A RAPID REVIEW OF FINANCIAL RISKS FOR WATER AND SANITATION BUSINESSES IN CAMBODIA

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east meets west
A PROGRAM OF THRIVE NETWORKS

Water For Women

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1 Purpose of the review

The desktop review of prior studies on financial risks in supply market of WASH products and services was conducted to better understand financial risks issues generally in developing countries and specifically in Cambodia.

This report synthesises issues identified in the review and document the risks that businesses encounter along the supply chains, and factors associated with these financial risks in the WASH markets.

The results will be used to develop a questionnaire to survey private sector businesses in the WOBA project.

2. Literature of financial risk of public-private partnerships water supply projects

Ameyaw and Chan (2015a) investigated the risk factors and assessed the risk level of PPP water supply projects in developing countries using the fuzzy synthetic evaluation (FSE) approach. A 40-factor risk list was established by investigating water project cases, relevant literature, and an industry-wide questionnaire survey with industry experts. The result produced 22 critical risk factors that significantly impact water supply partnerships. These factors were categorised into three principal factors: financial/commercial, legal and socio-political, and technical. The result pointed out that the overall risk level of water PPPs in developing countries was high, signifying that these projects were risky to both governments and private partakers. The fuzzy analysis confirmed that the financial/commercial risk category is the most critical principle factor, followed by the legal, socio-political, and technical classes.

Ameyaw and Chan (2015a) found that Financial/commercial risks contain eight significant risk factors. Based on the eight risk factors: foreign exchange rate, water theft, non-payment of bills, high operational costs, inflation rate volatility, interest rate, water pricing and tariff review uncertainty, financing and refinancing risk. The term 'financial and commercial' supports the definition of Xenidis and Angelides (2005). They explain **financial/commercial risks as factors that negatively affect a project's funding, cash flow and profitability.** This finding confirms a previous study by Inter-American Development Bank et al. (2006) that these risk variables affect project sustainability's financial structures. Most of them can change suddenly. This category's most significant risk factors include foreign exchange rate, water theft, non-payment of bills, operational cost overruns, inflation, etc. Inter-American Development Bank et al. (2006) assert that high foreign exchange and inflation rates adversely impact the infrastructure sector due to the difficulty of securing long-term domestic financing in many developing countries. Foreign exchange risk often has a highly damaging impact on water supply infrastructure projects in developing countries due to the mismatch between revenues and currencies in investment/costs (Matsukawa, Sheppard, and Wright 2003). Therefore, it is unsurprising that this risk ranks first overall and within this category. The results confirm that customers' ability to secure payment (non-payment of bills) is another critical risk factor (Haarmeyer and Coy G. 2002). The implication is that private participants will be less willing to run a water system if the contractual right to disconnect defaulters or a minimum rate of return is not guaranteed. Marques and Berg (2011) argue that the leading cause of project failure relates to the non-fulfilment of investment commitment by the project partners. Because financial and commercial events are associated with high project failures, governments and investors should thoroughly analyse these factors before embarking on a project.

Ameyaw and Chan (2015b) used a ranking-type Delphi survey to develop a rank-order list of critical risk factors related to PPP water projects in Ghana. Twenty essential aspects of risk with a high impact on water PPPs were established. The top-five risks relate to the foreign exchange rate, corruption, water theft, non-payment of bills and political interference. The risk factors that seem relevant to Cambodia's financial risk are as follows:

Non-payment of bills. Non-payment of bills is a significant threat to the sustainability of water services delivery. It was one of the critical risks that threatened the success of Ghana's first country-wide urban water management policy. Non-payment risk has two parts; household and institutional ("capture"). The former refers to situations where residential customers refuse or cannot pay their bills for unfavourable economic conditions, a well-rooted habit of non-payment and poor collection practices. The latter relates to refusal by public/private agencies to pay bills, as is often the case in Ghana. It is a disincentive to private investment. A political commitment is a prerequisite for enforcing strict collection measures, such as service cut-offs and court actions (Ameyaw and Chan 2015b).

High operational costs. This risk results from external (uncontrollable) factors and operator responsibility. The former is attributable to existing pressing economic conditions in the country, such as foreign exchange rate movements, inflationary pressures, soaring energy prices, and reduced raw water quality. Combining these economic factors explains partly the high operational costs associated with water services delivery. Water supply services are highly dependent on energy and vulnerable to price volatility. Energy cost accounts for over 20 per cent of a water company's total operational expenditure. They observed that the energy component to total supply cost for urban water systems is 29 percent; total operational costs/m3 of water supply is US$0.44 for urban water systems, and the energy cost/m3 of water supply for urban systems is US$0.13. Thus, in Ghana, energy electricity and diesel is a significant component of water service total costs, given the frequent changes in local and international economic conditions (Ameyaw and Chan 2015b).

Inflation rate volatility. Inflation rate fluctuations are of much concern to private investors and lenders due to their financial exposure and project profitability, especially in developing countries. The current inflation rate in Ghana stands at 11.8 for July 2013, an acceleration for six consecutive months. Critics argue that this partly explains the current skyrocketing interest rates, continual depreciation of the cedi to major foreign currencies and slow economic growth. In a PPP project, inflation risk raises the cost of production and operation and impacts loan repayment. For example, in 2006, the cash income of GWCL barely supported its expenditure due in part to high annual inflation of around 10-15 percent (Ameyaw and Chan 2015b).

Construction time and cost overrun. The most critical risks in PPPs include construction time and cost overruns (Akintoye *et al.*, 2003). The construction time and cost overrun risk ranked tenth, with the probability and consequence scores of 4.50 and 5.03, respectively, and an impact value of 4.76. The reasons could be unpredictable inflationary trends that aid inaccurate construction cost predictions, difficulties securing land-use rights and planning approvals for complex projects such as water treatment plants, and fiscal space problems. Completion risks result in cost escalations and additional finance, delayed maturity period, and high interest from untimely loan repayment. Cost escalations due to completion risk at the engineering and construction phase impose high tariffs, resulting in reduced demand and (potential) public resentment in the operational phase (e.g. Yuvacik BOT water scheme, Turkey) (Ameyaw and Chan 2015b).

Utilities (electricity) risk. Utilities (energy/electricity) necessary for constructing and operating a water supply system may be unavailable or unreliable. Ghana's energy crisis has been described as chronic, with an erratic electricity supply that affects potable water production and distribution. In urban settings, water services primarily depend on the national grid and, therefore, the frequent and unannounced power breaks result in

interruptions in service delivery. Under Ghana's first country-wide urban water management policy, widespread load shedding, persistent power outages, and low voltage meant that reliable water supply within many service areas could not be guaranteed. It explains why the experts rated the risk (Ameyaw and Chan 2015b).

Interest rate risk. If a project company has high leverage, a floating interest rate on its debt is not viable for lenders and investors. It makes the operating company financially vulnerable to changes in interest rates, potentially threatening profits and the provision of public water services under the PPP contract. It is explained by the weaknesses in the financial systems and rising commercial bank prime lending rates of 18.20 and 25.10 per cent in 2011 and 2012, respectively. For example, the Ghana Commercial Bank's base rate per year stands at 21.76 percent. It potentially influences both costs and funding availability for PPP projects in the country. However, given the underdeveloped local capital market, PPP projects will involve numerous foreign financing (Ameyaw and Chan 2015b).

Water pricing and tariff review uncertainty. The risk has declined in importance over time. The mid-late 1990s structural reforms have resulted in the divorce of policy formulation, service provision and regulation for the sector. The establishment of PURC has reduced the degree of political infiltrations in tariff setting and adjustment for water services (Ameyaw and Chan 2015b).

Financing risk. The root of the issue is how to fill the already massive gap between sector needs and financial resources. The available estimate shows that US$1.49 billion is needed to expand urban water infrastructure to meet demand by 2020, and another US$811 million is required to complete an access rate of 85 per cent by 2015. The risk ranked 18th, with moderate probability, high severity and high impact scores of 4.15, 4.93 and 4.52, respectively. The main risk is inaction or no investment, reflecting private underinvestment in the sector. The high-risk perception level could explain this in Ghana's water; reluctance of transnational companies to provide sizeable funds in developing countries following negative experiences regarding private investment; and immature local capital markets for long-term domestic debt financing for PPP infrastructure projects. Local commercial banks are not only unwilling to offer long-term debt financing but also inexperienced in large-scale project financing. Raising private finance for future PPPs must be based on sound contractual structures and fair risk allocations with enhanced credibility for water projects to enable good judgement from the financial market (Ameyaw and Chan 2015b).

