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Rural Piped-Water Enterprises in Cambodia: A Pathway to Women's Empowerment?

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Abstract: This research examined the extent to which women's ownership and management of water supply schemes led to their empowerment, including their economic empowerment, in rural Cambodia. Privately managed water supply schemes in rural Cambodia serve over one million people. This study is the first of its kind to systematically investigate the experiences and needs of female water supply scheme owners, using well-established theoretical frameworks for women's empowerment, namely Longwe's stages of empowerment, and Rowlands, VeneKlasen and Miller's elaboration on different types of power. Business management frameworks relevant to the water, sanitation and hygiene (WASH) sector were also drawn on to assess operational constraints and enablers. Fifteen structured interviews were conducted with female water entrepreneurs in rural Cambodia. Female entrepreneurs reported encountering four key barriers to establishing and managing water supply schemes. The first were operational, and government and regulatory related issues, followed by financial issues and limited demand for water services. Three important enablers were reported by entrepreneurs: social enablers, economic enablers and program support from government, associations and non-government organisations (NGOs). This study found that, whilst there was evidence of empowerment reported by female water enterprise owners, the complexity of the ongoing empowerment process, challenges and limitations were also observed. Women's empowerment can be advanced through leadership of, and involvement in water enterprises, as evidenced by this study, however, gender norms constrained women, especially with respect to mobility (leaving the home for extended periods), and household and family duties impacting on income-generating work or vice versa. As such, targeted strategies are needed by a range of actors to address such constraints. The findings of this study can assist NGOs, donors and governments incentivizing entrepreneurship in water services, to ensure that these interventions are not gender blind, and to draw on evidence of the barriers and enablers for female entrepreneurs and how these are influenced by contextualized gender norms.

Keywords: piped water; enterprises; women; gender; development; Cambodia; WASH; water; sanitation and hygiene

1. Introduction

Piped-water systems are essential to delivering the Sustainable Development Goals (SDGs) in Cambodia, given the goal of drinking water services being 'safely managed', which calls for clean water on premises. 'Universal and equitable access to safe and affordable drinking water for all' is a global goal by 2030. An indicator for this goal, is the 'proportion of population using safely managed drinking water services', which requires drinking water services to be 'on premises, available when needed, and free from microbiological and priority chemical contamination' [1]. One key means to

deliver drinking water services that meet 'safely managed' standards, is through well maintained piped-water systems. In 2015, there were an estimated 300 privately managed water supply schemes in rural Cambodia, serving over one million people [2]. Yet, in 2017, only 26% of Cambodians had access to safely managed drinking water services from government and privately managed schemes [3]. Globally, between 2000 and 2017, the population using piped sources increased from 3.5 billion to 4.8 billion [3].

The achievement of SDG 6 will not be possible without concerted, deliberate and transformative action on gender inequalities, as outlined in SDG 5 (Achieve gender equality and empower all women and girls). The relationship between SDG 5 and 6 has received attention from the water, sanitation and hygiene (WASH) and water resources management sector, yet significant gaps in understanding remain, largely related to poor data collection and management systems, and gender blind approaches [4]. The relationship between gender equality and WASH is complex, and ranges from differences in roles (e.g., who carries water), who makes decisions (about water management systems, allocations and ownership), to different needs (e.g., menstrual hygiene management, cooking), and different types of knowledge (e.g., household sanitation and hygiene). These interrelationships can also be seen at the macro-level. For instance, a study on the specific socioeconomic factors that affect access to improved water sources in the rural areas of developing countries, found that female primary school completion rate (and other variables, including gross national income and agriculture) were related to water access, demonstrating the complex interrelationship between access to improved water supplies, and gender [5].

While some research has been conducted on the drivers of privately owned, small piped-water schemes in the Asia and the Pacific, there is little evidence specifically focused on Cambodia. In Cambodia, small-scale piped-water systems delivered by enterprises are connected directly to people's houses or near their house, and fitted with a water meter. The water is used primarily for domestic usage (cooking, washing, bathing), and may or may not be used for drinking, depending on the choice of the household. Research on the emergence of privately managed, piped-water systems in Asia and the Pacific uncovered a range of drivers for entrepreneurship in this sector, including government policy and subsidies, transfer of community schemes to private enterprises when schemes are not performing, and gaps in government services [6,7]. While several international non-government organisations (INGOs), the Cambodian government and non-government organisations (NGOs) have worked to finance and support small-scale piped-water systems in rural Cambodia, they have not been the subject of a significant research, other than studies conducted by multilateral agencies, such as the World Bank [2,8]. One such study found that small, privately managed piped-water schemes in Cambodia were inadequately regulated, had limited staff capabilities, and struggled to access capital for service improvements and expansion [2].

Despite small-scale, privately owned and operated water supply schemes playing an increasing role in rural Cambodia, little is known about the different experiences of women in the sector, or how gender norms influence their business opportunities and their lives. Knowledge gaps that this study aimed to begin to address included: how gender norms and gender dynamics intersect with the development and growth of water supply schemes in Cambodia; what the experiences, challenges and opportunities of water entrepreneurs are; and how water entrepreneurship relates to women's empowerment, including economic empowerment. The present study, and a related concurrent study, separately published in Indonesia [9], are the first of their kind to systematically investigate the experiences and needs of female entrepreneurs in the WASH sector. The Indonesia research focused on a broader range of WASH enterprises and economic opportunity, including sanitation and hygiene, whilst this Cambodian study focused specifically on rural water supply enterprises.

Literature addressing barriers, enablers and support mechanisms related to female led enterprises in Cambodia (not confined to the WASH sector) are now explored, prior to presenting the gender analysis frameworks and theoretical grounding underpinning this study.

