describes the rationale for, and content of, each research activity. Most of the research methods were later refined on the basis of the experiences of their use in this project; they were made available in a handbook for WASH practitioners that was co-created by the research team (Barrington et al., 2017a).

The research activities focused on: (1) eliciting the individual and collective WASH experiences of all participants, (2) mapping WASH systems from the household to the city scale (see Rietbergen-McCracken and Narayan-Parker, 1998; Kumar, 2002), (3) revealing capabilities of residents through self-determined initiatives to make changes (Hojman and Miranda, 2018), and (4) bringing residents and non-resident enabling actors together to plan, support and execute actions (Supplementary Information, Table S3). We also employed a range of reflective – and reflexive – research practices throughout the project in order to better understand everyone's experiences of being involved in PAR (including our own). This included the preparation of daily reflective summaries, post-fieldwork reflections, and daily debriefs. We used these practices to adapt future project activities to be as relevant and useful as possible in the achievement of residents' WASH aspirations.

Table 1. Characteristics of informal settlements.

Informal settlement	Approximate population*	Ethnic composition	Religious groupings	Predominant group involved in research activities
Fiji 1	4000	Various Fijian Island ethnic groups (i-Taukei** and others) Indo – Fijian	Various Christian denominations Hindu	i-Taukei ethnic group of various Christian denominations
Fiji 2	400	Various Fijian Island ethnic groups (i-Taukei** and others) Indo – Fijian	Various Christian denominations Hindu	i-Taukei ethnic group of various Christian denominations A single Indo – Fijian, Hindu participant in some activities
Solomon Islands 1	5000	Various Solomon Islands ethnic groups	Various Christian denominations	Zone 1 (geographic area) inhabitants, several ethnic groups (although majority Malaitan) of various Christian denominations
Solomon Islands 2	3000	Various Solomon Islands ethnic groups	Various Christian denominations	Several ethnic groups of various Christian denominations, but mostly members of South Seas Evangelical Church
Vanuatu 1	300	Various Ni-Vanuatu ethnic groups	Various Christian denominations	Several ethnic groups of various Christian denominations
Vanuatu 2	1000	Various Ni-Vanuatu ethnic groups	Various Christian denominations	Several ethnic groups of various Christian denominations

Note: *exact population cannot be reported as these settlements are often not enumerated in national censuses and are in a constant state of flux owing to migration; ** i-Taukei are Indigenous Fijians.

Early in the project, the author team invited a wide range of people to take part in the research, and then spent substantial time in discussion with them. We met with residents of the selected informal settlements and with non-resident enabling actors who were interested, or involved, in WASH or in closely allied municipal and provincial governance and health sectors (Supplementary Information, Table S4). Throughout the project, participation was fluid and emergent. It was subject to new invitations, referrals, and expansions in the conceptual canvas; for example, when it quickly became apparent that land tenure and access to WASH products and services were closely tied, the participant group grew to include non-resident enabling actors who were working on land tenure. Activities were undertaken in English, Fijian, Pigin and Bislama, depending on the preference of participants. In Solomon Islands and Vanuatu, members of the author team were able to converse directly with participants speaking Pigin and Bislama, with the exchange supported by local research assistants who helped translate culturally specific nuances. In Fiji, translation was provided to the author team by a fellow author (S.M.) or a local research assistant; this translation occurred between or after activities so as to avoid disrupting the flow of conversation.

This paper reflects on the primary data collected throughout the project, which included 424.5 hours of transcripts, 4378 photographs, and 513 maps, drawings and lists produced by participants (Table S5 in Supplementary Information). All activities were audio recorded, with video recording when possible, only after receiving informed consent. Consent was either written or verbal, depending upon literacy levels, in accordance with ethics and research approvals. Interactions were translated into English (where necessary) and were transcribed. The author team photographed materials created during workshops (including maps, lists, and diagrams), leaving the originals with participants. Alongside the

production of primary data during workshops and interviews, throughout the project the members of the author team were critically reflective, so as to better understand and capture the iterative cycles of learning, reflection and action that were undertaken (Kolb, 1984). These activities produced the reflective data analysed here, specifically 171 daily reflective summaries and 48 post-fieldwork reflections.

Analysis

We began our project with the conventional imagining of the enabling environment as a generalisable checklist, with the goal of generating a better checklist. This was reflected by our initial research questions: "How can implementing organisations and the local water and sanitation marketplace best engage each other, and what enabling conditions are required (for example, institutional arrangements, marketplace literacy approaches, national policies)?" We anticipated the critical roadblock to be incomplete or incorrect checklists (see, for example, our own policy brief from 2017 in Barrington et al., 2017a: 76-80), and we pursued our goal through diligent coding of actors, rules and functions. Subsequent analysis of, and reflection on, our project, including open and axial coding of the primary and reflective data (see Table S6 for the codebook specific to this manuscript), forced us to confront the checklist itself and the notion of a checklist approach as major limitations. Analysing for a better checklist hid the processes and networks that were integral to how participation worked within the enabling environment; it did not sufficiently consider the political ecology within which the settlements existed. Accordingly, following our initial coding and analysis of the data, we engaged in a further search and analysis of the theoretical literature in the areas of WASH, critical development studies, science and technology studies (STS), and political science. Our aim was to bring together theoretical insights on the processes by which groups of people make change within an enabling environment, and how these groups are linked together. Following this synthesis, we returned to our own primary and reflective data to understand and discuss the dynamic enabling environment we found in our project.

Research approvals

We received ethical approval and relevant research permits or exemptions from the Monash University Human Research Ethics Committee (CF13/2672-2013001430), University of North Carolina Office of Human Research Ethics (13-3694), University of the South Pacific Human Ethics Committee, Fijian Ministry of Education, Fijian Ministry of Immigration, Solomon Islands Ministry of Education and Human Resources, and Vanuatu Cultural Centre Council.

THEORETICAL SYNTHESIS

Here we describe a synthesis of our theoretical insights relating to the enabling environment and participation within it. We explore two key theoretical aspects: the relations of knowledge and authority within the enabling environment, and the form of the enabling environment.

One of the core challenges of this project was the perceived non-political nature of development work generally (Ferguson, 1994; Li, 2007) and of WASH specifically (Bartram and Setty, 2021). This played out through the contrast between the technical grant proposal funded by the Australian Department of Foreign Affairs and Trade (DFAT) ("creating markets for WASH technologies in Melanesian informal settlements") and the reality that we experienced through fieldwork, where development is deeply intertwined in the political economy of Melanesia. Through the project it became apparent that the challenges that the research team had originally considered to be technical were in fact deeply political; that is, WASH actions were highly influenced by complex interpersonal relationships. Through the reflexivity built into the project's processes, we recognised that the pervasive assumption that the enabling environment should be approached as a checklist contributes to development being rendered non-political (Li, 2007).

Knowledge and authority within the enabling environment

We suggest that recognising the enabling environment as political and fostering participation within it requires engaging with relations of knowledge and authority, particularly the artificial and inaccurate, yet pervasive, dichotomy of expert vs beneficiary. The author team entered the project as purported 'experts', despite the fact that many of us had never worked in, or visited, Melanesia. WASH in Melanesia has been dominated by the 'rule of experts' (Mitchell, 2002) who are nearly always white foreign consultants from high-income countries. These experts seek to 'improve' local conditions, through processes that Tania Li (2007) identifies as 'problematization' and 'rendering technical'. Problematisation had already occurred to some extent in our project grant application, where we identified WASH as the problem at hand. Our PAR approach helped us to resist proceeding on the basis of our problematisation framework and imposing our will on communities, although we did set the scope of the research agenda.

Li suggests that there are two important aspects of rendering technical. First, "questions that are rendered technical are simultaneously rendered nonpolitical" (Li, 2007: 7). As Li outlines and we experienced, rendering WASH technical and thereby non-political means that larger political and economic structures are written out as potential causes of, and solutions to, WASH problems. It became clear as the project unfolded that the unquestionably political challenges of land tenure (McEvoy et al., 2020) were inherently intertwined with the accessibility of WASH services in the settlements; however, because WASH had been rendered technical, land tenure could not be within the scope of our project.

A second important aspect of the process of rendering technical is that it "confirms expertise and constitutes the boundary between those who are positioned as trustees, with the capacity to diagnose deficiencies in others, and those who are subject to expert direction" (Li, 2007: 7). Our PAR methods required continuous reflexive work which allowed us to resist conventional expert-vs-beneficiary distinctions; however, we did not always succeed. Often, it was easy to slip into the expert role and to view community members through a 'deficit lens' (Wynne, 1991). The implicit assumption was then that if people simply knew better, they would demand better WASH access, build it themselves, and use it consistently. We also struggled with whether we should, or even could, adopt the stance of an "honest broker of policy alternatives" (Pielke, 2007); we debated whether we should introduce our opinions on potential decisions and, indeed, whether we should even offer technical knowledge that we thought would be of value to community members. The continually reinforced boundary between experts and beneficiaries means that local expertise from both non-resident enabling actors and settlement residents has been largely ignored or devalued (Clarke et al., 2014).

We sought to challenge the boundary between experts and beneficiaries through participatory processes, what we thought of as "collective experimental practices 'in the making'" (Chilvers and Kearnes, 2016a: 15). Work by Abers and Keck suggests that one important outcome of these experimental practices is practical authority, "a kind of power-in-practice generated when particular actors or organizations develop capabilities and win recognition within a particular policy arena, enabling them to influence the behavior of other actors" (Abers and Keck, 2013: 2). The notion of practical authority is contrary to the prevalent 'deficit lens'. While the deficit lens implies that knowledge and associated authority is brought to the public by outside experts, practical authority (Abers and Keck, 2013) is generated by a participatory collective. This involves cycles of experimentation which lead to iterative gains in both knowledge and power. The fact of practical authority begins to dissolve the expert/beneficiary dichotomy. Both Abers and Keck and Chilvers and Kearnes – recognising that making change requires an iterative approach – underscore that actors and organisations take action without knowing whether or not a specific activity will achieve their goals. In this paper, we refer to this iterative collective process as 'experimentation' and specific activities as 'experiments'.

