Sustainable Integrated Water Resources and Wastewater Management in Pacific Island Countries

HOT SPOT ANALYSIS

Republic of Palau

Palau Environmental Quality Protection Board

June 2007

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Introduction

The "Sustainable Integrated Water Resources and Wastewater Management in Pacific Island Countries" (IWRM) Project process required completion of a national diagnostic report on water resources to provide background for a Hot Spot Analysis (HSA) which would then lead to a demonstration project design.

However, because the Republic of Palau did not get involved with the regional process until recently, a site for the project demonstration was selected by the Water Safety Program National Steering Committee (which had agreed to serve as the national committee for the IWRM project). This site, the Ngerikiil Watershed, was selected based on previous meetings of various committees and existing information on degradation, and the fact that within it lies the main water source for over 75% of the total population of Palau. Previous workshops (National Biodiversity Strategic Action Plan, Ecosystem Based Management Project) and working groups have identified Ngerikiil as a national priority (Palau Natural Resources Council, Marine Resources Pacific Consortium, Bureau of Public Works, etc.).

However, to ensure that national priorities fall in place with regional actions of the IWRM Project, the Palau Environmental Quality Protection Board (EQPB) carried out a Hot Spot Analysis (HSA) exercise. This HSA is a key component of the regional Integrated Water Resources Management (IWRM) program currently being coordinated by the Pacific Islands Applied Geoscience Commission (SOPAC) and the Global Environment Facility in partnership with the United Nations Development Program and the United Nations Environment Program.

This report provides the results of this HSA exercise.

Purpose of the HSA

The purpose of the HSA was to identify and evaluate areas, along with the pre-selected demonstration site (Ngerikiil), within the ROP of national or regional significance and where conditions adversely affect human health, threaten ecosystem functioning, reduce biodiversity and/or compromise resources and amenities of economic importance in a manner that would require priority management attention. A number of sensitive spots, defined as areas of national regional and/or global significance which, although not degraded at present, are threatened with future degradation, were identified and evaluated.

HSA Process and Methodology

The EQPB carried out the HSA exercise during an unschedule WSP NSC meeting, using the templates and guidelines provided by SOPAC.

The attendees were walked through the HSA process step-by-step with the participants, including familiarization with all the forms used to identify and rank the hot spots and sensitive areas.

The hot spots and sensitive areas were selected based on national significance and known degradation.

Hot Spot/Sensitive Area Selections, Scores

The following table provides details on the three hot spots and three sensitive areas selected and ranked during the HSA.

1. IDENTIFICATION SHEET FOR HOT SPOT 1

A. Title – NGERIKIIL WATERSHED

B. Location – Airai State, Palau; Southern Babeldaob

C. Surface Area – 33 square kilometers

D. Context of the Site:

E. Main human activity(ies) related to the site:

- Water extraction for public water supply servicing 78% of Palau's population.
- Small scale farms
- Housing development
- Road construction/drainage
- Airport runway drainage

F. Natural conditions/phenomenon related to the site:

- 5 sub-watersheds
- Low flow during dry season
- High sedimentation levels during heavy rainfall

G. Nature of threats and extent of threats (human and natural):

- Over-extraction
- Low flow
- Agricultural chemical pollution
- Bacteriological contamination from septic tanks (piggery)
- Feral pigs
- Soil erosion and sedimentation
- Invasive species
- Wild life habitat loss
- Solid waste disposal

H. If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Sedimentation from road construction
- Stream bank erosion
- Erosion from agricultural land lacking conservation practices
- Erosion from burned savanna
- Possible pollution from agro-chemicals but no data

Value of the site	Local	National	Regional/global
Environmental significance	High	High	Medium
Socio-economic significance	High	High	Low

List any data available in report form.

- Golbuu, Y., S. Victor, E. Wolanski, and R.H. Richmond. 2003. Trappings of fine sediments in a semi-enclosed bay, Palau, Micronesia. *Estuarine, Coastal and Shelf Science* 57:941-949
- OERC. 2002. First national communication to the United Nations Framework Convention on climate change. Government of the Republic of Palau.

