SOPAC

Water Demand Management Workshop

Nadi, Fiji Islands, Skylodge Hotel

21st to the 26th of June 1999

Miscellaneous Report 345

Compiled and edited

by Harald Schölzel and Rhonda Bower

The Water Demand Management Project is funded by NZODA.

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Introduction

In the past, development projects in the water supply sector have mainly concentrated on the upgrading or extension of existing water supply hardware. This supply-driven approach has proved to be very costly for both the donor and the receiving country and has not lead to a safe water supply even for the bigger urban centres in most of the Pacific Islands Countries (PIC). Most water supply systems operate at the edge of collapse not because that there is not enough water available at the source of abstraction, but because water supply systems in PIC lose more water through leakage and wastage than they actually deliver to customers. The patchy design of these distribution systems render not only the technical design of many aid projects technically questionable but also makes the management and operation by the local water authority very difficult. With more pressure on very limited resources, many PIC have realised that the key towards sustainability lies, not necessarily, in costly infrastructure extension but more in the sound management of the water supply system. This trend has been enforced with the appearance of institutional strengthening projects in the water sector, mainly funded by AusAID, that concentrate on building national capacity rather than giving away hardware.

Generally speaking water leakage and wastage are the main reasons for water problems in Pacific Island Countries and previous initiatives to resolve this problem have been limited to unsystematic and isolated projects. This often resulted in the only temporary set-up of leak detection units, instructed and trained over a very limited period by consultants. From time to time, multi-international donors fund some isolated activity to reduce leakage with little or no follow-up. Though a good part of the project is aimed at this particular problem of water conservation water demand management (WDM) stands for much more than that. It is a holistic approach towards controlling the water supply system and making fully-informed decisions. It includes preventative maintenance as well as setting up performance-monitoring devices or the zonation of the system by districts and pressure sub-zones. Economic and environmental issues influence the degree to which leakage detection program will be carried out and are part of WDM. After all, water pricing is an important tool for influencing consumer demand together with Public Awareness Campaigns. In short:

'Water Demand Management involves the adoption of policies or investment by a water utility to achieve efficient water use by all members of the community. (White, 1998)[1]'

The present report summarises the regional workshop which has been an integral planning tool for the NZODA-funded Water demand management project. It was attended by Water Utility Managers and Engineers from the Cook Islands, Fiji Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Many countries sent more than one participant which could indicate the importance of the subject to Member Countries (MC). In addition, the workshop was attended by observers from four countries.

[1] White, S., (1998), Wise Water management: A demand Management Manaual for Water Utilities, Institute for Sustainable Future, Universitty of Technology, Sydney, Research Report No. 86.

Acknowledgment

This workshop was funded by New Zealand Official Development Assistance.

SOPAC extends its thanks to Simon Webber, Jonathan Thirkell and David Grinter, Australian Capital Territory Electricity and Water Cooperation (ACTEW) who largely facilitated the fieldwork. Dennis Haraham (Australian Leak Detection) deserves our thanks for his efforts to demonstrate leak detection techniques in the field.

Special thanks are given to Ainslie Waldron (Ainslie Waldron & Assoc. Pty Ltd) and Tim Waldron (Chief Executive of Wide Bay River Water Utility) who were the main resource persons to this workshop. Their work over 6 days is appreciated.

Finally the authors wish to express their gratitude to Seema Deo (South Pacific Regional environmental Program) for her contributions to the workshop.

Monday, 21st of June

		Topic	Presenter/ Comments
From	**To**		
8:30	9:00	Workshop Opening and Introduction to Water Demand Management.	Dr. Russell Howorth (SOPAC)
9:00	10:30	Water Demand Management and Workshop Overview.	Tim Waldron (Wide Bay Water Authority)
10:30	11:00	Morning Tea	
11:00	12:30	Problem Identification of Member Country Working Groups.	Moderated by Harald Schölzel and Ainslie Waldron (AW&A consultants)
12:30	14:00	Lunch	
14:00	15:30	Problem Identification of Member Country working Groups (continued)	Moderated by Harald Schölzel and Ainslie Waldron
15:30	16:00	Afternoon Tea	
16:00	17:30	The structure of Water Losses.	Tim Waldron

Opening and Introduction to Water Demand Management

SOPAC's Program Manager, Mr. Russell Howorth, welcomed everyone to the workshop. Mr. Howorth outlined SOPAC's role as an aid to member countries whose work program activities are defined by the member countries. He mentioned how the water program originated at UNDP then later transferred to the SOPAC Secretariat. He also spoke on CROP (formerly SPOCC) and the part it plays within the regional agencies i.e. FFA, USP, TCSP, Forum Secretariat, SPC and SOPAC. Through workshops and meetings within individual regional agencies, action plans and ideas are formulated and pushed up the organisational hierarchy to reach governing bodies like SPOCC.

Mr. Howorth also spoke on the vulnerability of small island states mentioning that this issue comprised 3 aspects i.e. vulnerability, social and environmental aspects. He stated his definition of water demand management and encouraged the participants to use this workshop as a collective effort and useful tool to push water demand issues up the regional agenda. Thereafter he officially opened the workshop.

Mr. Harald Schölzel then introduced the two resource people, Mr. Tim Waldron of Wide Bay Water and Mrs. Ainslie Waldron of Ainslie Waldron and & Assoc. Pty Ltd. Mrs Waldron welcomed all the participants and spoke of her experiences with workshops and what she hoped the participants would gain. Mr. Tim Waldron spoke on his experiences with the water industry and gave a general overview of topics that would be covered during the week-long workshop.

(See Annex 1 for Country participants list)

Water Demand Management Workshop Overview - Tim Waldron

The purpose of this session was to give workshop participants an overview of what has been set up as content of the workshop and make the necessary and desired alterations to the agenda.

(See Annex 2 Introduction to Water Demand Management Slides)

Session 2: Problem identification – Working Groups

The idea of this session was to introduce, if possible a complete list of WDM issues and induce reflection on what the countries already do in terms of WDM. Participants were asked to form groups to formulate their specific expectations of the workshop. Country papers were loosely integrated into the presentations of working group results allowing for a less formal and more target-oriented way to present specific country information.

The following question was put to the group for discussion. What do you hope to get out of this week's workshop in the 5 areas of:

- engineering,
- finance,
- operations,
- management,

- other?

Session 3: Problem identification – Working Groups continued'

Group 1:Fiji – Presenter Mr. Samuela Tubui

(See Annex 3 – Fiji Slide Presentation)

Q:	What are your expectations regarding the workshop content?
A:	Group 1 whose members solely consisted of Fiji participants from both the Suva and Lautoka Public Works Departments wanted to find out how to properly manage a system.

Info: Fiji - The Public Works section comes under the Ministry of Works and Energy.

More specific problems identified by the Fiji group were:

Engineering

- Emphasis to be placed on water analysis
- Zoning management
- Water distribution (sample water)

Finance

- Investment in terms of capital project
- Viability of project
- Cost benefit analysis
- How to determine whether something is viable or not.

