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**THE FUTURE OF WATER, SANITATION AND HYGIENE:
INNOVATION, ADAPTATION AND ENGAGEMENT IN A CHANGING WORLD**
**Community financing of rural
water supplies in Timor-Leste**

A. Grumbley, Timor-Leste

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Timor-Leste is a new and emerging nation that has a history of instability and a large rural population. There has been a significant investment in rural water supply infrastructure, however sustaining this infrastructure has proven to be a challenge. Current research has shown that community management and in particular community financing of the operation and maintenance of water supplies has been the main constraint to sustainability. This paper then investigates the actual costs of operation and maintenance of the infrastructure, what communities can afford to pay and the current reality of community financing of rural water supplies in Timor-Leste.

Introduction

The small Southeast Asian country of Timor-Leste became independent in 1999 and a sovereign state in 2002, emerging from almost 500 years of occupation, its location can be seen in Figure 1. Underdevelopment and neglect left a profound legacy and Timor-Leste remains the poorest nation in Asia. The short life of Timor-Leste as a sovereign nation has been characterised by instability and conflict, leading to the establishment of a UN mission. Timor-Leste's total population is 1.1 million people, 80% of whom live in rural communities in mountainous areas that are often difficult to access (G-RDTL 2009).

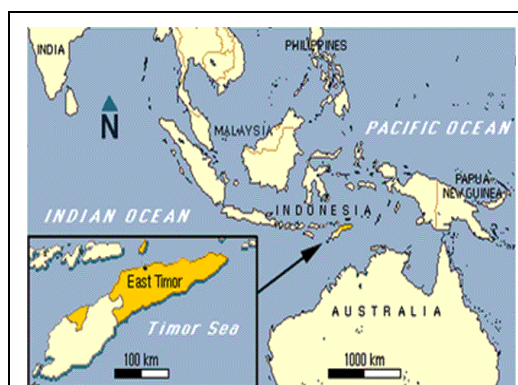


Figure 1. Timor-Leste (East Timor)



Figure 2. Aileu and Lautem Districts

Donors, international non-governmental organisations (INGOs) and the national government have invested a significant amount in rural water supply and sanitation infrastructure having spent US\$15 million per year on between 2006 and 2009 (Ministry of Infrastructure-MoI 2009), amounting to an average of US\$ 15 spent per person per year in rural areas. The government has also committed itself to achieving the Millennium Development Goal (MDG) target to provide 75% of its rural population with access to a safe water supply by 2015.

Survey of rural water supply and sanitation infrastructure

The INGO Plan completed a survey of rural water supply and sanitation infrastructure across the districts of Aileu and Lautem, see Figure 2, covering 271 rural villages. It was implemented in partnership with the Timor-Leste Government Water Supply and Sanitation Service between February and December 2009 and was funded by BESIK (Timor-Leste Rural Water Supply & Sanitation Program) funded by the Australian Government. As well as an assessment of physical infrastructure in the communities the survey included focus group discussions with community stakeholder groups, such as women and youth groups, and interviews with sector stakeholders.

The survey showed that coverage of the rural population with access to safe water facilities was only 44% and those with access to improved sanitation was as low as 20%, as defined in the 2008 Joint Monitoring Program report (WHO & UNICEF 2008). However, the results of the study show that the low levels of coverage have not been the result of the limited numbers of facilities constructed but rather challenges with sustaining the infrastructure: 70% of rural water supply infrastructure was found to be not fully functioning, defined as not being able to supply safe water through-out the year to 80% of the community, one year after their construction (Hamel, S. 2009a: 5.1.5). The largest challenge to increasing water supply coverage in rural areas and meeting the MDG target in Timor-Leste is then the poor sustainability of rural water supplies being constructed.

The cause of failure for each of the non-functioning water supplies surveyed was assessed in the Plan survey. The main constraint to sustaining the water supplies was then identified as failure of Community Management, which in turn was mainly the result of constraints to water user groups collecting and managing sufficient funds to cover the cost of operation and maintenance of the systems (Hamel, S. 2009a: 5.3).

