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UNITED NATIONS

**DEPARTMENT OF TECHNICAL CO-OPERATION
FOR DEVELOPMENT**

**WATER RESOURCES MANAGEMENT TECHNIQUES
FOR SMALL ISLANDS**

**A United Nations Interregional Seminar
convened in co-operation with
the Government of Fiji
Suva, Fiji
26 June to 1 July 1989**

Summary report, conclusions and recommendations

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NOTES

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FOREWORD

The United Nations General Assembly passed a Resolution (No. 32/185 of 19 December 1977) on an Action Programme in Favour of Developing Island Countries, in response to the special economic problems of many island countries, including transportation and communications difficulties, distance from markets and limited natural resources.

The problems that developing island countries have with development and management of water resources are related to small area, limited rainfall, high run-off and evaporation, lack of natural storage sites and lack of qualified technical personnel. The Water Resources Branch of the United Nations Department of Technical Co-operation for Development (UN/DTCD) has long recognized the special difficulties of small islands, and has provided them technical assistance in water resources assessment, development and management since the early 1960s. Long-duration projects have been established in many small island countries throughout the Caribbean, Mediterranean, Indian Ocean and Pacific areas. For many islands, water resources development is the key to social and economic development.

The first phase of an interregional project for water resources management in small island countries, funded under UN/DTCD's Regular Programme was initiated in the Caribbean in 1979. The project provided technical assistance to assess existing water supply systems and demand; to evaluate options for alleviating water-related problems; to plan, design and execute engineering works; to achieve rational exploitation and management of water resources; and to promote follow-up investment in water-supply facilities by bilateral and multilateral donors, as well as by the countries themselves. One of the earliest collaborative efforts initiated by that project was the Seminar on Caribbean Small Islands Water Resources: Assessment, Development and Management, held in Barbados in October 1980.

While the regional project in the Caribbean countries continues, financed by the United Nations Development Programme (UNDP), a new phase of the interregional effort was initiated in the Pacific in May 1986. The Pacific project draws upon the vast experience and global outlook gained in the Caribbean and elsewhere to tackle the more complicated problems of water resources development in the Pacific. It is based in Suva and has 10 subsidiary projects in other island countries.

It was therefore decided to hold a Seminar on Water Resources Management Techniques in Small Island Countries in Suva, as a supplement to the Pacific regional project, Water Resources Assessment and Management in Pacific Islands. The main objective of the Seminar was to present for the first time in the international forum the currently available range of solutions to the different water problems faced by island countries. Several successful case studies were presented, as tested solutions to specific problems which might apply to island countries in the Pacific.

The Seminar brought together representatives of islands in the Pacific and Caribbean, as well as some of the small islands of the Indian and Atlantic Oceans. Participants with broad knowledge of water resources management or small islands shared their experiences to mutual benefit.

The seminar was held in conjunction with a United Nations Development Programme/World Health Organization (UNDP/WHO) Consultation on the International Drinking Water Supply and Sanitation Decade, at which Pacific Island countries discussed with donors potential projects in the water supply and sanitation sector. The holding of the meetings simultaneously allowed many more participants to attend than would have otherwise been possible.

The present report summarizes the activities of the meeting and discussions which took place in Suva. The proceedings of the meeting will be published in early 1990 by the United Nations Department of Technical Co-operation for Development.

The United Nations expresses its deep appreciation to the Government of Fiji for its substantive, financial and administrative support to the Seminar and for the gracious hospitality provided.

CONTENTS

	<u>Page</u>
I. SUMMARY REPORT OF THE SEMINAR	1
II. CONCLUSIONS AND RECOMMENDATIONS OF THE SEMINAR...	5
A. Recommendations of the Working Group on Technical (Ground-water) Solutions	5
B. Recommendations of the Working Group on Technical (Engineering) Solutions	5
C. Recommendations of the Working Group on Institutional Solutions	6
Annexure: Excerpts from Recommendations of the Regional Workshop on Water Resources of Small Islands (Suva, 1984)	7
D. Conclusions and Recommendations of the Working Group on Economic and Legal Issues ..	8
E. Recommendations of the Working Group on Environment and Health	9
Annexure: Three-point Action Plan of the Decade Consultative Meeting	11