- Rengiil, G., 1999. The Water Quality Program Report, Department of Cooperative Research and Extension, Palau Community College and the Palau Environmental Quality Protection Board.
- USDA NRCS, 2005. Ngerikiil Watershed Resource Assessment
- Victor, S., Y. Golbuu, E. Wolanski, and R.H. Richmond. 2004. Fine sediment trapping in two mangrove-fringed estuaries exposed to contrasting land-use intensity, Palau, Micronesia. *Wetlands Ecology and Management.* 12:277-283

2. IDENTIFICATION SHEET FOR HOT SPOT 2

I. Title – NGERDORCH WATERSHED

J. Location – Melekeok State and Ngchesar State, Palau; Eastern Babeldaob

K. Surface Area – 47.4 square kilometers

L. Context of the Site:

M. Main human activity(ies) related to the site:

- Water extraction for public water supply.
- Small scale farms
- Housing development
- Road construction/drainage

N. Natural conditions/phenomenon related to the site:

- Largest freshwater lake in Micronesia – Lake Ngardok (15 million gallons)
- Low flow during dry season
- High sedimentation levels during heavy rainfall

O. Nature of threats and extent of threats (human and natural):

- Low flow
- Feral pigs
- Soil erosion and sedimentation, leading to shallower lake
- Invasive species
- Wild life habitat loss
- Over Development

P. If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Natural sedimentation
- Stream bank erosion
- Erosion from burned savanna

Value of the site	Local	National	Regional/global
Environmental significance	High	High	High
Socio-economic significance	High	High	Low

List any data available in report form.

3. IDENTIFICATION SHEET FOR HOT SPOT 3

Q. Title – NGARCHELONG STATE LANDFILL

R. Location – Ngarchelong State, Palau; Northern Babeldaob

S. Surface Area – 18.1 square kilometers

T. CONTEXT OF THE SITE:

U. Main human activity(ies) related to the site:

- Water extraction for public water supply
- Small scale farms
- Housing development
- Road construction/drainage
- Landfill

V. Natural conditions/phenomenon related to the site:

- Low flow during dry season
- High sedimentation levels during heavy rainfall

W. Nature of threats and extent of threats (human and natural):

- Over-extraction
- Low flow
- Bacteriological contamination from septic tanks
- Contamination of water source from Landfill
- Soil erosion and sedimentation
- Invasive species
- Wild life habitat loss
- **Solid waste disposal**

X. If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Point source - landfill
- Stream bank erosion

Value of the site	Local	National	Regional/global
Environmental significance	High	High	low
Socio-economic significance	High	High	Low

List any data available in report form.

- Fox, A., A Tiraa, and S. Raaymakers. 2007. Terminal Evaluation GEF/UNDP/SPREP strategic action program for the international waters of the Pacific Small Island Developing States. (IWP Terminal Report). RAS/98/G32. GEF, UNDP, & SPREP.

4. IDENTIFICATION SHEET FOR SENSITIVE AREA 1

Y. Title – Saltwater intrusion of freshwater lenses

Z. Location – Low-lying islands: Kayangel, Peleliu, Angaur, and the Southwest Islands of Sonsorol, Hatohobei, Merir, Fanna, Pulo Anna

AA. Surface Area – 52 square kilometers

BB. CONTEXT OF THE SITE:

CC. Main human activity(ies) related to the site:

- Water extraction for public water supply servicing.
- Septic tanks
- Housing development
- Heavy boat traffic

DD. Natural conditions/phenomenon related to the site:

- Flat islands
- Droughts
- Storm surges

EE. Nature of threats and extent of threats (human and natural):

- Over-extraction
- Saltwater intrusion
- Bacteriological contamination from septic tanks
- Solid waste disposal

FF. If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Septic Tanks – nonpoint source

Value of the site	Local	National	Regional/global
Environmental significance	High	High	Medium
Socio-economic	High	High	Low

significance			

List any data available in report form.

- Northern Islands Company. 1987. Comprehensive groundwater protection strategy. Government of the Republic of Palau.
- U.S. Army, 1956. Military Geology of Palau Islands, Caroline Islands, Engineer Intelligence Dossier, Strategic Study: Carolines, Subtitle: 19 Analysis of the Natural Environment.
- Winzler and Kelly Consulting Engineers. 1996. Final updated comprehensive groundwater protection strategy. Government of Republic of Palau.

5. IDENTIFICATION SHEET FOR SENSITIVE AREA 2

GG.Title – DIONGRADID WATERSHED

HH.Location – Ngardmau State, Palau; Northwestern Babeldaob

II. Surface Area – 20.6 square kilometers

JJ. CONTEXT OF THE SITE:

KK.Main human activity(ies) related to the site:

- Water extraction for public water supply
- Small scale farms
- Housing development
- Road construction/drainage
- Tourist site

LL. Natural conditions/phenomenon related to the site:

- Tallest waterfall in Palau
- Low flow during dry season
- High sedimentation levels during heavy rainfall

MM.Nature of threats and extent of threats (human and natural):

- Low flow
- Soil erosion and sedimentation
- Invasive species
- Wild life habitat loss
- Solid waste disposal
- Road drainage

NN.If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Sedimentation from road construction
- Road Drainage

Value of the site	Local	National	Regional/global
Environmental Significance	High	High	Low
Socio-economic Significance	High	High	Low

List any data available in report form.

