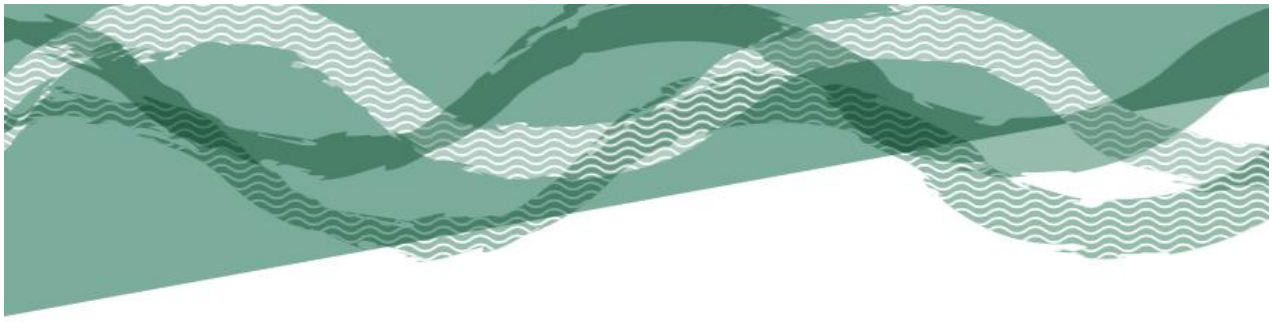
Policy brief 5: Life-cycle costs approach for sustainable piped water service delivery: a study in rural Viet Nam



Assessment of real costs to inform the governance of private water enterprises

The life-cycle costs associated with the delivery of safe and sustainable water services in rural Viet Nam are not well known, potentially compromising the long-term sustainability of water schemes. To address this gap, this study assessed the real cost structures of fourteen water schemes in northern and southern Viet Nam managed by private enterprises.

Drawing on IRC's WASHCost methodology[1], this study identified a range of gaps and opportunities to improve the financial management of private water enterprises in Viet Nam. This study was the first of its kind, collecting real cost data from privately owned water supply enterprises in rural contexts.

This policy brief outlines potential policy instruments, business planning processes for the water enterprises themselves (especially with respect to setting connection fees and tariffs), and support mechanisms that could be provided by government and development partners, with the ultimate aim to support a better informed and sustainable water supply sector in rural Viet Nam.

Life-Cycle Costs

Life-cycle costs (LCC) include the construction and maintenance of systems in the short and longer term, taking into account the need for hardware and software, operation and maintenance, capital maintenance, any cost of capital, and the need for direct and indirect support, including source protection, training and capacity development, planning and institutional pro-poor support.

Source: IRC (2011)

For more detail on life-cycle cost components, please see Table 1.

This research was conducted by a research partnership led by the University of Technology Sydney, Australia, with the Institute for Economics and Water Resources Management (IWEM) – Viet Nam, and East Meets West Foundation (EMWF) – Viet Nam.

[1] IRC WASHCost tools can be accessed at: https://www.ircwash.org/washcost

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Summary of Policy and Practice Recommendations:

1. Governments in Viet Nam (national and provincial) need to invest in **evidence-based processes to ascertain the real costs of water supply schemes over the long-term**, and use these to inform: a) appropriate ranges for technical economic standards for water schemes b) affordable and appropriate tariff structures and subsidies, and c) transfer of assets processes from government agencies to other types of water supply providers (such as private enterprises) underway in Viet Nam.

2. A better understanding of **how enterprises are investing in Capital Maintenance Expenditure (CapManEx)** along with drawing on depreciation forecasts and Cost of Capital (CoC) is required to ensure that water supply schemes are maintained in the long-term, in line with a strategic asset management approach. Calculating depreciation along with collecting CapManEx costs is important to 'sense check' investment levels (in terms of actual vs optimal).

3. Private water enterprises should to be **required and supported to collect financial data on a regular basis**, and provide this to relevant authorities and donors.

