

Introduction

Rain Catchment (RC) is an expensive option, especially if the supply is expected to meet all the water use needs of a community. Therefore, rain catchment systems are only viable to provide approximately 3 to 5 litres per person per day for drinking and cooking, and an alternative water source and supply should be found for sanitation needs such as dish-washing, bathing, laundry, etc.

It is also important to distinguish the number of people to be supplied by each rain catchment unit. The size of the units can depend on whether they are public supplies, i.e. cater for a total clan or village population, communal supplies which cater for approximately 50 people, and individual household supplies.

Whilst being the simplest of constructions in RWSS projects, some quite serious miscalculations have occurred, and some very basic principles have been ignored.

Rain Catchment Units

The method for calculating rain catchment units advocated in TAN TOOLS 7.2, 7.3 and 7.4, is the dry season demand approach. The catchment area is calculated according to the annual rainfall, and the tank volume is dependent on the number of annual dry season storage days expected. **Public RC supplies** are useful where large buildings with appropriate roofing materials exist. However, the size of catchment area required cannot be underestimated. For example, a RC solution for a Central Province population of say 1,000, requiring a need of 3litres / day, with an estimated annual 60 days dry season, would require a reservoir tank(s) with a volume of 180m³ and a catchment area of 1,110m², to meet those needs. An average sized church or school building has a catchment area of approximately 120m². If applying this example, a village in Central Province with a population of 1,000 would require about ten large buildings to meet drinking water demand. It would be an unreasonably high cost to benefit ratio to construct several large buildings purely to meet drinking needs alone. **Communal RC supplies** are useful where the majority of the village has appropriate roofing material. Large and sufficient catchment area exists when combining the roof

resources of more than one house. Using the factors of demand and storage requirements in the example above, a population of 50, would require a 9m³ reservoir and a 56m² catchment area. An averaged sized house is approximately 40m². therefore two houses combined would supply more than enough drinking water for 5 to 7 houses. Furthermore, if all those 5 – 7 houses combined to fill the reservoir, the supply would be sufficient for some other sanitation needs such as dish-washing, possibly laundry or bathing. **Individual RC supplies** provide households with independence. However, it is an expensive option for a total population coverage, because of the number of tanks required, and they are an extremely expensive option if the existing roofing material is inappropriate and needs replacing. An average house in Central Province requires 1.8m³ storage volume and 11m² catchment area, to provide 3litres / person / day, for a 60 days dry season.

Public and communal RC supplies require agreements between all parties supplying and benefiting from the RC, stating that ownership of the catchment area will not affect future use and access to the supply from intended users.

The most cost-effective solution is the communal supply, but other factors must be taken into account in calculating costs, such as annual rainfall, existing resources, user preference, etc. Central Province has the lowest annual rainfall in Papua New Guinea, and all rainfall data, cannot be guaranteed from year to year.

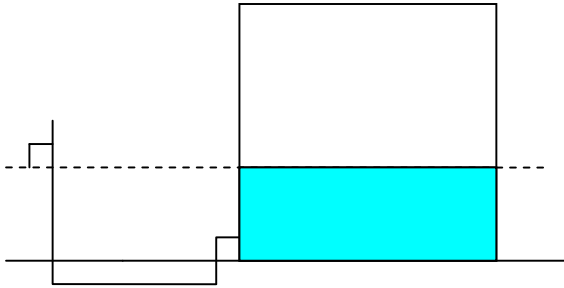
Common mistakes

- Overflow pipes drain onto the base of the reservoir tank causing subsidence and eventual collapse of the tank.
- When new catchment areas are constructed, they become stand alone structures in the middle of the village serving no purpose other than catching water. These structures can be used in a dual role, either as a school classroom, meeting hall, or other community building. Too often, the opportunity for other development has been missed. When siting rain catchment, it may be more prudent to upgrade existing roofs of community buildings.

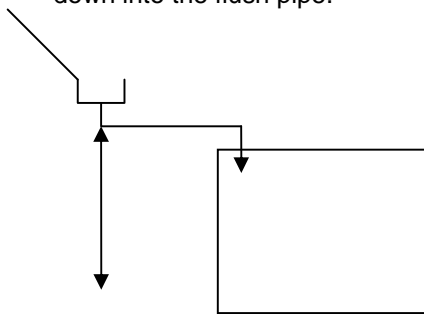
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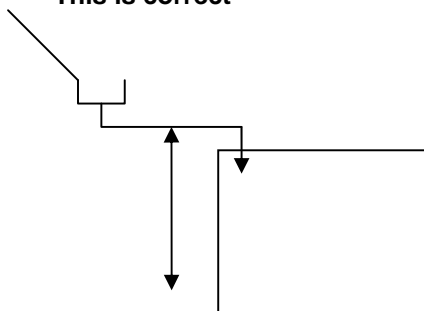
- When installing tap stand outlets from a tank, some field workers have sited the outlet above the base of the tank. In some cases, up to half of the tank water will never empty, as can be seen by the example below.



- some individuals or groups do not feel part-ownership of the supply
- First-flush pipes are not being considered fully in the design. Water must flow directly down into the flush pipe.



This is correct



This is incorrect

- Beneath the first flush pipe, drainage chambers that are equal in volume to the first flush pipe, have not been included in the design.

Operation & Maintenance

The community must be informed of the tank operation and maintenance requirements and its capacity to meet demand. For example, any calculations that were made at the feasibility stage, including expected rainfall, catchment area and tank volume, should be explained to the users, so that there is understanding of the supply limitations, and development opportunities to increase the catchment area. Training of men and women in equal numbers must occur before completion of the project. The down pipes must be regularly emptied, as often as after every rain. Equally, a routine cleaning schedule could be adopted to clear debris and leaves from the guttering. Inspections of the base will identify structural issues and fractures in the mortar, and any drainage issues. Inspections of the inside of the tank will reveal sedimentation build up and other contamination. Any leakages from taps and fittings must be repaired quickly to prevent total water losses. Pooling of water should be corrected with adequate drainage intervention.

Water Management

Rain catchment is a restrictive water supply. This means that users have to have individual and collective discipline in the amounts of water being taken on a daily basis, preserving reserves in the tank for future days, weeks or even months. Common new water management behaviours must be agreed between the users of each RC unit, which will ensure equal sharing of the water. One user who takes 1 litre more than their fair allocated share, could realistically leave another user with 1 litre less. Variations in season may also require stricter water management and reduced quotas or shares per individual.

Conclusions

RC can be expensive and, ineffective at the same time if not thought out thoroughly. The type of RC unit must be chosen by the community, and this should involve a decision-making process that includes the NSA facilitating one of, or a combination of three RC options; public, communal and individual household RC. The

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materials required must reflect an analysis of the different factors; demand in litres per day, population, dry season period, provincial average annual rainfall. An additional safety design factor will highlight consideration of how much of the rain landing on the catchment area is actually harvested.

The technical design must consider the following basic principles; overflow pipes causing drainage issues at the foundation, use of existing roof structures, or proposed new community buildings, total community voice being heard over owner preference and choice, first flush pipes with drainage chambers positioned correctly, so that run-off water runs directly down and is not running over the top of the flush pipe, height of the height of the tap stand in relation to the water level in the tank.

Training in operation and maintenance must consider repairing leaks, cleaning gutters, emptying first flush pipes, drainage checks, payment of spare parts and overall cleaning routines. Finally it is important to consider that RC systems are a restricted water supply, therefore requiring collective user management.



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