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SARIRI VILLAGE REBUILDING – PAPUA NEW GUINEA (PNG)

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ABSTRACT

In 2008 the Sariri Village was hit by cyclone Guba. The village is located on the North Coast of PNG, not far from the Kokoda trail with the nearest significant township being Popondetta. Sariri comprises around 7 tribes with approximately 300 inhabitants (expected to grow to 1000). When the cyclone hit, the village for all intent and purpose was erased from the map. The PNG government and tribal chiefs agreed to move the village from its existing river bank location to a safer site located approximately 2km inland. This move however created issues in relation to the most basic of water and sanitation needs.

In early 2014, Rotary Geelong approached Barwon Water seeking help on ways it could provide sanitation facilities along with safety and building skills to the village with the limited resources they had. Rotary had been active in PNG for many years and recently in rebuilding the Sariri village since cyclone Guba struck, but required help in relation to sanitation options.

1.0 INTRODUCTION

In our daily lives in Australia we take for granted the fact that you can turn a tap on and receive high quality water or push a button on the toilet and not have to worry about what happens with our waste from that point on. This is by no means a soap box statement but an observation that is driven home when you participate in a project such as this.

The Sariri village is located on the northern coast of PNG. Once in the town of Popondetta the journey to Sariri is by 4WD and takes up to a full day dependant on conditions and river levels. The drive itself involves several river crossings and very poor 4WD tracks to a river staging point. From there a canoe trip across the river and 2.5km jungle walk gets you to the village.

Figure 1: ***Sariri Village Location***

Rotary Geelong approached Barwon Water with a vision for the village and ongoing high level objectives they wished to achieve. These objectives were to:

- Plan a sewer system that can be implemented to service the Sariri Village
- Introduce an educational awareness program. Enhancing Sariri people and their sustainability (i.e. teaching how to produce, sell products, up skill to self-perform)
- Secure / provide funding for the project and attend Sariri to plan and deliver the sewer project
- Make a blue print for other villages for their implementation of similar village schemes (off the shelf villages layouts, plans and systems, educational, financial and governance)

Barwon Water conducted a workshop with over 40 staff to look at our ability to firstly help and secondly come up with sanitation solutions. From this initial meeting, a small team of Barwon Water staff worked on the many ideas that came from the workshops and shortlisted them based on sanitary risk mitigation, construction feasibility in a remote locate and usability. An innovative composting toilet design that utilised wheelie bins was developed. The Gordon Institute of TAFE was approached and through their Geelong Technical Education Centre (GTEC) built a prototype unit. This was then modified to become what was ultimately a flat pack toilet which was shipped to Sariri in February 2015.

In May 2015 the author flew to Sariri with Rotary to help in the installation and provide information on composting toilets and water supply systems which will aid future construction of many more units.

This paper will provide an overview of the development and implementation of a simple sanitary solution for the Sariri village.

2.0 ROTARY REQUEST TO FINAL SOLUTION

2.1 Rotary Workshop

Barwon Water conducted a workshop with over 40 staff to come up with sanitation solutions for Sariri Village.

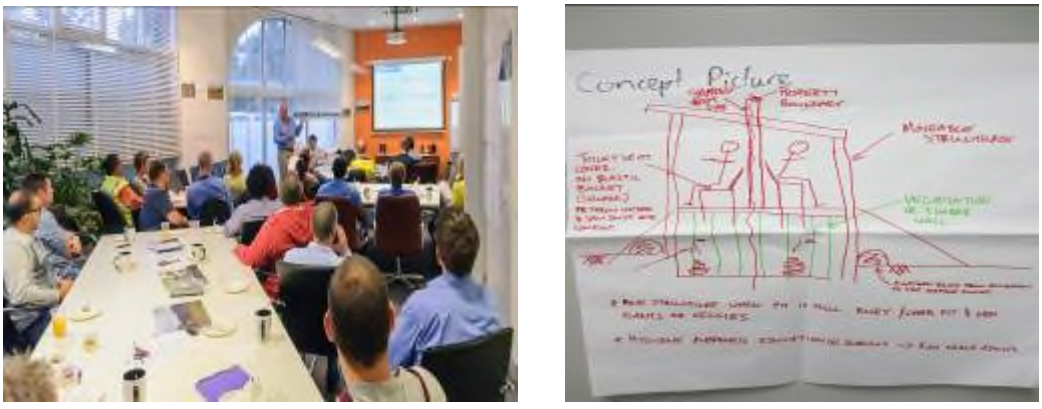

Figure 2: ***Rotary Workshop at Barwon Water Offices***

Our ideas and outcomes were defined by several constraints:

- Local custom did not allow for the handling of waste
- Ground water was at <1 metre in places and 2 metres maximum

- Town water was drawn from a groundwater well in centre of village
- The soils were permeable and sandy
- Resources are in short supply or non-existent and everything needs to be made from timber as a small portable saw mill is owned by the village
- Low skills based labour

From the workshop brainstorming sessions and group discussions many potential ideas, opportunities and constraints were highlighted.

2.2 Toilet Design Selection

The world health organisation has produced "A Guide to the Development of on-site Sanitation, WHO, 1992" which gives recommendations and design criteria for basic sanitation options. From our workshop outcomes and using this WHO guide, an options assessment was completed to validate the most appropriate final solution. (See Fig. 4)

An above ground composting toilet design using 240lt wheelie bins and timber sourced locally was agreed, however this design relied on the need to separate the solids and water components prior to the wheelie bin. An Australian designed and manufactured toilet seat with internal separator was found and sourced for this project. It allowed for all urine waste to be directed to slotted piping buried in infiltration trenches rather than filling the composting area of the wheelie bin. This was essential in maintaining an adequate wheelie bin change over frequency and reduce odours. The theory is that once changed over the bins would be placed in an area where they could compost for 12 months and then be emptied for beneficial reuse.

Figure 4: ***Options Assessment for Toilet Design***

2.3 Design Calculations

Constraints

Unknown local volumes of waste; Unknown number of people in family per unit; Unsure if toilet paper and feminine pads are degradable.

Assumptions

WHO and WASRAG references apply; Capacity of wheelie waste bin 2/3 x 240 litre = 180 litre; Some separation of urine from waste bin

Calculations

Base sludge accumulation rate per person = 60 litre/person/year
(Based on WHO Table 5.3 non-degradable cleaning materials)
Cf. WASRAG = 50-80 l/p/y
Factor up 50% for short term storage
Factor up 300% for organic covering e.g. Saw dust to aid odour & composting
60 x 1.5 x 3 = 270 l/p/y
Cf. WASRAG = 300 l/p/y
Volume sludge, say 5 people/ family = 1350 litres/year
240 litre bin two thirds full = 180 litre
Empty every 2 months

2.4 Toilet Construction

With the toilet concept and calculations finalised a detailed design was undertaken to allow construction of the toilet. The aim was to have a final design that was simple to understand and fabricate in a remote location with limited resources. The designs also needed to factor in air extraction/ventilation, stability during high wind and constructability.

Following detailed design it was decided that a prototype toilet needed to be constructed to ensure all objectives of the project had been met. It was also agreed that this prototype would be sent to PNG as a base model for other units to be copied off due to potential issues and skill levels required to follow detailed plans.