Annexes

I(A). Seminar on Water Resources Management Techniques in Small Island Countries, Suva, 26 June to 1 July 1989: List of Participants	12
I(B). WHO/UNDP Consultative Meeting of Pacific Island Countries: List of Participants	29
II. Seminar on Water Resources Management Techniques: Programme	33
III. WHO/UNDP Decade Consultation: Programme	37
IV. Documents	39

I. SUMMARY REPORT OF THE SEMINAR

An interregional meeting on water resources was held in Suva, Fiji from 26 June to 1 July 1989 for 150 participants from 30 countries. The meeting, which was a co-operative effort involving a number of international organizations, had two major components: The UN Department of Technical Co-operation for Development's Interregional Seminar on Water Resources Management Techniques for Small Island Countries, and the World Health Organization's Consultative Meeting of Pacific Island Countries for the Promotion of Water Supply and Sanitation.

The Water Resources Seminar was sponsored by UN/DTCDC, in co-operation with the Commonwealth Science Council (CSC), and the United Nations Development Programme (UNDP). It was held in conjunction with the WHO/UNDP Decade Consultative Meeting. The Government of Fiji generously hosted both meetings.

Participants came from all the Pacific Island countries, including Indonesia and the Philippines. Representatives from island countries in the Indian and Atlantic Oceans and the Caribbean Sea also attended. Resource persons, representatives of donor agencies and participants from Australia, Japan, New Zealand, the United Kingdom and the United States also contributed to the discussions. The lists of participants for each of the meetings are attached as Annexes I(A) and I(B). Those who attended both meetings are listed only in Annex I(A).

The main objective of the Water Resources Seminar was to present for the first time in an international forum the currently available range of solutions to the different water problems faced by island countries. Several successful case studies were presented as tested solutions to specific problems which might apply to countries in the Pacific. The Seminar drew on experience gained through the UNDP-UNDTCD regional project on water resources for small islands in the Pacific, based in Fiji, and earlier projects on small islands worldwide. The programme of the Seminar is attached as Annex II.

The WHO/UNDP meeting focused on identifying remaining constraints to attainment of the goals of the International Drinking Water Supply and Sanitation Decade, and on recommending ways to overcome them, with particular emphasis on future donor agency-WHO collaborative activities. The programme of the consultation is presented in Annex III.

DTCDC has been involved in all aspects of water resources on small islands for over 25 years. The Pacific phase of the global effort was launched in 1986 with seed money from DTCDC's Regular Programme, under which the Seminar on Water Resources Management Techniques was planned for Suva. The current 4 1/2 year \$1.5

million Water Resources Assessment and Planning project, funded by UNDP, is executed by DTCD and involves 25 long- and short-term staff located around the Pacific. During the course of discussions with WHO in 1988 and 1989, it became obvious that there was an overlap between this seminar and WHO's proposed Decade Consultative Meeting (DCM) and that the two activities should be co-ordinated. The excellent collaboration enabled a significantly larger number of participants to attend than would otherwise have been possible and allowed sharing of costs among the organizing parties and the host government.

The two meetings were opened by the Honourable Ratu W. Toganivalu, Minister of Lands and Mineral Resources. Other speakers at the opening session were: Mr. N. Ringrose, UNDP Resident Representative based in Fiji, and covering nine Pacific Island countries; Mr. P. Hadwen, Chief Technical Adviser of DTCD's Water Resources Assessment and Planning Project for the Pacific, who represented UN/DTCD; Dr. S.K. Ahn, WHO Representative, Fiji; and Dr. S. Malomo, Representative of the Commonwealth Science Council (CSC).

In his remarks, Mr. Ringrose noted that more than half of the world's island developing countries were represented at the meeting. The presence of so many country representatives, as well as high-level personnel from donor agencies, was an indication of the interest and concern of the international community on the subject of water resources in island countries. He stressed the importance of sharing experiences among countries and urged participants to seize the opportunity of this seminar as a means of furthering the goals and strategies of individual countries in water supply and sanitation.