2. Background on Barriers and Enablers for Female Entrepreneurs in Cambodia

Female entrepreneurs in Cambodia offer economic and societal benefits, despite gender norms curtailing their activities in numerous ways, and it is useful to consider these benefits in terms of what they might mean for the WASH sector. Female entrepreneurs across many sectors contribute significantly to their communities and economies, yet, in order to do so, they have to overcome barriers to accessing finance, societal expectations around their roles in the home, and often have lower education levels in comparison to men. Cambodia is ranked 93/150 in the 2019 Global Gender Gap report overall, with educational attainment for girls and women being 119th in the world [10]. Levels of female entrepreneurship are also affected by the competing demands on women's time beyond paid work (e.g., looking after children and family members), their ability to travel, their limited access to technology, and unequal rights within legal frameworks [11]. It is therefore relevant to consider these barriers and challenges to entrepreneurship overall, in order to understand how they may be expressed in piped-water enterprises.

Women own and manage the majority of enterprises in Cambodia, and yet face a raft of challenges in the setting up and running of these enterprises. The Asian Development Bank reported that 65% of all private enterprises in Cambodia (formal and informal) are owned by women [12], although women tended to own micro- and small businesses, whereas Cambodia's medium-sized and large enterprises were mainly owned by men [13]. A review of the literature on the barriers to female entrepreneurship (entrepreneurship overall, not confined to the WASH sector) in Cambodia found that key challenges for women included structural and social norm-based barriers [11]. Structural barriers included women's limited access to finance, due to the need to have documented credit histories, which men tend to have more than women, in addition to reported bias against women from financial institutions. It was also found that women in Cambodia had less access to business development services, as vocational training often reflected traditional gender norms, and membership fees were prohibitive for some women—especially those in rural areas. Women were disadvantaged as a result of fewer education and training opportunities in comparison to men. Lower levels of education and literacy impacted on the success of entrepreneurs, and women's domestic responsibilities prevented them from participating in training, which can be useful for developing successful businesses [11]. Finally, some forms of networks and networking which support business development were less accessible to women in Cambodia, because these networks were male-dominated, and because travel was not easily undertaken by women, due to concerns about safety, cultural norms including stigma, and household roles and responsibilities [11].

A range of programs and strategies to support female entrepreneurship in Cambodia have been documented, yet their reach and success or otherwise is not well understood or reported. Initiatives reported to support female entrepreneurs included: training and capacity development programs for women to lead and grow enterprises; business services and networking opportunities; field trips to visit successful businesses run by women; peer, individual and group mentoring [11]. Some organisations employed strategies to involve men early in capacity development programs, so that they were more likely to support their wives/partners and daughters in these initiatives [11].

Given the gap in knowledge of women's empowerment through their management of water enterprises, the research sought to uncover the benefits and challenges faced by women and their families in owning and operating private water supply schemes in rural Cambodia. This study investigated to what extent women were empowered, including economically empowered, through their management of water supply schemes in Cambodia. Drawing on prominent empowerment frameworks which focus on power (combined into a single cohesive framework), we examined common

barriers and enablers experienced by the female entrepreneurs, and compared these with the literature on female entrepreneurs' experiences in other sectors.

This study also addressed what needs to be done, and by whom, to support female water entrepreneurs in Cambodia to be empowered in a range of ways. We explored the strategies that existed to support female water entrepreneurs, the measures that entrepreneurs seek to support their water supply schemes, and whom they thought should provide these support measures. Finally, we identify implications for the Cambodian rural piped-water sector—in particular, for the enabling environment, which UNICEF [14] defines as the set of inter-related functions, and the capacities of governments and private actors to sustain WASH services.

3. Gender Analysis Frameworks and Theoretical Grounding

Empowerment has been defined as an ongoing process that can transform individuals through increasing critical consciousness, with a focus on the ability to choose, relying both on individual and collective action. Scholars such as Rowlands [15], Kabeer [16], Cornwall [17] and Batliwala [18] suggest that empowerment is not something that can be done 'to or for' anyone else, but, rather, is an "expansion of women's consciousness" [17] (p. 356) and capacity to act, both individually and collectively, to transform lives. 'Critical consciousness' is understood as an individual's ability to perceive discriminatory norms and practices in society, and for them to feel empowered to change these circumstances and choose a different reality [16,19]. Empowerment is not equivalent to having unlimited options and unrestricted freedom to choose whatever one wants. Rather, Kabeer explores choice through three interrelated dimensions: agency, as the process by which choices are made and individuals' sense of self-worth; resources, the medium through which agency is exercised; and achievements, the outcomes of agency [20]. It is important that the individual's experience of empowerment is considered alongside ongoing, relational and context-specific processes. There is no end-point of empowerment [21,22], instead, empowerment is an ongoing process, and can co-exist with disempowerment in different social relationships, over time, experiences and conditions [23].

Longwe's Women's Empowerment Framework was one of several empowerment frameworks developed over the last 30 years by scholars with a focus on power. Longwe developed the framework to be used to assess the extent to which development interventions empowered intended beneficiaries and increased gender equality [24]. The framework consists of five 'levels' of equality through which individuals and groups move: (1) Welfare; (2) Access; (3) Conscientisation; (4) Participation; and (5) Control (Table 1). Longwe noted that empowerment occurs through a process of social change and the five levels outlined do not necessarily occur lineally [25]. A key strength of the Longwe framework, identified by March et al. [26], was its usefulness in outlining why empowerment is "intrinsic to the process of development" (p. 99), allowing development projects committed to equality and empowerment to identify what has already been achieved, and what still needs to be done, in a range of domains. Potential limitations, also outlined by March et al. [26], were that the framework can be viewed as having a static nature, unable to account for how situations change over time, unless applied longitudinally. Additionally, critiques of the framework include that it focuses on the relationship between women and men in terms of equality, "rather than at the complicated system of rights, claims and responsibilities which exists between them" [26] (p. 100). Yet the empowerment domains identified by Longwe are found in other empowerment frameworks further developed by scholars from the Global North and South, and, for this study, were drawn upon to complement Longwe's method of evaluating empowerment.

