*Implementing Sustainable Water Resource and Wastewater Management in Pacific Island Countries*

# GEF PACIFIC IWRM PROJECT RESULTS NOTE

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# Improvement and Sustainable Management of Neiafu, Vava'u's Groundwater Resource

*Groundwater monitoring of Neiafu Aquifer*

*Setting up sanitation monitoring*

**Top 3 Project Results**

1. A 60% increase in community engagement in water management in Neiafu reflects the focus of this project on the community solving local water and sanitation challenges
2. The first assessment of sustainable yields from the Neiafu aquifer may ensure the long-term sustainability of an aquifer that has seen increasing salinisation due to over-pumping
3. The provision of infrastructure and services to meet community-led directions on providing the 5,000 Neiafu residents with access to sustainable sanitation
4. 100% Engagement of Primary Schools and NGOs during World Water Day celebration
5. Development of Analysis Scenario that will determine the future demand and risk analysis for TWB that could assist in development of the management strategy
6. Training of Trainers for Water Safety Planning for Household Level

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## 1. PROJECT OBJECTIVE

*Sustainable water resource assessment and protection of the fragile Neiafu Groundwater Resources through:*
*A. Mitigation of threats from contaminants;*
*B. On-the-ground protection; and*
*C. Development of a Water Resource Management Plan*

## 2. RESULTS: PROCESS

*By focusing on stakeholder engagement, the project has supported a community with failing sanitation systems and minimal understanding and engagement in water and sanitation management, the project has strongly engaged the Neiafu communities into developing and implementing targeted solutions to local water and sanitation challenges.*

**Figure 1** Community Audits of Rainwater Tanks

*The formation and subsequent work of the Neiafu Aquifer Management Committee has been pivotal in the changes seen. With strong commitment to awareness raising and capacity building programs, this committee has raised community awareness and stakeholder engagement. This significant increase in community engagement has enabled targeted strategies to be delivered to improve household water and wastewater management and agricultural practices.*

*The aquifer management committee was a new concept in Tonga, as is the current development of an aquifer management plan, piloting aquifer management strategies in the Pacific region. This has been supported by the first assessment of sustainable groundwater yields from the aquifer and the identification of system leakage. Both of these studies should support important decisions managing local water resources.*

*The project has re-invigorated the Tonga APEX body, which had not met for over a year, and is supporting the development of a national indicator framework and IWRM planning.*

**2013 update:** The project has continued to strongly engage the Neiafu communities by improving local people's knowledge on water quality and quantity. All the primary schools within Neiafu were visited in the weeks leading up to Blue Ribbon Week by the IWRM team and participating NGO's. The schools were made aware of the purpose of Blue Ribbon Week and the importance of working together to look after our valuable water

resources. The schools were then asked to create costumes and posters of sea animal to incorporate latest coastal project into integrated water management. Additionally the schools created a poem and song about water. Their context of their poems and songs indicates the improvements of people's understanding on water quality and quantity.

Water Safety Planning (WSP) workshop with members from all the different districts and relevant Ministries participating was held. This was a continuation of a 3 day workshop conducted in October of 2012, that covered conducting water collection and storage surveys, simple water treatment methods, septic system awareness and surveys, water wise use and water quality testing. All the participants are now the "Water Champions" within the community. The participants of the WSP workshops also contributed to the development of a household water safety manual. The final edits are being completed on the manuals and will be distributed within the Neiafu districts in the coming weeks. The 'Water Champions" will run additional water safety planning meetings within the communities and distribute the water safety plans with assistance of the IWRM team.

The primary purpose of the Project's scenario assessment was to assess future demands and available groundwater resources in the Tonga Water Board (TWB) well field near Neiafu in order to determine appropriate management practices for both the groundwater resources and the water supply system.

**2(a) INDICATOR#1: PROPORTION OF COMMUNITY ENGAGED IN WATER RELATED ISSUES**

At the project inception, communities were not engaged in the centrally-controlled water management in Neiafu, to the point where householders were forbidden from fixing household problems without written permission from government. The aim of the project was to increase active community participation by 30%. Household surveys indicated a lack of knowledge on the importance of managing of water resources and sanitation and there were few opportunities for communities to be engaged in water management, with no power in decision making.