Mr. Hadwen, speaking on behalf of Mr. N. Beredjick, Deputy to the Under-Secretary General of UN/DTCD and Director of the Natural Resources and Energy Division, traced the evolution of the department's small islands projects from their original conception to the regional projects in the Caribbean and Pacific. Those projects, which consisted of a regional base plus satellite projects in each of the island countries, had concentrated on water resources assessment and planning, design of systems and supervision of construction. Much of the work in individual countries had been carried out by Associate Experts and UN Volunteers, and much of the financial support had come from UNDP, the Capital Development Fund and Trust Funds. He noted that many of the people who had been associated with DTCD's island projects over the years were represented at the seminar, and that the group gathered in Fiji was especially qualified to present the range of solutions which had been found to the unique and difficult problems facing small islands.

Dr. Ahn, speaking on behalf of Dr. S.T. Han, Director of WHO's Regional Office for the Western Pacific, challenged the

Dr. Ahn, speaking on behalf of Dr. S.T. Han, Director of WHO's Regional Office for the Western Pacific, challenged the participants to focus on the important task of more effectively and efficiently mobilizing resources to deal with constraints in the water supply and sanitation sector. He noted that this meeting was an excellent forum for improving collaboration and co-ordination in this regard. He noted that the main constraints to attainment of Decade targets in developing island countries were a shortage of professional and other staff, lack of funds and operation and maintenance problems. Moreover, there was considerable wastage in urban centres of the Pacific because of leakage and the absence of any cost recovery systems. He trusted that the two meetings would identify courses of action to reduce constraints in implementing of water supply and sanitation programmes, especially in poor urban and rural areas. An important focus of the WHO/UNDP consultation for water and sanitation programmes was the on-going dialogue between the external support agencies and the national authorities.

Dr. Malomo described the activities of the Commonwealth Science Council in water resources of small islands. CSC had co-sponsored with UN/DTCDC the Seminar on Small Island Water Problems in Bridgetown, Barbados in 1980 and had held a related workshop in Suva in 1984. The CSC had developed the REFRESH Method - The Rapid Evaluation of Fresh Water Resources - for small coral islands. Training workshops using the method had been held in Tonga and Pohnpei, and had proved very useful in identifying fragile water resources on small islands.

Finally, Hon. Ratu W. Toganivalu expressed his appreciation for the collaboration among the UN/DTCDC, CSC, UNDP and WHO in holding the joint meeting. Pointing out that the meetings could easily have been held separately, he commended the agencies for pooling their resources and maximizing the benefits to the island country participants. He stressed that the common co-operative approach seemed to work in the Pacific, particularly in the water field, where expertise and equipment could be pooled, since no individual country had the resources to solve all its water problems separately.

Following the opening ceremonies, the WHO/UNDP Decade Consultative Meeting separated from the Seminar and approximately 50 participants took part in some of the DCM sessions. During the two and a half days of the consultation, participants presented country profile reports which documented progress made in Decade activities, and presented project proposals for external donor support.

The Seminar was divided into nine technical sessions, as follows: Surface water systems on small islands; ground-water systems; ground-water technologies; rain-water catchment systems;

institutional solutions; advanced technologies in island settings; operation and maintenance; economic and legal issues; and water quality and sanitation considerations. Each technical session consisted of an overview presentation and one or two subsidiary technical papers, as well as country case studies. Annex IV contains the list of technical and country papers. The papers themselves will be published in the Proceedings of the Seminar.

Working group sessions were held on the afternoon following session VIII, and covered: Technical (ground-water) solutions; technical (engineering) solutions; institutional solutions; economic and legal issues; and environmental and health considerations. Session IX, on water quality and sanitation, was conducted by WHO. The conclusions and recommendations of the working groups were presented at the final session, and are listed in the next section. The Seminar and the Consultative Meeting were closed by Mr. Marika Tukituku, the Permanent Secretary of Works and Transport.