Design and construction deficiencies. Design and construction quality are among the most critical risks in PPPs. The risk ranked 15th with overall impact, probability and severity scores of 4.56, 4.05 and 5.13, respectively. The experts perceived that water projects are highly sophisticated to design and construct because of severe public health and environmental consequences. Therefore, failure to meet design and construction standards has dire implications on the operational phase, including a project's failure to meet water quality standards and acceptance testing, operational difficulties, high operation/ maintenance costs, additional costs, and imposition of fines (damages) possible disputes between project stakeholders. Design and construction deficiencies may result from selecting inefficient design consultants and contractors (Ameyaw and Chan 2015b).

3. Water supply businesses in Cambodia

Water supplies can be roughly categorised into two groups – those offering water distribution to users or clients by a service provider and those managed and operated directly and independently by households. Despite the recent development and growth of water services, most rural households remain to secure water for their everyday needs by employing traditional non-serviced approaches (68 percent) (NIS, MOP 2018)). These include tube or dug wells that access groundwater aquifers, rooftop rainwater harvesting and storage systems, and

natural or constructed surface water bodies (ponds, rivers, or lakes). Tube wells might be classified as either a serviced supply (i.e., public wells run by a local committee) or a private supply (privately-owned wells) (WaterAid, n.d.).

Household water treatment is a relatively common practice in rural Cambodia, boiling the most widely practised practice. Water purification products were promoted or available in some marketplaces for over a decade (NIS, MOP 2018). These filtration products (mineral pot filters) are reportedly imported from nearby countries. In contrast, others are produced in Cambodia (such as ceramic and bio-sand filters) (Brown et al. 2012).

Over the previous decade, many of Cambodia's 12 million rural populations faced changes to their water supply practices (NIS, MOP 2018). According to the CSES 2017, about 27% of rural households purchased water from a service provider –most commonly from a piped water supply (PWS) system or a bottled water distributor, compared to only 11% in 2009. These changes resulted from the country's continued economic growth, increased household disposable income, and the appearance, consolidation, and expansion of water supply services. PWSs existed in some rural parts of Cambodia and were managed and run by entities typically private and may be licensed or unlicensed (SEVEA 2017). Water suppliers (such as locally functioned bottled water kiosks and informal water distribution merchants) extended their presence in rural regions. Water kiosks usually pump water from a water source, treat it, and store it, distributing it in 20-litre plastic containers. More informal water distribution services (such as tanker trucks, carts, and for-hire pumps) were also common – and frequently operated to meet temporary water demands during the dry season (WaterAid, n.d.).

3.1 Piped water supply

Rural PWSs are an improved water supply, and although overall coverage remains low (16%), it is increasing moderately year by year. Significant potential for growth remains - as indicated by low-moderate coverage rates within the licenced areas and a high proportion of the rural population estimated to be living in viable regions (60%) compared to the overall level of coverage (16%) (WaterAid, n.d.).

In addition to the 13 existing public urban water utilities, there are approximately 530 private PWS operators in urban and rural Cambodia that are known to the regulatory authority (MISTI) and the Cambodia Water Supply Association (CWA) (CWA 2018). About 350 private operators are categorised as Small Water Enterprises (SWEs) (GRET and ISEA 2017), typically serving small towns and rural areas. However, there is no distinction in the licensing and regulation of SWEs versus larger public and private operators. Households can only secure PWS services in locations where a connection to the distribution network is viable. In such areas, connectivity is influenced by the affordability of connection fees and tariffs and the willingness to change water habits (WaterAid, n.d.).

3.1.1 Supply chain mapping

Many actors provide the supporting functions for rural piped water supply, including MISTI and MRD, Donors/NGOs, financial institutions, local authorities, material suppliers, electricity suppliers, and raw water resources.

Many actors are involved in the setting up and operating of rural water supply. MISTI and MRD are the governmental bodies regulating, monitoring, and licencing the pipe water supply operations. At the initial stage, local authorities, donors, and NGOs play significant roles in setting up the piped water supply in rural areas, which are not very attractive for private investors to invest in the startup of these businesses independently. Many NGOs and donors provide technical assistance and seed funds, grants or subsidies, which partially cover the total

capital required, to local people to start pipe water supply enterprises. So, these enterprises also need additional money derived or borrowed from personal savings, friends, families, and finance institutions.

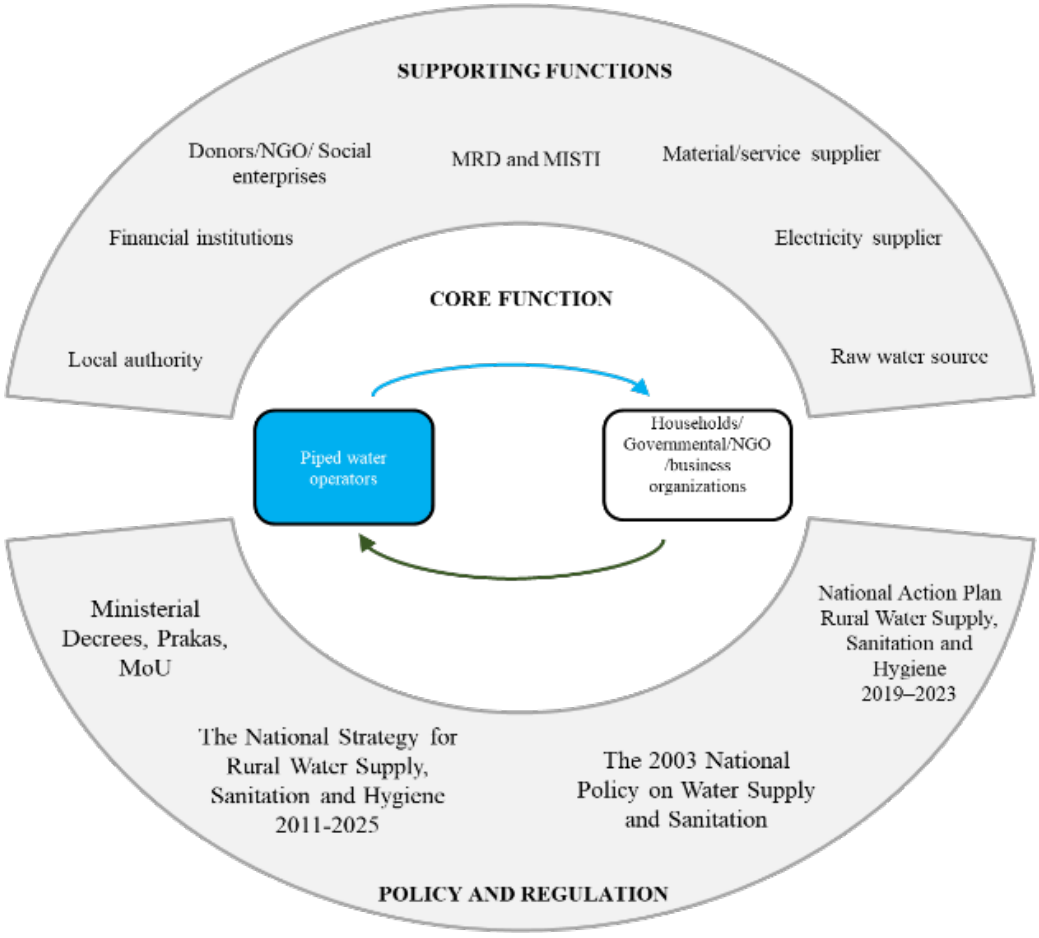

Figure 1: Rural piped water supply: supply chain.Source: Author's illustration based on the literature review and Market System Mapping of People in Needs organisation

After they have enough funds, investors need to identify the natural water sources that can provide constant raw water throughout the year. Then they need construction materials and services to design and build their water production system, including a water treatment plant, water storage tank, water tower, and pipe network. These can be sourced from local and national material and service suppliers and supporting organisations. Operators need materials and services such as chemicals and electricity at the operational stage.

Manly policies and regulations have been formed to govern the water supply, namely Ministerial Degrees, Prakas, and MoU, The National Strategy for Rural Water Supply, Sanitation and Hygiene 2011-2025, The 2003 National Policy on Water Supply and Sanitation, National Action Plan Rural Water Supply, Sanitation and Hygiene (2019–2023).

