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## **Water supply as a common pool resource in Timor Leste**

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*Spring fed water systems in Timor Leste are built in conjunction with communities. Water Sanitation and Hygiene (WASH) programs rely on Community Action Planning (CAP) processes and Community Led Total Sanitation (CLTS) to ensure community participation and commitment to constructing toilets and water systems. At the conclusion of implementation the community is acknowledged as the owner of the water system and is expected to manage the system via an elected community water management group (GMF). This kind of community ownership indicates that both the water and the water system are assumed to be 'common pool resources'. This paper considers the implications of recognising spring fed water systems as common pool resources. Observations and interviews for this research were conducted in East Timor as part of a larger study on complex adaptive systems. The theoretical framework is based on Elinor Ostrom's design principles for managing common pool resources (Ostrom 2008).*

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### **Introduction**

For many rural communities in Timor Leste access to a safe water supply is still an issue. In small rural communities in the mountains there are permanent springs and seasonal rivers that provide water but collecting water from these sources is often difficult and sometimes dangerous. Non-Government Organisations (NGOs) and the Government of Timor Leste implement WASH programs in these communities and include community participation in the form of CAP and CLTS processes. Communities also engage in the building of water systems usually led by staff from a local NGO. After the design and implementation of the water system is complete the system is considered to be owned by the community and is required to be managed by a GMF as per Decree-Law No. 4/2004 (GoTL 2010).

The Government of Timor Leste Rural Water Supply Guidelines (GoTL-RWSG) indicate that GMFs are responsible for maintenance and management of water systems that supply less than 1000 people (GoTL 2010). Communities are expected to manage and maintain both the water supply and the infrastructure. Government agencies and NGOs provide some ongoing technical and management support for GMFs. This form of community ownership can be considered as a common pool resource and the management of them may therefore be viewed through the lens of common pool resource management principles, as described by Ostrom (2008). Common pool resources are defined by Steins and Edwards (1999) as '*resources for which exclusion of users is difficult to achieve and for which joint use reduces the availability of benefits derived from the resource for others.*'

Several reviews of water systems in Timor Leste have indicated that GMFs may lack the capacity to adequately manage water systems (Grumbley & Hamel 2010; WaterAid Australia 2010; Willetts 2012). If this is the case then recognising the nature of water systems as common pool resources and ensuring that training and equipment are appropriate to managing common pool resources may enhance the durability of spring fed rural water systems.

There are a range of circumstances necessary for successfully managing common pool resources. Literature that looks at water as a common pool resource has tended to focus mostly on irrigation schemes, as opposed to small scale water supply for household use. Infrastructure maintenance for small communal infrastructure such as pipes, tanks and taps, appears to have generated little academic interest at all beyond several instrumentalist "how to" manuals (Eade & Williams 1995; UNICEF 1999) and some recent work on multi-criteria analysis of technologies (Steele 2010). Research looking at irrigation systems managed as common pool resources indicate general concurrence with Ostrom's eight design principles but focus predominantly on the resource (water) rather than the infrastructure as a point of consideration (Sarker & Itoh 2001). Ostrom's work is significant for its basis in systems

thinking techniques and the challenge that it presented initially to the work of economist Garret Hardin whose 'Tragedy of the Commons' indicated a bleak future for shared resources (Ramalingam 2013).

<b>Clearly defined boundaries</b>	The boundaries of the resource system (e.g. irrigation system or fishery) and the individuals or households with rights to harvest resource units are clearly defined
<b>Proportional equivalence between benefits and costs</b>	Rules specifying the amount of resource products that a user is allocated are related to local conditions and to rules requiring labour, materials, and/or money inputs
<b>Collective-choice arrangements</b>	Most individuals affected by harvesting and protection rules are included in the group who can modify these rules
<b>Monitoring</b>	Monitors, who actively audit biophysical conditions and user behaviour, are at least partially accountable to the users and/or are the users themselves
<b>Graduated sanctions</b>	Users who violate rules-in-use are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other users, from officials accountable to these users, or from both
<b>Conflict-resolution mechanisms</b>	Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials
<b>Minimal recognition of rights to organize</b>	The rights of users to devise their own institutions are not challenged by external governmental authorities, and users have long-term tenure rights to the resource
For resources that are parts of larger systems: <b>Nested enterprises</b>	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises

In order to understand the ways that rural water supply is or isn't treated as a common pool resource the next section of this paper assesses the first four of these principles in relation to the GoTL-RWSG (GoTL 2010) and in relation to the results of observations and interviews by the author in five rural communities in Timor Leste. Recommendations are made in terms of changes to process or practise that would enable communities and GMFs to manage water supply and infrastructure as common pool resources. Observations in communities indicated that lack of ability to monitor water levels is a substantial problem for community management, so a quite detailed recommendation regarding improvement of the monitoring function is included.