II. CONCLUSIONS AND RECOMMENDATIONS OF THE SEMINAR

A. Recommendations of the Working Group on Technical (Ground-water) Solutions

The Working Group drew up some recommendations which apply specifically to ground-water solutions for small islands, and other recommendations which apply more generally to the need for sharing and dissemination of data, as follows:

1. UN/DTCD should continue to co-ordinate with country representatives, the purchase of appropriate and, where possible, standardized ground-water investigation equipment.
2. On-going regular training of technical and professional staff, including bi-annual workshops for relevant island country representatives, should continue.
3. Copies of all investigation and monitoring data, reports and studies for each Pacific Island country should be forwarded, on an on-going basis, to a central information centre, initially the UN/DTCD Suva office, to enable other countries to have access to relevant information.
4. The information centre should arrange to obtain relevant information from other sources inside and outside the Pacific region on a regular basis and regularly disseminate this information to Pacific island countries, by means of a newsletter.
5. A qualified librarian should be appointed to set up a library, co-ordinate the collection of information from island countries and other sources, and disseminate information.
6. A special investigation should be initiated to compile available information and recommend appropriate methods and equipment to calculate recharge, sustainable yield and design of abstraction facilities for low coralline islands.

B. Recommendations of the Working Group on Technical (Engineering) Solutions

The Working Group on Engineering Solutions proposed that the following recommendations be incorporated into the proceedings of the Seminar:

1. One of the most important goals of the representatives of the Pacific region is to train national personnel to design,

construct, operate and maintain their own water supply systems adequately. To attain this objective, the group recommends that:

- a) Training officers should be appointed in each water undertaking, and professional recognition should be given to both trainers and those trained.
- b) Existing institutional facilities should be fully utilized before new ones are developed.
- c) Training functions should be included in all job descriptions of expatriate personnel, in an effort to emphasize the importance of the desired technology transfer.

2. Given the fact that leakage and wastage of produced water in the Pacific region are among the highest in the world, and that even in other regions wastage entails a considerable loss of revenue, each country should formulate a clear policy on leak detection and waste prevention.

3. Since developing island countries, particularly those in the South Pacific are located at long geographical distances from major supply centres, it takes an exorbitantly long time to deliver materials, supplies and spare parts. It is therefore recommended that each country adopt a policy, to be implemented through adequate legislation or other means, for standardization of materials and equipment.

4. While each of the countries in the Pacific region differs from the others in many respects, it is abundantly clear that most, if not all, have many of the same water sector requirements. To meet common needs, it is recommended that the UN/DTCD regional project, working in individual countries, prepare standard specifications for the basic required constructed elements that are appropriate to the region, such as ferro-cement tanks, septic tanks and fixtures.

5. Last but not least, the group recommends that all participating island nations take the required actions, taking into consideration their individual cultures and societies, to enable their water supply operating units to become self-sustaining autonomous bodies.

C. Recommendations of the Working Group on Institutional Solutions

The Working Group on Institutional Solutions recognized the on-going validity of regional co-ordination and that the regional needs identified in CSC's Regional Workshop on Water Resources of Small Islands (Suva, 1984) had still not been met (see

annexure). The group also fully appreciated the value of the UNDP/DTCDC regional project and supported its continuation into UNDP's fifth cycle.

The group therefore proposed that:

1. UNDP field a formulation mission, which should include people from the Pacific region, to address the establishment of a permanent capability in the region which would continue to meet the needs of the Pacific Island countries.

2. Collaboration and information exchange agreements should be established between the Water and Sanitation for Health Project (WASH) of the United States Agency for International Development (USAID) and similar organizations, and the UN/DTCDC regional project to respond to the need to acquire, organize and disseminate technical and project information. It was also proposed that WASH provide pro-active information services to the region.

3. Because of the importance of training at all levels in support of continued development and delivery of safe drinking water in the Pacific region, the Institute of Natural Resources, University of the South Pacific (Suva), should make available immediately, to as many participants from regional countries as possible, the report by W.R. Dale, entitled "The Training Needs of Water Supply and Sanitation Organizations in Eight South Pacific Countries". The Group also requested UNDP/DTCDC to seek responses from recipients regarding recommendations of the report and to implement those recommendations as appropriate for the region.