The project has dramatically raised community engagement through consultative meetings, direct engagement on the Steering Committee and several community initiatives, such as household audits. Gender mainstreaming and community engagement initiatives have been met with strong positive community responses, with a demonstrable increase of about 60% in community engagement in both awareness raising and active engagement activities. People now have the opportunity to state their opinions in an open forum and to use their local knowledge and skills on managing water resources.

In the first quarter of the year 2013, there was almost 100% attendance at awareness activities. NGOs, private sectors and Primary Schools have joined the project's awareness activities. Women are starting to form up more development groups and there is an emphasis on Water Safety planning at the household level.

**Figure 2** Falaleu Community Training

**Figure 3** Fungamisi Community

Communities have actively participated in our Water Safety Planning workshop. They are now the Water Champions and will contribute to the development of a household water safety manual. The

'Water Champions" will run additional water safety planning meetings within the communities and distribute the water safety plans with assistance of the IWRM team.

**Figure 4:** Neiafu Water Champions (Endorsed in March 2013)

## 2(b) INDICATOR#2: AQUIFER MANAGEMENT COUNCIL ESTABLISHED

The centralized management of Neiafu's aquifer prior to this project meant that decisions were often made with minimal local input and in turn, the Neiafu community had minimal understanding or ownership of their water resources. Under these arrangements, there was limited understanding of how to protect the aquifer, or even the need to do so, and the lack of an aquifer management plan or an understanding of the resources had resulted in over-pumping and salinisation of many wells. The aim of the prject was to establish and endorse an Aquifer Management Committee or Council.

The establishment of the Neiafu Aquifer Management Committee has rapidly addressed several of these issues. The raise in knowledge and capacity of the committee has been reflected in the broader community with targeted communication and capacity building strategies through a community-focused subcommittee. The committee and community ownership of the aquifer has been fundamental in the successful re-establishment of septic pump-out and disposal systems, providing broad access to sustainable sanitation in Neiafu.

The Neiafu Aquifer Management Committee is empowering local communities through the establishment of town water committees for each community in Neiafu, to plan their own water resources, reduce threats to groundwater, increase the safety of household drinking water and reduce waste of resources in water loss (leaks and careless). The project is supporting the Neiafu Aquifer Management Committee and town water committees in the development of an aquifer management plan and establishing a policy and funding framework to sustain these committees beyond the project. The committee not only works with freshwater resources but is now considering coastal resources as well.

**Figure 5:** Neiafu Aquifer Management Committee Members (30th of May 2012)

## 2(c) INDICATOR#3: MULTI-SECTOR APEX BODY ESTABLISHED

Prior to the project, the APEX Body had stopped meeting and no longer provided a focus for national water management. Decisions of individual agencies were being made in isolation, and the National Water Bill and National Water Policy progress had stalled. The project aimed to establish an APEX body for the coordination of water issues in Tonga.

The project reinvigorated this committee through a targeted retreat at the project site, bringing the members together and identifying strategies to increase sectoral and national coordination. During this retreat, the Neiafu Aquifer Management Committee and the APEX body worked closely on strategies to improve groundwater management and increase community engagement in water management. The APEX Body has subsequently progressed the National Water Bill and National Water Policy and was fundamental in supporting the development of a co-funded AusAID project to extend the GEF IWRM demonstration project to an integrated water and coastal management (IWCM) project. The APEX body holds regular bi-annual meetings and remains a strong influential body for the development of water management plans, including the upcoming Implementation for Water Management Bill.

**Figure 5** APEX BODY members at the meeting in Vava'u (demonstration site)

## 2(d)INDICATOR#4: Community Engagement

Prior to the project there was limited engagement of the community in water issues. The aim was to increase this to alt least 30% of the demonstration population. World Water Day Event is the most successful engagement activity in Vava'u. All Primary Schools of Neiafu District all participated with original traditional poems and songs. Ministry of Education and Training supported the World Water Day Event through the Blue Ribbon Week. Other Ministries were wearing the IWRM Blue Ribbon or wear Blue for the whole week. Women Development Groups, NGOs, and private sectors were participated in the parade and the exhibitions.