### **Clearly defined boundaries**

The GoTL-RWSG does not indicate that there are any particular rules about who can access water and the water system once it has been implemented (GoTL 2010). This means that the GMF is required to make decisions about access for new households or for households who have not contributed to the building and maintenance of the system. The participative process of implementation means that existing households generally contribute to the building of the system and continue to pay fees to the GMF whilst they can access the water. In one village some residents indicated their displeasure at having contributed time and resources to build a water system that they only benefitted from for a very short time, as there was often no water available at the bottom end of the system. The number of households that can extract water from a system and the amount of water that can be used are both dependent on the capacity of the source and the system. Understanding the capacity of the system and the needs of users ensures that informed decisions can be made regarding the extension of the system to new households or the expansion of household uses of tap water beyond drinking and cooking, to perhaps washing and gardening. This information would also enable GMFs to predict when they may need to invest in infrastructure, or request assistance, in order to bring more water to the village as the population grows or as water usage expands.

The capacity of the system should be made clear to the community during implementation and as part of the formation of the GMF in order that the limitations of the system are clear.

### **Proportional equivalence between benefits and costs**

The cost to the community of implementing a water system is usually in time and some local resources such as sand or plant materials. Other costs of implementation are usually covered by the government or by an NGO. The ongoing user fees are suggested by the implementing NGO and agreed by the community, mostly at about 25c per household per month. From interviews with NGO staff it seems that 25c is an arbitrarily fixed amount and does not

reflect the expected costs of maintenance over time. Of the water users who were asked about fees, most were happy to pay 25c or even more, with one man saying that “25c [per month] is ok – it doesn’t matter, it is easy and he could pay more” and several others agreeing with this sentiment, but notably only in the villages where water supply was reliable. The fees that GMFs collect are not proportional to the service level delivered. A household that can run a hose from a communal or private tap to a 44 gallon drum or a mandi (small open concrete tank) will use more water, require less effort and pay the same fees as a household located 30 minutes from a tap, whose water usage may only be only marginally more than if they were using an unimproved source.

The most obvious benefit to the community of new water systems is decreased time for water collection. In villages where the water source was plentiful enough for residents to use it for bathing and washing of clothes the average reduction in time used to collect water is 45mins per trip with up to three water collection trips being made per household per day. The benefits of spring protection for increased water quality are minimal since spring protection doesn’t provide disinfection. Water for drinking is almost always boiled to ensure that water borne pathogens are destroyed.

When a water system is not removing the labour involved in boiling the water over a wood fire to make it safe to drink, then the value of the system is less about having a ‘clean’ water supply than about have a close and plentiful water supply. If the water supply is either not particularly close to the house or if the quantity of water provided isn’t adequate to the needs of the whole community then the benefit of the system is further reduced. However, the willingness of residents to pay or to volunteer time and energy in maintaining the service is likely to increase with better service levels. A strategy of designing water systems to ensure a high level of service with ample water available from a tap located close to each house would create significant benefit for the community and a willingness to contribute to the maintenance of the system. Information about costs and durability of individual parts under local conditions would contribute to communal consensus on appropriate fees structures.

### **Collective-choice arrangements**

Ostrom et al. (1999) state that “Users need some autonomy to make and enforce their own rules, and they must highly value the future sustainability of the resource.” Communities and their GMFs need to manage the water system as a common pool resource. Some guidance is given within the GoTL-RWSG and support is given for the creation of regulations, fees structures and other processes. It is not clear whether the guidance that is given by local NGOs undermines the autonomy of the community or whether it allows for locally appropriate regulations and processes to emerge. Pogodda (2014) indicates that the indoctrination of local staff and users into the development paradigm may reduce their willingness or ability to look for innovative local solutions to issues. The fees issues describe above demonstrates this type of locked-in thinking. Counter to this, Ara (2013) in a discussion of community managed rural water systems in Bangladesh states that “*it should not be taken for granted that a group of people has the internal resources, common interest, or sense of solidarity to either initiate action or sustain the management of a facility*” indicating that some guidance is necessary. Certainly having a set of regulations handed down by an NGO is not an appropriate arrangement to enable autonomy. Being able to assess several different models of community management may allow for collaborative critical enquiry within the community. In two of the villages where data was collected telling stories of other villages, as suggested by Quinn (2013), allowed residents to consider future options and engage in finding solutions without showing disrespect for village leaders. A further strategy to find the balance between too much or too little external direction would be the provision of a set of guiding principles indicating a range of ways to structure the regulation and management of a water system. These should be clearly changeable and flexible as community needs, resources and capabilities change.

### **Monitoring**

Individuals make decisions about their use of common pool resources based on information about the status of the resource itself as well as information about how others use the resource. Brucks & Mosler (2011) indicate that as the availability of resources decreases, information about its status becomes more important in decision making, especially in periods of uncertainty in regard to the environmental replacement of the resource. They also indicate that individuals make different decisions depending on whether they believe that the resource is depleted because of environmental effects or because of the actions of other individuals. In the former case use is adjusted to conserve the resource whereas in the latter case use is more likely to be set at level that is considered the “norm” for community use (Brucks & Mosler 2011). If this holds true for rural water supply in Timor-Leste then more information about the status of water supply and environmental variability is required in order to assist community members in determining appropriate amounts of water extraction throughout the year.