6. IDENTIFICATION SHEET FOR SENSITIVE AREA 3

OO.Title – NGAREMEDUU CONSERVATION AREA

PP. Location – Aimeliik, Ngatpang, and Ngeremlengui States, Palau; Western Babeldaob

QQ.Surface Area – 86.3 square kilometers

RR.CONTEXT OF THE SITE:

SS. Main human activity(ies) related to the site:

- Conservation Area with certain no entry zones
- Water extraction for public water supply servicing
- Small scale farms
- Housing development
- Road construction/drainage
- Quarry
- Aquaculture ponds

TT. Natural conditions/phenomenon related to the site:

- 4 sub-watersheds
- Low flow during dry season
- High sedimentation levels during heavy rainfall
- Saltwater crocodile habitat
- Largest mangrove forest stand in Micronesia
- Highest biodiversity in Micronesia

UU.Nature of threats and extent of threats (human and natural):

- Soil erosion and sedimentation
- Invasive species
- Wild life habitat loss
- Development

VV. If heavy incidence of pollution, list the type of source (point, non point, diffuse) and pre-identify the exact source(s):

- Sedimentation from road construction
- Stream bank erosion
- Erosion from agricultural land lacking conservation practices
- Erosion from burned savanna

Value of the site	Local	National	Regional/global
Environmental significance	High	High	High
Socio-economic significance	High	High	Low

List any data available in report form.

- Ridep-Morris, A. 1999. Ngaremeduu Conservation Area Management Plan.
- Rengiil, G., 1999. The Water Quality Program Report, Department of Cooperative Research and Extension, Palau Community College and the Palau Environmental Quality Protection Board.

Aggregated scoring table for hotspot areas				
	Criteria / Hotspot	Ngerikiil Watershed	Ngerdorch Watershed	Ngarchelong State
1	Size of area at risk	3	4	2
2	Affected population (as percentage of national population)	15	9	3
3	Extent to which the natural watershed or aquifer and any associated receiving coastal and marine waters support the livelihood of local communities (e.g. subsistence or commercial farming, forestry, mining, tourism, fisheries)	20	16	16
4	Extent to which the natural watershed or aquifer and any associated receiving coastal and marine waters support the national development (e.g. commercial farming, forestry, mining, tourism, fisheries)	8	8	6
5	Extent to which the site is a recognized government priority (refer to National Sustainable Development Strategy, or other strategic action plans e.g. NEAPs.	15	12	9
6	Extent to which the site is of regional and/or global significance and priority (see WWF ecoregions, IUCN categories, UNESCO world heritage sites etc.).	6	10	4
7	Degree of Degradation at the site (e.g. type of degradation)	12	9	12
8	Extent of watershed/aquifer degradation on coastal and marine resources and any receiving systems	10	6	10
	Total score	89	74	62
	Normalized Score (%)	**89%**	**74%**	**62%**

Aggregated scoring table for sensitive areas				
	Criteria / Hotspot	Saltwater Intrusion of Aquifers	Diongradid Watershed	Ngaremeduu Conservation Area
1	Size of affected area (as percentage of total national land area)	4	2	8
2	Affected population (as percentage of national population)	9	6	6

3	Extent to which the natural watershed or aquifer and any associated receiving coastal and marine waters support the livelihood of local communities (e.g. subsistence or commercial farming, forestry, mining, tourism, fisheries)	20	20	20
4	Extent to which the natural watershed or aquifer and any associated receiving coastal and marine waters support the national development (e.g. commercial farming, forestry, mining, tourism, fisheries)	12	16	16
5	Extent to which the site is a recognized government priority (refer to National Sustainable Development Strategy, or other strategic action plans e.g. NEAPs.	6	12	15
6	Extent to which the site is of regional and/or global significance and priority (see WWF ecoregions, IUCN categories, UNESCO world heritage sites etc.).	8	6	10
7	Biodiversity value of the site	15	15	15
8	Cultural and public health value of the site	8	8	10
9	Extent of involvement of communities in local management	8	8	8
	Total score	90	93	108
	Normalized Score (%)	72%	74%	86%

7. Summary Table for Prioritized Hot Spots and Sensitive Areas

Country: **REPUBLIC OF PALAU**

Population: 20,000 people

Selected Hot-Spots			
	Title	Score	Priority Issues
Hot-Spot 1	Ngerikiil Watershed	89	Sedimentation and road related issues
Hot-Spot 2	Ngerdorch Watershed	74	Over-development
Hot-Spot 3	Ngarchelong State Landfill	62	Landfill contamination of water sources
Selected Sensitive Areas			
	Title	Score	Priority Issue
Sensitive Area 1	Ngaremeduu	86	Sedimentation and soil erosion

	Conservation Area		
Sensitive Area 2	Diongradid Watershed	74	Road drainage
Sensitive Area 3	Saltwater Intrusion	72	Over-extraction, septic tank contamination