Based on the work of Chilvers and Kearnes (2016b), we define participatory collectives as a group of people or organisations that engage in, develop through, and emerge from experimentation around one or more issues or viewpoints. We suggest that the development of practical authority by a participatory

collective can be conceived of as a feedback loop that increases the power of that collective within a broader network. Importantly, this power is not bestowed upon a collective or participants; rather, it emerges from the collective's activities. The question of practical authority – or a lack thereof – is also an important one for organisations or nodes within an enabling environment established by law, such as government departments or regulatory bodies. As Abers and Keck (2013) demonstrate in Brazil, simply because an organisation is legally created does not mean it has the ability to get things done. Similarly, although the author team was assembled to conduct action research funded by DFAT, we had to build our own practical authority over the course of the project in order to effectively engage with residents and non-resident enabling actors and to foster WASH improvements. We suggest that moving away from the checklist imaginary of the enabling environment requires understanding the participatory collectives that make up the enabling environment and the ways that these collectives interact.

The enabling environment as an ecology

We encountered a second politicised disconnect during the project. On the one hand, our PAR process was designed to bring researchers, policymakers and members of the public together in an emergent science and decision-making process; on the other hand, the linear model of the science – policy interface, which is nearly ubiquitous in applied development research such as WASH, assumes that 'good' science leads to 'good' policy (Pielke, 2004; Bartram and Setty, 2021). We argue that trying to constrain the participatory co-production of science and policy into a linear model where participation is seen as a separate but complementary process enables a depoliticised checklist imaginary of the enabling environment. We echo STS scholars who argue that science and policy are always co-produced (Jasanoff, 2004) or inherently intertwined. Work in STS has expanded notions of co-production to suggest that not only science and policy, but also 'the public' and 'democracy' are in fact co-produced in a dynamic process (Chilvers and Kearnes, 2016a). This expanded notion of co-production is helpful in thinking about how participation is in fact deeply political and is the foundation of an effective democratic process. We suggest that ideas of co-production are implicit in participatory approaches such as PAR, but are not always realised. A more explicit acknowledgement of the ways that science and policy are inherently intertwined can reshape the way we understand the enabling environment.

In our project, informed by reflecting on our own initial development of a checklist imaginary of the enabling environment, we moved to a networked view, where different participatory collectives (including organisations and other groups of non-resident enabling actors) formed nodes in a static network of relations. This interest stemmed from classic stakeholder mapping exercises, which are common in development; however, rather than constructing our own map, we asked non-resident enabling actors to generate the map collaboratively. As one member of the author team reflected,

> I was expecting that the participants would have very strong agendas. This was not the case. They were prepared to listen to the others, and engage in constructive debate. Our group [of non-resident enabling actors facilitated by a member of the author team] saw the activity as an opportunity to discuss how the entire system is working in addressing the acknowledgement that informal settlements are not [being] adequately serviced (Author team member, 17 February 2015).

The results of this activity in each country highlighted the dense, complex and dynamic connections between non-resident enabling actor nodes (Figure S1).

While we did create a two-dimensional map on paper, revisiting the conversations during the mapping activity for this paper (which had been video recorded, transcribed and coded) highlighted for us the complexity that we had sought to simplify, and the dynamic nature of relationships that we had sought to make stable by committing them to paper. A straightforward network diagram cannot capture an enabling environment; it could be better envisioned as an "ecology of participatory collectives" (Chilvers and Kearnes, 2016a). Ecology is described by the Ecological Society of America (ESA) as, "the study of the relationships between living organisms, including humans, and their physical environment" (ESA, 2021).

We suggest that the notion of ecology is important for three reasons. First, it highlights the relationships between participatory collectives. Chilvers and Kearnes' (2016a: 52) argue that "[v]iewing participation as a web of connections highlights the interrelations between all these spaces of participation. It also emphasises the multiplicity, diversities and variabilities of collectives of participation that make up spaces of negotiation". The second reason that the notion of ecology is important is that it refers to living organisms in such a way that it recognises the dynamic nature of participatory collectives and the relationships between them. Chilvers and Kearnes (2016a: 283) call attention to the dynamic nature of ecology, which has an "interplay between stabilities and emergence" where "participation is continually being remade" (ibid: 262), existing participatory collectives are continually being destabilised, and new participatory collectives are constantly emerging. Even the seemingly mundane process of creating an enabling environment map played a part in reworking this ecology, as non-resident enabling actors made new connections and identified places where collaboration between collectives would be fruitful. Third, imagining participatory collectives as part of a dynamic ecology connects them to the larger social, economic, political and environmental context or environment. In this way, an ecological perspective mitigates some of the consequences of rendering problems technical and non-political. More importantly, an ecological perspective recognises interdependencies between science, policy, participation and democracy, and the ways that these are intertwined and co-produced. Unlike a checklist imaginary of the enabling environment where what is important is to have all the elements, the dynamic complexity of an ecology means that that there are many possible approaches to achieving the goals of participatory collectives.

OBSERVATIONS, REFLECTIONS AND DISCUSSION

In Fiji, several interrelated new participatory collectives emerged, including WASH subcommittees in both of the informal settlements, and the Fiji Urban WASH Forum. WASH committees also emerged in the informal settlements of both Solomon Islands and Vanuatu. In all three countries, our conversations with other participants and the results of participatory mapping indicated that there were many other existing participatory collectives active in the WASH space. Some were formal (for example, established in policy) while others were informal (such as groups of non-resident enabling actors who wanted to improve sanitation as a collective). The author team ourselves were sometimes part of participatory collectives, working with other members to experiment and develop practical authority through attempts to improve WASH. In this section we describe some of the processes of participation. We also discuss how the political nature of participation affected the development of practical authority and the achievement of WASH outcomes in each of the project countries.

Participatory experimentation in Fiji

In all three countries, the two-day joint workshop (Activity 13, Table S3 in Supplementary Information) was designed to bring together residents and non-resident enabling actors in an effort to, (1) help them understand one another's roles in WASH (Day 1); (2) have non-resident enabling actors understand the WASH situation in the settlements (Day 1); (3) have non-resident enabling actors understand how residents intended to tackle WASH issues themselves (Day 2); and (4) plan joint actions to improve WASH (Day 2). In Fiji, the prevalent 'deficit lens' of development was echoed in a debrief session with the non-resident enabling actors at the end of the first day. In that session, one non-resident enabling actor stated that, "from what I see, I think that the people of the two settlements that we've visited care less about the situations that they're in, but more about what they expect to be done for them by external parties like us" (Non-resident enabling actor, water utility, in Fiji, 23 February 2015). This view was echoed by several other non-resident enabling actors at that time.

On the morning of Day 2, residents and non-resident enabling actors began planning joint actions to improve WASH in the settlements. 'Joint actions' referred to actions that were the responsibility of both

parties. The commitment of residents to effecting change obviously impacted upon this same non-resident enabling actor, who at lunchtime stated in a private reflection to the author team that,

> One of the things that I have noticed is that we as [non-resident] enabling actors should, you know, get more involved with the communities from the beginning (…). [I]n terms of water, I think basically these guys [residents] just need to [get clear on] a few processes that they need to know about and as authorities we should also be giving key indications on the right processes (…). [P]robably we [non-resident enabling actors] should keep on working with them [residents] closely, actually going down to the communities and discuss with them the action plan and see the involvement and try to take part in some of the things that the villages have organised as part of their own action plans (Non-resident enabling actor, water utility, in Fiji, 24 February 2015).

The Joint Workshop had facilitated a forum for individuals and organisations to bring their own knowledge and experience to emerging practical collectives and to develop give-and-take relationships, increasing social capital. At the end of Day 2, residents invited the non-resident enabling actors and the author team to join them in a kava ceremony.[1] This participant-initiated ceremony is an example of an emergent element of the research process and the creation of important linkages (Szreter and Woolcock, 2004). The author team, aside from the local member (S.M.), declined to join, leaving the non-resident enabling actors and residents to engage in several hours of discussion on water and sanitation in a social environment.[2] During the kava session the possibility of a 'WASH Forum' – raised during the workshop – began to be realised.

Non-resident enabling actors and residents decided to establish a WASH Forum comprised of enabling actors (both men and women, residents and non-residents), who would meet approximately bimonthly. The WASH Forum monitored the joint action plans of the informal settlements (initially developed during the joint workshop) and provided support and information as the residents worked on their WASH priorities. The WASH Forum resulted in the accumulation of practical authority, particularly through the installation of a new connection to the mains water system and assistance in applying for water meters in Fiji Settlement 2 (Supplementary Information, Figure S2). As explained by one non-resident enabling actor towards the end of the project:

> I think it is very important that it [WASH Forum] continues, because I've seen some changes happen in the two communities. One of the main projects that the [Fiji Settlement 2] people experienced was the [water] meters; we were able to have those things connected by the Water Authority. And that came about because one of the [non-resident] enabling actors from Water Authority was there. Coordinated that work. There are little things like, we had meetings with them [resident enabling actors] and we were able to discuss ways that they could improve – make suggestions for sanitation and encourage the community to work. I think these little things are certain to have an effect in the community as a whole (Non-resident enabling actor, NGO-based, in Fiji, 20 November 2015).

The resident enabling actors of the informal settlement that had negotiated the installation of new water meters with residents and various non-resident enabling actors subsequently demonstrated further accumulation and use of their practical authority. They began collaborating with an academic they had met at the joint workshop (not in the author team), who assisted them in acquiring resources to build concrete footpaths. Residents expressed the opinion that these footpaths would increase quality of life in the settlement, as the land was tidally inundated at least daily, a situation exacerbated by the illegal clearing of mangroves by an international construction company. The building of footpaths (Supplementary Information, Figure S3), combined with community-led repair and cleaning of drainage

[1] Kava is a psychoactive drink commonly consumed in Pacific Island cultures.