Annexure. Excerpts from Recommendations of the Regional Workshop on Water Resources of Small Islands (Suva, 1984)

The recommendations regarding a Water Resources Centre were as follows:

It was recommended that an urgent need for a Regional Water Resources Centre existed in order to assist in the assessment, development, and management of water resources of small island nations or nations with small islands in the Pacific and Indian Oceans.

The following were the activities recommended for the Centre identified in priority order:

1. Provide sub-professional and technical training;
2. Collect, store and disseminate information and data;

3. Reduce duplication of effort by various agencies;
4. Develop technology appropriate to the region;
5. Provide advice and guidelines for planning;
6. Identify, formulate and promote research projects;
7. Co-ordinate research in the region;
8. Supply, on loan, specialized facilities and equipment.

D. Conclusions and Recommendations of the Working Group
on Economic and Legal issues

The Working Group, which concentrated mainly on economic issues, concluded that cost recovery of the capital expenditure for most water supply facilities, especially where provided by aid funding, was unlikely if not impossible in most Pacific island countries.

1. It recommended that there should nonetheless be some contribution from the local community for a new water supply system to demonstrate its commitment and association with the new installation. While this contribution might only be in the form of voluntary labour or a modest fee to cover operation and maintenance expenditures, the people must participate in the upkeep of the facility.

2. The Group discussed various systems of water pricing for both urban and rural systems. It concluded that only when consumers are charged for water can expenses be met and excessive demand reduced. The following recommendations were made:

a) In rural areas it was considered that flat rates (per household, size of land or distance from source) were the simplest and easiest to administer. Flat rates should be adequate to cover at least operation and maintenance costs. Where the goal was demand management, however, consumers should be charged according to volume used, in order to reduce wastage. For example, consumers who are required to pay fuel costs for pumping are more likely to repair leaks than those served with a gravity supply. Education programmes and enforcement measures could supplement pricing policies to reduce demand for water in rural areas.

b) In urban areas, in order to recover costs and postpone investment in new facilities, metering and progressive tariffs were recommended. As consumption increases above a given basic level, tariffs per unit increase, discouraging excessive use.

At the least, consumers should meet all operation and maintenance costs.

3. Additional measures to supplement tariff policies were recommended as follows:

a) A water authority should be set up which is independent from government;

b) Proper legislation is required, which could be enforced (more likely under an independent authority);

c) A policy of active disconnection should be carried out when bills are not paid. A simple but effective locking device needs to be developed to make disconnection easier;

d) Incentives can be given to staff to identify illegal connections;

e) An active leak detection and repair programme can considerably reduce total consumption.

4. With regard to legislation, the group noted that conflicts between communities often resulted in disruption or delay in implementation of water supply projects. Legal resolution of conflicts needed to reflect the customary law of the country. Social attitudes concerning land and water, water rights and rights of way needed to be taken into account when drafting legislation.

E. Recommendations of the Working Group on Environment and Health

The Working Group on Environment and Health presented its recommendations, as well as a three-point Action Programme recommended by the WHO/UNDP Consultative Meeting (see annexure).

The Working Group's recommendations are as follows:

1. WHO guidelines on drinking water quality have not been universally adopted; each small island country should adapt these guidelines to suit its own circumstances.

2. The small island countries should establish policies for drinking water quality monitoring and surveillance according to their social, economic, cultural and logistical situations and should identify the agencies responsible for carrying out those policies. The main factor to keep in view is financial feasibility.

3. Monitoring of water quality should be linked to remedial measures. If no action is taken when adverse quality results are obtained, the tests are of little or no value.

4. Legislation should cover the adequacy and potability of water supplies.

5. There is a need to develop simpler and more economic water testing equipment and methodologies for use in rural areas. The use of sanitary surveys should be encouraged as a primary indicator of pollution.

6. More efficient use should be made of local testing laboratories.

7. There is a need for research into movement of pollution in ground water under sandy atoll conditions.

8. General rules for siting of latrines in relation to drinking water wells cannot be formulated, but should be made on case by case basis.

9. Proper management of solid waste is lacking in many small island countries. Governments should establish correct management plans for solid waste management including correct siting and sufficient leachate control.