In line with Longwe's 'levels' (though not sequential) of empowerment, other empowerment frameworks consider gender relations in terms of four types of power: 'power over', 'power within', 'power with' and 'power to'. The 'four types of power' framing, originally proposed by Rowlands [15] was further elaborated by VeneKlasen and Miller [27], Eyben, Kabeer and Cornwall [28], as well as Perezniето and Taylor [29], offers a range of ways to conceptualise empowerment, across a range of domains (Table 1). Power can also be visible, hidden or invisible [27]. Visible power relates to observable decision-making and definable aspects of political power, including formal structures, rules, institutions, authorities and procedures of decision-making. Hidden power relates to the setting of the political agenda by controlling who is at the decision-making table and what is on the agenda. Invisible power shapes meaning, whereby problems and issues are not only kept from the decision-making table, but also from the minds and consciousness of the players involved [27]. Considering this, the authors argue that change will not occur unless political strategies consider and address power dynamics in the public and private realms, as well as understand the visible, hidden and invisible forms of power at play [27]. Rowlands' understanding of how empowerment is experienced is expressed through three dimensions of empowerment: personal, close relationships, and collective [15]. In this sense, the personal is similar to the concept of 'power within' which relates to an individual's self-confidence and wish to undo the effects of internalised oppression. Close relationships relate to developing the ability to negotiate and influence relationships. Collective action (power with) involves people working together to achieve more than the individual could [15]. Another related and important concept within the empowerment literature relates to the triple roles that women undertake, as articulated by Moser, including reproductive work (childbearing and rearing responsibilities), income generating work, and community-level work [15,30]. Power dynamics therefore need to be considered across all these interlinking domains, including how engagement in one domain (e.g., reproductive work) impacts on another (e.g., paid employment).

Empowerment has also been considered as a process of transforming power relations between individuals and social groups in ways that bring about structural changes in economic, social and political institutions which traditionally constrain women [18,31]. While considering structural changes, it is also important to recognise the importance of hidden and invisible forms of power which enable these structures to exist in society. To develop a cohesive and manageable framework for the study, as shown in Table 1, Longwe's [24] levels of 'access', 'conscientisation', 'mobilisation' and 'control' were mapped to the four types of power, as articulated by other empowerment scholars. Longwe's first level of 'welfare' was excluded because Longwe offered that, when women were passive recipients of programs but did not produce the benefits for themselves, it was not empowerment, but was welfare [25].

Table 1. Mapping existing gender frameworks against four types of power.

Types of Power	Explanation (Based on Rowlands [15]; VeneKlasen and Miller [27]; Eyben, Kabeer and Cornwall [28]; and Perezniето and Taylor [29])	'Women's Empowerment Framework' Levels (from Longwe [24,32])	Examples of Empowerment (Adapted from Eyben, Kabeer and Cornwall [28])	Examples of Economic Empowerment (Adapted from Perezniето and Taylor [29])
'Power over'	Access to and control over financial, physical and knowledge resources	Access refers to the first level of empowerment, by which women improve their own status, relative to men, through work and organization, arising from increased access to resources such as education, land and credit.	Ownership and control over land, housing and freedom of movement	Access to credit, paid employment and income-generating activities
'Power within'	People's self-understanding, self-esteem, sense of entitlement to fulfilment of rights, self-belief to make changes in their lives, as well as ability to recognise individual differences while respecting others	Conscientisation is the process by which women realise that their relative lack of access to resources (status, welfare) arise from the discriminatory practices and rules that give priority access and control to men. It is concerned with a collective urge to action.	Perception that women have capabilities equal to men and are entitled to make their own choices	Learning business skills or financial literacy to feel prepared to start or manage a piped-water enterprise and have self-belief to make changes in their lives.
'Power with'	Process of group conscientisation and mobilisation to agitate for rights and to change the labour and market conditions, including finding common ground among different interests	Mobilisation involves women coming together, recognising and analysing their problems, identifying strategies to overcome discriminatory practices and planning to take collective action. This action level complements conscientisation.	Women claiming space with each other and forming networks to challenge social norms related to their roles and how they are treated by others.	Forming cooperatives, associations, unions and group-based financial services.
'Power to'	Decision-making roles in the household, community, and economy—extending to areas traditionally considered as men's occupations or domains, as well as the potential of every person to shape his or her life.	Control is the level reached when women have achieved gender equality in decision-making regarding access to resources. They no longer wait for resources to be given to them. This is also related to "power over" resources, as explained above.	Leadership by women in village-level committees and government agencies	Women managing decisions within their own piped-water enterprises

4. Materials and Methods

The research methodology was primarily qualitative, underpinned by a literature review and women's empowerment framing. The literature review investigated the barriers and enablers for female-managed enterprises in Cambodia in diverse sectors beyond WASH [11], to better understand how experiences of entrepreneurship in other sectors might relate to the rural piped-water sector. Empirical research was conducted in eight provinces of Cambodia: Koh Pong, Battambang, Kampong, Kampot, Sihanouk, Takeo, Kandal and Kratie. Purposive sampling was used to identify and conduct 27 structured interviews, which were primarily qualitative with some use of quantitative approaches (see Table 2). Female water entrepreneurs (n = 15), as well as female and male government stakeholders at the commune council (n = 4) and provincial and national level (n = 8) were interviewed by East Meets West and Cambodian Water Association staff with the Institute for Sustainable Futures, University of Technology Sydney.