[2] Although the author team considered this to be a positive outcome of the workshop, it should be noted that women do not customarily drink kava and so did not participate; so, while these discussions did encourage bonding between non-resident enabling actors and residents, the participants in this activity were all men.

ditches (Supplementary Information, Figure S4), made a marked difference in the settlement's environmental hygiene. As one resident stated, "I have seen footpaths around the community and very much thankful for WASH [the project] for the confirmation of certain aspects of healthy living and cleanliness" (Fiji Settlement 2 resident, 18 November 2015). Another resident said that, "with the existence of WASH [the project] I have seen many new and good changes within the community" (Fiji Settlement 2 resident, 18 November 2015). This demonstration of capabilities led to recognition of the practical authority of the residents by the rest of the settlement, the author team, and non-resident enabling actors. As one informal settlement resident in Fiji Settlement 2 stated, "I think that once the committee [Fiji Settlement 2 WASH Committee] is formed, we can get [a] standing order from the government so that the work of this committee['s] members carr[ies] weight and community members will respect the work that they are doing in the community" (Fiji Settlement 2 resident, 24 February 2015). In the vision of this resident, the formation of the committee involved the accumulation of sufficient practical authority that the government would recognise the committee, rather than the government creating the committee. Another resident emphasised how building practical authority by achieving physical changes in Fiji Settlement 2 had led to the engagement of residents who had originally chosen not to be involved in improving WASH. They stated that, "when they just see anything happening [such as new water meters, footpath construction], then they come. They just want to witness anything happens and then they can come" (Fiji Settlement 2 resident, 18 November 2015).

We suggest that there are two intertwined factors that made the participatory experimentation in Fiji 'successful'. The first factor is that participants came together to create collectives – WASH committees (within the informal settlements) and a WASH Forum (bridging the community and national scales) – and that these collectives carried out participatory experimentation. The second factor is that these collectives had the autonomy and support to experiment in self-determined ways (not those dictated by external 'experts'), which allowed them to accumulate practical authority.

Participatory experimentation in Solomon Islands

Throughout the project, the author team experienced intense frustration about its progression in Solomon Islands, wondering why things were not going as well as elsewhere, why people did not seem to want to engage in the project, why people were seemingly content with the status quo rather than working to enhance WASH access. It is likely that at least part of the reason for this was the history of previous interventions in the Solomon Islands such as RAMSI, which led to a general disillusionment and distrust of development processes.

A pivotal moment for participation and for the development of practical authority by the author team came at the end of a community research meeting in Solomon Islands Settlement 1, after the audio recorders had been turned off. One woman, Anne,[3] who had refused to participate up to that point, walked to the front of the group and demanded to know why she and others in their community should participate in this project. She stated that such allegedly participatory projects by non-resident enabling actors had not led to any change in the past and that they still had only limited access to basic WASH. Even though our first instinct was to be defensive, Anne's provocative question led to an hour-long conversation between residents and the author team about what participation means. The author team explained that we were also participants in this project and so we could make no guarantees about outcomes. We had no control over those in government or civil society with whom they had worked in the past, who may or may not have expressed obligations or promises to improve WASH situations. Anne subsequently joined in the project and became one of its most vocal supporters. This outcome is consistent with predictions of institutional theory, especially the sub-theories that focus on how change occurs in the structure of organisations and/or how new policies are diffused in society. These studies

[3] Name changed for anonymity.

have consistently shown that initially limited change happens when stakeholders perceive that a policy can resolve specific problems they confront, but that more permanent change arrives only when the policy acquires social legitimacy (Tolbert and Zucker, 1983). In our case, the success of the project only became possible when the author team and residents gained social legitimacy in each others' eyes.

At the joint workshop a few days later (Activity 13, Supplementary Information, Table S3), the main worries voiced by participants were that, (1) they would have done all of this preparatory work and nothing would come of it; (2) the non-resident enabling actors would not engage; and (3) people in the community would have been right about this being a waste of time and would make fun of those who participated. Many residents of the informal settlements attended the joint workshop; however, the worry of the residents was validated by the fact that few non-resident enabling actors attended, despite the many who had accepted our invitation (Supplementary Information, Table S4). Three non-resident enabling actors, for example, participated for the first morning but then left; they therefore never saw the WASH situation in the settlements for themselves. During the field trip when residents of the informal settlements were planning to present their WASH issues to non-resident enabling actors, there were only three non-resident enabling actors present; of the three, all lived in informal settlements themselves and so were familiar with the WASH issues.[4] The following day, some of the non-resident enabling actors returned, but did not engage; generally they only presented PowerPoint presentations on their own organisation and then left. Only two non-resident enabling actors stayed for the action-planning session. One of these was a staff member from an NGO that mostly worked with rural communities, so they could offer insights but not practical assistance. The other was a staff member from the Ministry of Health who empathised with the residents but could only offer limited assistance around hygiene education. This made it difficult, if not impossible, to develop joint action plans between residents and non-resident enabling actors.

We felt enormously guilty as (based on our positive experience in Fiji) we had assured residents that they would come together with non-resident enabling actors for this participatory experiment. We were also aware that the relative failure of this joint workshop could undermine the practical authority the author team had developed. Some non-resident enabling actors who did engage throughout the two days expressed frustration that their colleagues did not participate. They identified constraints to participation in the Solomon Islands, including resources and funding, saying that, "[W]e [NGOs] have a car, it's got fuel in it (…) [laughter], [w]hereas they [government employees] are taking their own buses and their own money, and it's very, not well supported at all" (Non-resident enabling actor, NGO, in Solomon Islands, 8 March 2016). Indeed, while we often idealise participation and see it as a low or no-cost activity, participation has costs in terms of time, money and other resources, so demands for participation, not just from 'beneficiaries', may be excessive (Crocker et al., 2017).

Despite disappointment that the desired results had not materialised, when we visited Solomon Islands Settlement 1 three months later, Anne and other residents shared documentation of how their new participatory collective (the WASH Target Development Committee, WTDC) envisioned their mandate and approach (Supplementary Information, Figure S5). They planned to leverage the involvement of Honiara City Council (HCC), particularly an HCC employee who had attended some of the joint workshop and had an existing relationship (and thus social capital) with the local pastor, who was also part of the WTDC. The HCC representative had offered to train residents in the construction of pour-flush latrines, particularly those that would be effective in the swampy, marginal land on which the informal settlement was located. The WTDC would then use these as demonstration toilets to convince the rest of the settlement that they could construct latrines. The HCC agreed to facilitate the training at no cost, but the WTDC struggled to find funding to pay for the materials necessary to undertake the training. The author team assisted the WTDC in preparing a budget and proposal and disseminating these

[4] These actors were considered non-resident enabling actors because they were affiliated with the project through their positions in government and they did not participate in the project as community members.

to potential funders. One International NGO (INGO) agreed to support the WTDC in improving sanitation; their preferred approach, however, was not aligned to the actions proposed by the WTDC.

During the years that this project was active, community-led total sanitation (CLTS) had become mandated by the national government as the only approach to rural sanitation. CLTS is premised on a deficit lens, where lack of sanitation is due to lack of knowledge or awareness and the approach is meant to work by 'triggering' communities through a series of activities; infrastructure provision or support is explicitly not recommended (Kar and Chambers, 2008). The INGO, following their programmatic checklist, wanted to use this approach with residents of Solomon Islands Settlement 1 rather than provide materials for the construction training requested. Strict adherence to this checklist did not make sense for two reasons: (1) this informal settlement was clearly part of urban Honiara as this part of the city's edge was demarcated by a river, not a land survey, so CLTS was not actually mandated; and (2) CLTS is only appropriate in communities that lack demand for sanitation, which was not the case here. The WTDC did not see value in the CLTS approach; they believed the lack of sanitation in the settlement was not an issue of needing to change their attitude about wanting sanitation; rather, it was due to a lack of knowledge and funds to build appropriate sanitation. The WTDC and the author team spent months advocating for the training materials through long discussions with potential funders but, in the end, the WTDC did not receive the funding to purchase materials for the training. Eventually a shorter, theory-based training was provided by HCC; it comprised information on how to build toilets, but no hands-on practical instruction. We suggest that building residents' WASH capabilities could have been more effectively achieved through a co-productive approach whereby the WTDC and the INGO that had sought to join with it collectively built practical authority.

The author team's initial assessment saw Solomon Islands as a location where our efforts to enable participatory and collective action had failed, a place with a 'disabling' environment; however, there is a more productive interpretation of our experience. The WTDC had attempted to build practical authority with non-resident enabling actors but had received limited support. When their initial attempt (through participation in our project) stalled, the WTDC did not disintegrate; rather, they turned to areas within their control. They made efforts to improve their water wells themselves and created a presence for their collective within the settlement. These actions earned them a new kind of practical authority that was recognised within the settlement and by some non-resident enabling actors; this allowed them to obtain some support for training. Practical authority can be earned through small acts, especially those conducted in the face of adversity. By keeping their participatory collective active, the group built its practical authority, albeit in a slower and less direct manner than in Fiji.