Policy context

The current national water decree states that rural communities will be responsible for operation and maintenance of their water supplies through a water management group who are responsible for collecting and managing fees for water supply services (G-RDTL 2004: Article 22). A new national water supply policy is in development that currently states that for a small rural community served by its own individual water supply it will be responsible for 100% of the cost of operation and maintenance through a fair and transparent tariff (G-RDTL 2010: Article 6).

Plan's 2009 survey data shows that across the two districts 73% of the population are served by 176 piped water supplies from shared tap stands, 156 of these piped water supplies serve one single community. The majority of the rural population are then responsible for 100% of the cost of operation and maintenance of piped water supplies. One single community refers to an *Aldeia* or sub-village normally with a population of 600 people or less and is the smallest administrative unit for the local government.

The first responsibility of water user groups after creation is to collect funds to cover the cost of maintaining and operating the water supply systems. After their formation the groups in Timor-Leste are struggling to manage this first step. This paper then uses the data from Plan's 2009 survey of rural water supply and sanitation infrastructure to look at the cost of operation and maintenance of rural gravity flow systems serving single communities, what would rural communities be able to afford to pay for water supply and the reality of household tariff collection and management by community water user groups.

Methodology

This paper first looks at the cost of Operation and Maintenance of rural water supplies. Generally the level of service expected and provided for rural communities are piped water supplies. Plan's survey shows that across the two districts 55% of communities were served by a gravity flow system (Hamel, S. 2009a: Annex5). The survey data from 52 gravity flow systems in Aileu district is then used to determine sustainable tariff levels (Hamel, S. 2009b: Annex8). Two household tariff levels are determined for community managed water supplies: one level covers the annual maintenance costs for on-going operation of the system and the second level also includes the cost of system renewal at the end of the design life.

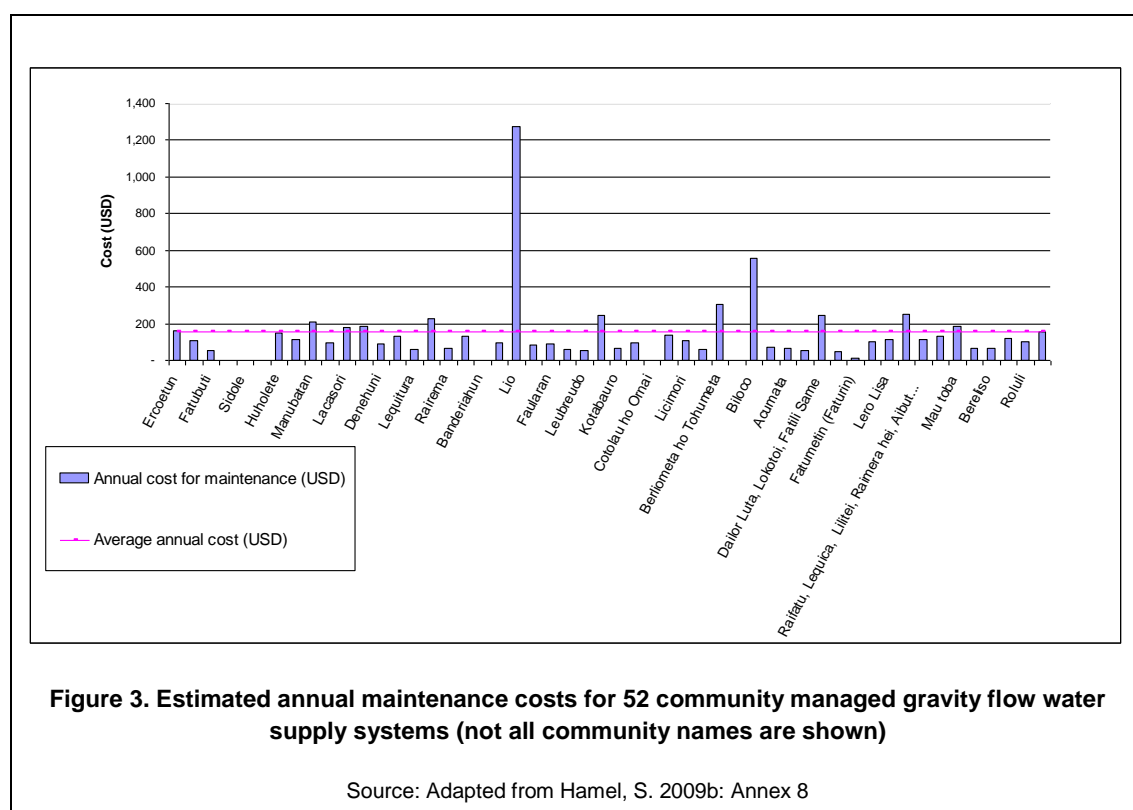
The next section of the paper uses the survey data on household incomes (Hamel, S. 2009a: Annex 1) and the Timor-Leste Living Standards Measurement Survey (World Bank 2005) to determine what amount of cash households have available for paying for water supply and looks at the distribution of household incomes in rural communities. It then looks at what is affordable for households as a tariff if we assume that