10. Existing information centres/training organizations and currently available sources of research and technical expertise in environmental health should be fully utilized before embarking on the establishment of a further institution. Sources available for use in the Pacific region include the University of Hawaii, the South Pacific Commission, the International Reference Centre (The Hague), the WASH Project, the WHO Regional Centre for the Promotion of Environmental Planning and Applied Studies (PEPAS), the University of the South Pacific and Canada's International Development Research Council (IDRC).

11. Some small island countries should urgently address the problem of deforestation which is having adverse effects on water supplies.

12. It is recommended that governments of small island countries should insist on environmental impact assessments for developmental projects affecting water resources.

Annexure. Three-point Action Plan of the
Decade Consultative Meeting

In addition, the WHO/UNDP Consultative Meeting of Pacific Island Countries for the Promotion of Water Supply and Sanitation proposed the following three-point Action Plan:

Action 1

Participants from island countries recommend that their governments hold regular regional or country-level meetings with external support agencies, either informally or coinciding with national planning cycles.

Action 2

Island countries should strengthen existing or initiate new national systems for co-ordination of the water supply and sanitation sector in order to:

- a) Streamline national resources to the sector;
- b) Enhance the profile of the sector in the overall national economy;
- c) Develop methods at national level, with assistance from external support agencies (ESA), to evaluate socio-economic benefits of water supply and sanitation, in both descriptive and quantitative terms.

Action 3

Pacific island participants recommend to the Asian Development Bank that at their Regional Consultation in June 1990 one or more of the following subjects should be discussed:

- a) Ground water resources management, including pollution and excessive depletion;
- b) Water supply and sanitation on small islands in the context of over-all environmental sanitation, considering particularly the limited supply and disposal potential on a small surface; and
- c) Complex and lengthy ESA project evaluation, funding and execution procedures.

ANNEXES

Annex I (A). SEMINAR ON WATER RESOURCES MANAGEMENT TECHNIQUES IN SMALL ISLAND COUNTRIES, SUVA, 26 JUNE TO 1 JULY 1989

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Annex II. SEMINAR ON WATER RESOURCES MANAGEMENT TECHNIQUES

PROGRAMME

Monday, 26 June 1989

8.00 Registration

9.00 Opening ceremonies

Mr.N.Ringrose
Mr. P. Hadwen
Dr. S.K. Ahn
Dr. S. Malomo
Hon.Ratu W.Toganivalu

10.00 Coffee break

10.30 Session I. Surface-water systems

Overview
Intake structures
Case Study: Surface water on Fiji

E. G. Fox
N. Hughes
L. Crick

12.00 LUNCH

1.30 Session II. Ground-water systems in small islands

Overview
Ground-water exploration techniques
Abstraction by gravity

A. Falkland
W. R. Dale
U. Golani

2.45 Coffee break

3.00 Modelling of the ground-water lens

J. Karanjac

Tuesday, 27 June 1989

9.00 Session III. Ground-water systems

Infiltration galleries
Low-cost drilling techniques

N. Hughes
J. Davies

10.30 Coffee break

11.00 Case studies

- Ground water in Papua New Guinea
- Potable water supplies for
Emae Island, Vanuatu

S.S. Egara
C.S. Cheney

- Conjunctive use of surface and Ground water on La Digue Island, Seychelles R. Cetoupe
- 12.30 LUNCH
- 2.00 **Session IV.** Rain-water catchment systems
 - Overview Y.S. Fok
 - Design and construction D. Parish
- 3.15 Coffee break
- 3.30 Case study
 - Rain-water catchments on Tuvalu C. Reynolds

Wednesday, 28 June

- 9.00 **Session V.** Institutional solutions
 - Experience in establishing specialized information centres D. Campbell
 - Regional small islands water project P. Hadwen
 - Proposal for Water Resources Centre A. Simpson
- 10.45 Coffee break
- 11.15 Training needs and programmes
 - Overview W. Dale
 - CCOP/SOPAC R. Howorth
 - ILO/INSTRAW Training Modules M. Johnson
 - The South Pacific Commission's rural water supply and sanitation project W. Dale
- 12.30 LUNCH
- 2.00 **Session VI.** Advanced technologies in island settings
 - Overview O.K. Buros
 - Use of microcomputers J. Karanjac
 - Desalination technologies T. Goto
- 3.30 Coffee break
- 3.45 Case studies
 - Bermuda N. Thomas
 - Tonga F. Koloi