Participatory experimentation in Vanuatu

In September 2015, the joint workshop (Supplementary Information, Table S3) was conducted in Vanuatu (Supplementary Information, Figure S6). During these activities, residents of Vanuatu Settlement 1 indicated that their most pressing WASH concern was rubbish and debris in the settlement, particularly following Tropical Cyclone Pam six months earlier.[5] In contrast to the nearby formal villages, the informal settlements we worked with had received limited support from INGOs following Tropical Cyclone Pam. A staff member of the INGO that had jurisdiction over emergency relief for these settlements told us that,

> these communities are communities made up of mixed people, they don't really own the land(…). I [would] prefer if we could do this program with the formal settlements in the existing communities. I'm targeting the

[5] Category 5 Tropical Cyclone Pam (TC Pam) made landfall in Vanuatu on 13 March 2015. In Settlements 1 and 2, respectively, approximately 80% and 70% of housing structures were completely destroyed (Live & Learn Environmental Education, 2015a, 2015b). The author team had initially been scheduled to conduct the joint workshop months earlier, in the week following TC Pam, but it was necessarily postponed and eventually rescheduled.

> main Indigenous people of the island rather than trying to do with mixed communities which they don't have the same attitudes (Non-resident enabling actor, NGO-based, in Vanuatu, 10 June 2015).

This speaks more generally to the political economy and ecology of Vanuatu and the usefulness of checklists in achieving development and emergency response aims; since the informal settlements did not meet the enabling environment 'criteria' desired by the INGO, they received only limited assistance. This is not an uncommon phenomenon (McDonnell, 2020). Despite being ethnically and religiously diverse, however, residents were able to build social capital through our project, and they were able to develop relationships between sub-communities of the settlement. On the second day of the joint workshop, residents of Vanuatu Settlement 1 decided to create a WASH Committee and began preparing a WASH action plan. Their first priority was a community-wide "awareness and clean-up". This clean-up was to involve collecting all of the informal settlement's rubbish and bringing it to central locations, from where it could be transported to the city's landfill. This was complicated because, although the WASH Committee felt they could fundraise to move the rubbish from the settlement to the roadside, they needed assistance in moving the rubbish to the landfill; they also needed for the landfill fees to be waived by the municipality.

Continuing their WASH action plan after the joint workshop, the WASH Committee publicised the clean-up and the requested donation of 200 Vanuatu vatu (VT) (approximately 1.85 USD) per household through another participatory collective, the Women's Savings Group.[6] The 200 VT paid for lunch and fuel for a group of men and boys from within the settlement to move the rubbish to nine roadside locations, ready for pickup and transportation to the landfill. According to the vice-chairperson of the WASH Committee, "when we started to emphasise the rubbish clean-up, everyone inside the community [was] really interested as well as being happy and glad" (Vanuatu Settlement 1 resident, vice-chairperson of WASH Committee, 4 December 2015). The committee had begun to build credibility towards practical authority by taking action and achieving something the residents considered important: beginning the process of moving the rubbish.

The next step, however, did not go as planned. Vanuatu Settlement 1 is part of Shefa Province (non-resident enabling actors from the Shefa Provincial Government had been very active in our project), but the landfill, despite being on Shefa land, was managed by the Port Vila Municipality (non-resident enabling actors from the municipality had been invited to participate in our project but had chosen not to) (Supplementary Information, Table S4). The Vanuatu Settlement 1 WASH Committee needed the municipality to waive the landfill fees. Over the course of several visits to the municipal offices, however, they could not find an individual overseeing the landfill; this may have been due to the dismantling of the environmental health unit within the municipality. (One non-resident enabling actor described to the author team during a workshop how environmental health capacity was now lacking.) WASH Committee members were eventually told by the municipality that the fees would be waived, but only if they provided a letter of support from Shefa Province. WASH Committee members approached Shefa staff whom they had met through the project; they produced the letter which a WASH Committee member took to the municipality, and the landfill fees were waived. Recognising the proactivity of the WASH Committee, Shefa Province also offered to organise and pay for the removal of the rubbish from the nine sites to the landfill. To us this demonstrated another restriction of considering static enabling environments and processes; in reality, the WASH Committee was able to use the social capital they had built during the project to engage in a reflexive process within and between the ecology of the participatory collectives and formal structures. It also highlighted how informal settlements often miss out on services because there is no formal mandate for supporting them.

Unfortunately, after several months the rubbish still had not been removed by Shefa Province. Residents became increasingly frustrated with the WASH Committee, who eventually took the initiative

[6] Name of collective changed for anonymity.

to use the little money remaining from the 200 VT donations to transport as much rubbish to the landfill as they could. This resulted in the removal of seven piles of rubbish. As the WASH Committee told us, when the community contributions had run out and there were still two piles of rubbish remaining, "The rubbish has been for too long and so the community members are starting to point out our failures and we [are] so ashamed of it" (Vanuatu Settlement 1 resident, member of WASH committee, 1 December 2015). Fledgling practical authority built through successful participatory experimentation, as described above, can also be eroded by failed actions, even where the 'failures' causing the setbacks are out of the hands of the participatory collective; that was the case here, with the WASH Committee having no control over the shortcomings of Shefa Province or the Port Vila Municipality.

The author team within the ecology of participatory collectives

In this project, although we began our role as outsider 'experts', we took seriously our obligations to the participatory collectives that we helped bring into being. We gained practical authority and became part of some collectives, although not necessarily of larger cultural, social, and institutional structures. One author noted that a resident had said that, "we had been totally different from any organisation she had ever experienced visiting the community, that we spoke and acted like friends, we didn't over promise or mislead, and that we adamantly stuck to our guns and put the onus on them to improve" (Author team member in Solomon Islands, 14 December 2015).

We did not see ourselves as holding power or authority over others in the collective and we consistently tried to make sure that we were not imposing our views. Throughout the project, we reflexively asked ourselves: What is our role? What questions can, and should, we ask? Are we listening enough or imposing our views or methods on the rest of the collective? How much should we be involved in the action planning? How much should we be following up with people or pushing them to participate?

We did not assume neutrality. We believed, for example, that some WASH technologies were more appropriate than others in certain physical environments and voiced this, deciding that it was neither possible nor desirable to be "honest brokers of policy alternatives" (Pielke, 2007). When, however, one community insisted that the most effective thing to do to improve their well-being was build footpaths and improve drainage (as described above), we did not obstruct or criticise it openly (although we were sceptical of it amongst ourselves in author team meetings). Ultimately, the footpaths were a successful initiative of the collective and were a great example of their building practical authority. By restraining ourselves, we allowed participation to continue to develop and the collective to gain authority.

Building connections between participatory collectives can strengthen the ecology of the enabling environment, and facilitating this can help build practical authority. A non-resident enabling actor who worked for a housing non-profit described what he saw as the value of the connections made through our project by saying that,

> So working in there not only makes me see how [organisation] can help out, but makes people there aware that there is an alternative out there. I think many of them don't know that there's [organisation] there. I talked to some of them, and they're not aware that [organisation] exists. Because we do not go out advertising (Non-resident enabling actor, NGO, in Fiji, 20 November 2015).

The workshops that we convened, which brought together residents and non-resident enabling actors in different configurations, provided time and space for connections among collectives to form and strengthen. As one non-resident enabling actor stated,

> The activities in this [joint] workshop have been quite good, getting together the community members and giving them the chance to talk openly and freely and allowing them to discuss what they think of the actions they can do to improve their own water, sanitation and hygiene issues (…). [A]lso, I think that the involvement of the enabling actors in this process helps the community themselves to understand some of the things that they may have been having doubts about or understand some processes that they have never

known exist, so [are] a good way to get things moving (Non-resident enabling actor, water utility, in Fiji, 4 February 2015).

CONCLUSIONS

Engaging with literature from critical development studies, STS, and political science allowed us to move away from a checklist imaginary of the enabling environment to a perspective in which participatory collectives are connected in a dynamic ecology. While development projects and initiatives often cite the need for a 'supportive' enabling environment and assign project failure to an insufficient enabling environment, we argue that these projects and initiatives are themselves new participatory collectives and a part of this dynamic ecology (that is, of the enabling environment itself). We recommend that development actors seeking to strengthen the enabling environment (of which they themselves are members, not bystanders) catalyse new participatory collectives, foster experimentation to develop practical authority within new or existing participatory collectives, and foster new and existing relationships among collectives. 'Strengthening' the enabling environment requires a co-productive understanding of the ever-changing ecological nature of science, policy and the public, including acknowledgement of the value of local knowledge. This supports the accumulation of practical authority by participatory collectives and ultimately increases the dynamism and resilience of the ecology.

Although the WASH sector has shifted towards approaches that are, at least nominally, participatory, work remains to be done. Nearly all participatory approaches in WASH are derived from seeing things through a deficit lens and are based on a linear understanding of the science – policy interface, whereby participation is divorced from processes of policy and knowledge creation. The deficit lens hides the real material, social, and legal challenges and vulnerabilities of informal settlement residents, transferring cause from the larger political – economic or political – ecological context to a lack of awareness or a failure of residents to express their agency. Reflexivity in participatory approaches is essential to working within the politics of development and contributes to the hard work of blurring the boundaries of 'expert' and 'beneficiary'; this blurring of boundaries, we argue, is required for successful collaboration and action. Participation is fluid and often unpredictable in its processes, participants, and trajectories. Non-resident enabling actors who narrowly interpret participation, such as participation as defined by SDG MoI Target 6B (UN General Assembly, 2017: 11), may find it ineffective at achieving the desired change.

We argue that moving beyond tokenistic or inadequate community engagement requires building and fostering longer-term collaborative relationships. While this may increase project costs, the alternative is unsustainable or failed projects which ultimately waste money and potentially have negative impacts on the health and well-being of participants (Barrington et al., 2017b; Davis et al., 2019). We encourage non-resident enabling actors who are working to achieve development goals to think broadly about participation, incorporate reflexivity into their methods, and commit to long-term relationships with the people they seek to serve.

ACKNOWLEDGEMENTS

Funding: This work was supported by the Australian Government under the Department of Foreign Affairs and Trade (DFAT) Development Research Awards Scheme [project number 201200898].