householders can afford or are willing to spend up to a maximum 5% of income on water supply and what scope there is for cross-subsidies within the community in order to cover the poorest households.

The third section takes the data from the 85 water user groups that existed in the communities at the time of the Plan survey and reviews the current operation of tariff collection and funds management by the groups.

What is the cost of operations and maintenance of rural water supplies in Timor-Leste?

In Plan's study the cost of replacement parts for maintenance was determined for 52 rural gravity flow water supply systems in Aileu District, as suitable data was available and the age of the systems meant that maintenance was necessary (Hamel, S. 2009b: Annex 8). This annual cost was determined by an assessment of the cost of all the parts for full repair necessary, which was then averaged by the number of parts required over the age of the system. This cost has been augmented to include an estimate for the cost of transport for purchasing of the spare parts and any requirement for delivery of parts, taken from Hamel, S. 2009b page 29, and assumes that costs to the community for operation and maintenance will only include the cost of parts and the related transport, as training of Water User Group members will have been completed and all the positions in the groups are voluntary, see Figure 3.



The average cost of procuring replacement parts for each system was then calculated to be approximately US\$154 per annum. The deviation from this average was generally limited, however for some systems the required maintenance costs were significant, the highest being approximately US\$1,275. The reason for this variation was determined to be a function of the quality of the initial implementation and construction of the water supply system.

The communities surveyed in Aileu District were on average 62 households in size this means that in order to cover on-going operation and maintenance costs then each household would need to pay a tariff of approximately US\$2.5 per annum or US\$0.21 per month. This result provides some insight into the level of tariff required from households in order to sustain ongoing operation and maintenance for gravity flow systems supplying water to single communities.

Plan's survey data (Hamel, S. 2009a: Annex 1) showed that the average age of a completely broken gravity flow water supply was 4 years, 10% of the total, at the time of the survey. Further reviews of rural supplies in two other districts indicated that about 50% of new schemes had a life expectancy of less than 2 years (G-RDTL 2010). The design life of 10 years indicated in the National Community Water and Sanitation Guidelines (DNSAS 2005) therefore seems optimistic but attainable assuming sector systems continue to improve. After this period of 10 years it is then envisaged that the water supply will require a certain amount of renewal and expansion to take into consideration an expanding population in rural areas (DNSAS 2005:4.1).

Plan's study made an estimate for the cost of materials for the renewal of all the water supply systems surveyed in 2009 in Aileu District (Hamel, S.2009b: Annex 8). If we take an average for the cost of materials for renewal of the 18 systems that were built 10 years previously or older then the approximate cost of materials for renewing a single community system in 2009 is US\$1,200. Standard practice for contractors in Timor-Leste in order to make an estimate is to add 30% to the cost of materials; total cost would then be approximately US\$1,560. An estimate of a tariff for rural households in order to cover on-going operation and maintenance costs and renewal of the system after 10 years can then be determined with the formula defined in Harvey, P.A. and Reed, R.A. 2004 page 103, see Box 1, this includes a 20% contingency for unforeseen events and inflation. This then increases the required household tariff significantly to US\$10.64 /annum or US\$0.89 /month for true long-term sustainability of the systems.