Operation

- Flow distribution
- Zoning of reservoir-distribution in areas that are not supposed to be distributed to.
- Process management system – deals with how we look at processes behind systems e.g. Treatment plant (management systems behind processes)
- Standard operating systems
- Maintenance

Management

- Customer focus
- Quality in terms product, service
- Strategic planning
- Public awareness

Questions and Answers following presentation:

Q:	Mrs. Ainslie Waldron: What does Water Demand Management mean to you?
A:	Water demand management means how you manage demand. From a supply, the distribution and operation to customers, supply management, metering etc.

Q: Where does Fiji stand in terms of water demand management?

A: At present the Fiji water supply is divided into 3 areas, Western, Central Eastern and Northern. All these areas have operations people in each division of supply and demand. Central office is the deciding body and makes plans and projects. Leak detection is currently being looked into. There have been complaints about metering and to remedy this, the Public Works Department has recently installed test batches. They are also undertaking pipe duplication to fulfil demands of customers.

Q: Mr. Robert Hadley (FSM). What is your rate of water consumption?

A: The rate of water consumption is as follows: Every unit costs 12 cents for less than $50m^3$ for domestic consumption. Commercial rates are higher at 60 cents per 1,000 litres and also added are sewerage charges per thousand litres used for sewerage treatment. (Note: Bills are sent out every 3 months.)

Q: Mr. Amerika Siale (Samoa). What is the average rate of consumption?

A: The average rate of consumption is as follows: 200-250 L/p/day for Suva and Lautoka. Labasa rural has an average rate of consumption of 50-150 L/p/day.

Q: Mr. Amerika Siale (Samoa). Are you trying to stick to one figure?

A: We are trying to stick to specifications especially in urban areas and work according to our master plan for these different areas which essentially is dependent on funding.

Q: Mr. Harald Schölzel (SOPAC). How do you derive design figures?

A: Design figures are adopted from another standard and is a base figure but am not sure which standard it is adopted from.

Q: Is it based on the demand you assume people already have?

A: This figure is seen to be a conservative one.

Info: Mr. Lemuel Siosi (Solomon Islands) – In the Solomons there is a water consumption of 250 L/p/d and this figure is derived from a billing system.

Q: Mr. Roy Matariki (Vanuatu). Are there any other organisations dealing with water issues in Fiji?

A: No

Q: Mr. Amerika Siale (Samoa)– Don't you think the charges placed on commercial consumption are expensive as this does not seem fair?

A: More charges are placed on Commercial ventures as they use up considerably more water so to bill them more is fair.

Q:	Mr. Ben Parakoti (Cook Islands). Does 150 L/p/day compared with 250 L/p/day in the case of Solomon Islands, seem like a realistic figure. The Cook Islands for example have a water consumption of 267 L/p/d that is a standard figure?
A:	The figure is derived from the average values obtained from the billing systems. This does not take into account leakage.
Q:	Mr Roy Matariki. (Vanuatu) – Do you have problems with government organisations in terms of billing?
A:	Yes. Recently Fiji enforced a ruling that government organisations that have previously not been paying for water will now be billed.

Group 2 : Fiji, Samoa, Tuvalu, Vanuatu, PNG and Marshall Islands – Presenter: Mr. Tuisiga Saitala

Problems Identified:

- Operations and management
- Water quality, hydraulic analysis – Samoa
- Illegal connections –RMI and PNG

Info: Tuvalu - no piping systems; mainly use rain water; although there is use of water distribution trucks it is not encouraged as they like to keep water supply simple.

(See Annex 4 for Tuvalu Country Paper)

Other problems encountered by Tuvalu: A solution to the current problem would be for Aid donors to assist with a Water Catchment Project. The plan for the project is to incorporate water catchments to civil servants houses and sub-divide the amount of expenditure for the project into short-term and long-term term spans. Also subdivide capacity and government usage.

Info: PNG – Out of the 19 provinces 11 have water supply systems managed by the The Water Board

(See Annex 4 for PNG Country Paper

Other problems encountered by PNG – Unaccounted for water, leakages, illegal connections. They have used meters to combat illegal connections but this is presently not working. Further problems are a lack of financial and engineering assistance.

Info: Samoa – Water consumption for the last 5 years has been very high with 600 L/p/d and are currently trying to cut down on this. They are at present attempting to install meters. Water supply is not treated apart from in the rural areas. The water authorities are currently running a public awareness program around areas of Samoa promoting issues such as water conservation. T$144/p/yr is a standard fee charged to everyone for water usage. Once metering is installed individuals will be charged according to usage. They are trying to concentrate on water quality, coliforms, salinity in both ground and surface waters.

Mrs. Ainslie Waldron Input

Mrs. Waldron stated that water suppliers need to be able to find a communication means for the whole spectrum between political ministers and customers. Mr. Ben Parakoti replied that in the case of the Cook Islands this may not always work out as the water suppliers prefer to perform the tasks independently as it is found to be more efficient. The reason for this being, that from past experiences with the involvement of Government bodies, nothing was ever decided upon.

Other problems encountered by Samoa are in engineering (designing) water supply systems, ie there are problems with hydraulic analysis.

Question and Answers following presentation:

Q: Mr. Lemuel Siosi (Solomon Islands)– With regard to your water consumption of 600 L/p/d has this figure been reduced?

A: Some factors allowed for a reduction of 250 L/p/d.

Q: Mr. Ben Parakoti (Cook Islands)–How do you arrive at 600 L/p/d?

A: Mr. Amerika Siale (Samoa)-A qualitative survey was performed by the staff recording the number of people per family, how much water was used and this method was used to determine the figure.

A: Mr. Ben Parakoti (Cook Islands)–In the case of the Cook Islands the water connections were metered and a standard figure was decided on. This figure being 267 L/p/d, which not only referred to each household but also included the lot next to it as they had taken into account the subsistence living of Cook Islanders.

Q: What percentage is present for illegal connections

A: Mr. Bill Mondo (PNG): 25 % at present

Q: Mr. John Chaniel (Vanuatu, UNELCO):-Do you have special clarifications regarding illegal connections?

A: Mr. Bill Mondo (PNG): 100 Kina to $500 Kina fine

Q: Mr. Samuela Tubui (Fiji):Regarding metering in PNG, what steps are you taking to check defective meters?

A: Mr. Bill Mondo (PNG): Presently have a calibration plan for this.

Group 3: FSM, ACTEW, Kiribati

Problems expressed by the different countries represented by group 3:

- Customer awareness and public education.
- Leakage detection equipment use.
- Unaccounted for water.

- Differences and relationships between demand and wastage and how to control and manage issues.
- Ways to manage and control water supply systems that are politically influenced?
- Why should we pay or be charged for water? How do you run a supply system?
- Water rates in each country.
- Cultural awareness of water systems.

Info: FSM – Are in the process of trying to corporatise water systems in FSM of which three states have already done so. The national government has allocated $30m for this project.

(See Annex 4 for FSM Country Paper)

Info: Kiribati – Currently has a water consumption of 40L/p/d. Tanker truck services are provided that cost AUS$12 per ton of water. Domestic use of water is free and commercial use is charged AUS$5.00 per ton. Groundwater is currently being used in Kiribati with their main line servicing a complete 24hours and village systems servicing 4hours/d.