A transformative research framework and collaborative partnership approach was employed to facilitate engagement between researchers and practitioners. A transformative framework asks: What is the researcher's role with regard to the promotion of social justice? How can researchers address issues of power and inequities as a means to furthering human rights? How can the design focus on a methodology that can support social change [33]? While all aspects of the research were led by the Institute for Sustainable Futures, University of Technology Sydney (ISF-UTS), it was conducted in partnership with East Meets West Foundation (EMW) and the Cambodian Water Association (CWA) to facilitate engagement between researchers and practitioners. This collaborative process included the co-development of research frameworks, interview questions, sampling processes and joint analysis workshops as part of the transformative research approach. The collaborative approach was also important for facilitating research impact, as the users of the research were meaningfully involved throughout the process, an established strategy for achieving research influence [34]. Ethics approval was provided by the University of Technology Sydney (ETH18-2599).

The conceptual framework used in this research drew on women's empowerment frameworks and focused on four types of power, as described above. A combined empowerment framework was used to assess the extent to which women were empowered, including economically empowered, through their management of small-scale water supply schemes in Cambodia. The empowerment frameworks informed the interview questions and codes applied to analyse transcripts across the four key dimensions of power [15,27–29], including Longwe's women's empowerment framework [24]. In addition, we also used a framework of business management functions to understand the enterprise operational situation, constraints and context.

NVivo qualitative data analysis software (QSR International, Melbourne, Victoria, Australia) was used with 163 codes applied in the analysis process. An inductive and deductive coding process was employed, whereby deductive codes were developed from the literature review, including empowerment frameworks, and inductive codes developed from the interview data. Interviewees were asked to rank a range of challenges (informed by the literature review) on a scale of 1 (small challenge) to 4 (big challenge) in terms of establishing and managing their piped-water business.

5. Results

We found that all but one of the schemes involved in the study were independently set up by the female entrepreneurs with support from her family. The outlier was donated by a non-government organisation, and then taken over and managed by the female entrepreneur and her family. Many of the women interviewed said that their brother, sister or other family member already had a water enterprise (in a different location), and so they were encouraged and inspired to start one up in their area.

5.1. Primary Barriers and Challenges Experienced by Female Entrepreneurs

Operational issues, government and regulation issues, financial challenges, and limited demand for the piped-water services were considered the greatest challenges by female water entrepreneurs interviewed. Definitions of each of these categories and scores assigned by entrepreneurs are shown in Table 2. Each of the key challenges is further discussed below.

Table 2. Stakeholder perspectives on the thematic challenges faced by entrepreneurs (mean responses on a 1–4 scale) averaged.

Challenges (Themed)	Definition Provided during the Interview	Entrepreneurs Average Score out of 4 (n = 15)
Operational Issues	Include high expenses such as electricity, rental, etc.; insufficient or irregular access to water resources all year round; equipment that breaks down.	3.1
Government and Regulation Issues	Include government requirements to pay fees or taxes; policies that make it hard to run a water enterprise; lack of government support; inconsistent approaches to subsidies.	3.1
Financial Issues	Include a lack of financing options for enterprises or their customers; high interest rates; customers not paying on time; and challenges to reach economies of scale, especially in remote areas.	2.9
Limited Demand for Water Services	Include low or irregular demand, which might be due to seasonal variations in water supply or demands; and lack of information about potential customers and what their needs are.	2.9
Human Resources Challenges	Include having too little or no access to technical and business skills, it being hard to find the right staff with the skills you need; not having enough time to manage your water enterprise.	2.1
Cultural Norms and Expectations	Include reduced economic independence and/or opportunities to attain financial stability; expectations that you will stay at home and look after the family rather than have paid work; not being supported (or allowed) to travel; the perception that women are of lower status than men.	1.7
Access to Networks	Include barriers to networking opportunities which help to support your business activities.	1.7
Education and Training	Include having lower levels of literacy in comparison to men, and less support for attending school or post-school education and training opportunities.	1.5
Scale: Unit of Measurement (Average Rating)		Colour Code
1 = not a challenge at all		
2 = not too much of a challenge		
3–4 = a challenge or major challenge		

Operational difficulties reported by entrepreneurs included: damage to pipes from road and fence building, a lack of cooperation from households and entrepreneurs, and limited personal mobility (especially at night). Seven of the fifteen entrepreneurs mentioned damaged infrastructure specifically, with one entrepreneur stating that “development of the road damaged pipes and lost water . . . (therefore we) were unable to supply clean water to the households due to damaged pipes”. Five entrepreneurs reported that their limited mobility at night reduced their ability to fix broken pipes, and their ability to travel to neighbouring towns and cities for training and networking opportunities. One interviewee said that a man would face fewer challenges if he wanted to set up a water service because “men have it easier than women . . . they can travel and go far away from home and attend meetings.”

Government and regulation issues were also rated as significant challenges, with entrepreneurs reporting a lack of policies in place to support their management of water supply schemes. Three entrepreneurs said that government regulations regarding water tariffs were tough or complicated, and in one case, an entrepreneur explained: “when the government enlarged the road, pipes were damaged and they did not pay any money for the damage”. Another entrepreneur stated: “I have some worries because now the regulation (related to water tariffs) is so complicated which has placed some constraints on my water service”.