Box 1. Estimate of Household tariff for rural community managed gravity flow systems in Timor-Leste

Using the formula $H=1.2 \times (M+A/N)$ and data above:

- Total annual maintenance cost, $M = \$154$
- Current Renewal Cost, $R = \$1560$
- Estimated number of years before renewal, $n = 10$ years
- Approximate interest rate, $r = 20\%$
- Annuity factor $AF_{r,n} = 3.944$
- Number of households, $N = 62$ (372 people)

Annuity, A = $R / AF_{r,n} = 1560 / 3.944 = \text{US\$}395.5$

$$\text{Estimated Annual Household Tariff} = 1.2 \times \left[\frac{M + A}{N} \right] = 1.2 \times \left[\frac{154 + 395.5}{62} \right] = \text{US\$ } 10.64$$

This can be divided by 12 to convert to a monthly household tariff of **US\$0.89**.

Source: Adapted from Harvey, P.A. & Reed, R.A. 2004: p103.

What can rural households afford to pay for water supply?

Plan's study included a simple assessment of household incomes in the communities surveyed. This involved asking randomly selected households to recall the amount of cash they had earned during the previous year. In Aileu District 73 households agreed to respond and incomes varied significantly from subsistence farmers earning no cash income to some households having a source of income in the thousands of dollars from the sale of coffee and rice crops. The range of incomes can be seen in Figure 4. This suggests that 18% of households would be contributing more than 5% of their annual income if the tariff was set at US\$2.5 per annum and that 75% of households would be contributing more than 5% of their annual income if the tariff was set at US\$10.64 per annum.

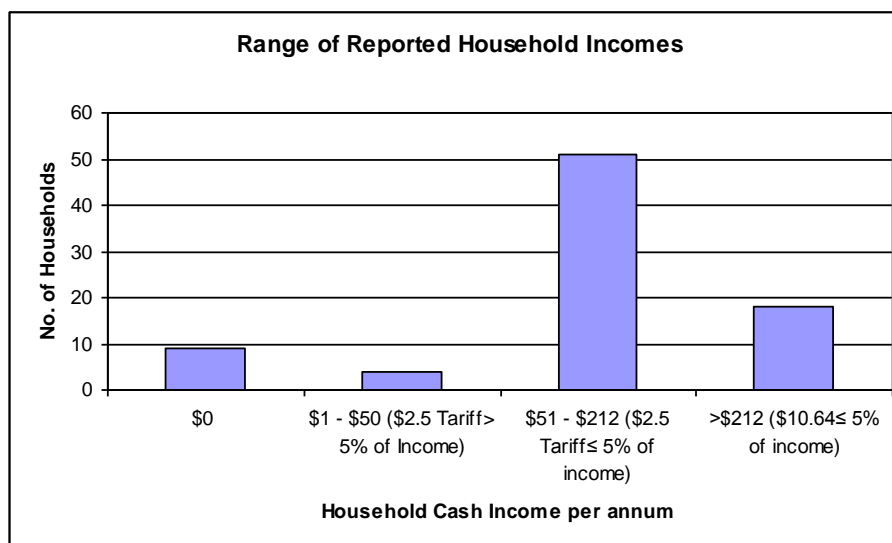


Figure 4. Distribution of Reported Household Incomes in Aileu District

Source: Adapted from Hamel, S. 2009a: Annex 1

The Timor Leste Standard of Living Survey in 2001 made an estimate of monthly household expenditure nationwide, see Figure 5. This shows a peak at approximately US\$15 per month or US\$180 per annum. This is close to the median of the Aileu survey of household incomes, with 70% of household incomes in the range US\$51-US\$212 per annum.