3.1.2 Associated costs

Two antagonising elements ponder the economic viability of WSPs. On the one hand, the need for significant initial investment, Capital Expenditure (CAPEX) of 720,000 USD on average, from the private sector limits the ability to implement this model on a large scale. But on the other hand, once the station is up and running, low fixed costs ensure quick economic viability for the operators.

However, despite the need for a significant initial CAPEX, the number of functioning stations points to the particular viability of the model for all scale operators. SEVEA (2017) stated that the WSPs could bring a form of solution to economic viability (SEVEA 2017). SEVEA (2017) provides short case studies of three different economically viable operators. Operator 1 was feasible because it was an easily accessible water source (the Tonle Sap) and in high demand. It planned to expand its coverage to another commune with financial support from two donors for soft loans. UNICEF also supports this WSP, which subsidises 50% of fee connection for poor households. Operator 2 faced many constraints, such as a lack of access to a water source in his coverage area and a sparsely populated service area. Despite the many difficulties, Operator 2 has grown its number of connections, from 300 in 2015 to 750 in 2017. He decreased the connection fee to half the price set by the MISTI and allowed people to pay at a rate of US$ 5 per month with no additional cost. The business of operator 3 was sustainable, but the WSP will not be able to expand its coverage area because all neighbour communes with potential are licensed already, and the two remaining communes have too many constraints to present any economic interest.

Three significant costs are associated with the piped water supply operation to construct the water production system, pipe network, and daily operation. They include:

(1) Investment costs of the water production system comprising investment costs for the water treatment plant, storage tank, and water tower. However, few operators build a water tower because they have already built a water storage tank and still pumper to pressurise water distribution.

(2) Pipe network investment costs, including pipe purchase and installation and trench digging costs.

(3) Operation costs include Chemical, Energy, Maintenance, Salary (total), and general admin expenses. In Cambodia, where most networks use diesel to power pumps and generators, energy accounts for 65 percent of average costs; for networks wholly reliant on diesel, energy represents 74 percent of average costs. Labour accounted for 17 percent of the total cost, while the maintenance cost was 13 percent, and the rent was 5 percent (Sy, Warner, and Jamieson 2014).

The WSP operators build their network through personal financial commitment. The needed sum to invest in such an operation, of hundreds of thousands of dollars, means that these operators were already wealthy enough most of the time. Indeed, with collaterals needed for a loan that ranges from 100% to 300% of the amount, it is clear that the operator who invested in them already had his investment capacity.

3.1.3 Financial risks

SEVEA (2017) found that the economic viability score of piped water suppliers in Cambodia was three on a scale of 4, indicating that they are economically sustainable. However, there is still a lot of improvement. This rating is likely based on the authors' observation and personal evaluation rather than any mathematic calculation. Recent figures on small water enterprises' functional and full cost recovery are not available. Historical figures have shown that most operators have been profitable (83%) and achieved operational and full cost recovery (Sy, Warner, and Jamieson 2014). Insufficient data exist on current sustainability conditions. Ministry of Industry,

Science, Technology and Innovation (MISTI)'s recent Prakas[1] on water tariffs aim to ensure full cost recovery and depend on small water enterprise's efficiency and performance.

Some **sustainability risks** have been identified, including high-interest rates, low revenue during the rainy season, the cost and quality of the water production system (Sy, Warner, and Jamieson 2014), and high energy costs (CWA 2018; Sy, Warner, and Jamieson 2014).

High-interest rates.

In Cambodia, where borrowing from formal financial institutions is widespread, enterprises expressed concern about collateral requirements and (to a lesser degree) interest rates. Commercial banks require that loans be collateralised with land or buildings, typically at a value of at least 130 percent (Sy, Warner, and Jamieson 2014).

Low revenue during the rainy season

In Cambodia, sales of minimal networks (fewer than 750 connections) during the rainy season are half what they are in the dry season. More extensive networks experience about a 25 percent drop in sales in the rainy season. During the rainy season, 75 percent of households with a network connection also used rainwater (Sy, Warner, and Jamieson 2014).

Limited demand for water services

Similarly, Grant et al. (2018) found that low demand for water services included lower demand from customers through the rainy season and the perceived need for increased community understanding of the importance of clean water, increasing the demand for services. It reported that lower water levels were consumed during the rainy season (which reduced profits). It 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 the importance of clean water. They still use a lot of well water.

The cost and quality of the water production system

An important determinant of service quality and financial viability is the cost and quality of the water production system. Both are affected by the supply chain for design and construction inputs. In Cambodia, The market for materials and equipment is well developed, with competitively priced and reasonably reliable materials imported from China and Thailand. The problem is that few local companies can provide professional consulting services for design, construction supervision, or monitoring systems. International consultants with these capabilities are available, but they cater mainly to larger firms that build and operate urban water systems. Local enterprises cannot afford their services. Sixty percent of the enterprises surveyed did their design work, and three-quarters built network facilities themselves or used local tradespeople and labourers (Sy, Warner, and Jamieson 2014).

High energy costs

Energy is one of the utmost vital parts of operating costs. It is particularly costly for diesel operations to power generators and pumps. In Cambodia, where most networks use diesel to power pumps and generators, energy accounts for 65 percent of average costs; for networks wholly reliant on diesel, energy represents 74 percent of average costs. Unreliability of power supply affects the ability of firms to deliver a consistent level of service to their customers. In Cambodia, networks with connections to the grid experienced 30 outages per year (Sy, Warner, and Jamieson 2014).

[1] Prakas is a Cambodian term which means official proclamation. It is a ministerial or inter-ministerial decision signed by the relevant Minister(s). A proclamation must conform to the Constitution and to the law or sub-decree to which it refers.

Customers not paying on time

Similarly, Grant et al. (2018) also stated that customers not paying on time are financial barriers for water supply entrepreneurs.

High investment cost

For WSPs, the main barrier is the initial investment. It requires a large amount of savings and personal investment to be able to start the business. However, once it is operational, the nature of the costs, for a significant part variable (around 70%) and linked to the production of water, makes it easier for them to reach breakeven every month.

3.1.4 Regulation, institutional structure and governance structure

The Department of Rural Water Supply governs the water supplies utilised by rural Cambodians in the Ministry of Rural Development (MRD). In addition, the Department of Potable Water Supply (DPWS) in the Ministry of Industry, Science, Technology & Innovation Industry and Handicrafts (MISTI) had the same responsibility (SEVEA 2017; MRD 2019). The Government of Cambodia intends to ensure that 100% of rural HHs have sustained access to a safe water supply by 2025 (MRD 2019). DPWS is in charge of the oversight of PWSs and private bottled water operations across the country – and their engagement in RWS has become increasingly important and relevant as PWS coverage has expanded rapidly in rural areas in recent years. Rural water kiosks fall under the authority of MRD as a community-managed water supply and under MISTI as a bottled water producer. However, no clear institutional mandate for regulating rural kiosks remains, and they are not yet formally controlled or monitored (WaterAid, n.d.).

While MISTI regulates piped water supply services, a government decree has been issued that states that non-private (mostly community managed) piped water supply that operates in rural areas is under the authority of MRD. Such public and small-scale piped water supplies are rare, but their prevalence is increasing due to interest from donors and NGOs. Little is known about their functionality, sustainability, and service levels[2]. (WaterAid, n.d.).

Regulation Licensing coverage is rapidly increasing in rural. 61% of small water enterprises (SWEs) in rural areas were licensed (up from approximately 33% in 2011), with most non-licensed SWEs having their licensing application in progress (AFD 2017).

Some qualitative evidence has emerged indicating that the burden of regulation – including tariff caps and heavy administrative requirements – is an issue (Grant et al. 2018). Government and regulation issues were also rated as significant challenges, with entrepreneurs reporting a lack of policies and regulations that supported their management of water supply schemes. Three entrepreneurs said that government regulations regarding water tariffs were challenging or complicated. 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 is so complicated which has placed some constraints on my water service'. Both the national and provincial-level stakeholders also perceived the role of government as necessary, with one provincial government interviewee stating that challenges for women in managing a water

[2] Functionality refers to Dysfunctional and/or abandoned systems, Frequency and duration of service outages, and amount of water losses. Sustainability refer to financial viability or profitability and operational and full cost recovery. Service levels cover accessibility, reliability, quality, and quantity of the water supply.

supply scheme included a lack of 'outside support such as regulation and administration'. Commune-level stakeholders did not rate this challenge as highly as the other interviewees (Grant et al. 2018).