(See Annex 3 for Kiribati Country Slide Presentation)

Other problems encountered by Kiribati – low water pressure, politically difficult to proceed with restructuring the water sector.

Questions and Answers following presentation:

Q:	Ms. Seema Deo (SPREP) – Have you set up a desalination plant and how much does it cost?
A:	Mr Taboia Metutera (Kiribati):Yes we have, it produces 1,000 tonnes of water p/d and cost a total of $200,000.
Q:	Mr. Tim Waldron – What is done with the effluent created by the plant?
A:	Mr Taboia Metutera (Kiribati):. The effluent is dumped on land.
Group Question:	What is your definition of water demand management?
A:	Controlling water demand on systems by controlling leakages.
A:	Mr. Jonathan Thirkell ACTEW – Controlling the water demand on the system. This includes the “use” of water through leakages, other losses as well as consumer consumption.

Group 4: Cook Islands, Vanuatu, Solomon Islands – Presenter – Mr. Ben Parakoti (Cook Islands)

Info: Cook Islands - A good water pressure is found in systems in the Cook Islands however water is untreated and only undergoes filtration. Irrigation systems have a 24 hour water supply as Cook Islanders lead a subsistence lifestyle (agriculture) and this

accounts for a 30% loss. Monitoring of this was performed however there was found to be no change in water intake over a 24-hour basis during the survey. A 24-kilometre grading survey has been carried out which displayed the degraded state of the water pipe line. The same galvanised pipes have been used for the last 34 years. The water authority is currently working on upgrading the network. They presently have 12 intakes scattered through the islands and have trunks and two ring mains which are in good condition, however the other mains are experiencing problems.

Other problems encountered by Cook Islands – Irrigation is a high consumer with water water quality as a problem. However, people have not complained about this so the Cook Island water supply feel that they are not in a position to treat the current water supply as the cost to treat 12 sources of water would be too high.

In the Cook Islands at present tariffs are not placed on water and ADB is putting pressure on Cook Islands to implement tariffs or may face the prospect of not receiving further funding.

Question and Answers following presentation:

Q:	What is the pressure range found in the Cook Islands?
A:	Mr. Ben Parakoti (Cook Islands): The pressure range found in the Cook Islands are from 20-70m with a lot of the intakes occurring around 60-80m in altitude.
Q:	Do you undertake water quality tests to ensure water is safe?
A:	Mr. Ben Parakoti (Cook Islands): Yes, a two-month survey is performed every year at source points however not points along the system.

Info: The Rural Water Supply Section in Vanuatu has gone through 12 Ministers in the last three years making it difficult to implement any long-term ventures. The accessibility to most of the areas in Vanuatu is difficult and the supply is arranged to feed off to small populations. UNELCO has been contracted to manage the water supply systems in Port Vila for the next 20 years. Under the contract requirements UNELCO are stipulated to provide good quality water supply over a 24-hour to the area. Vanuatu Development Bank has invested $310M vt for the next 10 years in this project. At present Port Vila supplies water to the population, of 4500 connections consisting of 80km of pipe works.

Other problems encountered by Vanuatu: At present they have few engineers and are in need of more trained personnel. As well as this there is also a lack of public awareness and a need for more programs as 80% of the population in Vanuatu at present is represented by rural dwellers. Land issues are prevalent and interfere with the proper running of the water supply systems. The charging of water was also found to be a problem as well as the lack of support staff for the water supply section.

Info: Solomon Islands - The Solomon Islands Water Authority (SIWA) is a relatively young organisation that has been in operation for about 5 years. They are fully corporatised and are only mandated to work in urban areas. The general need stated by SIWA is for an overall framework connecting all areas and utilities and departments to each other. This allows for the better communication with all the different utilities.

SIWA is currently taking a strategic management approach, an internal scan of the department. They are in the process of placing tariffs on water supply, with a survey already carried out showing the following charges:

1kL/d - SI$0.65 for domestic use and SI$1.30 for commercial use.

The rural areas around Solomon Islands are looked after by the Rural Water Supply.

(See Annex 4 for Solomon Island Country Paper)

Other problems encountered by Solomon Islands - Leakage problems, trying to access meters located underground, illegal connections and unaccounted for water which is one of their biggest problems. Often there is estimation in meter reading, and this does not account for correct values. Catchment management is also a problem as some schemes come under customary land tenure to which landowners are paid for their water use. The water quality is sometimes poor with rains causing the water supply to become brown and block meters.

Question and Answers following presentation:

Q:	Mr. Robert Hadley (FSM): Does SIWA come under the same umbrella as the Electrical Utilities etc.
A:	Ms. Antoinnette Wickham (Solomon Islands): SIWA presently comes under the Ministry of Mines
Q:	As a non-profit organisation, how do you intend to privatise.
A:	Ms. Antoinette Wickham (Solomon Islands): The government is still in the process of undertaking this, however they feel that privatisation needs to be defined.
Q:	Mr. Samuela Tubui (Fiji)-What would you do when the consumer demands outweighs your production capacity and you have no financial means to combat this?
A:	Mr. Tim Waldron (Fiji)-I would perform a survey to see how efficient the system is and then work form this point once this information is obtained. I would then be able to determine whether something can be done with the existing system if this option seems more viable.

(See Annex 4 for Tonga Country Paper)

Final thoughts:

There is currently a global move from commercialised → corporatised → privatised patterns within the water industry. Once a Water Utility becomes privatised it no longer receives grants, donations, etc. and would then need to actually earn income.

It is important to have a network of people to disseminate information. It was stated that when you commercialise, corporatise, and privatise you are in the business of selling water and raised the question as to whether you are reducing demand. This can be seen in two aspects:

The first aspect being that as a government employee, if you reduce demand you are doing well for the country. As a corporate employee it is the opposite as an increase in demand would in turn increase your revenue after which he moved on to show two more slides on other demand management issues and planning for success slides.

Session 4: The structure of water losses

The purpose of this session was to provide a detailed account on the structure of water losses as well as how results of water loss assessments should be presented. In particular participants were introduced to the worldwide-accepted approach of Burst and Background Estimates (BABE) to assess leakage levels in water supply systems.

For his own reasons Mr. Waldron did not want to make this presentation available in electronic form. Therefore it has been reproduced as text only. SOPAC apologises for the inconvenience and any part of the original presentation that may have been missed.

Slide: Determining optimal level of leakage

Slide: Unaccounted for water:

- **Unaccounted water when talking about comparing leakage levels**
- **Unmetered uses include: fire fighting and training; flushing water mains; sewers; stolen unmetered water**
- **Leaks in water mains**
- **Leaks from hydrants**
- **Leaks from valves**
- **Water meter measurement errors in properties**
- **Unmetered water tanks**
- **Evaporation from uncovered reservoirs**
- **Unmetered filling of swimming pools most often through fire hydrants**
- **Reservoir overflows**
- **Incorrect bulk meter readings**

Mr. Tim Waldron Input

In some countries replacement programs of meters may be uneconomical. There may be a need for a meter testing program rather than a meter replacing one. Through the testing of meters you are able to find out if the meters are in your tolerance range. After meters are seven years old testing of them should then be performed every two years and if more than 7% doubt is found further investigation is required.