**Figure 6:** Neiafu Primary Schools' Parading GIO Recycling (Private Sector) during the WWD Exhibition


**Figure 7:** Neiafu Women Development Group Exhibition (NGO) and VEPA Exhibition (NGO)

**Figure 8:** TCDT Exhibition (NGO)

**2(e)INDICATOR#5: Replication of IWRM on Coastal Management**

The project aimed to replicate the lessons learned into other projects or regulations by the end of the project. An additional fund from the AusAID through the SPC is now being managed by the Neiafu Aquifer Management Committee to replicate the IWRM skills on coastal management. I would like to give the credit to Mr. David Duncan for all his assistance, without his guidance and his professional leadership on Vava'u Project, the committee would not have this implementation.


**Figure 9:** Integrated Water and Coastal Management Committee also Integrated Water Resources Management Committee now a bind committee for both water and coastal management Project

**2(f)INDICATOR#6: Population with access to safe water supply**

At the commencement of the IWRM project there was limited access by people to a safe water supply. Of the number of households in Neiafu 30% had unreliable access to a safe water supply (2010 Preliminary Survey Result for houses do not have rainwater tanks). The target of the project was a 30% increase in access to safe water supplies in Neiafu (approximately 1,500 people).

The scenarios for the estimated present water system loss showed that all scenarios are exceeding the desired sustainable pumping rate. However, in the case of an improved water loss from the piped system, the scenarios do not exceed the sustainable pumping rate over the 20 year time period. The investigations of the scenario development have been endorsed by the steering committee and have aided in the development of the Water Resources Management Plan. Draft IWRM Plan has been completed; still there is no chance of endorsement from National Water Resources Management Committee due to overseas travel of its member. Implementation of the Water Safety Planning in district level is currently ongoing. IWRM Project received kind assistance (AusAID) in enabling the project to funds the finalization and printing of the manual. There are 1200 copies *(600 Tongan version, 600 English Version)* that were printed, and Project has already conduct training of the distributors in requires resources needed for the process of distribution to be successful.

Confirmation, there are more than 700 copies that are already distributed especially to the Project communities and stakeholders and are open to other communities in the island.

**2(g) INDICATOR#7: Project Design and PM&E plan implemented**

For the successful implementation of the project it was necessary to develop the project design and PM&E plan. This was to be completed by August 2011 and endorsed by the project Steering Committee

PMU through community consultation has enabled to complete this part. Project Monitor & Evaluation was conducted on communities' level, and from our view the communities are now eager to participate and commit to the betterment of the whole community.

**Figure 10:** One of the community consultation in two different communities in Vava'u

**2(h) INDICATOR#8: National staff across institutions with IWRM knowledge and experience**

Prior to the projects implementation there was limited knowledge of IWRM practices and concepts. The aim of the project was to show an increase in staff knowledge and experience, or by proxy through training and work roles.

The IWRM Project has supported opportunities for the National officer to engage and participate in available training related to IWRM. The Project Assistant attended a JICA Water Resources Conversation Management workshop in Island Area Training in Japan in 2010 and a MoH Food and Water Safety Training in 2011 in Nuku'alofa. The Project Manger completed a Post Certificate study on Water Resources Management, and is currently undertaking a Master in Water Resources Management in Brisbane, Australia. These trainings have increased the knowledgeof the IWRM Project team and have created an environment that is knowledgeable on IWRM processes and concepts.

**2(i)INDICATOR#9: Sectoral engagement in formal multilateral communication on water issues**

Prior to the IWRM project there was no sectoral engagement in formal multilateral communication on water issues which created a fragmented environment for addressing water challenged in Tonga. Through the project sought to increase this engagement.

The project supports the participation from established committees, and aimed to increase engagement of the water and other related sectors they represent. Despite the different agendas of different committees, from the project views to the ongoing meetings proved the engagement each stakeholder represents. The project is influenced by this engagement, such as technical contribution in technical committee meetings that have supported the project in technical decisions, task force (Water Champions), steering committee, and National committee.