Financial issues related to interest rates, expenses, and seasonal demands for water interfere with a steady income flow. Entrepreneurs explained that financial issues included high interest rates for borrowing capital, high expenditure on electricity and rent, and customers not paying on time. Several entrepreneurs also reported not making a profit, or that their expenses were greater than their income. One woman explained that: “income is not consistent due to seasonal variations and expenses are more than income. I have received a small income and most of it has gone to paying my staff”. Not being able to access finance also limited the entrepreneurs’ ability to expand their water schemes, as stated by another: “I do not have enough money to connect the main pipes to the remote households”.

Low demand of piped-water during the rainy season, and the perceived need for increased community understanding of the importance of clean water, were identified as important factors that impacted entrepreneurs’ financial viability. Three entrepreneurs explained that lower levels of water were consumed during the rainy season (and that this reduced their income at this time). One interviewee explained: “in the rainy season, I find additional money from other sources because people use little water”. Two entrepreneurs also explained that lower demand from customers was due to a lack of understanding in the community about the importance of clean water: “people do not understand about the importance of clean water . . . people still use a lot of well water”.

These interrelated key challenges experienced by entrepreneurs (operational, government, financial, and seasonal demand) were seen by female entrepreneurs to limit their profitability, and to result in considerable concerns to them. Entrepreneurs reported that they were worried about repaying their loans and associated high interest rates, and that financial issues were troubling for them, as one woman reported “(M)y water service has not received any income to make my family living condition better.” Such challenges have bearing on the empowerment experienced, or not, by female piped-water scheme owners.

5.2. Women’s Empowerment

Considering how challenges reported by female entrepreneurs related to empowerment frameworks helped to determine whether or not the reported challenges were gender related, or experienced by women and men alike. The most significant barriers and challenges experienced by female water supply entrepreneurs were mapped to the four empowerment categories: ‘power over’ (access), ‘power within’ (conscientisation), ‘power with’ (mobilization) and ‘power to’ (control), to examine the extent to which empowerment was experienced through managing piped-water schemes in rural Cambodia.

While entrepreneurs expressed confidence in having ‘power over’ (access to) some financial management aspects of their business, overall they reported that they had not yet seen financial

benefits flowing from the enterprises. 'Power over' suggests that women feel empowered in relation to their access to, and control over, financial, physical and knowledge resources [15,27–29]. Twelve entrepreneurs reported having confidence in managing the finances of their enterprises and valuing the access to, and control over, the financial resources the business provided them. This confidence was expressed by one female entrepreneur: "it is a good option for women to work in water supply services, because women can earn money by themselves. It is brave for women to have businesses so that they do not have to rely on their husbands". However, concerns about high interest rates, access to finance and worries about the financial status of their enterprises, limited their experience of economic empowerment. One entrepreneur explained the impact of these financial concerns "I have not made any profit because I continue to spend money on pipes for expansion, for workers to dig and lay pipes and on other materials and equipment . . . I have not yet felt confident because the expenses are more than income."

Entrepreneurs displayed 'power within' (conscientisation) through their self-belief in possessing equal management capabilities to men, and few interviewees identified discriminatory norms and practices to be greater challenges for them in comparison to men. 'Power within' suggests that women have high self-esteem, sense of entitlement to rights and self-belief to make changes to their lives [15,27–29], and that there is awareness that their relative lack of resources arises from discriminatory practices and rules in society that prioritise men [25]. Entrepreneurs articulated 'power within', in terms of their perception of having the same capabilities as men in managing a water supply scheme (n = 10 of 15). However, there were varied levels of recognition of the discriminatory practices and rules which prioritised men (generally in society), including the triple roles [30] undertaken by women with respect to their reproductive/household and water enterprise related responsibilities. One female entrepreneur stated that "Setting up and operating a water service is the same for women and men. It is based on individual determination, goal setting, knowledge and commitment." Another suggested that: "It is different for men and women to set up a water service . . . men do not do as much housework as women do, and men have more knowledge than women . . . men work faster and it is easier for them to go out and work at night (for example if pipes leak)."

The benefits of female entrepreneurs supporting each other were reported by female entrepreneurs, but evidence of 'power with' (mobilization) through collective action and networking that resulted in improved working situations for these women was not evident, other than through family connections. 'Power with' refers to the capacity to collaborate with other women in a process of group mobilisation and networking [25], in order to overcome discriminatory practices and change labour and market conditions [15,27–29]. It was clear that women gained inspiration from other female entrepreneurs in feeling able to establish a water enterprise, as stated by one woman: "I saw other women running this business and I love it too . . . I (then) studied the location, I collected data, I communicated with the Commune Chief to consult with him." Entrepreneurs also expressed a desire to help other women establish water businesses: "It is a very good option for women to run the water supply scheme . . . I will advise them if they are interested in setting up a water service".

Evidence of female entrepreneurs' 'power to' (control) make decisions related to financial resources in their water enterprises and households was articulated by interviewees, and these were primarily joint decision-making processes, rather than individual. 'Power to' involves women feeling empowered to have decision-making roles in the household, community and economy, extending to areas traditionally considered as men's domains [15,27–29], and particularly in relation to access to resources [25]. The 'power to' manage financial decisions and have increased independence, including financial independence, was expressed by some female entrepreneurs. The majority of entrepreneurs reported managing the finances of their water supply scheme (n = 10 of 15) and all entrepreneurs were involved in decision-making roles related to household expenditure. One female entrepreneur explained that: "I feel confident in managing the financial matters of my business because my income and expenses are okay . . . I want women to not rely on their husbands only". While the majority of female entrepreneurs were involved in decision-making processes, when it came to decisions related

to access to resources (such as finances), joint decision-making was common as most of these water supply schemes were family businesses (13 of 15 were managed with husbands and family members). While women interviewed expressed confidence in managing financial matters, as stated above, they also expressed concerns related to limited or no profits and high-interest rates, thereby undermining their 'power to' control financial resources.