4. **Care is needed when comparing life-cycle costs** from one context to another, as costs are highly contextualised.

Key research findings

- **Both capital and operational expenditures varied significantly.** Capital and operational expenditures varied widely across the 14 schemes assessed. Capital expenditure (CapEx) averaged USD 324 per connection, however, had a wide range of USD 55 to USD 552. Operational expenditure (OpEx) reported by scheme operators averaged USD 23.9 per connection and 0.22 per cubic meter, and varied between USD 14-48 per connection per year and USD 0.09-0.34 per cubic metre. Some of the variation in costs could be explained by the age of the systems and the source of the water.

- **Operational expenditure was driven by electricity and labour costs** which accounted for two-thirds of operational expenditure, and key cost determinants included climate, the water source, and the size of the system.

- **Most schemes generated an operating profit over the previous 12 months, but only a minority were profitable when factoring in depreciation.** Twelve of the 14 schemes generated an operating profit in the most recent calendar year, however, when taking into account depreciation as well as historical subsidies and connection fee payments, only four (29%) of the schemes were profitable based on an assumption of a 20-year design life.

- **Reported CapManEx (expenditure on asset renewal) was surprisingly low.** This could have been a result of data collection processes or respondent recall issues, despite systematic and rigorous data collection processes being implemented in the study. Additionally, it is not known if the reported low levels of CapManEx were due to adequate levels of spending for operational expenditure (regular maintenance), or if infrastructure was being pushed to its limit prior to being replaced.

- **Tariff levels appear to be adequate to cover operational expenditure, but not likely the full long term life-cycle costs**. Questions remain as to whether or not CapManEx is adequately resourced, however, if such costs are factored in to the life cycle costs, then tariff levels may not be sufficient to cover CapManEx costs including the Cost of Capital (CoC). To further clarify this area, systems for tracking financial flows would need to be put in place to ascertain the full range of costs over the longer term.

- **Private enterprises reported funding a high proportion of CapEx themselves (from commercial loans and personal funds)**. This situation represents a significantly different business model to community, NGO and government funded schemes explored through the IRC WASHCost initiative, in which the operator of the system may not have been the financer. This is important as it informs how public funding can be best leveraged for universal access to safe water services. The research found that the average cost of capital expenditure by scheme was USD 1,462 (standard deviation USD 3,129).

- **The CapManEx for rural piped water supply schemes should include and reveal the Cost of Capital (CoC) and Return on Capital (RoC).** In the Vietnamese context, the CoC and RoC are often missed or not mentioned in water tariff policy and price setting. Most private enterprises are not aware of the capital cost or opportunity costs when setting their tariffs, which could result in them not knowing the benefits and risks of investing in a private water scheme. Water operators reported that the CoC was costing them between USD 0.77 and USD 5.35 per connection, but this could be an underestimate. Further research is required to ascertain the real CoC for water scheme operators, and how this is incorporated into the full life-cycle costs used to inform the tariff.

- **Collecting high quality cost data on rural water services is challenging but important to continue.** Without an understanding of the true costs of a water supply scheme in the short and long term, it is impossible to align tariffs and subsidies to these costs, and for governments and NGOs to target funding at the key areas of financial need for sustainable rural water supply services.

Methodology

Financial data were collected from 14 privately owned and operated piped water supply schemes between December 2016 and March 2018 using a template designed for the research, based on WASHCost categories (2011). The sites were selected through a purposive sampling process, with four located in the northern part of Viet Nam, and ten in the south (Figure 1). This geographical representation was considered important given variability in technical, institutional and socio-economic characteristics. For example, in the north of Viet Nam private enterprises are often larger than those in the South/Mekong region, and draw from surface water sources to a greater extent.