**Figure 11:** Technical Group Meeting

**Figure 12:** Television Program by PMU and Project stakeholder

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## 3. RESULTS: STRESS REDUCTION

Neiafu relies heavily on groundwater for water supply. However, the sustainability of this resource is threatened by a combination of pollution from septic tanks and agricultural practices and over-pumping to supply water through a system with significant leakages. The project is addressing both these threats through a combination of on-ground works, guideline development, targeted training, community engagement and overarching IWRM strategies and plans.

Prior to the project commencement septic tanks were failing across Neiafu due to a lack of pump-out facilities. This challenge has been addressed through the establishment and operation of pump-out facilities, supported by awareness campaigns to support uptake. Further reductions have been achieved through the installation of eleven trial sanitation systems, including a compost toilet.

Studies have identified agricultural impacts and training has been provided to farmers to improve land management practices and reduce threats to the groundwater.

Assessments of sustainable groundwater pumping rates and supply system leakage have identified key areas for improvement to mitigate stresses on the aquifer.

A guideline development of scenario gives guidance into future development and future stresses on groundwater and how that might be dealt with. It assesses future demands and available groundwater resources in the Tonga Water Board (TWB) well field near Neiafu in order to determine appropriate management practices for both the groundwater resources and the water supply system. The likely impacts to the future water resources with a risk rating were developed to determine the likelihood and the intensity of potential risks and/or hazards. Events that are most likely to occur and have a moderate to major impact on the future water demand and supply were used to develop the 4 Scenarios over 10 and 20 year projections. The factors included, population growth, increased tourism and prolonged drought conditions and all scenarios were done under current and reduced water loss from the piped system.

Target training was done as a guideline for a safety plan on drinking water at a household level. The workshops covered topics such as conducting water collection and storage surveys, simple water treatment methods, septic system awareness and surveys, water wise use and water quality testing.

Community engagement during the Word Water Day Event, enhanced the idea of water sustainability within the communities of Neiafu.

**Figures 13 & 14:** Workshop on the proper handling and use of agrochemicals

**Figures 15 & 16:** Nutrient monitoring in to assess reduced nitrogen discharges to groundwater. Sampling site (left) and testing (right)

**3(a) INDICATOR#1: NITROGEN POLLUTION DISCHARGED TO GROUNDWATER IN NEIAFU**

Prior to the project commencement, Neiafu had been without septic tank service facilities for many years, causing many of the town septic tanks to fail, creating unsanitary conditions around many tanks and dramatically increasing groundwater pollution. At the request of the Neiafu community, the project reestablished a septic pump-out management system. Households were surveyed to identify failing septic tanks and advice provided through a combination of media (television, radio and a school-based awareness competition). Trial sanitation systems have been installed to demonstrate reduced groundwater impacts, including sand filtration and compost toilets.

The pump-out service has been established with a sustainable financial model and has already been used by approximately 20% of Neiafu households, representing a 5% reduction in nitrogen and organic pollution of groundwater. It is anticipated that, by project completion, the target of 20% reduction in nitrogen pollution of groundwater will be achieved. This will be augmented by almost complete reduction of pollution from the eleven demonstration site households.

The Project was aiming to treat liquid waste from infiltrate directly from the septic system into the environment. The coming choice of demonstration to be made was sand filter system and compost toilet. Sand filter system was a biological treatment method of 2 filtration tank is buried in a level of the septic storage, in which the liquid waste is gravitationally overflow from septic to the 1$^{st}$ then to the 2$^{nd}$ treatment tank, in which the liquid waste is allow with requires time to treat naturally through the tanks fills with sands and gravel of different sizes. Treatment through filtration then to microbiological activities such as anaerobic processing is expect to happen during this naturally treatment method. Tests have been made on the outlet of the 2$^{nd}$ tank and believe to be very effective regards the presence of nutrients.