The project was managed by International WaterCentre. The authors would like to thank all the participants involved in this project, as well as local staff from Live & Learn Environmental Education, University of the South Pacific, and Divine Word University. Thanks to Olivia Molden, Lourdes Ginart, and Fiona De Los Rios-McCutcheon for feedback on drafts of this manuscript, and to Katie Meehan for introducing us to the concepts of participatory collectives and practical authority.

SUPPLEMENTARY INFORMATION

Table S1. Enabling environment definitions and associated frameworks and tools.

Definition	Reference
"A set of interrelated conditions that impact on the capacity of..development actors.. in a sustained and effective manner".	Enabling Environments for Civic Engagement in PRSP Countries (Thindwa, Monico, and Reuben 2003, 4).
"A set of interrelated sector functions that enable governments and private and public partners to engage in sustained and effective WASH service delivery development process…an enabling environment for WASH is one that creates the conditions for a country to have sustainable, at-scale WASH service".	Strengthening enabling environment for water, sanitation and hygiene (WASH). Guidance Note (UNICEF 2016a, 9).
"Policies, financial instruments, formal organisations, community organisations and partnerships which together support and promote needed changes in hygiene practices and access to technology".	Sanitation and Hygiene Promotion Programming Guidance (WSSCC and WHO 2005, 10).
"Includes all of the supporting conditions of the.. • Private sector (Businesses) • Financial services • Public Sector (Government) • Civil Society Organizations which must be in place for achieving sustainable WASH services at scale".	WASH: enabling environments (World Vision International 2017).
"Comprising the following six categories: (i) Government support, (ii) Legal and regulatory framework, (iii) Institutional arrangements, (iv) Skills and capacity, (v) Financial arrangements, and (vi) Socio-cultural acceptance".	Enabling Environment for Sustainable WASH Interventions. (EAWAG 2018). Detailed further in Community-Led Urban Environmental Sanitation Planning (CLUES): Complete Guides for Decision-Makers with 30 Tools (Lüthi et al., 2011).
"The policy, institutional and financial framework that is necessary for sustaining and replicating large scale…programs".	Scaling Up Rural Sanitation: Core Components (WSP 2018)
"Components of the "enabling environment": documenting government policy and institutional frameworks; the volume, sources and targeting of investment; the sufficiency of human resources; priorities and gaps with respect to external assistance".	GLAAS 2012 Report. UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (WHO 2012, 1).
"The set of interrelated conditions such as legal, governance and monitoring frameworks, politics, financing and human capital that are able to promote the delivery of WASH services".	Financing universal water, sanitation and hygiene under the sustainable development goals: UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water

	(GLAAS) 2017 report (WHO 2017, 86)
"The blend of formal rules, informal rules, and the physical environment that impact on the capacity of individuals and organizations to increase access to and use of safe and sustainable drinking water sources".	Influence of the Enabling Environment on Drinking-Water Programs: Qualitative and Quantitative Analyses (Ojomo 2016, 31)
"[The] five 'building blocks' that widely reflect the enabling environment of WASH service delivery…include: (1) policy and strategy, (2) institutional arrangements, (3) financing and budgeting, (4) planning, M&E and learning, and (5) capacity development".	WASH Bottleneck Analysis Tool: Country Implementation Guide (UNICEF 2016b)

Table S2. Analysis of current WaSH policies in Melanesia. Vanuatu is not included because it did not have a WaSH policy during the project period (2013-2016).

	Fiji	Solomon Islands
Geographic scope	Rural	Rural
WaSH scope	*Water:* focus of policy. *Sanitation:* seems to be an afterthought. The policy states that all Water Supply Management Plans (WSMP) must include appropriate sanitation, but the focus is on water as the name implies *Hygiene:* only mentioned as part of the definition of safe water, which states that safe water must be suitable for personal hygiene in addition to consumption.	*Water:* focus is on technologies with some mention of community management. *Sanitation:* focus is on technologies and approaches to sanitation behaviour change. *Hygiene:* focus is on approaches to hygiene behaviour change
Approach	Prescribe a specific approach – WSMP	Prescribe a specific approach – Community Led Total Sanitation or Participatory Hygiene and Sanitation Transformation
Summary	Focus on rural areas, water, and a specific approach means that this policy is very limited.	Comprehensive in terms of WaSH but limited to rural geography. Functions and marketing system assets are generally included, but the focus on specific approaches can limit the effective exercise of all necessary functions in practice.

Table S3. Details of individual research activities conducted during the project.

Activity	Participants	Rationale and objective/s	Description	Page in Barrington et al., 2017
1. Rapport building	Residents of a single settlement	Consistent with the principles of community-based participatory research (Ozanne and Saatcioglu 2008; Minkler and Wallerstein 2008) the author team needed to develop trust and build rapport with residents of the informal settlements. Developing high-quality relationships should be the basis upon which good participatory research is based (Chambers 2008).	The first fieldwork activity focused on meeting with residents of the settlements outside of the formalised research agenda. As part of this activity, the author team met with residents of each informal settlement over a half day period. The meetings used an open-ended informal conversational method (Turner 2010).	15
2. WaSH issues and priorities	Residents of a single settlement	Group workshops were conducted to provide the author team and the residents with the opportunity to identify WaSH-related issues and problems that were most relevant to the community. An important objective was to collaboratively seek workable solutions to community issues and problems and develop local community capabilities. The workshops adhered to the principles of community-based participatory research (Ozanne and Saatcioglu, 2008, Minkler and Wallerstein, 2010) used a basket of flexible participatory methods that maintained an emphasis on collective reflection and action (Chambers, 2008).	In each settlement there was one workshop over a one-day period during the first fieldwork trip. In order to identify the WaSH issues and priorities of the residents, activities included community-led transect walks, community mapping and the identification and ranking of WaSH concerns.	16-17, 37
3. Group Interview 1	Residents of a single settlement	The collective 'lived' experiences of community groups in terms of WaSH were elicited through	The interviews adhered to the principles of community-based participatory research (Ozanne and Saatcioglu, 2008, Minkler and Wallerstein, 2010) and followed an open-ended informal	18

		a series of group interviews during the first fieldwork trip.	conversational method (Turner, 2010). The unit of analysis was the group, so the conversation maintained an emphasis on collective decision-making, reflection and action.	
4. Ladder of Life	Residents of a single settlement	The residents of the settlements lived in poverty and aspired to experience wellbeing. However, poverty and wellbeing are multidimensional and complex concepts. Poverty does not result from the lack of any one thing, such as income. In fact, even with lowest incomes, some may not necessarily feel poor, while others with reasonable incomes may still feel quite vulnerable (e.g. they may lack meaningful assets, live with uncertainty of casual labour, experience social/ethnic stigma, suffer disabilities, or use poor quality clothing, food, and housing). Locally meaningful WaSH market dynamics must also empower and preserve human rights. Hence, it was vital to gain understanding of each settlement's own lived-experience definition of wellbeing and ill-being (good living and poor living). Also, locally identifying vulnerable groups was useful for encouraging their inclusion in the future research activities (when brainstroming community WaSH actions and assessing whether those solutions will inclusively benefit everyone). For non-resident enabling actors, these results highlighted the initiative that poor people in the settlements take to move out of poverty, and allowed them to better design participatory social, political,	The activity generated local definitions of poverty, wealth, and causes of vulnerability and upward mobility; categorisation of community households onto the rungs of a Ladder of Life; and local knowledge pertaining to WaSH at each rung on the Ladder of Life (Narayan, Pritchett, and Kapoor 2009).	24-26

		and economic WaSH opportunity structures in the local enabling environment.		
5. Individual interviews 1	Residents of a single settlement	The individual 'lived' experiences of community members in terms of WaSH were elicited through a series of individual interviews with community members. Note that in Vanuatu additional individual interviews were conducted following Cyclone Pam in 2015, to understand the damage this caused to WaSH services and infrastructure, and the coping behaviours residents were engaging in.	The interviews followed an open-ended informal conversational method (Turner 2010). The unit of analysis was the individual, so the conversation maintained an emphasis on individual decision-making, reflection and action.	35-36
6. Individual interviews 2	Non-resident enabling actors	Interviews aimed to understand the activities of non-resident enabling actors within the enabling environment, their sense of successes, challenges, and opportunities in their own work and for WaSH more broadly, and their sense of what communities wanted. Through snowball sampling, the interviews helped to identify additional non-resident enabling actors. Finally, these interviews were an opportunity to build rapport and introduce our larger project to these non-resident enabling actors. Note that in Vanuatu some of the interviews were undertaken following Cyclone Pam to understand its specific impacts on communities and the local WaSH sector.	Interviews were conducted by one or two members of the author team with one or more participants. The interviews followed an open-ended informal conversational method (Turner 2010), offering participants an opportunity to introduce themselves, their work, and their perspectives on WaSH in informal settlements.	40-43

