



**REPUBLIC OF THE
MARSHALL ISLANDS**

**Hot Spot Analysis (HSA) Results
& Selection of Demonstration Project**

Integrated Water Resources Management (IWRM) Program



Pacific Islands Applied Geoscience Commission (SOPAC)

RMI Environmental Protection Authority (EPA)

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Introduction

On 9 March, 2007, the Republic of the Marshall Islands (RMI) Environmental Protection Authority (EPA), with assistance from local consultant Benjamin Graham, carried out a Hot Spot Analysis (HSA) exercise. This HSA was 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 within the RMI of national, regional or global 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 appear to warrant priority management attention. In addition to hot spots, a number of sensitive areas were also identified and evaluated. In short, these sensitive areas are defined as areas of national regional and/or global significance which, although not degraded at present, are threatened with future degradation.

HSA Participation

Appendix 1 provides a list of the participants in the HSA. The HSA followed a consultative and participatory process and included a cross-section of representatives from: EPA, Economic Policy, Planning and Statistics Office; Majuro Water and Sewer Company; Majuro Weather Station; Ministry of Internal Affairs; Office of Disaster Management; College of Marshall Islands Land Grant Program; Ministry of Health; Women United Together Marshall Islands (NGO); and Ministry of Transportation and Communication.

HSA Process and Methodology

As indicated in the SOPAC *Guidelines and Template for Hot Spot Analysis*, the RMI had some liberty to carry out the HSA exercise how it saw most suitable and appropriate.

After careful review of the general HSA guidelines, the EPA and consultant chose to conduct the HSA as a workshop over the course of one full day and according to the following general process and methodology.

Many of the HSA participants were already consulted during the drafting of the IWRM Diagnostic Report for the RMI and were therefore somewhat familiar with the intent of the HSA exercise and the overall IWRM program. Nevertheless, at the outset of the workshop, the consultant conducted a presentation entitled "Introduction to IWRM Principles and the Project" to familiarize the participants.

The consultant and EPA staff then 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 participants then moved into three separate breakout groups, each of which was responsible for conducting their own HSA and reporting back to the larger group with three identified and ranked hot spots and three identified and ranked sensitive areas.

Upon completion of their respective HSAs, each group presented its three hot spot and three sensitive area selections along with a short description of the major priority issues and an overall justification for each selection.

The three groups thus collectively identified and ranked a total of nine hot spots and nine sensitive areas (see next section for summary of these).

Upon completion of the HSA, these final hot spots and sensitive areas were further evaluated and considered by EPA senior staff and the consultant in order to make a choice on which would be most suitable for the next step of the IWRM process, the Demonstration Project (see section below, “Final Selection of Hot Spot for Demonstration Project”).

In summary, the four main steps followed during the HSA and leading up to the final selection of the Demonstration Project were:

1. Familiarization of participants with IWRM and HSA process
2. Three break-out groups separately carry out HSAs
3. Break-out groups report back to main group results of analyses: 9 hot spots and 9 sensitive areas identified and ranked
4. EPA senior staff and consultant evaluate selections with consideration of other factors and criteria and then make final selection for Demonstration Project

Hot Spot/Sensitive Area Selections, Scores, Priority Issues

The following table provides details on the nine hot spots and nine sensitive areas selected and ranked during the HSA. As shown in the table, the hot spots and sensitive areas were of different types, including: thematic (cross-cutting and not specific to a particular place), geographic, institutional, and policy/legislation.

The information under “Priority Issue/Justification” in the table summarizes the justifications verbally presented by each group at the HSA workshop for each of their respective selections.

1. Group 1 Results		
Hot Spots	Score	Priority Issue/Justification
1. Education on Water and Sanitation	80%	Poor overall awareness and education levels leading to poor water/wastewater management, health problems, etc.
2. Majuro Sewer System	79%	Size of affected area and population large, leakage/theft in system wasteful
3. Groundwater Assessments	77%	Need better assessment of groundwater resources, supply and quality, especially during drought periods and on outer islands and Laura
Sensitive Areas	Score	Priority Issue/Justification
1. Mangrove Forests	78%	Critical habitat threatened by pollution, development, etc.
2. National Water Policy	73%	Need a national water policy to guide management and govern water resources
3. EPA/Ministry of Health	71%	Need further strengthening of two organizations to improve IWRM
2. Group 2 Results		
Hot Spots	Score	Priority Issue/Justification
1. Laura Village	87%	Strong reliance of Majuro population on Laura groundwater, but this resource is increasingly threatened by many factors
2. D.U.D. Area	83%	Very large population area (20,000+) with limited water and wastewater resources and