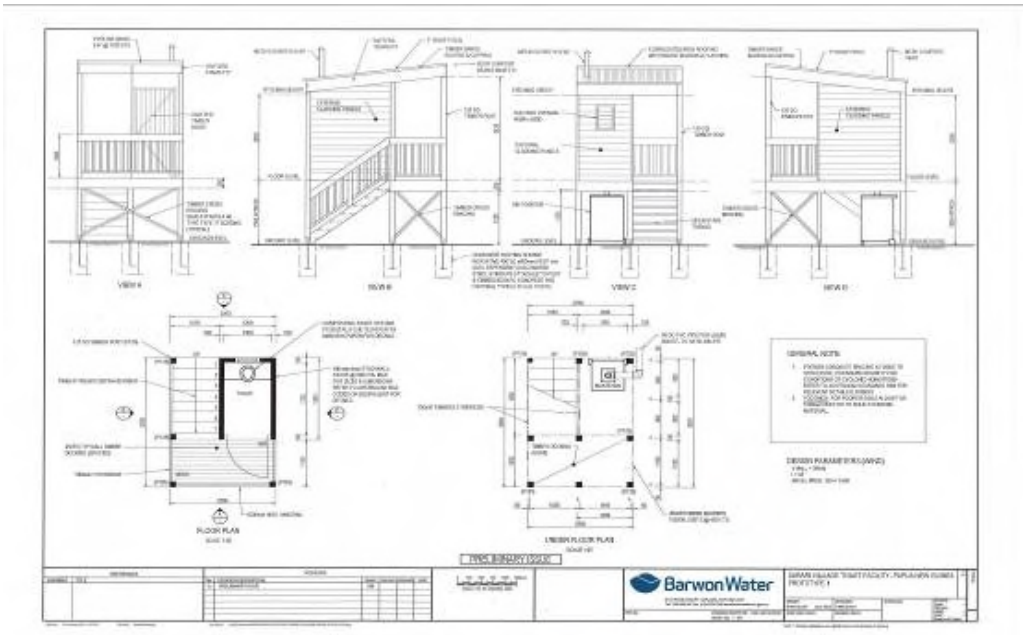

Figure 5: ***Detailed Design Drawing***

For the construction, a partnership was formed between Rotary, Barwon Water and Geelong Technical Education Centre (GTEC). Barwon Water supplied all the materials and the staff and students in the building and carpentry sections of GTEC constructed the prototype.

This was an outstanding partnership as the staff and students provided significant input into design changes and modifications during construction which allowed for simplification and reduction in materials used.

They also came up with the concept of modular design and flat packing. This had three significant benefits:

1. Ease of shipping the prototype to PNG
2. Allowed us to label and colour code connection points and components
3. Allowed the villagers to build new toilets in simple sections or modules and then construct.

Finally the GTEC students assembled and dismantled the final unit in a bush setting using techniques available to villagers to ensure our design and construction methods were sound. It was then packed up and sent to PNG.

Figure 6: ***Test Build and Flat Pack Shipping***

2.5 Sariri Village Build

The toilet and other items need for the village were shipped to PNG in February 2015. From the Oro bay port the contents of this shipping container were transported to the village over a month. In June 2015 a team of 6 people (the author and 5 rotary members) travelled to Sariri Village for a 14 day period to complete multiple projects including construction of the flat pack toilet and then fabrication of a second unit built from resources available to the village.

Although originally designed to be installed at houses, the village decided that the first toilets would be built near the school (Rotary had built this on a previous trip). This allowed for the children to be taught about its use, care and composting and allow them to pass this information onto others in the village.

Once we had arrived at the village it took several days for all the components to make their way across the river to the construction site.

Figure 7: ***Flat Pack Toilet Component Arriving in Sariri Village***

When all the components were onsite it took two days to construct the flat pack toilet.

As with a lot of projects completed during this trip; improvisation was essential as there was no stores, hardware or otherwise within a day's travel.

Several items had gone missing between the port and the village and using some of the taps and PVC fittings from the toilet project to repair the water systems took priority.

Once the first toilet was complete we travelled into the jungle and milled enough wood with the portable mill saw to construct a second toilet (Boys & Girls). All the work completed by GTEC in the prototype phase of the project paid off as the second toilet was built in modules using the first as a template. This allowed the second toilet to be completed in a timeframe of two to three days once the wood arrived onsite.

Figure 8: ***Toilet Build***

3.0 CONCLUSION

Rotary approached Barwon Water in 2014 looking for a small amount of help in relation to sanitary options for a village in PNG. What this initial request delivered was a project that allowed interaction between multiple organisations, people and community services that would never normally happen in the course of our daily roles.

The project allowed us to take a simple idea from concept to completion for minimal cost and help people that we would never normally interact with, and hopefully provide some additional benefit to their lives moving forward. It was certainly rewarding for the Barwon Water team involved.

4.0 ACKNOWLEDGEMENTS

Sariri Village
The people of Sariri for your acceptance, hospitality, culture and hard work to get these projects completed
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Barwon Water
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5.0 REFERENCES

World Health Organisation. *A Guide to the Development of on-site Sanitation* (1992).