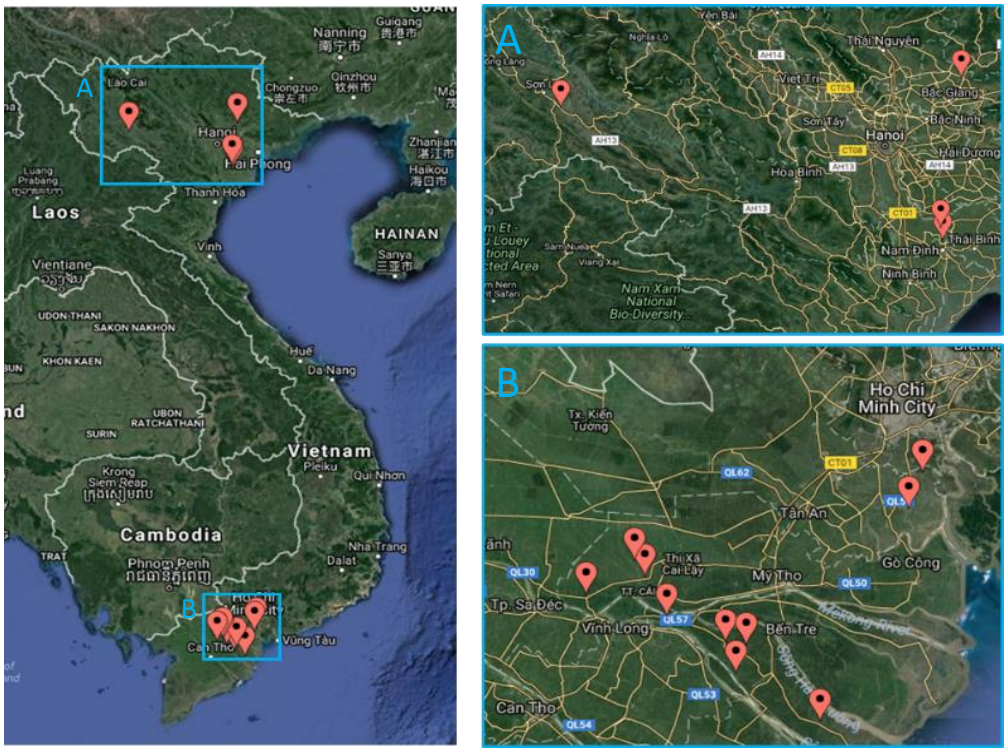

Figure 1. Locations of empirical research in Viet Nam

Table 1. Life-cycle cost components

Cost type		Description
Upfront costs	Capital Expenditure – Hardware and Software (CapEx)	the capital invested in constructing fixed assets such as concrete structures, pumps and pipes, including (as 'software') one-off work with stakeholders prior to construction and technical supervision.
Recurrent costs	Capital Maintenance Expenditure (CapManEx)	expenditure on asset renewal, replacement and rehabilitation, covering the work that goes beyond routine maintenance, to repair and replace equipment, in order to keep systems running.
	Cost of capital (CoC)	the cost of financing a program or project, taking into account loan repayments and the cost of tying up capital.
	Operating /Minor Maintenance Expenditure (OpEx)	expenditure on labour, fuel, chemicals, materials, regular purchases of bulk water and minor maintenance to keep the service running.
	Expenditure on Direct Support (ExpDS)	the expenditure on post-construction support activities direct to local-level stakeholders, users or user groups (such as training or capacity building).
	Expenditure on Indirect Support (ExpIDS)	the costs of macro-level support, planning a and policy making (e.g. at department level).

Policy and practice recommendations

The research findings have clear implications for policy and practice in Viet Nam, with respect to governing water supply systems, and ensuring their sustainability and ability to serve communities equitably. The results provide a valuable reference point for development of technical economic standards[2], both in terms of the magnitude of the costs involved, and the distribution and drivers of those costs. This reference point can inform the design of regulations for the formulation of tariffs and connection fees, support mechanisms such as subsidies and other incentives, initiatives to assist operators with business planning, and data collection requirements and tools to aid these processes.

The implications of the research are captured in the four policy recommendations below. These are relevant to a range of actors, as each one has a stake in incentivising and regulating privately owned and operated water schemes in Viet Nam.