Slide: Misleading statistics

- **Unaccounted for water**
- **Measurements from temporary isolated distribution networks**
- **Statements from water supply managers, people who “are on-the-spot”**

Slide: Traditional performance indicators:

- **A percentage of input (Japan, Australia and South Pacific)**
- **Loss rate property/hour or day (UK)**

- **Loss rate km on the system (names and connections length)/hour (France)**
- **Multiple methods (America)**
- **IWSA Copenhagen conference**

    1. **Litres/connection/hour/meter of pressure**

    2. **Litres/km of mains/hour/meter of system pressure**

Slide: Estimation of leakage – Includes Graph

- **Reduce demand at property point**
- **Reduce flow shares**
- **Rural flushing systems**

Slide: Real and Apparent losses

- **e.g. of apparent losses**
- **errors on source and production litres and errors in customers water consumption**
- **adjustment due to meter reading log time**
- **Illegal connections and theft**

Slide: Examples of Real losses

- **Background leakage on joints and fittings**
- **Reported and unreported bursts in pipes**
- **Leakage and overflows from reservoirs**

Slide: Task Force Conclusions (Slides info incomplete)

- **Re-arrange annual water balance components into authorised consumption and total losses (ISWA Standard components)**
- **Split annual volume into apparent and real losses**

Slide: Influence for capital consumption on % losses

Slide: All Burst and Background Estimates (BABE) calculations use common parameters and concepts

Slide: Summary

- **Don't use percentage influenced by consumption**
- **L/conn/d/meter +/- 33% density**
- **27 countries**

Slide: Percentages are misleading don't use them –who says so?

- **German DVGW 1986, UK Managing leakage, 1994, OFWAT, 1997/98**

Question and Answers following session:

Q:	Mr. Johnathan Thirkell (ACTEW) – If a meter under-measures over a period of time, say from 5-7% should customers be overcharged that month's bill on the difference.
A:	Mr. Tim Waldron - It would not matter but if it occurs consecutively over a period of time then an increase in price should be placed across the board to every consumer under the supervision of a regulator.

Tuesday, 22nd of June

		Topic	Presenter/ Comments
From	**To**		
8:30	10:30	Meters and Turbine Presentation	Tim Waldron
10:30	11:00	Morning Tea	
11:00	12:30	Leakage Control Finance	Ainslie Waldron
12:30	14:00	Lunch	
14:00	15:30	Flow and Pressure Control/ Measurement	Tim Waldron
15:30	16:00	Afternoon Tea	
16:00	17:30	Hydraulic Network Modelling	Harald Schölzel

Session 1:Presentation by Tim Waldron -Meters, Turbine

The purpose of this session was to introduce participants to the problem of flow measurement, ie. systematic errors that occur with each measurement method applied. In terms of WDM the session relates to the problem of measuring the extent of water losses and real consumption as well as real production.

Mr. Tim Waldron Input

In terms of flow measurement, most water meters in the Pacific region apply the 'turbine principle'. Problems with turbine meters may arise in that at every point of the turbine, water moves at different speeds. They are specifically designed that the highest velocity units occur at the center, which causes the numbers being generated on these meters not to correspond to the velocity going through the meters.

Insertion meters, when used need a length of straight pipe approx. 100 times the diameter in order to obtain correct flow readings.

Turbulence in pipe flows is generated by numerous factors, some of which are gate valves and sluice valves, bends, reduction and extensions, pipe walls etc. Any intrusion into the water pipe for that matter can cause turbulence and therefore problems with flow measurements.

Old pipe systems can cause problems with meter readings as they are ovally shaped and may not properly be aligned.

Question and Answers following session:

Q	Mr. Jonathan Thirkell (ACTEW) - Would ultra-sonic flowmeters cause turbulence?
A	Mr. Tim Waldron - Ultra-sonic flowmeters fits on the outside of pipes, and these types of meters are round 15% inaccurate. They repeat measurements continuously and create a confidence level for accurate measurement. A highly turbulent and/ or unsteady flow can not be accurately measured with ultra-sonic flowmeters.

Session 2: Mrs. Ainslie Waldron – Leakage Control Finance

(See Annex 5 for Leakage Control Finance slides, Handouts for Case Studies of the Determination of the Unit Cost of Leakage, Handouts for 4 Working Examples)

After the Leakage Control Slide presentation, Mr. Andre Siohane from Niue then made a country slide presentation on the current leakage control program, showing data and cost analysis.

(See Annex 3 for Niue Slide Presentation)

Session 3: Flow and Pressure Control/ Measurement

The purpose of this session was to provide participants with an overview on the importance of 'being in control' of the water supply system. The point is less trivial than it sounds since

very few water utility operate their water supply system with sufficient understanding of what exactly happens within the system from the point of entrance, eg the source, to the point of consumption in terms of pressure and flows. The session particularly emphasised the paramount importance of pressure control since leakage is extremely sensitive to pressure levels within the water supply system.

For his own reasons Mr. Waldron did not want to make this presentation available in electronic form or as a printout. It has not been reproduced as text only. SOPAC apologises for the inconvenience.

Session 4: Hydraulic Network Modeling

The purpose of this session was to provide an overview on the usefulness of a numerical model of the water distribution system with regard to its operation and control of leakage levels. It related directly to the previous session as an important tool to understand the way the system is operating and performing.

Large parts of this session highlighted the benefits of hydraulic network modeling for the operational engineer. However, it also comprehensively summarised their limitations and data requirements for their set up and their maintenance.

Available software products were mentioned and briefly discussed. Current work with Pacific Island countries was presented. Mr. Schölzel reiterated the importance for PIC to develop models using their own personnel. This approach has been successfully demonstrated in a recent project SOPAC implemented with the Tonga Water Board.

The full presentation has been attached as Annex 6 – Hydraulic network modelling.

Wednesday, 23rd of June

		Topic	Presenter/ Comments
From	**To**		
8:30	10:30	**Working Groups Session** Session 1a – Flow and pressure control Or Hydraulic Network modelling Session 1b – Pressure, pipe bursts and background losses.	Tim Waldron and Harald Schölzel
10:30	11:00	Morning Tea	
11:00	12:30	Continuation of discussion from Session 1a and 1b.	Tim Waldron and Harald Schölzel
12:30	14:00	Lunch	
14:00	15:30	Intrinsic leakage levels Methods of leakage control Methods of leakage detection Designing Step Tests	Tim Waldron and Harald Schölzel
15:30	16:00	Afternoon Tea	
16:00	17:30	Working Groups – Step Tests	Simon Webber (ACTEW)
23:00	5:00	Practical Step Test Exercise	Simon Webber, Jonathan Thirkell, David Grinter, Harald Schölzel and numerous PWD Fiji staff

Session 1a: Working Groups Session. Flow and Pressure Control OR Hydraulic Network Modelling (wrap up of the previous day's session).

The purpose of the working groups was to consolidate the insights gained on the previous day during the presentation, mainly through facilitating an open and objective discussion amongst participants.

Solomon Island Country Presentation – SIWA, Presenter Mr. Lemuel Siosi

(See Annex 3 for Solomon Island Slide Presentation.)