7. Satellite Imagery + Reflection 1	Residents of a single settlement	This session aimed to identify and share residents' knowledge about general and WaSH-related landmarks in the settlements, share community knowledge about what has changed over time, and to reflect on the activities conducted earlier in the project.	This activity followed an open-space technique, which is a flexible, self-selecting process for identifying, exploring, and sharing issues, problems and opportunities (Chambers 2002). Consistent with an open-space technique, there was no formal finish time, and the participants were free to leave, or change groups at any stage. Through the use of Google satellite images, this activity offered residents an opportunity to identify and share community knowledge about general and WaSH-related landmarks in the peri-urban settlements, share community knowledge about what has changed (or not changed) since the satellite image was taken, and facilitate the creation of an overlay map to understand the current WaSH situation. Members of the author team then shared the collated data from the early research activities, discussed with participants how things have changed since those activities, particularly with reference to discussions during the Satellite Imagery activity, and discussed future possible actions that could address some of the issues, problems or opportunities identified.	22-23, 38
8. Individual Household WaSH Systems Mapping	Households	Systems mapping/modelling is a useful participatory method to explore WaSH systems, and the role of individual households within these WaSH systems (see Rietbergen-McCracken and Narayan-Parker 1998; Kumar 2002). It can also assist understanding of how individual households shape and transform WaSH markets, identify inequities/bottlenecks within the system, and explore intra-household	In each settlement a representative sample of individual households were invited to participate in a systems-mapping activity where they selected a WaSH item from within their household and mapped its relationships to other parts of both the internal and external systems.	20-21

		dynamics and decision-making. The unit of analysis is the WaSH System. The objective of the activity was to bring together existing information and knowledge about WaSH systems, which could inform planning and development of WaSH marketing in the Pacific.		
9. Diary study	Residents of a single settlement	The objective of this particular fieldwork activity was to conduct a diary study to measure habitual content in individuals' WaSH behaviours. In previous psychological research, diary methods have been effectively used to compile naturalistic and thick, descriptive data on habits (Wood, Quinn, and Kashy 2002). It is suggested in the WaSH literature that long-held habits may be significant barriers to WaSH intervention success (Mosler 2012). Habitual WaSH activity would indicate that it is acted out routinely and with little deliberation, thus clouding the issue for sanitation programs hoping for behaviour change based on cognitive processes. The author team wanted to understand what WaSH behaviours were habitual and to what extent they were habitual.	The exercise elicited, through respondents keeping a diary, habitual patterns of WaSH activity, such as time of day, device/system used and so on; it also elicited contextual triggers associated with the habits, i.e. cues in the immediate situational environment – location/space, immediate preceding activity, encountering particular people, etc. The exercise also revealed nuances of what behaviours reflect a consumptive aspect – e.g. "buying" soap for handwashing; "paying" to use a toilet (thus highlighting aspects of "demand" in WaSH). Such data allow the author team to reflect on the extent of habitual WaSH activity, why people were engaging in these habits, and hence possible ways in which to leverage or overcome their occurrence.	N/A
10. (AKA 'Non-resident Enabling Actor Workshop') Reflection 2 + Group systems mapping + WaSH governance +	Non-resident enabling actors	The main purpose of this workshop was to bring non-resident enabling actors together as co-researchers on the project. The workshop emphasized the importance of developing social capital between the actors themselves and the author team, as well as sharing the research thus far collected. The objective was that after the workshop, the non-resident enabling actors would understand how	This workshop consisted of several smaller activities. Non-resident enabling actors: • were presented with a thematic analysis of the earlier Individual interviews (with non-resident enabling actors). They were then engaged in a discussion about the priorities, successes, challenges and opportunities in the WaSH sector and in working with informal communities.	44-45

WaSH in informal settlements + WaSH service ideas	they/their organisation fit into the WaSH landscape of their city/country, and how they could potentially work together and with informal settlements. The workshop also leveraged the knowledge and experience of the non-resident enabling actors with regards to potential WaSH technologies, initiatives and marketing exchange systems that could be of use to target communities and prepared to share each of these with residents in a later project activity.	• began to think about the broader context in which they worked, through systems analysis. This included understanding one another's roles in WaSH and informal communities more broadly and how they are all interrelated, as well as understanding the major inputs and output to the system. • Discussed WaSH governance with a focus on informal settlements more specifically. For those non-resident enabling actors not currently working in WaSH or informal settlements, an additional goal was to have them start thinking about how they might be able to contribute to this issue/project. • Discussed the WaSH services/products/processes/exchange systems that they already knew of. The author team presented ideas of additional WaSH services/products/processes/exchange systems to get participants' thoughts on why these may/may not work in the Pacific.	
11. Bonding social capital mapping + Community wellbeing + Reflection 3 + Community-centred WaSH action plan 1	This workshop was developed with several activities, each with a different (but complementary) rationale: • If the community members became aware of bonding social capital as an inherent strength of their community, they could begin to develop strategies to leverage this strength in the context of their WaSH efforts. The activity also aimed to provide a sense of the limitations of bonding social capital, i.e. whilst it helps in survival and coping, it may hinder the ability to thrive and prosper.	This workshop consisted of several smaller activities. Residents: • Developed social capital maps for their community, beyond just WaSH; • Developed 'aspirational wellbeing maps' for their settlement; • Reflected on the outputs developed in earlier project activities; • Developed an initial community-centred WaSH action plan.	28-33

- Qualitative portrayals of the typical wellbeing and ill-being experienced by individual households were surfaced during the Ladder of Life activity. The objective of this new activity was to build on those and get participants to evolve a 'collective' portrayal of wellbeing of the community as a whole (CWB), as well as its aspirational CWB. Such collective portrayal can assist a community to understand its status and prioritize its WaSH goals.
- Consistent with the principles of participatory research (Ozanne and Saatcioglu, 2008, Minkler and Wallerstein, 2010), an objective was to share the collated data from earlier project activities with participants, discuss how things have changed, and update any of the participant-developed outputs as necessary.
- Research shows that when communities actively take self-determined initiative toward their wellbeing by leveraging their local capabilities, they develop an enhanced sense of local ownership of problems and decisions, which fosters human agency and hence greater control over wellbeing outcomes (Hojman and Miranda 2018). The final objective of this workshop was for the participants to begin brainstorming a WaSH action plan. The idea was that a locally developed action plan would help the community focus, prioritize, and make commitments to their WaSH goals.

12. Bridging social capital + Preparation for joint workshop + Community-centred WaSH action plan 2	Residents of both settlements in given country	Researchers have shown that local community development initiatives foster a sense of local ownership of problems, decisions, and outcomes. Research also shows that such outcomes have amplified effects on human wellbeing when communities collaborate in such endeavours. This workshop was developed so that the two informal settlements in each community could work together prior to a workshop with the non-resident enabling actors. In addition: • The bridging social capital activity aimed to raise participants' awareness of the bridging social capital potential between their two communities and those who are not the 'same' as them within their own communities. That is, the potential of groups to work with each other for collective action. If the communities become aware of this potential, they can begin to leverage this 'strength' to get better access to resources in the context of their WaSH efforts. • There was an opportunity for participants to prepare for the upcoming workshop with non-resident enabling actors, identifying strategies for sharing their WaSH concerns, etc. In addition, the author team developed the activity so that participants could discuss and determine where their communities were lacking capabilities and would like to enlist the non-resident enabling actors in order to reach their WaSH goals. *"The moderator-facilitator's role is to*	This workshop consisted of several smaller activities. Residents: • Developed social capital maps for their community, beyond just WaSH; • Prepared for the upcoming workshop with the non-resident enabling actors, discussing and amending the outputs they had prepared; • Continued work on their community-centred WaSH action plans.	34

		facilitate the discussion, probe key issues, elicit comments from all participants, and focus the discussion on the issues of interest without seeming to interrupt or ignore peripheral comments from participants. The observer-facilitator's role is to take notes on the content of the discussion and process of group dynamics" (Grootaert, Van Bastelaer, and World Bank 2002). • The objective of the final activity was for the participants to further develop their Community-Centred WaSH Action Plans.		
13. (AKA 'Joint Workshop') Hopes and worries + Ground rules + Enabling system mapping + Sharing outputs + Exchange visits + Debrief following exchange visit + Sharing of community-centred WaSH action plans + WaSH options and action planning +	Residents + non-resident enabling actors	The overarching objective of this two day workshop was to develop joint WaSH action plans between residents of the settlements and the non-resident enabling actors. However, it also encompassed some smaller aims: • Initiate a sense of bridging and linking capital between embedded and enabling actors; • Demonstrate that in this forum everyone was treated as equal and was entitled to voice their own ideas and opinions. • Have non-resident enabling actors and residents understand one another's roles in WaSH and how they are all interrelated; • Have non-resident enabling actors understand the WaSH situation in communities, and how communities planned to tackle WaSH issues that are their priority;	This workshop consisted of several smaller activities: • The 'hopes and worries' activity encouraged participants to think about what it was they expected to and hoped they would achieve from the workshop, and what they are worried may happen. This also helped the facilitators understand the participants' mindsets before beginning; • The 'ground rules' activity led to the development of concrete rules for respecting one another and maximising what could be achieved over the two-day workshop • In the 'enabling system mapping' activity the non-resident enabling actors shared and explained the map they created during an earlier workshop, and answered questions, so that residents of settlements could understand the WaSH system beyond their household/settlement, and the roles and	48-63

Participant feedback	• Contribute to the building of further local capabilities in decision-making and problem-solving.	responsibilities of the different non-resident enabling actors; • In the 'sharing outputs' activity the residents shared the various outputs they had prepared throughout the project thus far, so that the non-resident enabling actors could better understand the WaSH systems, issues and priorities within the settlements; • In the 'exchange visits' activity, residents took non-resident enabling actors on a 'tour' of their settlement, so that they could gain context as to the WaSH situations in the two communities; • In the 'debrief following the exchange visit' activity, non-resident enabling actors discussed with the author team their impressions, particularly their surprises, regarding the WaSH situation in the two settlements they had just visited; • At the beginning of the second day, the residents shared their community-centred WaSH action plans with the non-resident enabling actors; • The remainder of the day was focussed on examining different WaSH options in the two specific settlements, and informal settlements in the city generally, and making action plans to address prioritised issues; • Throughout the second day of the workshop, participants were encouraged to share their reflections on the project thus far (particularly the PAR process) through privately recording their thoughts with a Dictaphone.