Efforts to license all SWEs are ongoing and sector-wide compliance with national laws will require continued monitoring, capacity assessment, capacity development, and targeted investments. MISTI has recently initiated a Management Information System (MIS), but in practice, only been deployed for larger (typically urban and public) systems. (WaterAid, n.d.).

3.2 Water kiosks & packaged/bottled water

Figure 2 shows three different models of the 20-litre bottle market and how they distribute their products, including large-scale private enterprises, family-owned businesses, and community kiosks. Bottled or packaged drinking water is an improved water supply by international standards but an unimproved water supply by Cambodian standards (NIS, MOP 2018). There is no regulation of family-owned businesses and kiosks in Cambodia, and the responsibility is of the facility operators (and NGO platforms) to monitor water quality. Water quality conditions at some kiosks have been independently evaluated by provincial authorities and UNICEF and revealed the presence of significant microbiological contamination in some samples taken from both the treatment systems and the 20 litres jugs themselves (WaterAid, n.d.).

3.2.1 Large-scale private enterprises

Large-scale private enterprises account for a substantial portion of the 20 litres bottle market, focusing on high demand parts of the countries. They sell around 100,000 20 litres of bottles in Phnom Penh and approximately 50,000 per month. The bottles are distributed through local retailers able to order between 30 to 150 bottles per customer (i.e. retailers located in urban areas, primarily provincial towns). The delivery starts only at a total order value of a minimum of 1,000USD to 1,500USD (SEVEA 2017).

3.2.2 Associated costs

These companies are likely medium or large enterprises and have a wide range of associated startup costs and daily operation expenses like other private companies.

The startup costs include Equipment, Incorporation fees, Office space, Inventory, Marketing, Website, Office furniture and supplies, Utilities, Payroll, and other expenses.

Operating costs are related to the maintenance and administration of an enterprise on an everyday basis. Operating costs contain direct costs of goods sold (COGS) and other operating expenses—often called selling, general, and administrative (SG&A)—including rent, payroll, other overhead costs, and raw materials and maintenance expenses. Operating costs exclude non-operating expenses related to financings, such as interest, investments, or foreign currency translation (Investopedia n.d.).

The particular cost of large-scale businesses to supply 20-litre bottled water includes constructing a water production system containing a water treatment plant, water bottling equipment and machines, and distribution vehicles (trucks). These companies are likely medium or large enterprises and have a wide range of associated startup costs and daily operation expenses like other private companies.

Considering they are the sole owner of their businesses, an essential part of the profits (an average of 2,000 USD per month for small operators to 11,500 USD for large ones) come back to them, even if some is dedicated to future investments in the business (SEVEA 2017).

3.2.3 Financial risk

20-litre bottles' market constraints and low profits

Indeed, selling small bottles is much more interesting because they are 8.5 times more expensive, easier to transport and free from constraints such as the deposits and washing of the 20L bottle. Moreover, there is always a risk that 20L bottles will not be given back and the centralisation of treatment plants in Phnom Penh increases the cost of transport in outer regions. So, large-scale companies can't compete with family businesses which sell in rural areas.

Stringent rule on deposits

Large-scale companies have a stringent rule on deposits, and its high price, 4 USD, can be unaffordable for poor populations. Family businesses are more prevalent in impoverished areas. They are cheaper and can often cut costs on the bottle deposit to less than 2 USD because of their geographical proximity with their customers and less firm rules.

The cost and quality of the water production system

These companies have water treatment plants and may face similar risks as the piped water supply. An important determinant of service quality and financial viability is the cost and quality of the water production system. Both are affected by the supply chain for design and construction inputs. In Cambodia, The market for materials and equipment is well developed, with competitively priced and reasonably reliable materials imported from China and Thailand. The problem is that few local companies can provide professional consulting services for design, construction supervision, or monitoring systems. International consultants with these capabilities are available, but they cater mainly to larger firms that build and operate urban water systems. Local enterprises cannot afford their services. Sixty percent of the enterprises surveyed by Sy, Warner, and Jamieson (2014) did their design work, and three-quarters built network facilities themselves or used local tradespeople and labourers.

High energy costs

Energy is one of the greatest components of operating costs. It is particularly costly for diesel operations to power generators and pumps. In Cambodia, where most networks use diesel to power pumps and generators, energy accounts for 65 percent of average costs; for networks wholly reliant on diesel, energy represents 74 percent of average costs. Unreliability of power supply affects the ability of firms to deliver a consistent level of service to their customers. In Cambodia, networks with connections to the grid experienced 30 outages per year (Sy, Warner, and Jamieson 2014).

Regulation and governance

Commercial water service providers are likely under the supervision of the MISTI. In the province, the provincial Industry, Science, Technology, Innovation department controls the Commercial water service providers.

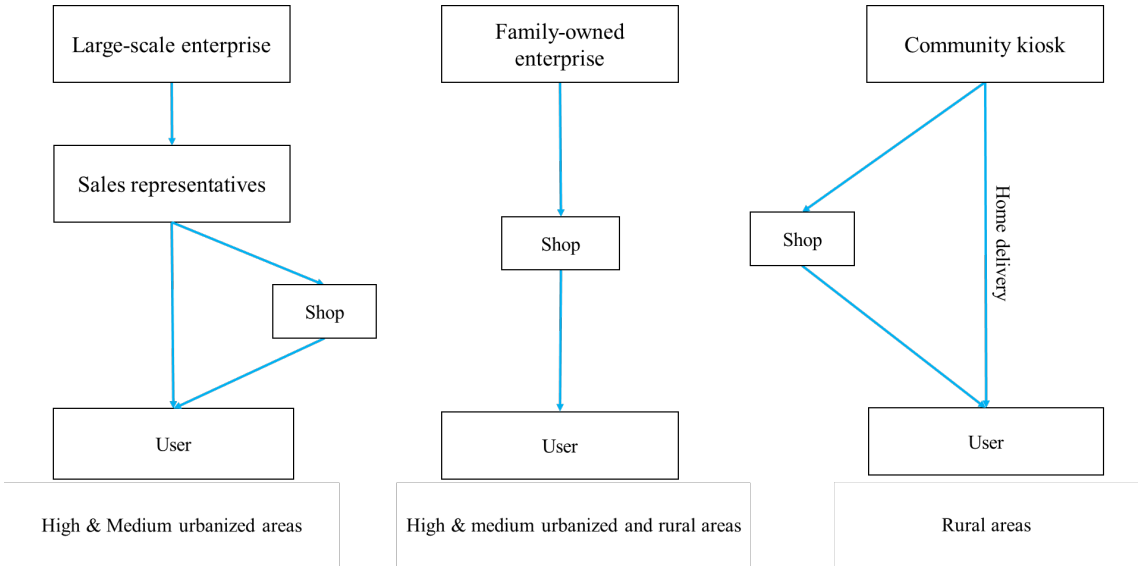

Figure 2: 20 litres bottled water supply chains. Source: SEVEA (2017)

3.3 Family-owned enterprises

The family-owned business of bottled water (micro-small scale) sells 20L bottles to local grocery shops and deliverers: Ownership and management by a private entrepreneur, local production and local business to business distribution.

3.3.1 Associated costs

They have flourished due to the low price of the initial investment (5,000USD to 8,000USD for a lower-end water treatment station allowing to process 1,000 litres per hour) and cheap labour as they often work in families. Big companies have a strict policy on deposits, and its high price – 4USD – can be prohibitive for poor populations. Family enterprises are more prevalent in impoverished areas. They are cheaper and can often cut costs on the bottle deposit to less than 2USD due to their geographical closeness to their customers and less strict regulations.

3.3.2 Financial risk

Lack delivery systems

Family-owned enterprises are constrained to small scales since they lack delivery systems, so they cannot serve customers beyond 40 km from their production location. Therefore, it is hard to approximate the number and the actual share of family enterprises in the 20-litres bottled water market) (SEVEA 2017).