Recommendation 1. Governments in Viet Nam should invest in evidence-based processes to ascertain the real costs of water supply schemes over the long-term, and use these to inform: a) appropriate ranges for technical economic standards for water schemes b) determine affordable and appropriate tariff structures including subsidies, and c) transfer of assets processes underway in Viet Nam.

a) **Using life-cycle cost analysis to inform appropriate ranges for technical economic standards.**

The research found that expenditures varied widely across the schemes studied, which indicates that *ranges* of costs are more useful for considering expected costs rather than averages, or highly specified technical economic standards. Circular 75[3] outlines general cost components, however, our research identified more detailed costs that need to be accounted for (for example differentiated labour costs).

b) **Using life-cycle cost analysis to inform appropriate tariff structures.**

[2] Technical economic standards are also referred to as "cost norms" which are estimates or ranges of the cost of specific components of water supply systems. Cost norms are applied to each component of the design, and include the estimated quantities of all materials and labour needed to construct each component of the scheme. In Viet Nam, technical economic standards are developed by the Department of Finance (DOF), and then issued by the People's Provincial Council (PPC). They differ for each province to reflect different costs of construction materials, geography and other local factors.

[3] Joint Circular No. 75/2012/TTLT-BTC-BXD-BNNPTNT dated 15/5/2012 of Ministries of Finance, Construction and Rural and Agriculture Development guiding principles, the method determining the competence to decide the price of clean water in urban areas, industrial zones and rural areas.

The setting of appropriate ranges for tariffs and connection fee needs to be contextualised through the use of localised cost data (technical economic standards, or cost norms). Currently, ranges set out in relevant circulars are designed for larger-scale urban water utilities, which are not completely applicable to rural contexts. Therefore, this research finds that there is a need for tariff levels to better reflect CapManEx and the cost of capital, while being responsive to the ability of the community to pay, and ensuring equitable access to, and use of, safely managed water services.

Provincial government authorities can use this research, and life-cycle cost methodologies to inform equity measures such as subsidies for the poor. Viet Nam has policies calling for people in poor and remote areas to be subsidised at the provincial level, for example Circular 75, Article 3 which makes reference to supporting policies for '*the poor households of the regions of ethnic minority and mountainous areas, coastal areas and islands and border areas under the current criteria prescribed by the State*'.[4] Previous research in Viet Nam showed that connection fees were the greatest barriers to poor households connecting to piped water supplies delivered by private enterprises (Grant et al, 2016)[5]. As tariffs and connection fees move towards better reflecting life-cycle costs, these kinds of barriers need to be considered in pricing arrangements, and governments together with donors and development partners can play significant roles in supporting more equitable access to piped water services. Cross-subsidies (such as uniform pricing so that more dense and wealthier areas and large water users such as business are able to subsidise the poorer and more remote areas) could be considered to assist in reducing inequalities across different parts of a province.

Some provincial governments have subsidy schemes in place for rural water schemes (such as the 60:40 scheme in Ha Nam Province; and capped subsidies for new and expanding works in Thai Binh Province), and in line with Circular 54 (Article 21: Depceciation of the Works)[6] which set out the conditions for provincial government funding (Box 1).

BOX 1. Circular No. 54/2013/TT-BTC, PROVIDING FOR MANAGEMENT, USE AND EXPLOITATION OF THE CONCENTRATED RURAL CLEAN WATER SUPPLY WORKS. Article 21. Depreciation of the works

1. Principles for depreciation of the works:

a) All works must be depreciated fully in accordance with regulations. In special case, if depreciation of the works is not able to be conducted or not able to be conducted fully in accordance with regulations, the provincial People's Committees will decide on reduction of depreciation level for each works for conformity.