'Power to' negotiate mobility was also found to be limited in some cases where gender-related barriers to movement (e.g., traveling) were reported by entrepreneurs (n = 5 of 15). As stated by one: "women are afraid, women cannot travel far away and stay for a long time". Reduced mobility was reported to have affected the entrepreneurs' ability to attend training workshops and take advantage of networking opportunities, as well as manage their businesses if pipes broke at night.

5.3. What Supports Female Water Entrepreneurs?

Entrepreneurs reported that the factors which most supported them in establishing and running their piped-water schemes were social and economic enablers, and program support delivered by a number of organisations. Family support was critical, and women were inspired by other women in similar roles. Equally, women reported the importance of loans, finance management skills and navigation of financial markets support. Below, we provide further detail on these findings.

Social enablers reported to have assisted entrepreneurs in setting up their water supply schemes included receiving encouragement and practical help from family members and friends, and seeing other women succeed in the sector. Almost half of the entrepreneurs interviewed reported that support and encouragement from family (husbands, brothers, children and family in general) and friends had helped them to set up their water supply schemes. One woman stated that "If he (my husband) had disagreed with my idea, it would have been so difficult in the beginning. Then, I would have had to choose between running a water supply business and my family". Family were also important in the day-to-day running of the schemes. One entrepreneur explained that her family "helps to do general management of staff to produce clean water, to do water connections and to provide technical assistance". In some cases, this encouragement and support was linked to the fact that their family or friends already had water supply schemes, so they were able to advise, teach and support the entrepreneurs in setting up a new business.

Financial and technical support were seen to be enablers, as well as areas of further assistance sought by entrepreneurs. Twelve of the fifteen entrepreneurs interviewed had received a loan from a bank or microcredit institution. Of these twelve entrepreneurs, four had also received capital from their family or invested money they had saved themselves, as explained by one entrepreneur: "I did not receive any loan from the bank. I received financial support from relatives". Entrepreneurs suggested that they would like further support in terms of training in financial management and literacy, and facilitation of access to loans from microfinance institutions and banks, as well as identification of financial institutions with lower interest rates. As well as financial support, the kind of program support most requested by entrepreneurs was technical assistance in the running of water supply schemes (n = 11 of 15). Technical support included both training and direct technical assistance related to managing a water supply scheme and ensuring acceptable water quality.

Interviewees identified a number of programs aimed to support water entrepreneurs delivered by government and associations in Cambodia. The Cambodian Water Association (CWA), for example, provided support in the form of training and networking opportunities. Seven of the fifteen entrepreneurs reported receiving technical and financial training, as well as opportunities for peer-to-peer networking from the CWA, and were offered to all CWA members (not only women). The provincial government was also reported to have provided training on management of the technical and administrative aspects of water supply schemes.

Other support mechanisms that entrepreneurs identified would be helpful from associations, NGOs and government departments, included how to navigate the regulatory environment, as well as engaging and communicating with government and communities. In particular, entrepreneurs

sought support to educate communities on the benefits of clean water (to increase demand for their services), access to peer-to-peer support networks, and subsidies for the poor to connect to the scheme. Entrepreneurs also identified that it would be useful for them to receive information on how to obtain 20-year licences from the Cambodian Ministry of Industry and Handicrafts.

6. Discussion

6.1. Support Mechanisms

The study confirmed that the types of support that entrepreneurs have historically received from a range of providers in Cambodia are likely to be relevant to the rural piped-water sector, as well as the need for family (social), and financial support. The kinds of initiatives identified through literature on support mechanisms that had been delivered in Cambodia for female entrepreneurs (beyond the WASH sector) included training and capacity development programs for women to lead and grow enterprises; business services and networking opportunities; field trips to visit successful businesses run by women; peer, individual and group mentoring [11]. This study confirmed that these kinds of support mechanisms are also sought by female piped-water entrepreneurs, and in addition to these kinds of programs, social support from family and funding was critical, in line with a related study in Indonesia [9]. The finding that 13 of the 15 enterprises studied were family businesses, in that family members undertook roles to help run the water enterprise, supports other research which found that the family was the principle unit for irrigated farming across the world, despite it being depicted as a “man’s world” [35].

6.2. Challenges and Barriers for Female Piped-Water Entrepreneurs

This study confirmed that barriers experienced by female entrepreneurs overall in Cambodia were relevant to piped-water entrepreneurs. Barriers experienced by female entrepreneurs (across all sectors), as identified in the available literature, included a range of issues spanning operational issues, regulatory barriers, financial issues (including fees and taxes), limited access to business development services, cultural values limiting women’s options, human resources challenges, barriers to networks and networking [11]. These barriers were also experienced by female piped-water entrepreneurs to varying degrees, but this is the first study that we know of that has ranked these barriers by the entrepreneurs themselves. This ranking process identified that the most significant challenges experienced by female piped-water entrepreneurs were operational issues, government and regulation burdens, financial challenges, and limited demand for the piped-water services.