Thursday, 29 June 1989

9.00 Session VII. Operation and maintenance

- | | |
|--|---------------------------------|
| Overview | B. Mosley |
| Leak detection and repair | T.R. Newton |
| Spring and well protection with
community participation | E. G. Fox |
| 10.45 Coffee break | |
| 11.00 Case studies | |
| - Rural water supply in Vanuatu | J. S. Temakon
G. Barrowcliff |
| - Urban water supply in the
Solomon Islands | S. De Haan |
| 12.30 Field trip to Nukulau (Box lunch) | |

Friday, 30 June 1989

9.00 Session VIII. Economic and legal issues

- | | |
|---|-------------|
| Pricing policies and demand
management in island countries | M. Brewster |
| Implementation of AIDAB water
resources projects | R. Dickson |
| 11.00 Legal issues | |
| Overview | P. Hadwen |
| Case studies | |
| - Ground-water law in
Papua New Guinea | J. King |
| - Water law in the Philippines | J. De Leon |
| 12.30 LUNCH | |
| 2.00 Working/Group sessions | |
| Technical - Engineering | |
| Technical - Hydrogeology | |
| Institutional | |
| Economic and legal | |
| Environmental and health | |

Saturday, 1 July 1989

9.00 Session IX. Water quality and sanitation considerations

Water quality

J. Morrison

Sanitation

J. Hazbun

Solid waste management

B. Fisher

H. Ogawa

10.45 Coffee break

11.00 Presentation of recommendations
and conclusions by Working
Group Chairman

12.00 Closing ceremony

**Annex III. WHO/UNDP DECADE CONSULTATION
PROGRAMME**

Monday 26 June

8.30 - 9.00 Registration
9.00 - 10.00 Opening ceremony
10.00 - 11.00 Photo session and coffee break
11.00 - 12.30 Session on donor co-ordination
12.30 - 14.00 Lunch
14.00 - 15.00 Vanuatu presentation
15.00 - 15.30 Solomon Islands presentation
15.30 - 16.00 Coffee break
16.00 - 16.45 Papua New Guinea presentation
16.45 - 17.00 Overview of discussions

Tuesday 27 June

8.30 - 9.30 Fiji presentation
9.30 - 10.15 Kiribati presentation
10.15 - 10.35 Coffee break
10.35 - 11.15 Federated States of Micronesia presentation
11.15 - 12.15 Tonga presentation
12.15 - 14.15 Lunch
14.15 - 14.35 Marshall Islands presentation
14.35 - 15.00 Western Samoa presentation
15.00 - 15.30 Coffee break

- 15.30 - 16.30 Western Samoa (continued) and Niue presentations
- 16.30 - 17.00 Tuvalu and other interested countries' presentations
- 17.00 - 18.00 Overview and conclusions of discussions

Wednesday 28 June through Saturday 1 July

- 14.00 - 15.30 WHO/UNDP Decade Consultative Meeting: Working Group on Issue-Oriented Proposals for Action