[4] Circular 75: https://vanbanphapluat.co/joint-circular-no-75-2012-ttlt-btc-bxd-bnnptnt-guiding-principles-and-method

[5] Grant, M., Dominish, E., Carrard, N., Buy, L., Ha, H., Nghiem, T. (2016), Reducing or increasing inequalities? The role of private water enterprises in rural Viet Nam, Development Bulletin, No 77. https://crawford.anu.edu.au/rmap/devnet/devnet/db-77/db-77-ee-4.pdf

[6] Please note that the English and Vietnamese versions of the Circular have different article numbering (English references Article 22 as pertaining to depreciation, and Article 21 as pertaining to accounting of works). The Vietnamese numbering has been used for this Policy Brief. English source: https://vanbanphapluat.co/circular-no-54-2013-tt-btc-management-use-exploitation-of-the-concentrated-rural-clean-water-supply-works.

b) Cost for depreciation of the works is remitted to state budget as prescribed by law on state budget, except for case allowed keeping for investment back in the works under decisions of the provincial People's Committees.

c) If plan on clean water sale price is lower than plan on cost price of clean water which has been calculated properly and adequately in accordance with regulations, **the provincial People's Committees shall consider on permission to decrease depreciation level but still ensuring cost for maintenance of the works. In case where the all depreciation level has been reduced but still failing to offset costs, the provincial People's Committees shall decide on granting subsidies for the difference from local budget as prescribed in Decision No. 131/2009/QD-TTg dated November 02, 2009 of the Prime Minister.**

It would be beneficial for provincial governments to adopt processes to determine the potential gap in funding between what rural households are able and willing to pay, and what water supply schemes cost to operate and maintain over the long-term (especially in relation to CapEx and CapManEx). This could also involve amending or expanding Circular 75, which presents principles and methods for the determination of, and competence to decide on, clean water selling prices in urban centres, industrial parks and rural areas, and conditions for subsidy by provincial authorities, as stated in Article 8 (Box 2):

Box: 2. Price setting as informed by Circular 75

'Clean water supply units are based on clean water consumption **price bracket prescribed by the Ministry of Finance**; Regulations on valuation promulgated by the State; principles and methods of determining clean water prices stipulated in this Circular to build **clean water price plans** and report to the Department of Finance for presiding over and coordinating with the Department of Construction, Department of Agriculture and Rural Development for **evaluation before submitting to the provincial-level** People's Committee for decision and approval.' [7]

Funding provided by donors and development partners to the sector needs to be evidence-based, including being informed by life-cycle costs analysis. Life-cycle costing data can assist development partners and donors (including civil society organisations, multilateral agencies, international donors) to better target their funding for private water enterprises. This study indicated that there may be under-investment in CapManEx, which if proved to be the case, could be an area to support enterprises to access an appropriate means for sustainable financing (which could come from a range of sources including tariffs, subsidies, grants etc.). In some country contexts, donors have played useful guarantor roles for repayable finance for service delivery providers and this could be one model to explore (ISF-UTS, 2014).

c) **Using life-cycle cost analysis to inform transfer of assets processes underway in Viet Nam.**

At the national level, the new Degree 57/2018/NĐ-CP on support for enterprises in rural areas (Article 13) identifies incentives for new and upgraded water treatment plants. Life-cycle cost analysis is needed to inform how this Decree is delivered, in that the real costs of water supply systems need to be understood in order to target incentives appropriately. Such information is also useful in informing what type of public-private participation (PPP) may be most relevant in a particular context, for example build, own, operate (BOO); build, own, operate transfer (BOOT) etc.

Recommendation 2. A better understanding of how enterprises are investing in Capital Maintenance Expenditure (CapManEx) along with drawing on depreciation forecasts and Cost of Capital (CoC) is required to ensure that schemes are maintained in the long-term, in line with strategic asset management approaches.

[7] Circular 75: https://vanbanphapluat.co/joint-circular-no-75-2012-ttlt-btc-bxd-bnnptnt-guiding-principles-and-method

Asset management is a process that water utilities and enterprises can use to make sure that planned maintenance can be conducted, capital assets (pumps, motors, pipes, etc.) can be repaired, replaced, or upgraded on time and that there is enough money to pay for these. A high-performing asset management program includes detailed asset inventories, operation and maintenance tasks and schedules, and long-range financial planning. [8] Life-cycle cost assessment is a key component of such asset management processes.