6.3. In What Ways Were Entrepreneurs Empowered?

Drawing on empowerment frameworks, this study confirmed that empowerment is not a linear process or constrained to any one domain of a woman’s life, and, through the application of empowerment literature with a focus on power, a better understanding of gender norms and issues, and how these relate to piped-water enterprises, is possible. In considering empowerment in terms of four types of power; ‘power over’ (access), ‘power within’ (conscientisation), ‘power with’ (mobilization) and ‘power to’ (control), empowerment is recognised as a process of transforming power relations in favour of social justice, including women’s and marginalised peoples’ rights, which is ongoing, relational and context-specific. The study confirmed that, by thinking through different types of power within an empowerment framework, a more nuanced understanding of the range of ways that women experience gender norms, and how they influence the day-to-day management of a piped-water enterprise can be developed and used to inform policies and programs.

The triple roles that women undertake, as articulated by Moser (reproductive, income generating, and community-level work) [30], was found to influence how women were able to manage their water enterprises. As a result of juggling these three key roles and expectations around them, entrepreneurs reported limited ‘power to’ negotiate their own mobility, in terms of not being able to go out at night or

away from the family for an extended period of time. This finding is well supported by the literature on the role and importance of mobility for empowerment [36,37], indicating that mobility shapes gender, and gender shapes mobility [38], and related research on female WASH entrepreneurs in Indonesia in which limited mobility affected women's ability to reach their customers and participate in networks [9]. Other literature on mobility has questioned how it is used as an indicator of empowerment, given 'many empowered women chose not to leave their households for long periods of time due to responsibilities at home, maintaining assets or enterprises' [39] (p. 845). In one study, Schuler et al. observed that the types of travel and movements that people made changed over time (for example, going to the movies was no longer a relevant indicator because people were watching more movies at home). As a result, they moved to use whether 'A women goes out on occasion just because she wants to, can go to market if needed' as a more relevant indicator of mobility [39] (p. 845). Our study found that, while barriers related to gender norms were not considered by entrepreneurs to be their greatest challenge, women's limited mobility (impediments to travelling far away from the home and to going out at night) and household duties were reported as concerns. These mobility and workload challenges made it harder for female entrepreneurs to manage their water supply schemes, and constrained women's attendance at events, as well as their capacity to respond to some operational issues involved in managing piped-water schemes. Of the fifteen women interviewed, five reported that their limited mobility at night reduced their ability to fix broken pipes, and their ability to travel to neighbouring towns and cities for training and networking opportunities. These findings should be considered in light of the broader literature around mobility, which finds that some 'empowered women' may choose to stay home and not travel far from the home for a variety of reasons, including personal safety and cultural norms/taboo/stigma. In this case, her mobility is influenced by the socio-structural context and not a result of her own personal or individual empowerment or self-confidence.

Entrepreneurs, while reporting limited 'power with' other women (in terms of collective action), were members of the Cambodian Water Association, where they accessed training and support. 'Power with' was also demonstrated in terms of offering support to other women who wish to establish a piped-water scheme. Overall, however, Longwe's concept of 'conscientisation' (in terms of being a process by which women realise that their relative lack of access to resources arise from the discriminatory practices and rules that give priority access and control to men) was not significantly evident, as demonstrated by responses from female entrepreneurs who offered overall that it was just as easy for a woman and man to set up and run a piped-water business.

A study reviewing 70 evaluations of programs aimed to increase economic empowerment of women, found that interventions providing economic skills and services alongside life skills and other training services (including gender training) appeared to deliver the best results for women's economic empowerment [29]. Economic interventions alone were therefore found not to be sufficient to economically empower women (even if they increased women's income) [29]. This complexity was supported by our study, where economic empowerment was found to be mixed, with women being concerned about the profit levels and financial viability of the enterprises, whilst being confident in their abilities to manage finances and make financial related decisions, often with their husbands. As a result, financial support was highlighted as a major enabler by enterprise owners, as up-front capital investment is required to build schemes. While traditional financing mechanisms, in the form of bank loans and micro-credit loans, appeared to be the norm, some interviewees had received financial aid from NGOs and donors. Financial, training and capacity building support mechanisms were sought by female entrepreneurs to support them to build, and maintain a piped-water supply system.

7. Implications and Recommendations for Policy and Practice and Further Research

7.1. Operational Policy and Practice Implications

Operational challenges were identified as significant by female entrepreneurs, and required attention to communication between government and scheme owners, feasibility studies, and training.

Operational challenges included high expenses such as electricity and rent, leaks and pipe damage (due to road building and construction), and equipment breaking down. It was found that many operational challenges that entrepreneurs faced could be significantly improved by increased communication between different levels of government and enterprises about construction works that may damage pipes/disrupt services. Government at a number of levels needs to be made aware of this problem, and NGOs and associations could support enterprises in effectively communicating this to government agencies. Support was also needed for professional feasibility studies to determine the best location for the water sources and treatment plants, and for water scheme planning. In one case, a groundwater extraction plant was set up in what was described as the “wrong location”, the water source dried up, and it had to be moved, resulting in higher capital expenditure than originally anticipated. As well as improved communications from government actors, enterprises would benefit from compensation when pipes are damaged and services are disrupted as a result of road construction. Some entrepreneurs explained that the challenges of ‘government and regulation issues’ also included caps on tariffs and burdensome administration, but more research is required to identify what the specifics were with respect to government and regulation issues, in order to better target support in this area. Technical training and support was identified by entrepreneurs as their greatest need (area of requested support), including water management and water quality monitoring. Further research is required to determine the specific areas of training that entrepreneurs would most benefit from, and whether or not there are gendered barriers (such as traveling to training and family duties) that are preventing women from taking up existing or future opportunities.