The reality of spring fed water systems is that there are often no indicators of whether the system is functional or not until the taps run dry. Being a fully enclosed and opaque system it is difficult to know if a tank is refilling as

expected. One of the conditions that Ostrom et al. (1999) identified in regard to successful management of common pool resources is that users should have clear indicators of the current condition of the resource. Once the tank has emptied the most urgent problem for residents becomes access to another source of water, rather than fixing the existing water system. The installation of a highly visible water level indicator would give the whole community early warning if problems arise and assist communities to quickly gain a visual understanding of the normal flow and accumulation of water through the day. Photographs 1 and 2 shows what this might look like, in the picture on the left the woman collecting water would be unaware that the tank is almost empty. In the picture on the right the woman would be aware that the tank is almost empty, and if this was unusual she would be able to request appropriate action by the GMF or technician.

A visual water level indicator like the one shown in Photograph 2 could be made from materials that are readily available in rural villages. A schematic for a retrofitted water level indicator is shown in Figure 1. Plastic containers that cooking oil is purchased in are ubiquitous in the villages and they are often used to carry water (see Photographs). The filling for the weighted bottle could be clean sand or gravel. Small lengths of bamboo or hose pipe are commonly available. The cord may need to be purchased and an indicator could be as simple as a brightly coloured woven palm disc weighted with stones.



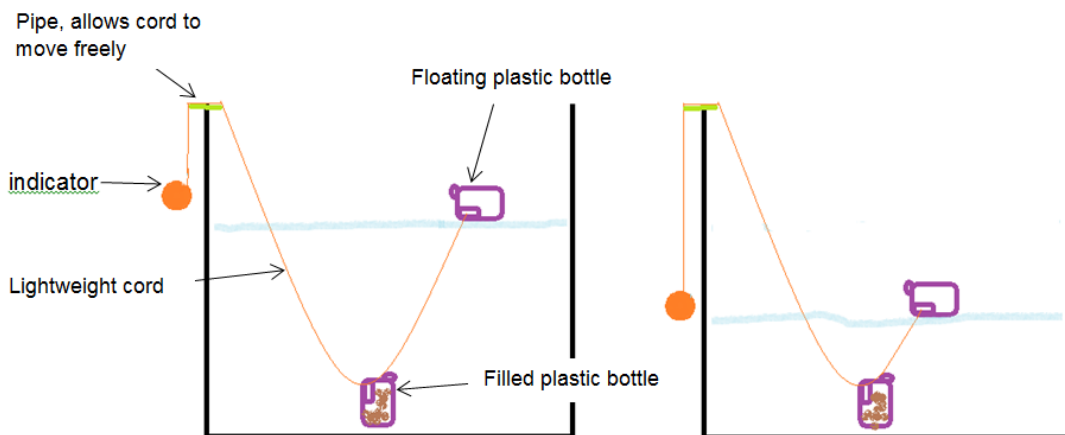
**Photograph 1. Water tank without a water level indicator**

Source: Author's photograph



**Photograph 2. Water tank showing a water level indicator**

Source: Author's photograph and graphic



**Figure 1. Visual water level indicator for a concrete tank using locally available materials**

Source: Author's work

## The other four design principles for managing common pool resources

The four further design principles for managing common pool resources also deserve some consideration in the context of community managed water supply. Of particular interest are the links that the last four principles indicate between the resource and resource managers and the wider policy environment. These principles will form the foundation of further discussion and analysis in the future.

## Conclusion

This paper has briefly assessed the implications of four Ostrom's eight design principles for managing common pool resources in respect to their application to spring fed water systems in Timor Leste. It has shown that the application of these design principles could influence the effectiveness of GMFs if applied throughout the processes of design, implementation and operation and maintenance of a water system. Suggestions arising from analysis of Ostrom's (2008) common pool resource management design principles are:

- Ensure that GMF members understand the capacity of the system they are managing in order to make informed decisions about water uses and extension of the water system to new users.
- Design of the system should aim for the highest possible standards of service delivery, particularly in terms of distance to a tap and quantity of water available for each household.
- The users of the system, including the GMF need to be able to make informed decisions about access, fees, and regulations of the water system. Information, guidance, genuine ownership and a choice of models can help facilitate communities in making good collective decisions.
- The GMF and water users need to be able to monitor the water level and the condition of the infrastructure during the operation and maintenance phase. Visual water level indicators would provide communities with additional monitoring capacity.

If community water management groups are to be expected to manage a water resource in a new and unfamiliar way then it is important that the advice and support given to the GMFs is based on accurately identifying the water system as a common pool resource and ensuring that guidance is consistent with current knowledge of management in this field.

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