Questions and Answers following the group work and presentation:

Q: Mr Samuela Tubui (Fiji) – In your briefs during the presentation some of the figures don't add up, are we to assume readings are taken on faulty meters.

A: Mr. Lemuel Siosi (Solomon Islands) - We are unsure whether 250L/p/d is a correct figure for water consumption as this figure is taken from meter readings which we assume reflects the demand. This is just a basic figure.

Q: For your meter replacements, do you have testing facilities to test faulty meters.

A: Yes, we do (Fiji)

Q: What populations are you dealing with in relation to your revenues?

A: The number of connections being dealt with is approximately 6000 customers in the area of Honiara alone. However, revenue that is collected fluctuates every month. Time-payment can be arranged for customers who have difficulty in paying bills all at once.

Q: Can you identify the most common complaints of your customers in the area you service regarding water supply?

A: The main complaint brought forward is the low pressure experienced in the taps. This is due to the fact that initially town planners and the water supply division did not consult with each other in planning for better system. This resulted in a settlement being located 20m above the highest water system. It is commonly found that there is often no consultation between utilities.

Q: What type of equipment do you use for step tests in the Solomon Islands?

A: The same as SOPAC (Portaflow 300, manufactured by Panametrics, UK).

Q: Mr. Lemuel Siosi (Solomon Islands)-What type of equipment would you recommend for step tests?

A: Mr. Tim Waldron- Kent 3000L are the best turbine meters for low-flow measurement but can often become damaged, thereforee strainers can be used to even out the flow. Dirt boxes need to be cleaned out to avoid problems that could arise due to turbulence.

Session 1b: Pressure, pipe bursts and background losses - Presentation by Mr. Tim Waldron.

(See Annex 7 for 'Factors Affecting Leakage' presentation slides)

Every supply system has an intrinsic leakage level. Pipe work systems of a certain age, working under a certain pressure can become tired. The standard of training of workers can also affect supply systems. Leakage control measures need to be sustained over a period of time to avoid going back to the same level of leakage problems encountered previously.

Higher pressures will increase the rate of loss of water from an individual leak, and may in turn cause more leaks to appear. Higher rate of loss however, usually makes the leaks easier to locate using sounding. By reducing pressure one can also reduce net night flow, yet it becomes harder to locate the leaks.

Time Factor- refers to the Time Related Pressure which is determined by what proportion at a particular pressure is related to the rest of the day.

Pressure break tanks are often cheap with no mechanical workings. Systems designed at low pressures can be at risk of contamination.

Question and Answer Section after presentation

Q:	Why should pressure, make any difference at all?
A:	The total pressure in system is dependent on the level of the reservoir and when consumers cease using water at night the pressure increases and therefore the flow and finally the water losses (as part of an increased flow).
Q:	Mr. Tim – Waldron - Does any country have guidelines which is used for pressure, for e.g. WRC has a pressure guideline of 80m?
A:	Fiji has a guideline of 50m pressure and Samoa has a guideline of 70m pressure.

Mr. Tim Waldron Input

Flow Modulator Pressure-Reducing Valves are pressure-reducing valves (PRV) that measure pressure and alter the flow going through the system. The valve 'senses' when the demand decreases and starts to automatically close the PRV down. The valve re-opens again when it detects an increase in demand again. These valves are used to try to reduce total water demand.

Q	Mr. Harald Schölzel - Do you often have complaints about your pressure reductions from consumers?
A	Mr. Tim Waldron – Through the use of these valves in areas in England there weren't any complaints as it was made sure that these pressure-reducing valves only altered its flow by 5% and no more.

Q	Mr. Jonathan Thirkell - With reduced pressure, loss of water still occurs, is this the right assumption?
A	Mr. Tim Waldron – This is partially the correct assumption as very simply PRV's reduce the amount of flow, so you use the same amount of water, more than you would lose water for leaks. But you could possibly reduce infrastructure costs.
Q	In this sense is some part of it the rationing of water?
A	Yes! However, well-designed systems would not need to be concerned with the use of PRV's.
Q	Mr Samuela Tubui (Fiji)-What about declarations of supplying 24-hour water service in mission statements?
A	Along with corporate plans, water utilities normally have mission statements. An obligation made in this statement is to supply water 24-hours a day. With these PRV methods, systems may actually be closed down for a time so may not fully adhere to declarations made in these statements.
Q	Would you recommend variable speed pumps?
A	Mr. Tim Waldron – No, variable speed pumps are replacing elevated towers and are only recommended when highly-skilled operators are used. Problems arising from the use of variable speed pumps are that they are very complicated to use. They are systems that with varying speeds give out water that is related to demand and when the pumps are not in operation, no water is found in the system. Speed pumps have various attachments, which are required for its operation such as meters and pressure cells. Never rely only on one pump – 'one pump is no pump'.

Session 2 – Continuation of discussion from Sessions 1a and 1b.

Session 3 –Intrinsic leakage levels, methods of leakage control, methods of leakage detection, designing step tests presented by Mr. Tim Waldron.

The purpose of this session was to provide background on step tests to the participants. Step testing is a relatively easy method of assessing leakage levels in water supply systems. Moreover they provide extensive insights into the system operation as well as on the inventory and its operating status.

Session 4: Working Groups – Step Tests – presented by Simon Webber

This session planned the step tests to be carried out later that night.

Session 5:Practical Step Test Exercise – Simon Webber and others

Three separate groups were transported to assigned areas and step tests were carried out until 5.00 AM in the morning. **(See Annex 8 for schematic diagrams of the step tests and a detailed report on the step test exercise.)**

Thursday, 24th of June

		Topic	Presenter/ Comments
From	**To**		
9:30	10:30	**Working Groups** Step Test Results Group Presentations and Evaluation.	Participants
10:30	11:00	Morning Tea	
11:00	12:30	Dealing with stakeholders and employees. How to cope?	Mrs. Ainslie Waldron
12:30	14:00	Lunch	
14:00	15:30	Customer Satisfaction Index	Mrs. Ainslie Waldron
15:30	16:00	Afternoon Tea	
16:00	17:00	Various Presentations	Mr. Ainsllie Waldron Mr. Simon Webber
17:15	19:00	Leak detection using correlators	Mr. Dennis Harahan

Session 1: Step Test Results Group Presentations and Evaluation.

Results from step tests presented by ACTEW. **(See Annex 9 for ACTEW report of results from step test exercises).**

Question and Answer section after presentation:

Q	What are some of the factors you would consider when designing a step test?
A	Firstly, a maximum of only twenty steps should be performed in a night and no more. Other factors to consider are the length of the pipe, age of pipe and pipe material which would also influence the reduction in a step test. An idea to consider could be making steps similar in length and volume size so at the end the results are compatible. Experience also allows you to choose your valves more accurately and allows you to get to know your system better and therefore break up the test in a better way.

Session 2: Dealing with stakeholders and employees. How to cope?

The purpose of this session was to give participants an overview on existing possibilities to achieve an improved service performance of their water utility, measured through eg a customer satisfaction index.

(See Annex 10 for Customer Satisfaction slide presentation.)

Question and Answer section after presentation.