Globally, small and community managed rural water schemes typically suffer from under-investment, a lack of asset management processes, and business and financial skills shortages[9]. However, well-resourced OpEx and CapManEx investment is needed to maintain systems in the long-term. The research found that reported CapManEx (expenditure on asset renewal) was surprisingly low, and there are a number of possible explanations for this. There is therefore a need to clarify the adequacy of current investment in asset renewal, and ensure that private enterprises are able to meet the financial demands of capital maintenance, thereby securing the long-term viability of their services. Determining whether current investment in CapManEx is sufficient would require review of the physical condition of all the relevant assets including prediction of their expected life before renewal, and related longitudinal cost data. This is important to ensure that water tariffs are cost reflective (to the extent possible given socio-economic conditions and economies of scale), and that private enterprises understand the potential returns that they may see as a result of their investment in a water supply enterprise.

'a simple straight-line depreciation of capital investment that assumes a design life of 20 years, was *six times greater* than the CapManEx estimate reported by private enterprises who participated in the study. This may point to under-investment, under-reporting of CapManEx or a combination of the two.'

To examine larger-scale maintenance aspects of water scheme assets, in accordance with the WASHCost methodology (which purposively focussed on actual expenditure), this research collected CapManEx costs reported by 14 scheme owners. These historical costs were initially prioritised over calculating depreciation, however, depreciation was also recognised as a critical consideration, not least because it is promoted by relevant policy instruments in Viet Nam. For example, Circular 45 (Guiding regulation on management, use and depreciation of fixed assets) sets out the way depreciation is to be calculated for fixed assets, and includes an annex which identifies a minimum and maximum design life over which a range of fixed assets should be depreciated (Government of Viet Nam, 2013). Calculation of depreciation is also a useful sense check in light of concerns regarding data quality for CapManEx. For example, a simple straight-line depreciation of capital investment that assumes a design life of 20 years, was *six times greater* than the CapManEx estimate reported by private enterprises who participated in the study. This may point to under-investment, under-reporting of CapManEx or a combination of the two.

It is therefore recommended that users of WASHCost methodology recognise that it is a framework for capturing what is being *spent* on delivery of water services rather than the costs that may actually need to

[8] Adapted from US EPA, See: https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities

[9] Gero, A., Carrard, N., Murta, J. and Willetts, J. 2013, 'A systematic review of current evidence', Private and social enterprise engagement in water and sanitation for the poor – Working Paper 1, Institute for Sustainable Futures, University of Technology, Sydney.

be covered in order to deliver the desired water service level. For this reason, calculating component based depreciation is an important complement to aggregating standard WASHCost categories, particularly to ascertain potential under-investment in capital maintenance, and to inform tariff setting. Such thinking needs to occur within a broader asset management framework in which planned maintenance and use of asset inventories ensures that capital assets (pumps, motors, pipes, etc.) can be repaired, replaced, or upgraded on time.

The CapManEx for rural piped water supply schemes should also include and reveal the Cost of Capital (CoC) and Return on Capital (RoC). In the Vietnamese context, the CoC and RoC are often missed or not mentioned in water tariff policy and price setting. Most private enterprises are not aware of the capital cost or opportunity costs when setting their tariffs, which could result in them not knowing the benefits and risks of investing in a private water scheme.

BOX 3. Circular No. 54/2013/TT-BTC, PROVIDING FOR MANAGEMENT, USE AND EXPLOITATION OF THE CONCENTRATED RURAL CLEAN WATER SUPPLY WORKS.

Article 22. Maintenance of the works

1. Costs for maintenance of the works are determined by one of the following methods: a) Determination based on economic – technical norms prescribed by the Ministry of Agriculture and Rural Development, or norms decided specifically by the provincial People's Committees, based on actual conditions at their localities.

b) Determination on the basis of average cost of maintenance of the works in adjacent previous years plus element of slippage in price (if any).

c) Combination of two methods specified in points a, b of this Clause. 2. Cost for maintenance of the works is accounted directly or allocated gradually into cost for clean water production and business in period.