7.2. Finance Policy and Practice Implications

Financial challenges (low or no profits, high interest rates, and seasonal demand for water services affecting income) were also identified as significant issues for entrepreneurs managing piped-water schemes in rural Cambodia, requiring support mechanisms to be offered. Support mechanisms could include offering and facilitating financial advice, and assisting entrepreneurs to access low interest loans. NGOs/donors/government/financial sector could assist with up-front finance (to assist with establishing the scheme and connecting to remote properties and those of marginalized/poor families), and development of alternative financing options (i.e., subsidised loan facilities). This could also include financial support for poor community members to connect to the scheme, and may include the establishment of locally managed revolving funds. It was also identified that entrepreneurs needed increased support to understand the financial benefits and risks of water enterprises, so that their expectations around profit levels and return on investment, were realistic and manageable. Without this, entrepreneurs may feel they are failing and be ill-equipped to manage the inherent risks involved in a piped water scheme requiring significant up-front capital expenditure. Future research is also needed on the gendered and equity dimensions related to community members accessing piped-water supplies, including issues of governance and affordability.

7.3. Tackling Social and Gender Norms

Women’s limited mobility, as a result of cultural norms and household responsibilities, was reported to have prevented women from going far away from the home or out at night, and could be alleviated by an increased understanding of these challenges in the Cambodian context by NGOs and government. Household duties were reported to make it harder for female entrepreneurs, sometimes preventing them from attending meetings and responding to operational challenges involved in managing a piped-water scheme. Safe transport options, additional support for women to be able to travel with their families (husband and children, for example) and other methods to assist women to safely travel could be part of a response to the challenge of constrained mobility resulting from gendered expectations, stigma, and women’s household commitments [40].

While gender-related challenges were uncovered through the research, further investigation is needed to determine whether or not the triple roles [30] of managing a household and looking after children while running a water enterprise and engaging in community life are a significant challenge for women, and what society overall can do to help to address this. The 'triple role' issue is not limited to the water enterprise sector, and therefore such research could be more broadly useful. Based on relevant findings, it may be possible that awareness-raising is needed, for example, through introducing commonly used tools which help to reveal the differences between men's and women's workloads. Incorporating the use of women's empowerment frameworks into WASH sector programming and monitoring and evaluation and learning approaches could assist organisations to better understand gender differences, such as mobility and time constraints, identified through this research, and lead to improved support of female entrepreneurs in the Cambodian water sector.

7.4. Limitations

The study encountered some challenges related to translation from Khmer interview notes into English, and issues related to exploring sensitive gender issues in environments that were sometimes not completely confidential. The method of recording interviews was by handwritten notes in Khmer, which were then typed into collation templates in English. This resulted in the collation templates capturing the key points raised by the interviewee, but not a great deal of detail, potentially resulting in some nuances being missed. Additionally, in some interviews, husbands stayed with their wife, and were present during the interview. This may have impacted the female entrepreneurs' responses related to gender issues, decision-making and household duties. However, great care was taken to ensure interviewees felt safe and comfortable, and this meant not asking husbands to leave the interview space on these occasions. It was also important to acknowledge that many of the water supply enterprises were family businesses and operated with the support of several family members, hence the husband wishing to be part of the interview process in some cases.

8. Conclusions

This study found that, whilst there was evidence of female entrepreneurs being empowered in several aspects of their lives, the complexity of the empowerment process, challenges and limitations were also observed. This aligns with empowerment theorists who describe empowerment as an ongoing, relational and context-specific process [16,17,23,25]. Drawing on empowerment frameworks, especially those developed by scholars from the Global South [18,20,25], can help navigate the complexity of gender-related impacts and the experiences of people delivering WASH services. While operational challenges (such as road construction) and financial challenges (such as long pay-back periods and low profits) reported by female entrepreneurs were not directly attributed to gender norms (by the entrepreneurs themselves), some gender-related challenges, such as reduced mobility and juggling employment with work in the home were identified by participants of this study to be challenges to the day-to-day running of piped-water enterprises.

Empowerment reported to be experienced by female entrepreneurs included that they had 'power to' manage financial decisions and increased independence, including financial independence. Entrepreneurs also reported significant 'power within' (conscientisation), which was evident from women expressing how confident and able they were to run piped-water businesses, and that they generally had the capabilities needed to manage the enterprise. Interviewees felt overall that they could do the job as well as men (if not better, with respect to some tasks), and that women have capabilities equal to men. Women involved in the study also reported having accessed a number of training opportunities offered by an association and/or government, and expressed that they felt supported by their families in managing a piped-water business.

'Power over' (access to resources) was less evident in the lives of the female entrepreneurs, who reported that financial concerns were significant 'worries' for them, and they had not, in most cases, seen profits stemming from the piped-water enterprises. Similarly, while some women expressed that

they would like to support other women who would like to set up a piped-water enterprise, there was little evidence of women mobilising or working together ('power with') to support each other in the rural water context, although interviewees offered to support other women should the opportunity arise. Specific funding, training, policy, community education and engagement opportunities could be pursued by a range of actors to support entrepreneurs who are part of the growing rural water supply sector in Cambodia. For water services to function effectively and help to meet the outcomes as identified in the Cambodian National Strategy for Rural Water Supply, and the Sustainable Development Goals, a number of actors need to work effectively together, supporting the needs of entrepreneurs, and addressing barriers, including gender related barriers. Female entrepreneurs identified the need for training and technical support, financial support, improved communications (between government actors and enterprises) related to operational issues such as road construction which impacts on water pipes, consistent government policy and the promotion of professional networks as key enabling factors that they would benefit from in delivering piped-water services to their communities.

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