Intense competition with other family enterprises

They have little opportunity for expansion because they were restricted by intense competition with other family enterprises, low-income potential clients who cannot afford bottled water in some rural areas, no long-term business or action plan, an inability to reach new customers as they have no delivery system, a limited capacity of production per treatment unit (between 1500 and 3,000 bottles per month) (SEVEA 2017).

Likely low water quality

Although the water distributed is more likely to be safe initially, the critical lack of regulation for the family business and the necessary regular and not-so-obvious maintenance that must be regularly performed does not ensure the water's quality. Some of them may cut expenses on the treatment to be able to have very competitive prices (around US$ 0.45 in rural areas), which may also lead to low quality.

The cost and quality of the water production system

The family businesses have water treatment plants and may face similar risks as the piped water supply. An important determinant of service quality and financial viability is the cost and quality of the water production system. Both are affected by the supply chain for design and construction inputs. In Cambodia, The market for materials and equipment is well developed, with competitively priced and reasonably reliable materials imported from China and Thailand. The problem is that few local companies can provide professional consulting services for design, construction supervision, or monitoring systems. International consultants with these capabilities are available, but they cater mainly to larger firms that build and operate urban water systems. Local enterprises cannot afford their services. Sixty percent of the enterprises surveyed did their design work, and three-quarters built network facilities themselves or used local tradespeople and labourers (Sy, Warner, and Jamieson 2014).

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Regulation

Although the water distributed is more likely to be safe initially, the critical lack of regulation for family enterprises and the necessary regular and not-so-obvious maintenance that needs to be regularly performed do not ensure the quality of the water. As MISTI does not license most family enterprises, they are not underwater quality regulations. As a result, some of them may reduce expenses on the treatment to have very competitive prices (around 0.45USD in rural areas). Family enterprises represent significant potential in terms of access to 20-litre bottled water. Still, as long as no regulatory framework and no capacity building is implemented for these actors, such actors can hardly be considered suppliers of drinking water (SEVEA 2017).

3.4 Water kiosks

Teuk Saat 1001 (TS1001) and other NGOs have supported water kiosks. Teuk Saat 1001 is a local NGO that works to implement to sell 20L bottles of water in the partnership with 1001fontaines. For the past 15 years, 1001fontaines had initiated and optimised a water kiosks model, enabling the decentralised production of safe drinking water sustainably. 1001fontaines acted as the head of the project's network, with a global team supporting the local units with strategic guidelines, knowledge transfer, advocacy and partnership establishment. National entities are set up as franchising organisations. They guarantee the successful placement of new kiosks and the endurance of service in the long term. The regional platforms were the offices supportive of existing water kiosks by distributing various services in return for a

proportion of the revenues (in other words, "franchising fees"). Water kiosks were set up directly in underserved areas. They are entrusted to local entrepreneurs trained by the local teams to purify local water sources to strict World Health Organization standards and deliver the distilled water in reusable 20-litre bottles to the consumers' homes. In Cambodia, 1001fontaines depended on its local collaborators, Teuk Saat, to achieve the two-fold mission of growing the country's footprint and backing the current water kiosks. The number of supported kiosks increased significantly from 134 in 2015 to 258 in 2020. And it is projected to increase to 420 in 2025. The percentage of water kiosks still in operation since 2005 was 82% (1001FONTAINES, n.d.).

3.4.1 Associated costs

Investment costs to set up the treatment station are US$ 25,000 per station on average, of which mostly around 75-80 percent are granted by the supporting NGOs and about 15-20 centres covered by the commune. Costs & Expenses were high fixed costs brought by salaries, and platform fees make the breakeven hard to reach for entrepreneurs (SEVEA 2017). TS1001's sites do not need to worry about CAPEX, subsidised by international grants. It is harder for them to reach their breakeven, considering that around 85% of their expenses are fixed costs (largely salary and platform fees). This explains why TS1001 can get more isolated zones through initial external investment and the absorption of losses by the NGO while the business is still scaling up. With half of their stations generating a loss, their system only becomes possible when they are monitored and helped by the platforms and headquarters in Phnom Penh. Without this opportunity, it is harder for WSPs to risk themselves in more challenging communes (SEVEA 2017). The local entrepreneurs managing the kiosks only make around an average of 150USD per month, revenues.

3.4.2 Financial risk

Sustainability to date appears to be high, but longer-term risks remain. NGO-initiated kiosks have reportedly achieved operational cost recovery (SEVEA 2017). 78% of the water kiosks founded in 2005 reached financial self-sustained, which meant they could cover all their operating expenses, including salaries, water production and delivery, consumables, franchise fees, etc. Teuk Saat actively supports the remaining 22% to develop their businesses and engage new consumers. After 15 years of progressive placement, the Teuk Saat franchise had become financially sustainable. This was due to the critical number of 258 water kiosks in 2020, providing the required income to cover the operating costs of the regional and national support offices (1001FONTAINES, n.d.).

Relying on NGO's financial support and Low ability to scale-up independently

TS1001 has a hybrid business model, with NGOs taking care of the CAPEX but financial independence for stations afterwards. Revenues are based on the sale of water, with the sale of bottles compensating the investment. Costs & Expenses: High fixed costs brought by salaries and platform fees make the breakeven hard to reach for entrepreneurs. While the TS1001 kiosk model, which has been improved over the years, seems to be operational now (with only one site opened after 2012 to have closed), it still relies on international funds to cover all its initial CAPEX. Moreover, one-third of the water kiosk supported by TS1001 is not viable and survives on NGO funds while gaining economic viability. This dependency on external funds, without which the system would not be sustainable.

A capacity for replication facilitated by a model had been tested and improved multiple times by the NGO, improving the process over time. But in the actual model, replication is possible only on NGO funds, as they cover the total CAPEX or each new station opening. Finally, constraints will appear with a progressive status change, when the Supporting NGO's overview will disappear, and the branch will lose its NGO advantages. With a full ability to scale up on a national level, currently planning 30 new stations every year until 2020, Teuk Saat seems fully operational on this point. However, the model has its limits, with a high dependency on international funds and outside support that is meant to fade at one point, but also a failure to scale up on the minor scale that prevents the project from reaching its full potential, thus justifying their average mark (SEVEA 2017).

Regulation:

Both NGO-initiated and private water kiosks are not yet regulated in Cambodia. Institutional arrangements have not been defined, including separations between NGO-initiated and privately-initiated facilities (WaterAid, n.d.). Water kiosks are primarily NGO supported projects. There are few effects of the lack of regulation on revenue and cost because they are monitored and subsidies by the supported NGOs.

3.5 Vendor/tanker truck cart

Water delivery services represent an unimproved water supply. National coverage is reported as 9% (NIS, MOP 2018), but this figure also includes bottled water kiosks. A survey in 2012 did separate kiosks and delivered water and revealed that very few HHs rely on delivery services as the primary water source (WHO and MRD 2013). Water delivery services may take many different forms, including delivery by tanker truck, motorised cart, pushcart, or for-hire pumps (that transport nearby surface water over a distance into HH storage jars and tanks) (MRD and UNICEF 2010). Vendors may not be accessible to the customer when needed, as they may not be based within their community and may only operate temporarily when demand exists. Water delivery services are also costly due to transportation costs associated with moving large volumes of water (WaterAid, n.d.).

3.5.1 Associated Costs

The associated cost includes the cost needed to buy/rent transporting vehicles/equipment such as tanker trucks, motorised carts, pushcarts, or for-hire pumps (WaterAid, n.d.).

3.5.2 Financial risk

Water delivery service providers tend to operate temporarily when and where demand exists. Unstable demand is the most like financial risk (WaterAid, n.d.). By their very nature, water delivery services are often temporary and not available on-demand. Therefore, their operations cannot be consistently relied upon by their customers year-round in most circumstances. Complaints of delays between the time when an order is placed and when it arrives at the HH have been reported (WaterAid, n.d.). Such services rarely constitute a household's primary water supply but become active in the dry season (and even more so towards the end of the dry season) when local water supplies in some areas dry up (such as shallow wells and ponds)

3.5.3 Regulations

Water delivery services are not regulated in Cambodia. Monitoring None Water delivery services are not monitored in Cambodia (WaterAid, n.d.)

4. Latrine supply chains in Cambodia

WSP, The World Bank (2008) assessed the supply chains for sanitation facilities and services in rural and peri-urban areas in Cambodia. The study areas were rural areas of Siem Reap and Svay Rieng provinces and peri-urban regions of Phnom Penh and Kandal. They include a range of socio-economic and environmental conditions that broadly represent rural and peri-urban areas in Cambodia. Figure 3 shows the Latrine supply chain of this report.