Q	In a survey population, how would you consider who is the right and who is the wrong person for your survey?
A	The right people for the survey are those people that represent your total population. For e.g. in the case of the Cook Islands the population is 18,000. Then you need to work out how many are male and how many are female. In using an example of a survey group of 200, you would need to have both males and females equally presented thereforee having 100 males and 100 females in your survey. If a certain percentage of your population are illiterate, this would also need to be included in your sample population according to the ratio of illiterate males and females.
Q	Do you consider this a complete survey?
A	Statistically these surveys would be complete, as long as a percentage of the different proportions are represented, and in some cases where the factors cross and merge you may need to do separate surveys.

Session 3: Customer Satisfaction index presented by Mrs. Ainslie Waldron

The session provided further background and information on performance evaluation of the water utility from the customer's point of view.

Session 4: Various presentation

This session was intended to provide more aspects of WDM in a more informal way at the same time showing ideas for small public awareness campaigns.

Short Quiz Exercise carried out by Mrs. Ainslie Waldron.

Q	What percentage of the World is covered by water?
A	Three quarters or around 71%.
Q	What percentage of the world's water is available for use?
A	1% is available for use. 97% is comprised of salt water alone, 2% is ice leaving 1% available for use.
Q	What is the worlds driest inhabited continent, 97%, which consists of desert?
A	The worlds driest inhabited continent consisting of 97% desert is Australia.
Q	How much water goes into making a family car?
A	150,000L of water goes into making a family car.
Q	How much water is wasted a day by a continuously dripping tap?
A	Approximately 600L of water is wasted a day by a continuously dripping tap.
Q	How much water is used in an average toilet flush?
A	Around 12L of water is used in an average toilet flush in Australia.
Q	How much water do you use if you keep the tap running while you brush your teeth?
A	If the tap is kept running while you brush your teeth you use around 5L.

- Video Tape Presentation-Water wise presentation on school efforts in Australia to reduce water consumption through the use of low flow taps and showers, dual flush toilet systems, specially operated urinals that are activated only when in use.
- Video Tape Presentation-Sensors, correlators, transmitters etc.
- Presentation by ACTEW on leak detection equipment.

Customer Service Group Discussion Summary – Mrs. Ainslie Waldron

To measure index:

- Have focus groups to find out what is important to customers
- Doing a survey and watching samples in survey
- Areas you need to be looking at for customer satisfaction

Public Awareness Group Discussion Summary – Ms. Seema Deo

Looked at what countries wanted to do.

Objectives of what countries wanted to do

- Control leakage
- Catchment care - water conservation awareness.
- Economic value of water

Session 5: Leak detection using correlators by Mr. Dennis Harahan

The purpose of this session was to allow participants the application of sophisticated leak detection equipment to locate a presumed leak under real circumstances.

This exercise was possible only with the assistance of Mr. Dennis Harahan and the Pacific Water Association that both made their correlator equipment available.

(See Annex 11 for further information.)

Friday, 25th of June

		Topic	Presenter/ Comments
From	**To**		
9:00	10:30	Leak detection – leakage assessment and leak pinpointing	Dennis Harahan.
10:30	11:00	Morning Tea	
11:00	12.30	Drought Assessment	David Scott
12:30	14:00	Lunch	
14:00	15:30	Drought Discussion	Harald Schölzel David Scott
15:30	16:00	Afternoon Tea	
16:00	17:30	Internal and External Communication	Ainslie Waldron.
17:30		Workshop Social	

Session 1: Leak detection – leakage assessment and leak pinpointing

Presentation by Mr. Dennis Harahan

The purpose of this session was to provide an overview on existing leakage assessment techniques and elaborate on the differences between leakage assessments and leak pinpointing. The session also intended to provide an update on available technology.

The advantage of noise correlators is that the use of them doesn't require shutting off any valves and associated problems like high pressure fluctuations within the system that may result in the destruction of parts of the water supply system. Step tests show the extent and occurrence of leakage while correlators just indicate that leakage is there. Noise correlation assessments in contrast to step tests require far less work (and hence time). However, since step testing involves numerous analytical activities regarding the water supply systems it is still believed to be an important tool for water utilities to analyse their system.

As with all correlators one needs to look at how easy they are to use, are they durable for your purposes etc. When selecting a correlator there are certain factors that need to be considered. These factors are: where are your service back-up's or where is your nearest service center, what are the operating (maintenance) costs etc.? There are no engineering skills required to operate noise correlators.

Leakage assessment provides an idea whether there is leakage at all and where approximately the leakage might be. ***Leak detection*** pinpoints the individual leak.

Question and Answers following after presentation:

Q Have any South Pacific countries been using correlation as a means for detecting leaks?

A None as yet but Samoa have recently bought a correlator but have not yet used it.

Q In the case of South Pacific countries with low budgets, what would you suggest for correlators?

A A suggested correlator would be the Palmer MC-6 costing around AU$20-30,000. An idea could be a time-share between countries.

Q Does water quality affect the use of a correlator?

A Water quality does not affect the use of a correlator but pressure does as it affects the sound transmission.

Q Does a correlator monitor the pressure?

A	No
Q	If there is a low pressure in a system and instead of water coming out of a leak, water is going into the leak, infiltration, is a correlator able to pick this up?
A	No a correlator will not pick this up.
Q	In that case do you recommend not to use a correlator on low pressure systems?
A	If there is low pressure in the system, then you have other problems aside from leaks, your system is not working properly due to other reasons.

Step Test Summary presentation by Mr. Tim Waldron.

When doing step tests it is necessary to find out the facts. One needs to know where the valves are and how to perform an analysis to prove what you have got to do. Follow up work needs to be carried out after step tests by sending staff around to properties in order to check that all the properties that are meant to have water, still do after the step tests have been performed. Whenever there is an indication of leaks, a house by house inspection needs to be carried out to check if each house has water. A thorough understanding of the water system needs to be obtained.

Session 2: Drought Assessment

Presentation by David Scott.

(See Annex 12 for a full presentation Drought Presentation slides)

The purpose of this session was to provide an overview on drought forecasting, drought indices and possible mitigation strategies.

The timescale measurements of rainfall in droughts is concerned with situations relevant to its' own circumstance e.g. a river would be concerned with flow. Droughts are a recurring problem that can be responded to the same way you would to other natural disasters, however to survive it planning ahead is required. (Drought Management Plans).

The following part of the session was moderated and intended to demonstrate that drought management is only part of normal water demand management and an essential and integral part of any planning routines within the water utility.

Q	How did each country respond to the drought last year?

DROUGHT RESPONSE OF DIFFERENT COUNTRIES

Reactive Drought Measurements	RMI	Fiji	Kiribati	Tonga	Cook Islands	FSM	Samoa	Niue	Solomon Is.	Vanuatu (Rural)	UNELCO (Port Vila)	PNG
										No	**No**	
Production Capacity (LT)	**X**									**Drought**	**Drought**	
Water Restrictions (ST)	**O**	**X**	**O**			**X**	**X**		**X**			**X**
Leakage Control (On-going)			**O**	**X**	**X**		**X**	**X**				
Public Awareness (LT)	**O**		**X**	**X**	**X**	**X**	**X**	**X**	**X**			
Transportation of water shipping, barging, carting. (ST)	**O**	**X**	**X**	**X**	**X**	**X**	**X**					
Increased Storage (LT)						**X**			**X**			

Session 3: Drought Discussion

Drought Discussion facilitated by Mr. David Scott and Mr. Harald Schölzel

Q With regards to the recent drought that occurred in Fiji in 1998, was there any indication in general for this drought.