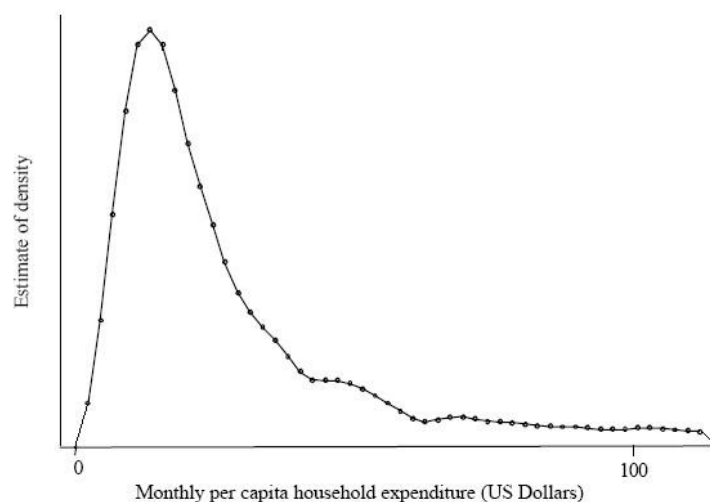


Figure 5. Density function of household consumption in Timor-Leste

Source: World Bank 2005: Figure 3.2

There is then a wide range of household incomes in rural communities and the setting of a flat tariff for water supply means the burden will fall greatest on the poorest most vulnerable households. For the tariff rate of US\$ 0.21 per month it seems feasible for approximately 80% of the community to pay US\$ 0.25 per month in order to cover the 20% of the community that do not have a large enough income. An equitable cross-subsidy would have to be planned and the criteria for the poorest households set with the community.

The tariff rate of US\$ 0.89 per month would be affordable for only 25% of the community and it does not seem feasible that a smaller proportion of this group could pay a higher tariff than this in order to cross-subsidise a large majority of the community. A tariff set to cover operation and maintenance and also renewal of the water supply system would then not be affordable for communities and the cost will likely need to be shared with government for long-term sustainability of systems.

The reality of household tariff collection and management by water user groups

Plan's survey covered 85 Water User Groups that had been previously formed and were still identifiable. The results showed that only 15% of these water user groups had funds for preventative operation and maintenance of water supply systems; see the results of the survey of Water User Groups funds in Figure 6. The reality is then that Water User Groups across the two districts struggle to raise and manage the funds required for operation and maintenance and very few raise enough funds to cover the future renewal of the system.

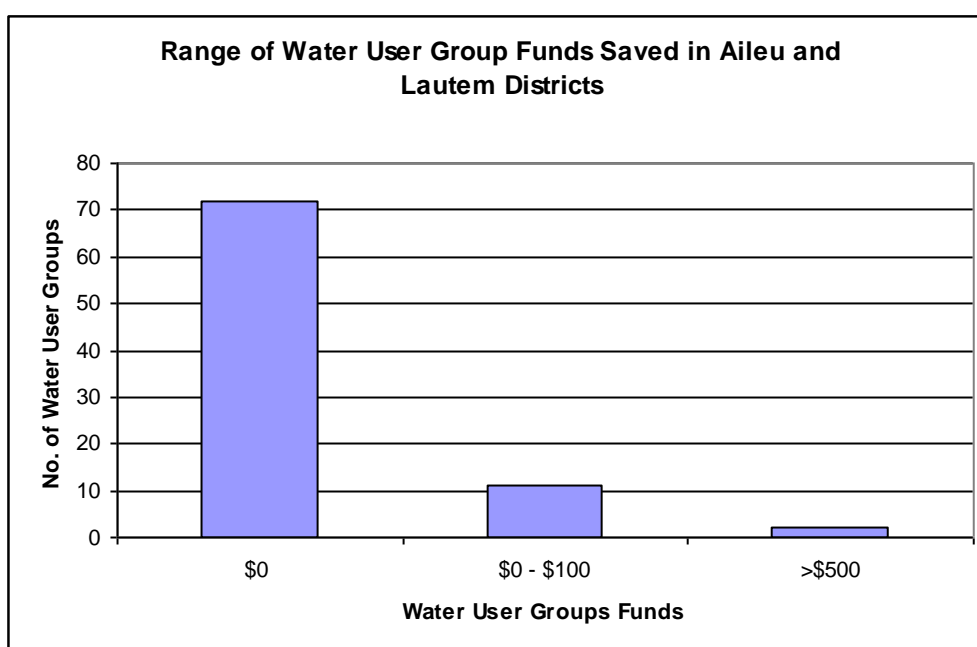


Figure 6. Range of funds saved by Water User Groups in Aileu and Lautem Districts

Source: Adapted from Hamel, S. 2009a: Annex 12

The great majority of community Water User Groups then only raise money when there is a significant problem that stops the flow of water, not many practice preventative maintenance and usually make do with patches to systems with locally available materials. This then leads to a low level of service and significant 'down-time' for most of the systems, captured by the low numbers of fully functioning systems in the survey results (Hamel, S. 2009a: 5.1.5).