14. Solomon Islands settlements group interview	Residents of a single settlement	Due to various logistical issues, there was a significant lag between being able to conduct the workshop directly above, and the workshop directly below, in Solomon Islands.	Between the workshops the author team conducted a group interview with residents of each settlement and offered assistance as facilitators/mediators where necessary to achieve further WaSH action.	N/A
15. Private sector interviews	Non-resident enabling actors	The private sector plays an important role in providing both inputs and outputs to the WaSH marketing system in informal settlements. The purpose of these interviews was to gain insight into the marketing exchange role played by the private sector in relation to WaSH.	The interviews followed an open-ended informal conversational method (Turner 2010). The unit of analysis was the business.	N/A
16. Supporting WaSH exchanges	Residents + non-resident enabling actors	This workshop aimed to identify the roles needed to enable residents of settlements to meet their WaSH needs through the four types of marketing exchange (Sridharan, Barrington, and Saunders 2015) and embed these roles into the WaSH action plans.	This workshop used classic brainstorming techniques to identify, discuss and action the functions required for more residents of the informal settlements to meet their WaSH needs through marketing exchange.	46-47
17. Gendered focus groups	Residents of a single settlement (split by gender)	This activity aimed to understand changes in personal agency that may have come about as a direct or indirect result of this project. Personal agency is indicated by a person's felt state of power and a sense of control over everyday decisions and is directly necessary for wellbeing (Hojman and Miranda 2018).	Throughout the discussion, participants were prompted to make use of the pinned up past data tools as aids to their conversation. This included, for example, amending the Ladder of Life and/or Aspirational Community Wellbeing posters to demonstrate how things have changed since the initiation of the project.	69-70
18. Individual interviews 3	Residents	Natural leaders identified throughout this project were likely to have been the most involved in the process and have many ideas and reflections to share. Interviewing such	The interviews followed an open-ended informal conversational method (Turner 2010). The unit of analysis was the individual, so the conversation maintained an emphasis on individual decision-making, reflection and action.	71

		natural leaders should offer some insight into the following questions: 1. What changes have been implemented as a direct/indirect result of our project? 2. Have the changes that participants wanted to see been implemented? 3. What barriers to implementing participants' changes were identified and how were these addressed? 4. Were participants satisfied with their opportunity to be heard and influence decisions? 5. How did the community or enabling actors benefit from the participation/action/outcomes? 6. Are there any new, beneficial relationships and partnerships between the community and the enabling actors? What would need to be done to sustain these relationships?		
19. WaSH Team Activity	Resident enabling actors (members of WaSH committee)	This activity aimed to understand changes that may have come about as a direct or indirect result of this project; particularly those that have been facilitated by the community WaSH team. These include WaSH actions that have taken place, or are continuing to take place, but also less tangible aspects, such as whether the participatory process has contributed to improving governance or individual empowerment in the community. It also	The interviews adhered to the principles of community-based participatory research (Ozanne and Saatcioglu 2008; Minkler and Wallerstein 2008) and followed an open-ended informal conversational method (Turner 2010). The unit of analysis was the group, so the conversation maintained an emphasis on collective decision-making, reflection and action. During the interview, participants were asked whether they would like to	67

		probed participants for an understanding of whether the WaSH changes that have occurred throughout the project could be sustainable in the longer term.	share anything physical with the author team, including taking the team on a transect walk to point out any changes in the WaSH situation of the settlement.	
20. Individual interviews 4	Non-resident enabling actors	These interviews had three goals: 1. To probe on the functions performed by non-resident enabling actors, using a list of functions compiled from Activity 15: Supporting WaSH exchanges. 2. To solicit feedback on the project and the PAR process. 3. To begin a conversation on what could happen once the project was over and how this type of work could continue.	Interviews were conducted by one or two members of the author team with one or more participants. The interviews followed an open-ended informal conversational method (Turner 2010).	N/A

Table S4. Non-resident enabling actors invited to take part in the project, and whether they participated.

		Activity 6 (Individual interviews 2)	Activities 10 (Non-resident Enabling Actor Workshop) and 13 (Joint Workshop)				Activity 16 (Supporting WaSH exchanges)		Activity 20 (Individual interviews 4)
			Invited to 10 and 13	Accepted 10 and 13 (.5 for accepting one of the two activities)	Atten -ded 10	Attended 13 (.25 for each half day attended)	Invited to 16	Attended 16	
Fiji	Academic	4	4	3	2	1	2	1	1
	Govt – environment, climate, disaster risk reduction	5	3	1			1		1
	Govt – health	2	2	2	2	0.5	4	1	1
	Govt – housing, lands		1	3	3		1		2
	Govt – social services	3							
	Govt – water	2	2	1	1	1	1	1	1
	International development project (financed by bilateral donor or IFI)	1	1		1	0.5	1		
	Multilateral	3	5	2	1		4		
	Municipal government	1	1	1	1	0.5	1	1	3
	NGO	3	5	2	2	1.5	3		1
	Utility	1	3		1	1	5	4	5
	TOTAL	25	27	15	14	6	23	8	15
Solomon Islands	Govt – environment, climate, disaster risk reduction	1	1	0.5			1		
	Govt – health	1	1	1	1	1.75	5	1	3
	Govt – housing, lands						2		
	Govt – planning						1		

	Multilateral	1	3	3	3	1.25	5		1
	Municipal government	1	1			0.75	2	2	1
	NGO	4	5	4	3	0.75	8	5	6
	Provincial government		1	0.5	1				
	Utility	4	3	1	1	1	4		
	TOTAL	12	15	10	9	5.5	28	8	11
	Academic	1	1	1	1	1			
	Govt – environment, climate, disaster risk reduction	1	1		1	0.5	1		
	Govt – health	1	1	1			1	1	1
	Govt – housing, lands	1	1	1			1		
	Govt – planning								
	Govt – water	2	2	1	1		2	1	1
Vanuatu	International development project (financed by bilateral donor or IFI)	2	4	0.5			3	1	1
	Multilateral	2	2	1			2		
	Municipal government		1	1					
	NGO	6	10	4	4	4.5	10	2	2
	Provincial government	4	3	1	1	2.5	6	2	1
	Regulators		2	1	1	1	3	1	1
	Utility	1	1	1	1	0.5	2		1
	TOTAL	21	29	13.5	10	10	31	8	8

Table S5. Activities conducted throughout the project (a rationale and brief descriptions of each activity is available as Table S3).

	Activity	Participants (in addition to author team)		Data from Fiji			Data from Solomon Islands			Data from Vanuatu			Activity detailed in Barrington et al., 2017 (pg. number)
				Settlement 1	Settlement 2	Non-resident enabling actors	Settlement 1	Settlement 2	Non-resident enabling actors	Settlement 1	Settlement 2	Non-resident enabling actors	
1	Rapport building	Residents of a single settlement											15
2	WaSH issues and priorities	Residents of a single settlement	# Participants	5	25		20	22		19	25		16-17, 37
			Hours of audio transcripts	1.75	1.5		1.75	2		3.25	4.5		
			# Participant produced artefacts	0	3		8	6		7	9		
			# Photographs	62	51		92	199		55	92		
3	Group Interview 1	Residents of a single settlement	# Participants	20	20		20	22		37	23		18
			Hours of audio transcripts	1	1		0.75	1.5		2	3		
4	Ladder of Life	Residents of a single settlement	# Participants	5	9		15	19		37	23		24-26
			Hours of audio transcripts	1	1.25		3.25	2.75		4.25	3.25		
			# Participant produced artefacts	5	2		3	2		6	4		
			# Photographs	6	2		18	23		32	37		
5	Individual interviews 1	Residents of a single settlement	# Participants	N/A	1		3	N/A		18	18		35-36

			Hours of audio transcripts		1		0.75			4.75	4.75		
6	Individual interviews 2	Non-resident enabling actors	# Participants			16			9			16	40-43
			Hours of audio transcripts			10			7.5			9.75	
7	Satellite Imagery + Reflection 1	Residents of a single settlement	# Participants	5	9		15	19		22	6		22-23, 38
			Hours of audio transcripts	3.75	9		3.5	3.5		2.5	0.5		
			# Participant produced artefacts	3	3		4	9		4	1		
			# Photographs	15	24		81	131		119	11		
8	Individual Household WaSH Systems Mapping	Households	# Participants	23	19		21	15		28	19		20-21
			Hours of audio transcripts	12.25	15.25		7.5	12.5		14.75	12.75		
			# Participant produced artefacts	23	19		21	15		28	19		
			# Photographs	257	323		212	171		224	190		
9	Diary study	Residents of a single settlement	# Participants	16	18		20	15		24	16		N/A
			# Participant produced artefacts	16	18		20	15		24	16		
10*	Reflection 2 + Group systems mapping + WaSH governance + WaSH in informal settlements + WaSH service ideas	Non-resident enabling actors	# Participants			15			19			30	44-45
			Hours of audio transcripts			7.5			14			14	
			# Participant produced artefacts			7			15			16	
			# Photographs			12			32			54	
11	Bonding social capital mapping + Community wellbeing + Reflection 3	Residents of a single settlement	# Participants	8	13		15	16		32	35		28-33
			Hours of audio transcripts	4.25	4		4.5	3		4.5	6.25		

	+ Community-centred WaSH action plan 1		# Participant produced artefacts	7	12		23	13		10	14		
			# Photographs	28	70		41	28		34	99		
12	Bridging social capital + Preparation for joint workshop + Community-centred WaSH action plan 2	Residents of both settlements in given country	# Participants	11			34			48			34
			Hours of audio transcripts	5			4.25			11			
			# Participant produced artefacts	7			10			5			
			# Photographs	44			38			40			
13+	Hopes and worries + Ground rules + Enabling system mapping + Sharing outputs + Exchange visits + Debrief following exchange visits + Sharing of community-centred WaSH action plans + WaSH options and action planning + Participant feedback	Residents + non-resident enabling actors	# Participants	47			45			40			48-63
			Hours of audio transcripts	21.5			17			14.75			
			# Participant produced artefacts	11			5			16			
			# Photographs	201			126			239			
14	Solomon Islands settlements group interview	Residents of a single settlement	# Participants				6	12					N/A
			Hours of audio transcripts				2	1.25					
			# Participant produced artefacts				8	0					
			# Photographs				26	5					
15	Private sector interviews	Non-resident enabling actors	# Participants		3				6		16		N/A
			Hours of audio transcripts		2.5				4		8		
16			# Participants	15			19			30			46-47

