

# Providing Water and Sanitation Services in Papua New Guinea

By Eric Kalmbach, Engineering Design Manager, Cardno Acil (PNG)

Papua New Guinea is mountainous and most parts are still difficult to access due to the harsh topography, thick rainforest and lack of maintained infrastructure.

	<b>Population</b> 5.6m
	<b>Water supply coverage</b> 44%
	<b>Sanitation coverage</b> 39%

Source: WaterAID

The total renewable water resources available per person in Papua New Guinea is around 170 thousand cubic meters - an amount considered

to be very high compared to most countries. In the remote Star Mountains region extreme rainfall of up to 11 metres of rain per annum have been recorded.

Despite this abundance of raw water, access to safe drinking water is quite low. In rural areas, where about 85 percent of the population lives, only a small percentage of water is potable. Most rural households depend on unsafe surface water sources from rivers, springs, ponds, lakes or dams. In many towns of Papua New Guinea, water supply systems are unreliable, deteriorated or non-operational due to the lack of skilled operators or maintenance.

Access to clean drinking water is an issue for over half of the population and there are large disparities between water and sanitation provision throughout the country. With the foregoing



picture, it is not surprising that water related diseases like diarrhoea and worm infestations are a common cause of illness, malnutrition and death in PNG's people.

The physical infrastructure division of Cardno Acil in Papua New Guinea is actively and successfully addressing these issues by providing engineering services to provide safe water and sanitation facilities throughout the country. Currently, we provide services that include investigations, desktop and feasibility studies, design and documentation for projects in Paiam (Enga Province), Kiunga and Daru (Western Province) and Konebada (Central Province) near Port Moresby.

The priority considerations to achieve these objectives are affordability and sustainability. The designs must be suitable for the application and working environment. Our experience confirms that by keeping appropriate designs as simple and standard as possible successful long-term operational, maintainable and manageable systems are achieved.

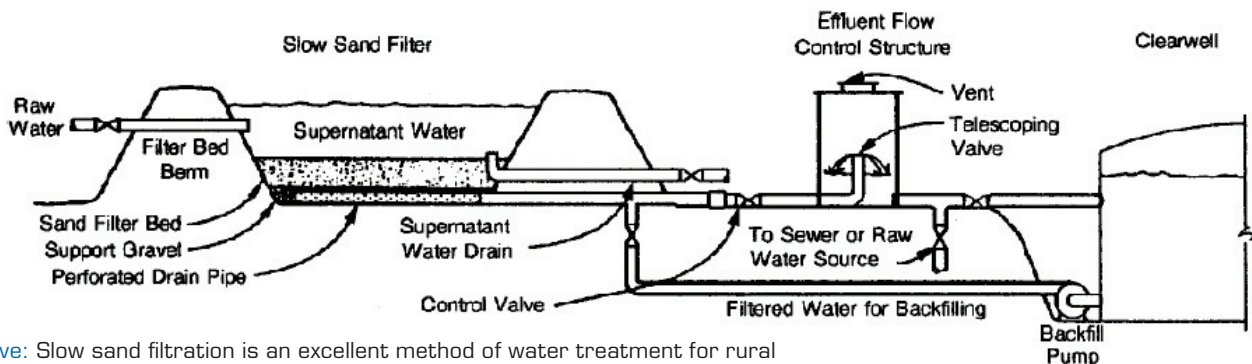
Appropriate and where possible, low maintenance systems and equipment are considered for design solutions. An increasing amount of our consulting work in Papua New Guinea has been to assess and to redesign water and sewer schemes that incorporate complex and high maintenance technology. These complex design solutions often fail completely within a fraction of their intended operational life due to the inability or lack of resources to maintain the systems. Below are some pictures to better illustrate this situation.



Above: Complex sewerage treatment plants like the one shown above often fail due to lack of maintenance and skilled operating personnel - resulting in discharge of untreated effluent.



Above: Waste stabilization ponds as shown above near Waigani, provide a useful method of waste-water treatment and disposal for growing communities where funds and trained personnel are in short supply.



Above: Slow sand filtration is an excellent method of water treatment for rural water-supplies. It can give good results and requires a minimum of operational and maintenance skill. A schematic diagram of an open slow sand filter.

When carrying out site investigations, many interesting aspects of deteriorated infrastructure components and how the local communities deal with them are being discovered. Two examples are described below.



**Above:** This picture shows the leaking trunk main at a river crossing that is supplying the Daru Township. Locals on the mainland use this source to fill up their bottles. Sometimes leaks are manmade but often they are also caused by corrosion.



**Above:** This picture shows how a leak on an above ground water main that was caused by corrosion was stopped by inserting a sharpened wooden stick into the opening. Of course this quick fix will not last and replacement of this pipe section is urgently required.

Table I. Cardno's involvement in some current Water and Sanitation Projects in PNG

Project	Client	Scope	Capital Cost	Special Features
Kiunga Water Supply and Sewerage Augmentation	Ok Tedi Mining Ltd	Investigation, design and documentation of augmentation works	K10.5 million	Bore water is the primary water source. Upgrade works include installation of two 1.1ML storage tanks which will improve water availability and working pressure.  Installation of waste stabilization ponds will improve sanitary situation in Kiunga.  Kiunga's population is estimated at over 10,000
Daru Feasibility Study – Water Supply and Sewerage	PNG Sustainable Infrastructure Ltd	Investigation and Feasibility Study	K15+ million	Water is being pumped over a distance of 16km from a mainland intake, because not sufficient potable water is available on the Island. 4km of this supply pipeline is laid on the seabed. The Island does not have a functioning sewerage system.  The study investigates deficiencies in the current system and explains ways of improving and upgrading the existing system.  Daru's population is estimated at over 14,500.
Daru Aquaculture Project	PNG Sustainable Development Program Ltd	Investigation, Design, Documentation and Supervision	K2 million	Design of a salt water supply system for a Barramundi fish hatchery. The intake is located in the open sea. Extreme tidal movements (up to 4m) have to be taken into account.
Paiam Water Treatment Plant	Porgera Joint Venture	Design and Documentation	K450,000	The existing package treatment plant is often not functioning due to the lack of maintenance and skilled operating personnel. Cardno designed a slow sand filter system to replace the existing plant and to minimize maintenance and operation requirements.
Konebada Petroleum Park Project	Konebada Petroleum Park Authority	Desktop Study	N/A	The purpose of this study is to assess possible water supply, water treatment systems and sewage treatment options for major future developments near Konebada.