The survey also captured a general unwillingness to pay for water supply and preventative maintenance among community members for a number of reasons identified:

- The community members do not trust the Water User Group to manage money ;
- community members do not normally have cash available for tariffs on a regular monthly basis;
- the Water User Groups can not easily access banks or micro-finance institutions; and
- the institutions they have difficulty accessing have prohibitive charges or minimum balances.

(Hamel, S. 2009b: 6.3)

However, some Water User Groups managed to collect over US\$500 and a number of others were identified as being successful in collecting and spending funds to maintain their systems, having addressed a number of these constraints to effective financial management through significant investment in and support to community institutional capacity building, see box 2.

Box 2. Bereleuhai Community Water User Group

Bereleuhai Community in Remexio Sub-district, Aileu District has a gravity flow water supply system and associated Water User Group set-up in 2003 with the assistance of an INGO. At the time of the survey the system was fully functioning and the group currently had approximately US\$800 in funds. The group continued to collect US\$0.25 from each household on a flexible but relatively regular basis linked to seasonal incomes, female headed households and other poor households were also exempted.

At the same time as creating the water supply system and water user group the INGO had created a separate village savings and loans association with 23 community members who were interested in creating the group. The water user group then had access to the village savings and loans association which received and loaned-out all the funds each month. This proved to be very effective and community members were willing to pay a regular tariff as the money was seen to be managed accountably and was not even leaving the community.

Source: Adapted from Hamel, S. 2009b: Annex 4

Sufficient support for institutional capacity building for communities is then critically important for sustainable rural water supply and a much greater investment in community institutions will likely be required to realise sustainable community management of water supplies in Timor-Leste.

Conclusions

Community management of water supplies in Timor-Leste does seem to be feasible but has had limited success to date. The WASH sector in Timor-Leste then needs to consider the following for long-term sustainability of community managed rural water supplies:

1. The collection of community tariffs for operation and maintenance of water supplies does seem to be possible. However, communities are not homogeneous and the range of household incomes in rural communities is varied. A flat rate tariff is therefore not appropriate and implementers need to work with communities and water user groups to create a transparent system of cross-subsidy that ensures the most vulnerable households are not over-burdened with water supply costs. Since the Plan 2009 survey was completed BESIK (Timor-Leste Rural Water Supply & Sanitation Program) has identified a number of examples of community managed water supplies that have created equitable tariffs based on the volume of water used by different households.
2. For holistic long-term sustainability of water supplies the cost of renewal of the water supply system has to be covered, a community tariff that covers this cost does not seem to be affordable for communities and the cost will likely need to be shared with government. This needs to be carefully planned for and considered if a vicious circle is to be avoided, in which inadequate tariffs lead to a deteriorating water supply service and lower levels of service then result in further unwillingness to pay the low level of tariff. The latest draft of the BESIK supported National Water Supply Policy for Timor-Leste (G-RDTL 2010: 3.5) makes an allowance for water supply owners to request transfer of ownership to the government for their operation and management which will allow for the alleviation of this situation.
3. Community water user groups in Timor-Leste struggle to raise and manage funds and a significant investment in institutional capacity building in communities is required, including long-term support mechanisms. BESIK has supported the introduction of government district staff, Sub-district Facilitators, with the responsibility to support water user groups and create the important link between water user groups and local government. BESIK has also worked on improving the community engagement process to better ensure that water user groups are created transparently and that their roles and responsibilities are clearly communicated. The evidence from the Plan 2009 survey suggests that the water user groups should also receive legal recognition within the local government structure and it would also be

beneficial for the groups to form associations or federations in order to support each other and advocate together. The latest draft of the National Water Supply Policy for Timor-Leste (G-RDTL 2010: 5.0.10) states that water user groups shall be assigned legal status, this should be closely aligned with the village councils, as the traditional governing structure, to ensure recognition by community members of this status.

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Contact details

Alex Grumbley
BESIK, DNSAS, Rua Jacinto Candido, Caicoli, Dili, Timor-Leste.
Tel: +670 745 7042
Email: alexgrumbley@gmail.com