	Supporting WaSH exchanges	Residents + non-resident enabling actors	Hours of audio transcripts	7.5			14			14			
			# Participant produced artefacts	7			15			16			
			# Photographs	12			32			54			
17	Gendered focus groups	Residents	# Participants	5	18		11	12		22	20		69-70
			Hours of audio transcripts	1.5	2.75		4.75	2.5		2.5	3		
			# Participant produced artefacts	2	4		2	3		4	6		
			# Photographs	0	15		18	35		6	47		
18	Individual interviews 3	Residents	# Participants	14	18		8	8		14	12		71
			Hours of audio transcripts	3.75	6.75		4	4		3.5	4.75		
19	WaSH Team Activity	Resident enabling actors (members of WaSH committee)	# Participants	2	7		11	13		5	9		67
			Hours of audio transcripts	1.25	1.25		2.75	1.75		1.25	1.75		
			# Participant produced artefacts	0	0		5	2		0	1		
			# Photographs	16	54		150	325		144	78		
20	Individual interviews 4	Non-resident enabling actors	# Participants			8			8			8	N/A
			Hours of audio transcripts			6.5			4.75			4.5	

* (AKA 'Non-resident Enabling Actor Workshop')

+ (AKA 'Joint Workshop')

N/A: not recorded/no notes taken

Table S6. Codebook of themes relevant to this manuscript.

Code	Description
Action planning	Relating to planning WaSH improvements
Agency	Indicating or demonstrating the agency of informal settlement residents to make positive changes to their living conditions (not limited to WaSH improvements)
Collaboration	Designing and implementing improvements with inputs from informal settlement residents (including from other settlements) and/or non-resident enabling actors
Collective action	Actions taken where multiple residents of an informal settlement work together for a common goal
Communication	How non-resident enabling actors communicate with one another and residents of informal settlements
Coordination	How non-resident enabling actors coordinate with one another
Enabling-disabling	Examples of enabling actors (resident and non-resident) enabling or disabling improvements in WaSH
Facilitate community stakeholder interaction	How non-resident enabling actors facilitate the engagement of other non-resident enabling actors and residents of informal settlements
Formal rules (e.g. Regulations, Standards, Policies, Acts)	Formal rules at the levels of local, regional or national governments
Informal rules – non-resident enabling actors	Informal rules that non-resident enabling actors abide by
Informal settlement governance	Governance structures and examples within informal settlements
Informal settlement scale rules and regulations	Formal and informal rules and regulations developed and enforced at the settlement level
Linking social capital	Examples of social capital between non-resident enabling actors and informal settlement residents
Members of Parliament/politicians	How politicians influence the lives of informal settlement residents, particularly with regards WaSH and land tenure
Non-resident enabling actor perceptions of community	Non-resident enabling actors' perceptions of the individuals within, and governance of, informal settlements
Our project	Non-resident enabling actors' opinions on the PAR project
Participatory action research	Relating to involvement in this project, including perceptions of the value and experiences of taking part in various activities
Past or ongoing adaptations	Examples of adaptation to poor/disrupted/changing WaSH conditions
Planning – non-resident enabling actors	How non-resident enabling actors plan activities/programmes/actions
Policy development	How non-resident enabling actors develop policies

Priorities – settlement or household or individual	Priorities of informal settlement residents (not just WaSH related)
Program conditioning	How previous WaSH programmes have conditioned informal settlement residents to behave (both real and perceived by non-resident enabling actors), including discussions of a 'welfare mentality'
Providing technical support	How non-resident enabling actors provide technical support to informal settlement residents
Reason for engaging with us	Reasons residents on informal settlements gave for engaging in the PAR project
Relationships	Descriptions of relationships between non-resident enabling actors, informal settlement residents and individuals
Roles and responsibilities of residents	Roles and responsibilities of informal settlement residents as perceived by residents
Roles and responsibilities of non-resident enabling actors	Roles and responsibilities of informal settlement residents as perceived by residents and non-resident enabling actors
Trust	Discussions of trust (including distrust) between informal settlement residents
WaSH – dissatisfaction with the situation	Examples of dissatisfaction with the current WaSH situation, from both non-resident enabling actors and informal settlement residents

Figure S1. Results of participatory stakeholder mapping in Fiji (A & B), Vanuatu (C), and Solomon Islands (D).

Figure S2. New connection to water mains in Fiji Settlement 2. Source: authors.

Figure S3. Newly constructed footpaths in Fiji Settlement 2. Source: authors.

Figure S4: Cleaned drainage ditch in Fiji Settlement 2. Source: authors.

Figure S5. Documentation of WaSH Target Development Committee (WTDC): A) Structure; B) Aims and objectives WTDC; C) Priorities and action plan. Source: authors.

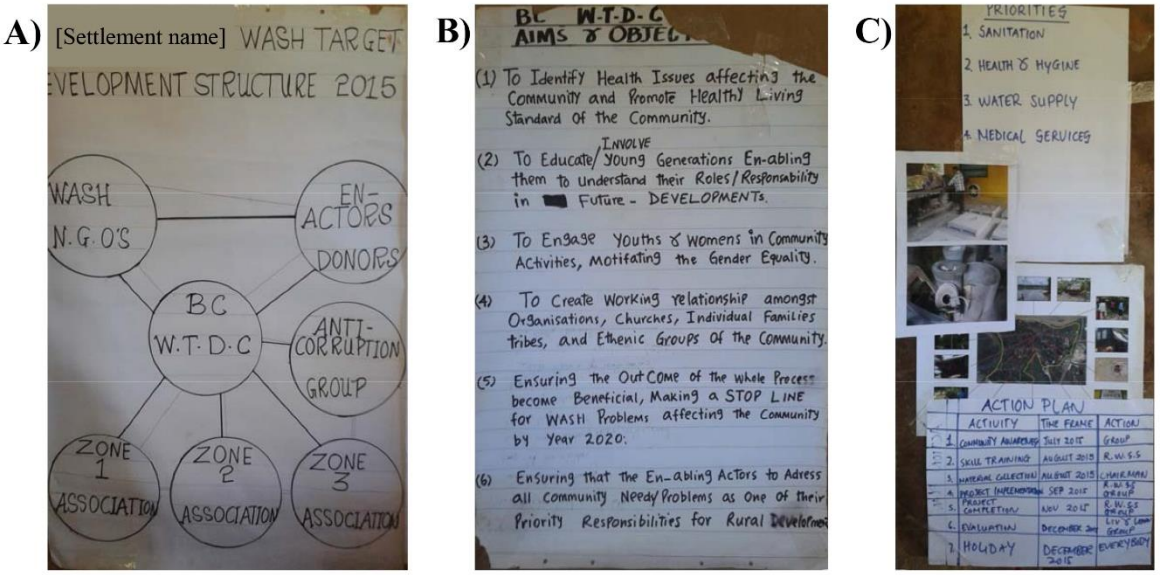
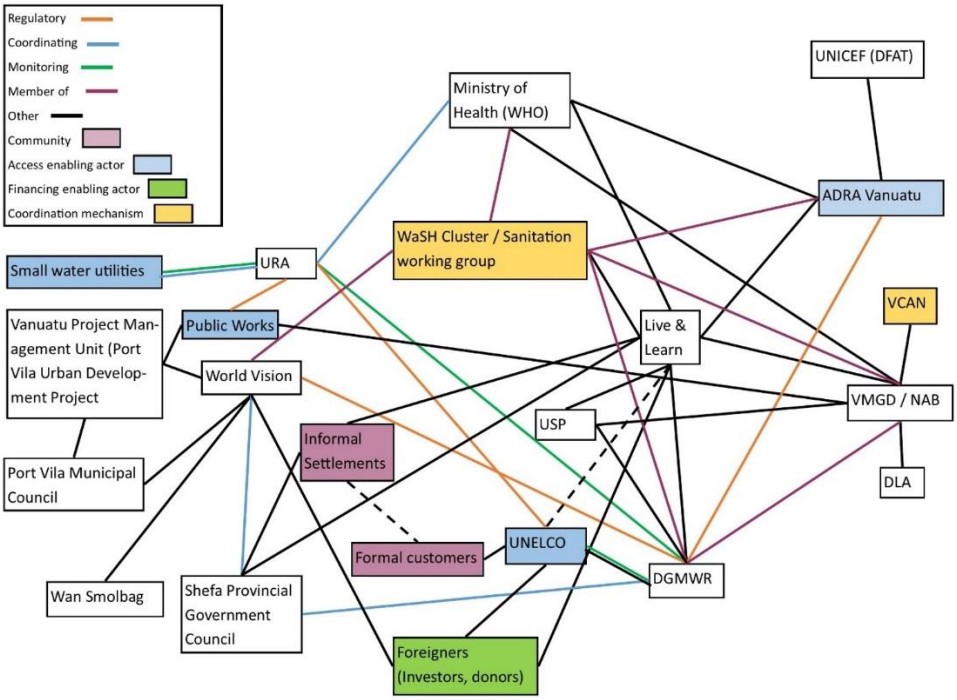


Figure S6. Conversations between non-resident enabling actors and residents in Vanuatu during the Joint Workshop: A) Residents share a poster with non-resident enabling actors on perceived capabilities in the settlement; B) Non-resident enabling actor shares the digitized map of the WaSH enabling system (for map see Supplementary Information 1, Figure S7); C) Enabling actors and residents examine a well together during the visit to the informal settlement; D) WaSH Action plan from Vanuatu Settlement 1 indicating plans for the community clean-up (row 1). Source: authors.

Figure S7. Digitized map of the WaSH enabling system for Vanuatu.



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