A Yes, there was a full 12 months before the actual drought. The MET service announced that an El Niño was developing at a particular speed and intensity and the areas this would occur around with its effects being felt around three months later. The prospect is of having reasonably good forecasts of up to 6-12 months ahead. Once the utility has the warning it can plan ahead to make conditions during the drought easier. It is also useful to have a measure as it becomes a political question and a legal matter. There is a need to get the politicians and public aware and involved. The worst impacts of the drought were the loss of income to people involved in the sugarcane industry, loss of opportunity and consequently loss of food supplies and school fees etc.

Q How did MC respond to drought last year. (Refer to table)

A **Republic of the Marshall Islands**-A grant was received from the United States with which seven new desalination plants were purchased to increase supply capacity. A state of emergency was declared and funds mobilised which were used to transport water to household rainwater tanks. The main source for public water supply at present in the Republic of the Marshall Islands is groundwater. Radio programs and newspaper articles were used as a means of public awareness on the water shortage.

A **Fiji**-The Public Works Department did not increase capacity but placed water restrictions on the public. There was a need to minimise usage as the catchments suffered during the drought. The demand was reduced artificially by the placing of restrictions. Also a declaration of natural disaster was made which helped to mobilise funds faster. ‘Career Expo’ has been used as a means of public awareness as well as street appeals with pamphlets being handed out on street corners etc.

A **Kiribati**-Lack of rain for a period of two months caused the rainwater tanks to empty. A severe drought was experienced over 2-3 months and during this time water was ferried out to different areas and islands. The water utility is currently in the process of a five-year plan to upgrade the water supply system. Radio programs were used as a means of public awareness to reduce water consumption.

A **Tonga** (Nuku’alofa)-During the period of the drought, consumers who were relying on rain as a source of water for drinking and washing were without water and were hooked up onto the system. Couldn’t supply the production rate required resulting in consequent low pressure. Outer islands relying on rainwater were using saline water for washing, bathing etc. and water was shipped to these areas for use. Radio programs on the wise use of water, and encouragement to report leaks were used as a means of public awareness.

A **Samoa**-During the drought, water rationing was imposed as the supply was not enough to satisfy the existing demand. Leaks were fixed to maintain the system. The three-

month drought effected a key performance in the corporate plan, e.g. paying for the trucking of water, paying for the over-time workers. Radio programs were used to encourage the public to report bursts. The use of public officers helped to explain the installation of meters and consequences of having meters in place. Pamphlets were also sent out with water bills to customers.

A **Solomon Islands**-There was a decrease in the water level with the greatest impact being felt at Auki to which an effort to rehabilitate the system was made. Water restrictions were placed on systems allowing a specified time of usage throughout the day and public awareness campaigns were run to support this.

A **Niue**-In terms of water problems Niue did not really feel the effects of the drought as the water supply mainly relied on groundwater. The drought however was seen to decrease the quality of the water, which prompted the Health Department to increase Public Awareness and employ material used for World Water Day campaigns and found it effective.

A **Vanuatu**-Effects felt on the very low-lying islands and only one or two of the big islands. School children were transferred to islands with a reliable water source. Apart from that no drought impact was experienced.

A **Vanuatu (UNELCO Port Vila)**-If there is a possibility of drought in the country UNELCO will be informed by relevant agencies and will take relevant measures. UNELCO is required to supply water 24-hours a day. UNELCO has a resource management scheme in place and manages impacts by controlling pumping practices.

A **PNG**- Apart from rationing water supplies and electrical power did not take any other particular action. However, PNG was severely affected by ENSO.

A **Cook Islands**-Closed down some intakes and had only an estimated 40% of its usual capacity on the network. The Water Works performed leakage control and outer islands relied on roof catchments, wells etc and used saline water for washing etc.

Mr. Harald Schölzel Input

Anticipating drought and informing decision makers promptly on the likely impact helps to mobilise funds. A drought index could be used as a tool to monitor and demonstrate developments. A lot of governments and water utilities tend to wait for disasters to occur rather than use the lead time given to develop some sort of plan to overcome the hardships experienced during these periods.

Delivering very arbitrary amounts of water to an area may be seen in the same light as shutting off the tap completely.

Increased capacity means drilling a borehole or using a desalination plant. Compensating for a lack in water supplies.

Q	How could leakage control be seen as a drought measure as with no water in pipes this would almost seem redundant.
A	The reason for leakage control during a drought is to conserve already scarce water, so you deal with the leaks to remedy this.
A	What is the point of pumping more water into the source and losing it again.

Thoughts on leakage and droughts

Mr. David Scott Input

Leakage control is a long term operation but it could also be a matter of choice whether you do it in a time during the drought or over a period of time. Being in control of your leaks is an on-going operation. This will allow you to be one step ahead when a drought occurs and already scarce water is being lost through the leaks.

Q	How effective did you find the public awareness campaigns? Did the government restrictions do a better job than the public awareness?
A	The government restrictions did a better job and was found to be more effective than the public awareness campaigns.

Ms. Seema Deo Input

Public awareness campaigns are when people are advised on the choices they are able to make or options they are given. You provide them with a background to work with. Restrictions are not a form of public awareness as they are enforced by government or other such governing bodies.

Info (Samoa)-In Samoa the public is not given choices they are told exactly what to do. From being told what to do they were then able to manage water properly.

Thoughts on shipping water being a long-term or a short-term venture.

Mr. Jonathan Thirkell (ACTEW)-Shipping water could be seen as a long-term water conservation measure as during a drought when users are shipped a certain amount of water, they learn to make that water last for a certain period of time before the next shipment. This may in turn induce a change in habits and behavior in the long term. This simply means that shipping water to areas as a means of necessity could in turn change users behavior to using water more manageably in the long term.

Q	Ms. Lesieli Niu (Tonga)-If people are made to live with little water for a long period of time wouldn't it be the same as placing restrictions?

Fiji-During the drought, the Fiji Public Works Department shipped water to the outer islands that needed it and once the drought was over this practice stopped. These

outer islands mainly relied on roof water catchments thereforee during the drought were left with no water at all.

Thoughts on Reactive Management

Federated States of Micronesia-FSM was forewarned regarding the El Niño and the on-coming drought and a committee was formed to deal with issues relating to this. Action was taken before the drought actually occurred.

Thoughts on increased capacity and storage.

Fiji-The Suva supply increased water capacity by increasing the number of boreholes.

Question and Answer section.

Q	Under what circumstances would you increase your tank size, considering everything else remains the same?
A	A condition for the increase in tank sizes would be intermittent supply.
Q	Mr. Lemuel Siosi (Solomon Islands)-Why would you increase storage when there is no water?
A	Ms. Lesieli Niu (Tonga)-The increase in storage was a pro-active measure performed before the drought to store water.

Mr. Jonathan Thirkell (ACTEW)-In the case of Federated States of Micronesia the increase in capacity was due to the fact that another water source was being used. The desalination plant was used to obtain more water and this was used to fill up reservoirs. Bore water usage was not stopped or reduced.