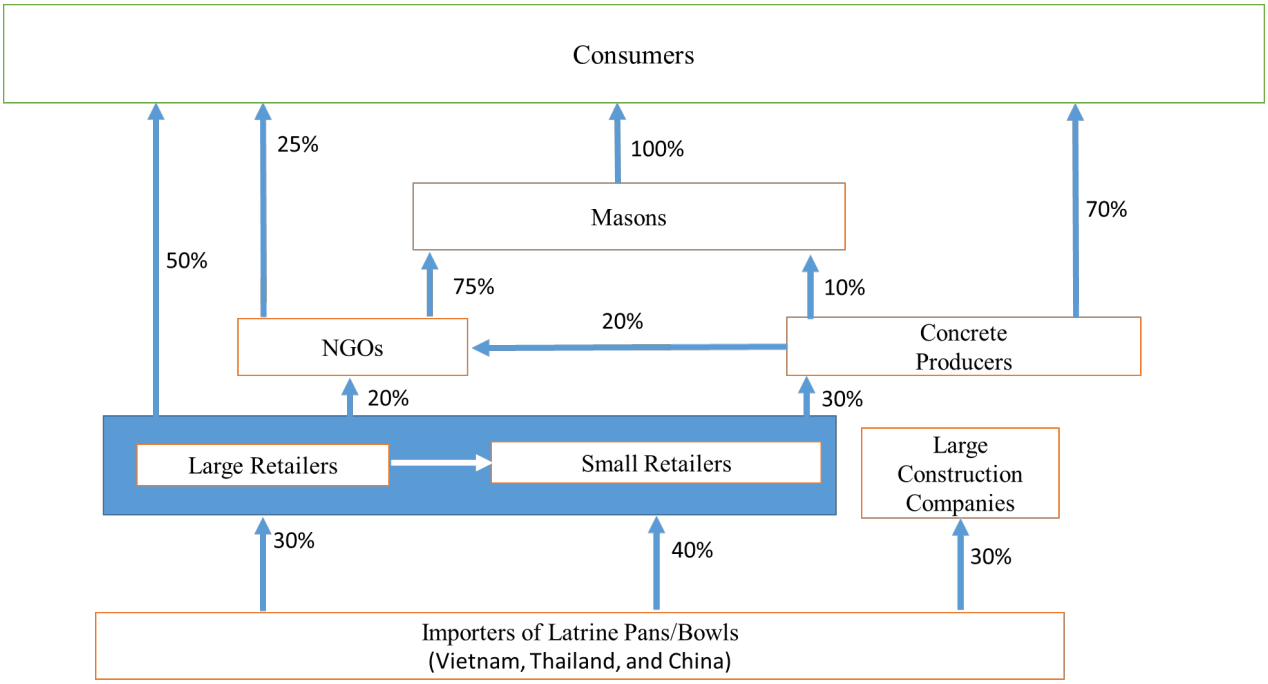

Figure 3: Latrine supply chain in Cambodia. Source: WSP, The World Bank (2008)

4.1 Importers and wholesalers

Latrines are made from a large number of components. Depending on latrine design, these can include concrete, bricks, sand, gravel, PVC piping, zinc sheeting, ceramic pans, and tiles. Many of these components are imported, typically from Thailand or Vietnam and China. Cement, bricks, sand and gravel are also produced locally. These products are supplied nationally by large importers/wholesalers.

Importers and wholesalers are companies that import construction materials (e.g. cement, ceramic pans, PVC tubing, galvanised steel sheet, tiles, etc.) from outside Cambodia for wholesale in the country. They sell to retailers and construction projects and might also sell small amounts directly to clients. Latrine components are usually a minor part of their product variety. The importers and wholesalers were far remote from the end consumers and traded their products – essentially construction commodities – with limited understanding or interest in their end-use (WSP, The World Bank 2008).

These companies include Chip Mong Group, Peng Huot Co., Heng Asia, BPC Co., K Cement, etc., based in Phnom Penh but have networks of warehouses and trucking fleets. They arrange delivery to their

customers in the provinces, have sales staff, and do marketing. They advertise extensively. Some also run annual "workshops" in Phnom Penh, where significant customers are invited to learn about new products, promotions or distribution schemes.

Importers and wholesalers supplied 30 percent of their products to large retailers, 40 percent to small retailers, and 30 percent to large construction companies (Roberts, Tanner, and McNaughton 2007).

4.1.1 Assocaited costs

These companies are likely medium or large enterprises and have a wide range of associated startup costs and daily operation expenses like other private companies.

The startup costs include Equipment, Incorporation fees, Office space, Inventory, Marketing, Website, Office furniture and supplies, Utilities, Payroll, and other expenses.

Operating costs are related to the maintenance and administration of an enterprise on an everyday basis. Operating costs contain direct costs of goods sold (COGS) and other operating expenses—often called selling, general, and administrative (SG&A)—including rent, payroll, other overhead costs, and raw materials and maintenance expenses. Operating costs exclude non-operating expenses related to financings, such as interest, investments, or foreign currency translation (Investopedia n.d.).

4.1.2 Financial risks

The financial risk of importers and wholesalers was the lack of capital for daily operations and enterprise growth. The solution to this risk can be developing linkages with existing credit sources (Banks, MFIs, suppliers, etc.) and providing training in credit management (Roberts, Tanner, and McNaughton 2007).

4.2 Retailers

Retailers are typically family-owned shops in urban or rural markets that sell construction materials, including latrine components. There is usually more than one in each local market, creating a competitive retail environment, especially in the provincial town markets. About 60% of the rural retailers' latrine-pan sales occur in the dry season, coinciding with the local population's post-harvest cash and labour availability.

Sales figures for latrine pans average about seven units per month for rural retailers and some 30 units per month for urban retailers. Latrines only account for a small part of these retailers' total sales activity - latrine-pan sales represent only 3-5% of their total sales. However, they also sell other construction materials required for a latrine. About 50% of their latrine-pan sales are direct to households, about 30% to concrete ring and slab producers who embed them in concrete and re-retail them, and about 20% to NGO sanitation programs. Retailers reported that ceramic latrine pans are heavy to transport and are easily broken during transportation or storage.

No examples of retailers having service contracts with masons to install latrines for retail customers were found. However, when retailers acted as suppliers on contracts tendered by Commune Councils, NGOs, or government and private contractors, some subcontracted or partnered with masons to execute the contract services. It may be possible to extend this 'bundling' of services – retailer and mason roles – to retail customers, especially if they could group to derive multiple latrine constructions under a single contract.

Retailers supply 50 percent of their sales to the consumer, 20 percent to NGOs, and 30 percent to concrete producers (Roberts, Tanner, and McNaughton 2007).

4.2.1 Associated costs

These companies are likely medium enterprises and have a wide range of associated startup costs and daily operations like other private companies.

The startup costs include Equipment, Incorporation fees, Office space, Inventory, Marketing, Website, Office furniture and supplies, Utilities, Payroll, and other expenses. Operating costs are related to the maintenance and administration of an enterprise on an everyday basis. Operating costs contain direct costs of goods sold (COGS) and other operating expenses—often called selling, general, and administrative (SG&A)—including rent, payroll, other overhead costs, and raw materials and maintenance expenses. Operating costs exclude non-operating expenses related to financings, such as interest, investments, or foreign currency translation (Investopedia n.d.).

Large retailers are medium-size businesses operating with proper legal status. They register with either the Department of Commerce and/or the Department of Industry, Mines and Energy. They file tax submissions with the Provincial Department of Taxation. They keep sales or accounting records. This is usually done manually. The enterprises are family-owned businesses with family and relatives in charge of primary operational functions (for example, the wife as general affairs manager, a daughter as accountant/record keeper, etc.). The businesses stock many kinds of products. There are about 600 to 700 different kinds of stock. We estimate that around 20 to 30 of the products stocked are latrine-related supplies, including ceramic pans (different pans), tiles, cement, gravel, galvanised steel sheets, PVC tubes, and bricks. We roughly estimate that these businesses each have total assets of over $100,000, with the largest around $500,000. This includes trucks, cranes, and stock (EMC 2009).