The operation of the Project pump-out truck has been servicing satisfactory to the whole island of Vava'u. It has now pump-out more than 200 trucks since operate, proved of it's so needed by the island. This waste is discharge to a simple sewage construct by the project, where layers of rocks, gravel up to fine sand sizes on top. This is a simple primary treated sewage that proves to reduce more than 60% of the discharge contamination to the environment. Project is having a challenge of this sewage where it cannot accommodate the needs of the whole island, since this project was demonstrated to the urban town of the island only, while the project committee makes exception in allow the pump-out truck to service to the whole island.

After participating in the Water Safety Planning Workshop, people now understand proper septic construction and how the leakages from septic tanks can affect groundwater quality. Pump-out services are now popular in the whole of Vava'u.

**Figures 17 & 18:** Vacuum truck and sludge management beds at Kalaka Site

**3(b) INDICATOR#2: REDUCTION IN WATER LEAKAGE LOSSES IN VAVA'U**

The Neiafu town water supply (approx. 5,000 people) is groundwater sourced; however over-pumping of some wells has increased water supply salinity to levels that are approaching undrinkable. The need for the high level of pumping was thought to be high system losses; however no reliable assessment had been undertaken prior to this project. The project aimed to reduce water leakages by 40%.

**Figure 19** Old infrastructure associated with 70% leakage losses. A key study suggest that old valves may be contributing significantly to losses

**Figure 20** Leak detection in Neiafu

As part of the project an assessment on Neiafu Groundwater and sustainable management has been completed, which identified 70% water losses. This figure is much higher than previously anticipated and has focused thinking on cost-effective responses. The assessment concluded that the majority of water loss was attributable to failing old infrastructure, including leaking pipes and valves. The project is working in partnership with Tonga Water Board to reduce water leakage from the system through a combination of leak detection, targeted on-ground works and system management.

Additional water leakage losses are being targeted by the project at the household level, with audits being undertaken to identify household losses and improve household water use efficiency. This work is being supplemented by trial household level treated wastewater reuse schemes.

The Neiafu Aquifer Assessment Report of the GEF IWRM Project has reported to the National Water Resource Committee and it emphasized on the 70% leakages in Vava'u. At the moment the Tonga Water Board is negotiating for funds that can reduce the leakages.
Awareness program is still reminding the communities on all land-based pollutions that can affect groundwater resources.

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## 4. RESULTS: WATER RESOURCE AND ENVIRONMENTAL STATUS

A project survey identified that over 90% of Neiafu was operating failing sanitation systems. A further small percentage had no access to improved sanitation. Through the project, it has been possible to pilot the rehabilitation of ten failing systems, install two demonstration compost toilets and service the failing systems to ensure access to improved sustainable sanitation. Household level audits currently being developed will enable the Neiafu communities to ensure that all sanitation systems are functioning sustainably.

Through the rehabilitation of ten failing systems and the 2 composting toilets have the houses have been able to improve their sustainable sanitation. The sanitation systems guide the communities toward alternative ways of how to sustainably protect groundwater resources. In the 2nd quarter, 2013 a household survey was conducted to monitor improvements from the 2010 sanitation audit.

### 4(a) INDICATOR#1: POPULATION WITH ACCESS TO IMPROVED SUSTAINABLE SANITATION

Prior to the GEF IWMR project, the failing sanitation systems in Neiafu meant that people needed to dig out septic tank sludge and were dealing with leaking and overflowing system. The project aimed to increase access to improved sanitation in Neiafu by 90% (approx. 4500 people). In a hilly community with relatively high rainfall, this also resulted in unsanitary conditions across much of the community. A project Household Survey on sanitation and water supply identified the high sanitation system failure rate, largely attributable to the lack of a pump out system available. Through a combination of establishing a septic pump-out and disposal system, eco-sanitation and household level treatment trials, the project is removing many of the risks associated with failing sanitation systems and also barriers to improving household sanitation. Household level guidelines are being developed in

partnership with communities through this project to raise the awareness of results and aid to uptake. Current monitoring suggest that over 20% of Neiafu systems are now sustainable, and by project completion, should reach the 90% target.

Following the success of the composting toilets coastal communities in particular are now requesting composting toilets. People understand how sanitation systems can help reduce the unsanitary conditions across much of the hilly community.

**Figure 21** Composting Toilet at Fungamisi