Thoughts on Drought Management.

Question and Answer Section

Q	What keeps you from using the issues mentioned in the table as a management tool?
A	Mr. Jonathan Thirkell (ACTEW)-The main problem would be funding. In some instances a state of emergency needs to be declared to obtain funds for this.
Q	What reactive drought measures would be used to avoid these emergencies?
A	Ms. Antoinette Wickham (Solomon Islands)-The problem in the Solomon Islands is that managers are not trained to be pro-active in the long term.
A	Mr. Samuela Tubui (Fiji)-Due to financial constraints in the case of Fiji, taking management measures before would be difficult and the present budget would need to be adapted.

Q	Mr. Harald Schölzel-Why did we perform the drought exercise?
A	Mr. Lemuel Siosi (Solomon Islands)-The drought exercise showed us where we stand in terms of the Pacific Islands when placed in this type of situation. It helps us to set up a scenario, in this case a drought situation and shows us how we can plan ahead. If we find that there is enough water supply, this means we can defer capital cost.
Q	Mr. Harald Schölzel-What from the table did you find was discussed in the workshop?
A	Almost all aspects discussed in the workshop are encompassed in the table from management issues, technical issues etc., hence water demand management is active drought management.

Session 4: Internal and External Communication

Communication Presentation by Mrs. Ainslie Waldron

The purpose of this session was to assist participants with communication problems that occur with a water utility.

When working for a corporate body to a private banner, there will always be problems with change. The biggest problem can at times be with the public service boards as they often want to be in control. Resistance to change usually occurs.

Q	Mrs. Ainslie Waldron-Do you find problems arising with difficult employees?
A	Ms. Lesieli Niu (Tonga)-One of the main problems encountered is the lack of feedback from employees leading us to the assumption that work activities are running smoothly when in fact there may be a problem.
A	Mr. Lemuel Siosi (Solomon Islands)-A problem arises when graduates enter the work place and can sometimes have clashes with longer-standing staff. Another problem found is the constant abuse of government vehicles.
A	Mr. Taboia Metutera (Kiribati)-Problems with older staff often arise which is seems to be a Pacific problem.

In any operation relating to water supply, high quality work must always be produced. A senior officer to be respected must lead by example.

Video Presentation-Managing problem People. (Moaning Mini)

Video Presentation-Enforcing Senior Management.

One of the important issues from the video presentation is that it is important to know the senior managers. If one is interested in undertaking a project, reasons for undertaking the project need to be well thought through with background data information.

Fiji-Influencing Senior Management Group Discussion Summary

Q Discuss main factors that you would use to persuade your senior management that you require to begin a series of water demand management programs?

A The factors used to persuade senior management are:

Positiveness

Focus on your goal and objectives

Have a benchmark where you are able to relate to, an example of how project had benefited from this exercise

Q Emphasis on how you would persuade them

A They may be persuaded by:

Facts and figures

Have good background knowledge of what you want to do

Approach them at the right time.

Saturday, 26th of June

		Topic	Presenter/ Comments
From	**To**		
9:00	10:30	Managing a leak detection program	Tim Waldron
10:30	11:00	Morning Tea	
11:00	12:30	Workshop Evaluation, Country Action Plans and Closure	Harald Schölzel
12:30	14:00	Lunch	

Session 1: Managing a Leak Detection Program

Video Presentation: Non-return fittings

The purpose of this session was to summarise the workshop and develop a water demand action plan for each country.

General Round Up of Topics. By Mr. Tim Waldron

- Cost of leakage and the cost and leakage control.
- Find out total water on meters and also total flow during night time.
- Immediately start measuring pressure in the area.
- Examine total schematic view of the area and look at district metering
- Service boarders between district meter areas
- Continuing monitoring system correctly.

Group discussion on development of general action plans for each country

Provided with handouts to develop a realistic action plan for the next 5 years in water demand management.

(See Annex 13 for Country Action Plan Summary)

Prior to the workshop participants were issued with questionnaires consisting of questions relating to the many aspects of different water utility operations. The questionnaires were then collected from the participants before and during the workshop and summarised.

(See Annex 14 for Questionnaire summary)

Session 2: Work Evaluation, Country Action Plans and Closure

Customer Service Video-The Brittas Way

Thoughts on development of action plans

Ms. Antoinette Wickham (Solomon Islands)-When in the process of formulating action plans they were looked at in terms of the needs of the Solomon Islands specifically.

In their case needs were in order of priority:

- Engineering-tasks involved are data collection, design etc
- Management: inventory of existing equipment, proper time schedules
- Operations
- Finance

Mr. Amerika Siale (Samoa)-Management needs

The need for timetables, to be very specific having exact dates. Then working to time frame strictly giving these time timeframes to managers and subordinates.

Mr. Samuela Tubui (Fiji)-Action Plan in terms of the financial aspect

Need to focus on financial needs and place a dollar value relating to this. The lack of proper financial analysis training is one of the biggest shortfalls in Fiji. Financial assistance is provided, however the knowledge of the proper management of funds is lacking. There is also a need for proper plans in hydraulic monitoring and computer software training.

Mr. Tim Waldron Input.

Whatever action that is decided upon, it is important that it must be kept sustainable. In the case of a leak detection program the use of a correlator or sounding stick will not make much difference if the project is not well set up. Focus should be placed on more than just the equipment. Flow measurement and pressure measurement need to be performed on systems regularly to get a feel for each individual system. Before deciding on the types of equipment you would like to use, an initial step should be initiating a proper framework within water utilities.

A general concern brought up by the group was regarding communication, or the lack of communication services being provided in most countries. Assistance was asked for setting up a better means of communication services.

Final Thoughts, Mr. Simon Webber (ACTEW)

It can be seen from the information gathered during the workshop that no one country really has proper information regarding the different water supply systems or a proper mapped-out system. All countries need to find out first of all the details on each individual system which would firstly include where all the valves, meters etc are. Maps of water supply systems are needed together with the installation of water meters as data needs to be measured and collected. Staff of water utilities should be sent out to different areas to map out the systems, preferably long serving staff who would know where pipes and valves were initially laid, supported by new staff for new developments. Resources need to be metered which include meters on the outlets to reservoirs, bores and dams. Placing staff out in the field concentrating on leak detection is important and all these actions need to be performed quickly to be in control of your water supply system.

PWA Presentation-John Chaniel

Conclusion and Thanks –Mr. Harald Schölzel.

Annex 1: Country Participants List

Annex 2: Introduction to Water Demand Management Slides

Annex 3: Country Slide Presentations

Annex 4: Country Papers

Annex 5: Leakage control Finance Slides

Annex 6: Hydraulic Network Modelling Material

Annex 7: Factors Affecting Leakage

Annex 8: Step Test Schematic diagrams and other Material used for Step Test.

Annex 9: ACTEW Step Test Results Report.

Annex 10: Custmomer Satisfaction Presentation Slides

Annex 11: Correlation Step Tests exercise results.

Annex 12: Drought Presentation Slides

Annex 13: Country Action Plan Summary

Annex 14: Questionnaire Summary