OTHERWISE REVERT TO DTCD AGENDA

Annex IV. DOCUMENTS

<u>Symbol</u>	<u>Title</u>	<u>Author</u>
ISWSI/SEM/1	Water Resources in Small Island Countries: An Overview	UN/DTCD Secretariat
ISWSI/SEM/2	Solutions for Training Needs	W.R. Dale
ISWSI/SEM/3	The REFRESHR Project	W.R. Dale
ISWSI/SEM/4	Status of Groundwater Resources Development for New Providence, Bahamas	M.S. Swann D.W. Peach
ISWSI/SEM/5	Hydrogeology and Approaches to Wellfield Management in New Providence, Bahamas	D.W. Peach M.S. Swann
ISWSI/SEM/6	WASH and USAID: Experience in Establishing Specialized Information Centers	Dan B. Campbell
ISWSI/SEM/7	Design, Operation and Maintenance of the St. Brendans, Bermuda, Brackish Water Reverse Osmosis Desalination Plant	E. Norman Thomas
ISWSI/SEM/8	Water Resources and Supply, Bermuda	E. Norman Thomas
ISWSI/SEM/9	Assessment and Development of Ground- water Resources in Fiji	B. Rao
ISWSI/SEM/10	Potable Water Supplies for Emae Island, Vanatu: A Case Study	C.S. Cheney
ISWSI/SEM/11	Water Supply Leakage Detection and Control Options	Ian Sharp
ISWSI/SEM/12	Water Supplies in W. Samoa	Isikuki Punivalu E. Gordon Fox
ISWSI/SEM/13	Incineration of Solid Waste as a Potable Water Resource	E. N. Thomas
ISWSI/SEM/14	Progress of Rainwater Catchment Systems: Planning, Design, Development, and Management	Yu-Si Fok

ISWSI/SEM/15	Water Resources Assessment, Planning, Development and Management in Kiribati	Taboia Metutera
ISWSI/SEM/16	Assessment, Planning, Development and Management of Solomon Islands Water Resources	Donn Tolia
ISWSI/SEM/17	A Case Study on Rural Water Supply in Vanuatu	G. Barrowcliff
ISWSI/SEM/18	Country Paper on Niue Water Resources and Development	T. Tongatule
ISWSI/SEM/19	Notes to Accompany Field Trip to Nukulau	S.K. Booth
ISWSI/SEM/20	Discussion Paper and Data for Rainwater Catchments	J. Wanneck
ISWSI/SEM/21	Water Resources and Water Supply in Vanatu	J.S. Temakon
ISWSI/SEM/22	Investigation and Monitoring of Freshwater Lens Behaviour on Coral Atolls	T. Falkland
ISWSI/SEM/23	Decade Progress and Problems in Pacific Island Countries	World Health Organization
ISWSI/SEM/24	Relevance of Non-conventional Water Resources Technologies in Island Environments	O.K. Buros
ISWSI/SEM/25	Use of Groundwater for Village Water Supply in Papua New Guinea	S.S. Egara
ISWSI/SEM/26	Sea Water Desalination	Totaro Goto, Kunio Kikuchi, Mikuyoshi Hirai
ISWSI/SEM/27	Statutory Regulation of Groundwater in Papua New Guinea	Jonathan King
ISWSI/SEM/28	Background on Seychelles Water Resources	Ronald Cetoupe
ISWSI/SEM/29	Reverse Osmosis Technology for Desalination in Tonga	F. Koloi
ISWSI/SEM/30	CCOP/SOPAC and its Training Programme	R. Howorth
ISWSI/SEM/31	The Optimum Approach: Water Conservation from Raw Source to End-User	T.R. Newton

ISWSI/SEM/32	Modular Training for Higher Level Professionals: Multi-media Modular Training Packages on "Women, Water Supply, Sanitation"	United Nations Internat. Research and Training Inst. for the Dev. of Women (INSTRAW)
ISWSI/SEM/33	Spring Protection Works - An ILO Special Public Works Programme in Western Samoa	ILO Office for the South Pacific
ISWSI/SEM/34	Operations and Maintenance: An Overview	Barnabas Mosley
ISWSI/SEM/35	Implementation of AIDAB Water Resource Projects	Roger Dickson
ISWSI/SEM/36	Rainwater Catchments in Tuvalu	Colin Reynolds
ISWSI/SEM/37	Country Paper on Urban Water Supplies in the Solomon Islands	Simon de Haan
ISWSI/SEM/38	Water Resources Management in Small Island Countries: Cost Recovery and Demand Management	Marcia Brewster
ISWSI/SEM/39	Ground-water Development and Conservation in Selected Island Countries in the ESCAP Region	Secretariat, U.N. Economic and Social Commission for Asia and the Pacific (ESCAP)
ISWSI/SEM/40	Low-cost Drilling Techniques	Jeffrey Davies