		connectivity
3. Ebeye Island	74%	Large population (10,000+) affected by poor water and wastewater services (due to poor utilities)
Sensitive Areas	Score	Priority Issue/Justification
1. Ailuk Atoll	70%	Currently heavily affected by drought
2. Utrik Atoll	63%	Currently heavily affected by drought
3. Wotho Atoll	47%	Currently heavily affected by drought
3. Group 3 Results		
Hot Spots	Score	Priority Issue/Justification
1. Ebeye Island	75%	Large population, suffering from poor water and sewer service, have to rely on Kwajalein base, poor sanitation
2. Utrik Atoll	72%	Currently heavily affected by drought
3. Office of Disaster Management	71%	Office very important but very weak and needs strengthening immediately
Sensitive Areas	Score	Priority Issue/Justification
1. Laura Village	66%	Fast growing population, increasing reliance on and pollution of water lens, no current plan for safeguarding
2. Information and Coordination	66%	Poor inter-agency sharing of information and coordination of work and projects
3. D.U.D. Area	63%	Main population center of RMI, many water and wastewater problems being experienced

Altogether, the hot spot and sensitive area scores yield the following relative rankings, from highest to lowest:

Hot Spot Rankings	Score	Sensitive Area Rankings	Score
Laura Village	87%	Mangrove Forests	78%
D.U.D. Area	83%	National Water Policy	73%
Education on Water/Sanitation	80%	EPA/Ministry of Health	71%
Majuro Sewer System	79%	Ailuk Atoll	70%
Groundwater Assessments	77%	Laura Village	66%
Ebeye Island	75%	Information and Coordination	66%

Ebeye Island	74%	Utrik Atoll	63%
Utrik Atoll	72%	D.U.D. Area	63%
Office of Disaster Management	71%	Wotho Atoll	47%

NOTE: Ebeye Island selected by two groups as hot spot

4. Final Selection of Hot Spot for Demonstration Project

As the last step, EPA senior staff and the consultant reviewed the above results with a view towards selecting one hot spot as the choice for the Demonstration Project.

In considering which hot spot would be most suitable for selection, the group considered the criteria already provided in the HSA documentation (as reflected in the scores) as well as a wider set of considerations and criteria not directly addressed in the HSA documentation. This included the general assessments and recommendations of the IWRM Diagnostic Report for the RMI, the outlook on funding and other assistance in the pipeline for water related projects (and whether this assistance would be channeled to any of the identified hot spots), the future outlook of the hot spot in general (including future demands, problems, threats), and the overall feasibility of planning and carrying out a demonstration project at each hot spot.

In other words, the process by which the selection of the final hot spot for the Demonstration Project was made incorporated more than just the HSA scores and justification.

After due consideration and review, the group decided to select Laura Village as the most suitable hot spot for the Demonstration Project. Laura is the third largest population center, after the Majuro D.U.D. area and Ebeye. As mentioned in the above tables, Laura's groundwater is increasingly relied upon by the greater population of Majuro and yet it faces mounting threats. These threats include:

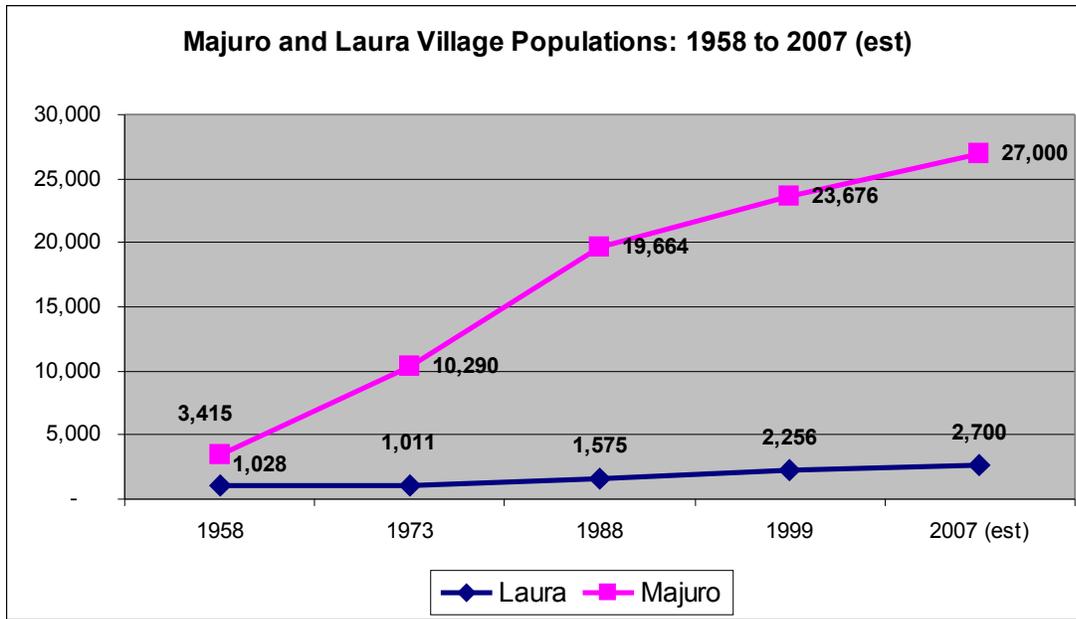
- growing population and development (the Laura population has almost doubled from 1,575 in 1988 to around 2,700 in 2007, see chart below)
- increased use of chemicals for farming
- lack of a solid waste management system
- lack of a sewer system and heavy use of septic tanks
- lack of a septic tank emptying service
- lack of any toilet facilities in a number of homes
- proliferation of grave sites
- animal waste