Recommendation 3. Private enterprises need to be both required and supported to collect financial data on a regular basis, and provide this to relevant authorities.

There are currently no incentives or requirements for private enterprises to collect financial data or for them to use this in their long-term planning processes. Many water schemes are charging tariffs that are in line with provincial government defined caps, but these tariffs may not reflect actual costs over the life-cycle of the scheme. While the research found that OpEx was largely covered by tariffs, it is not known if other costs are fully covered, especially CapManEx and CoC. Therefore, it would be ideal for provincial governments and development partners to require water enterprises to complete a quarterly to annual summary of income and expenditure, simplified to make the process manageable and to ensure the highest level of completion possible. Over the longer term, this data can be used to ascertain whether or not the full life-cycle costs are being covered by income received through tariffs and connection fees, and subsidies provided by donors and government. Given this would be a new process, and introduced to enterprises whose financial and administrative skills are still evolving, a simple approach could comprise a paper based template, with a support mechanism from donors, development partners or provincial government to input and analyse such data.

The development of business development services (BDS) for water enterprises can be informed by this research in terms of capacity building on how to calculate life-cycle costs for their schemes, as well as collect data in an accessible and locally appropriate way (i.e. in a way that is in line with entrepreneurs technological and educational levels).

Viet Nam has policy instruments setting expectations for water enterprises to be capable of managing the water supply scheme and associated financial and administrative processes, yet few mechanisms exist to support enterprises in rural areas in these domains. Circular 54 (providing for management, use and exploitation of the concentrated rural clean water supply works) states in Article 14 that enterprises assigned for management of the works must satisfy a number of conditions, including that they have '*capability of managing and operating the works*', and '*conducting reports, accounting, depreciation and maintenance of the works in*

accordance with this Circular and relevant law'.[10] In relation to the present study, financial literacy and ability to calculate water tariffs and connection fees in relation to life-cycle costs needs to be supported by government and development partners.

Viet Nam could consider establishing an association for rural private water enterprises (such as the Cambodian Water Association) which could provide business development services targeted at the needs of the sector, and able to be informed by gaps analysis and research such as this.

Donors can also use this study to determine support they could provide towards the enabling environment, especially in terms of increasing financial literacy related to life-cycle cost analysis, and ensuring tariffs and connection fees informed by life-cycle cost analysis. For example, donors could consider funding business development services (rather than enterprises themselves), to support private enterprises to manage the finances of their water supply businesses more professionally, including enhanced record keeping.

Recommendation 4. Care is needed to be taken by researchers and policy makers when comparing life-cycle costs from one context to another.

The research found that life-cycle costs, even on a unit basis, can vary dramatically. Moreover, a number of factors appear to influence these costs including scheme size, water resources, climate, and service level. This shows that generalized cost norms or benchmarks should be interpreted carefully and in light of contextual factors. Both the OpEx and CapEx reported in this study were substantially higher than those documented by the WASHCost initiative in Burkina Faso, Ghana, Mozambique and India (Burr and Fonseca, 2013).[11] This disparity is somewhat similar to the findings of Hutchings et al (2007), and there were a number of possible explanations for this discrepancy.

Therefore, researchers analysing costs need to take care with comparisons across country contexts, and governments need to take care even when comparing different provinces or geographic areas. Additionally, it would be useful to use a common service delivery level so that cost norms or benchmarks are tied to similar, and ideally safely managed service levels, thereby making comparisons more relevant.

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www.dfat.gov.au www.enterpriseinwash.info www.isf.uts.edu.

[10] Circular 54 can be accessed at: https://vanbanphapluat.co/circular-no-54-2013-tt-btc-management-use-exploitation-of-the-concentrated-rural-clean-water-supply-works

[11] This comparison was done by converting the costs from this study to USD (2011) in PPP terms per person.


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