4.2.2 Financial risks

The financial risks of retailers include late or non-repayment of credit (e.g., credit supplied to masons), lack of capital for daily operations and enterprise growth. The solutions are training in credit management and developing linkages with existing credit sources (MFIs, suppliers, etc.) (Roberts, Tanner, and McNaughton 2007).

4.3 Prefabricated concrete producers

Prefabricated concrete producers manufacture and sell such products as concrete rings for wells, water tanks and latrines, and slabs for use in latrine construction. Some larger producers closer to urban areas also sell tiled concrete slabs with embedded ceramic pans. Producers' latrine related sales are the highest among all supply chain members, with about 40% of products used for latrines in rural locations and 65% in urban areas.

A relatively low capital requirement for entry (about $300) and simple skill requirements has permitted many micro-enterprises to set up concrete production. As many as 6-8 concrete producers may be located in a provincial town and 2-to 3 in a rural district.

The prices of concrete latrine components varied significantly from area to area – some areas retailing at double the expense of the other regions, due mainly to the regional variation in the costs of inputs – well-graded sand and gravel vary proportionally to their accessibility. Concrete producers in urban areas are

typically full-time businesses with less pronounced seasonality of demand (about 60% dry season versus 40% wet season). In rural areas, sales are more seasonally variable, with the dry season accounting for about 80% of annual sales. This leads to a seasonal turnover of labour and a less experienced workforce, which may also affect the quality.

Concrete producers provide 70 percent of their product to the consumer, 20 percent to NGOs and 10 percent to the masons.

4.3.1 Costs

We estimate the minimum startup capital for a concrete producer at around $8,000 (for a truck, moulds, and working capital). Although it is possible to enter on a smaller scale – approximately $1,000 in the capital, mainly for moulds – concrete producers said this would be very difficult. They explained that money is required to cover customer credit since customers pay slower than that demanded by suppliers (if suppliers will give credit at all to new producers). Only with a very close relationship with a building material supplier could a concrete producer startup for $1,000. Many larger concrete producers have assets of around $30,000 or more, comprised of a truck with crane, cement mixer, moulds, stock, materials and other equipment (EMC 2009).

Concrete producers are small or micro-sized businesses usually registered with the Department of Industry, Mine and Energy Department. However, we believe not all enterprises registered their business operations. Those who register to pay an annual operating patent but they don't file tax submissions. Concrete producers don't keep sales or accounting records. The enterprises are family-owned businesses with family and relatives employed full-time or part-time. They tend to be reasonably entrepreneurial. We encountered some involved in multiple business activities, including water supply, catering services (for weddings and other ceremonies), and livestock raising (as well as those selling construction materials) (EMC 2009).

4.3.2 Financial risks

The financial risk of importers and wholesalers was the lack of capital for daily operations and enterprise growth. The solution to this risk can be developing linkages with existing credit sources (Banks, MFIs, suppliers, etc.) and providing training in credit management (Roberts, Tanner, and McNaughton 2007).

4.4 Masons

Masons are construction workers who build latrines as a part of their general construction services. They range from (1) skilled masons with advanced masonry and construction skills and who typically lead a construction team, earning $5 - $10 per day (2) Simple masons that have basic skills and would typically work under the supervision of a skilled mason, earning $3 - $4 per day, and (3) labourers who are unskilled workers providing simple manual tasks like digging, mixing, carrying materials etc., earning $1.50 - $2 per day. At present, masons' knowledge of latrine design is deficient due to a lack of formal training. Hence, their ability to communicate latrine design information and choices to consumers is limited. Even with the correct design information, the quality of construction is generally poor due to both cost-cutting and the level of technical ability (WSP, The World Bank 2008). Mason provides 100 percent of its services to the consumer.

4.4.1 Associated costs

There is no cost associated reported in the previous study.

4.4.2 Financial risks

The financial risks include lack of capital for daily operations and enterprise growth, lack of ability to offer customers credit, and suppliers not providing loans due to a lack of trust. The solution to these risks is training in credit management, developing linkages with existing credit sources (MFIs, suppliers, etc.), and establishing an "interest group" among supply chain actors to encourage communication, coordination, and trust (Roberts, Tanner, and McNaughton 2007).

5. Governance structure of water and sanitation in Cambodia

The 2003 National Policy on Water Supply and Sanitation formed the basic principles for delivering urban-rural water supply and sanitation services, together with duties and responsibilities for planning and implementation, standards, and monitoring and evaluation. This policy called for greater private sector involvement, improved cost recovery, cross-subsidies wherever necessary, the autonomy of public utilities, and the formation of a regulatory body. Obligation for the water supply and sanitation services is nevertheless fragmented, requiring cooperation between ministries to continue implementing the national policy principles. While delivery is delegated to provincial waterworks and the private sector, the Ministry of Industry and Handicraft oversees urban water supply. The Ministry of Public Works and Transport supervises urban sanitation, whereas operation and maintenance are under provincial wastewater units. The MRD is accountable for the RWSS provision. The Rural Water Supply, Sanitation and Hygiene Strategy (RWSSHS) of the MRD plans to attain 100% access to affordable, sustainable, and safe water supply and sanitation by 2025 (ADB 2019).

5.1 2003 National Policy on Water Supply and Sanitation

This policy was enacted on 7 February 2003 by the Council of Ministers. The National Policy aims to make the sanitation policy for provinces, cities, and city centres, focusing on choosing available options of sanitation technologies that contribute to the protection and conservation of water and its resources.

The National Policy aims to encourage the people's quality of day-to-day living and welfare. Adequate water supply and sanitation services with low costs and a sustainable, environmentally friendly sanitation system nationwide.

This policy contains three main sections as follows: (1) Clean water supply policy for provinces, cities and towns,(2) Sanitation policy for provinces, cities and town areas (3) Clean water supply and sanitation in rural areas.

Section 1: Clean water supply policy for provinces, cities, and towns aims to find an appropriate solution within the water supply development to ensure service sustainability and provide opportunities for poor people.

Section 2: Sanitation policy for provinces, cities and town areas aims at ensuring the effectiveness and sustainability of investment and processing of sanitation systems, especially installed facilities.

Section 3: Clean water supply and sanitation in rural areas have objectives to (a) enable the enactment of this policy for all stakeholders; (b) detect the development priority in water supply, and rural sanitation and long-term sustainability; (c) create a most suitable methodology to support the programme/initiative targeting clean water supply and rural sanitation; and (d) deliver the services to people.

5.2 National Strategy for Rural Water Supply, Sanitation and Hygiene 2011-2025

The Strategic Objectives of the Strategy are:

1. Water Supply: 50 per cent of the rural population will have access to improved water supply by 2015 and 100 percent by 2025.
2. Sanitation: 30 percent of the rural population will have access to improved sanitation and live in a hygienic environment by 2015, and 100 percent by 2025.
3. Hygiene: 30 percent of the rural population will practice basic safe hygiene behaviour by 2015 and 100 percent by 2025.
4. Enabling environment: By 2015, legal instruments, institutional arrangements, and human resources will become available and expand and sustain services rapidly.
5. Financing: A budget for capital and recurrent expenditure will be in place.

5.2.1 Strategic Components of the Strategy

Strategic Objective 1 – Increasing access to sustainable improved water supply services

Component 1.1 – Increase in access to water supply services

- Provide a new water supply facility using funds from the government, donors and the community
- Rehabilitate existing infrastructure using funds from government, donors and community
- Identify more appropriate technology
- Encourage the private sector

Component 1.2 - Application of water quality standards

- Develop procedures for water supply scheme to conform to water quality standards:
- Promote water quality safeguard

Component 1.3 – Improvement in operation and maintenance

- Promote community O&M

Component 1.4 – Increase in markets for WASH products

- Improve the WASH supply chain

Strategic Objective 2 – Increasing access to improved sanitation

Component 2.1 – Increase in access to sanitation

- Promote uptake and use of latrines
- Promote the variety of sanitation options

Component 2.2 – Improvement in operation and maintenance

- Promote household O&M
- Develop pit emptying service

Component 2.3 – Improvement of sanitation in schools, health facilities and other rural institutions

- Promote school sanitation and hygiene
- Promote sanitation in health centres
- Manage waste safely

Strategic Objective 3 – Improving hygiene behaviour

Component 3.1 - Hygiene promotion

Increase awareness of people in practising safe hygiene

Strategic Objective 4 – Achieving sustainable services

Component 4.1 – Improvement in sector Management

- Develop a plan for institutional improvement
- Coordinate, manage and monitor service delivery at the district level
- Define clear roles and responsibilities
- Increase accountability of local authority
- Include set standards for accountability in developing guidelines and procedures to ensure effective service delivery

Component 4.2 - Human resources and capacity development

- Strengthen the capacity of DORD to facilitate and sustain services

Component 4.3 – Support for private sector development

- Create a competitive environment
- Build capacity and improve access to finance for the private sector

Component 4.4 – Improvement in planning and management information Systems

- Establish a unified management information system (MIS)

Component 4.5 - Evaluation and learning

- Promote learning and sharing of knowledge

Component 4.6 - Research, development and innovation

- Establish procedures for promoting research, development and innovation:

Component 4.7 – Improvement in communication

- Improve effective communication inside and outside the sector

Component 4.8 – Inclusion of poverty, minorities and vulnerability

- Support service provision for the poor
- Ensure disability-inclusive service delivery

Component 4.9 - Gender mainstreaming

- Mainstream gender in the sector:

Component 4.10 – Environment

- Mitigate impacts on the environment in developing and providing services

Component 4.11 – Climate change and disaster risk management

- Increase the resilience of services

Component 5.1 – Increase in the financing of capital costs

- Increase funding for building new and rehabilitating existing water supply facilities
- Develop a sanitation financing mechanism
- Make funding available to develop the management capacity of institutions and the private sector

Component 5.2 – Increase in the financing of recurrent costs

- Make funding for sustainable water supply and sanitation services available
- Increase finance from the sub-national government

5.3. Ministerial Decree from MIH issued regarding the licensing process

- This decree covers all-natural persons or legal entities that may be a public enterprise, public-private partnership and a purely private enterprise engaged in water service. Still, it excludes 18 water service providers with special contracts (such as Design-Build-Lease and Design-Build-Operate schemes).
- It sets the term permits at 20 years for purely private enterprises and unlimited for public enterprises and public-private partnerships.
- It contains procedures for issuing and replacing water permits and issuing the necessary operating certificates (5 years), allowing licensees to continue operations in case of compliance with the permit conditions.
- In addition to a direct granting process, it contains provision for a competitive granting, where feasibility studies are made available to shortlisted bidders, and a permit is granted to the bidder with the lowest tariff.
- It stipulates the necessity to submit a feasibility study with the application, including a systems- and build-out plan indicating how the area will be served within five years.
- It includes procedures for requesting expansion licenses covering adjacent communes/ service areas with essential services and maintaining records and reports in MISTI format.

- It provides for Tariffs and Fees in the permit and stipulates that MIH shall study the tariff every five years for adjustment based on actual circumstances.
- It contains procedures for suspension, revocation of licenses in case of non-compliance with the obligations under the license (SEVEA 2017)

5.4 National Rural Drinking Water Quality Guidelines- 2015

The NRDWQG supersede the January 2004 "Drinking Water Quality Standards". The objectives of the NRDWQG are to establish and define:

- Measures for water quality comparison and actions related to water quality.
- The minimum requirement for monitoring and surveillance, the roles and responsibilities

References

1001FONTAINES. n.d. "Scaling and Sustaining Decentralised Safe Water Services: The 1001Fontaines Case Study in Cambodia."

ADB. 2019. "SECTOR ASSESSMENT (SUMMARY): WATER AND OTHER URBAN INFRASTRUCTURE AND SERVICES."

AFD. 2017. "CBRS Phase II Feasibility Study."

Ameyaw, Effah Ernest, and Albert Chan. 2015a. "Evaluation and Ranking of Risk Factors in Public-Private Partnership Water Supply Projects in Developing Countries Using Fuzzy Synthetic Evaluation Approach." *Expert Systems with Applications* 42. https://doi.org/10.1016/j.eswa.2015.02.041.

Ameyaw, Ernest Effah, and Albert P.C. Chan. 2015b. "Evaluating Key Risk Factors for PPP Water Projects in Ghana: A Delphi Study." Edited by Dr Anna Walker. *Journal of Facilities Management* 13 (2): 133–55. https://doi.org/10.1108/JFM-10-2013-0051.

Brown, Joe, Ratana Chai, Alice Wang, and Mark D. Sobsey. 2012. "Microbiological Effectiveness of Mineral Pot Filters in Cambodia." *Environmental Science & Technology* 46 (21): 12055–61. https://doi.org/10.1021/es3027852.

CWA. 2018. "Cambodian Water Supply Association (CWA) and Its Member."

EMC. 2009. "Water and Sanitation in Kampong Speu, Cambodia: Supply Chain Analysis and Strategy Development." Final Report. Emerging Markets Consulting.

Grant, M., S. Soeters, J. Willetts, and T. Megaw. 2018. "Female Water Entrepreneurs in Cambodia: Considering Enablers and Barriers to Women's Empowerment, Enterprise in WASH – Research Report 9." Report. UTS. https://opus.lib.uts.edu.au/handle/10453/154100.

GRET, and ISEA. 2017. "Market Research on the Feasibility of an Innovative Water Supply Financing Scheme in Cambodia: Draft Inception Report."

Haarmeyer, David, and Debra Coy G. 2002. "An Overview of Private Sector Participation in the Global and US Water and Wastewater Sector." In *Reinventing Water and Wastewater Systems: Global Lessons for Improving Water Management*. John Wiley & Sons, Inc.

Inter-American Development Bank, Antonio Vives, Angela Marcarino Paris, Juan Benavides, Peter Raymond, Darío Quiroga, and Javier Marcus. 2006. *Financial Structuring of Infrastructure Projects in Public-Private Partnerships: An Application to Water Projects*. IDB Publications (Working Papers).

Investopedia. n.d. "What Are Operating Costs?" Investopedia. Accessed April 24, 2022. https://www.investopedia.com/terms/o/operating-cost.asp.

Marques, Rui Cunha, and Sanford Berg. 2011. "Risks, Contracts, and Private-Sector Participation in Infrastructure." *Journal of Construction Engineering and Management* 137 (11): 925–32. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000347.

Matsukawa, Romoko, Robert Sheppard, and Joseph Wright. 2003. "Foreign Exchange Risk Mitigation for Power and Water Projects in Developing Countries," December. https://policycommons.net/artifacts/1457051/foreign-exchange-risk-mitigation-for-power-and-water-projects-in-developing-countries/2093869/.

MRD, and UNICEF. 2010. "Assessment of the Availability and Capacity of Small-Scale Private Service Providers in Supplying Safe Water in Arsenic Affected Areas." Ministry of Rural Development & UNICEF.

NIS, MOP. 2018. "Cambodia-Socio Economic Survey 2017." Phnom Penh, Cambodia: National Institute of Statistics and Ministry of Planning. https://www.undp.org/content/dam/cambodia/docs/DemoGov/NearyRattanak4/Cambodian%20Gender%20Strategic%20Plan%20-%20Neary%20Rattanak%204_Eng.pdf.

Roberts, Michael, Aaron Tanner, and Andrew McNaughton. 2007. "Supply Chain Assessment for Sanitary Latrines in Rural and Peri-Urban Areas of Cambodia." International Development Enterprises and The World Bank Water and Sanitation Program.

SEVEA. 2017. "Access to Drinking Water in Rural Cambodia: Current Situation and Development Potential Analysis." SEVEA.

Sy, Jemima, Robert Warner, and Jane Jamieson. 2014. "Tapping the Markets: Opportunities for Domestic Investments in Water and Sanitation for the Poor." Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-0134-1.

WaterAid. n.d. "Rural Water Supply in Cambodia: A Consolidation of Data & Knowledge and Identification of Gaps & Research Needs." WaterAid.

WHO, and MRD. 2013. "National Microbial Assessment of Rural Household Point of Consumption Drinking Waters." World Health Organization and Ministry of Rural Development.

WSP, The World Bank. 2008. "Identifying Constraints to Increasing Sanitation Coverage Sanitation Demand and Supply in Cambodia." The Water and Sanitation Program.

Xenidis, Yiannis, and Demos Angelides. 2005. "The Financial Risks in Build-operate-transfer Projects." *Construction Management and Economics* 23 (4): 431–41. https://doi.org/10.1080/01446190500041552.