Image 1. Laura Village from the air.



Source: USGS

Figure 1. Majuro and Laura Village Population Trends: 1958 to 2007 (estimated)



Source: Economic Policy, Planning and Statistics Office

In making its decision, the group also felt that Laura offers the opportunity to design a solution that integrates a number of water and wastewater related issues – thus, a project for Laura would naturally lend itself to the IWRM approach and principles. This would in turn strengthen the IWRM process in the RMI and serve as an example of integrated and participatory water resource management.

APPENDIX 1. HSA Participants

1. John Bungitak EPA
2. Abraham Hicking EPA
3. Julian Alik EPA
4. Rodney Arelong EPA
5. Carl Hacker Economic Policy, Planning and Statistics Office
6. Arlington Robert Majuro Water and Sewer Company
7. Reginald White Majuro Weather Station
8. Nallo Samson Ministry of Internal Affairs
9. Antonio Eliu Office of Disaster Management
10. Amlet Kaleman College of Marshall Islands Land Grant Program
11. Thompson Keju Ministry of Health
12. Elbia Rusin Women United Together Marshall Islands
13. Deborah Lorennij Ministry of Transportation and Communication
14. Benjamin Graham IWRM Consultant to EPA/SOPAC

APPENDIX 2. Hot Spot and Sensitive Area Identification Sheets (Top 3 HS and SA only)

Identification Sheet for Hot Spot 1

1. Title:

Laura Village

2. Location:

Western Majuro Atoll

3. Surface area:

Total catchment area estimated at .9 square kilometers (SOPAC Technical Report 342)

4. Context of the site:

4a. Main human activity(ies) related to the site:

Third largest settlement in RMI, after D.U.D. area (Majuro) and Ebeye Island. Current population estimated at almost 3,000 with continued growth.

4b. Natural conditions/phenomenon related to the site:

n/a

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

Pollution and other threats include:

- growing population and development
- increased use of chemicals for farming
- lack of a solid waste management system
- lack of a sewer system and heavy use of septic tanks
- lack of a septic tank emptying service
- lack of any toilet facilities in a number of homes
- proliferation of grave sites
- animal waste

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

All three types of pollution sources found, exact sources: septic tanks, trash pits, graves, animal waste, farms

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:

SOPAC Technical Report 342

Asian Development Bank and Parsons Engineering Science, Inc. 1997. Majuro Water Supply and Sanitation Project, ADB Loan No. 1389 RMI (SF), Laura Well Field System Improvements, Preliminary Design Report. Pasadena, CA.

Identification Sheet for Hot Spot 2

1. Title:

D.U.D. Area (combined villages of Djarrit, Uliga, Delap)

2. Location:

Eastern Majuro Atoll

3. Surface area:

.51 square miles

4. Context of the site:

4a. Main human activity(ies) related to the site:

Largest human settlement area in Marshall Islands, with approximately 20,000 residents. Capitol city, commercial center.

4b. Natural conditions/phenomenon related to the site:

Heavily developed environment, highly polluted groundwater and coastal waters, much degradation.

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

Mostly human development and pollution threats, but also susceptible to high wave action (see diagnostic report section on Island Vulnerability).

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

All sources of pollution present. Wastewater, road runoff, solid waste, toxic chemicals (industry), etc.

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

List any data available in report form:

All major reports on Marshall Islands contain sections discussing D.U.D. area (see RMI Reference listing of water and wastewater and related documents).

Identification Sheet for Hot Spot 3

1. Title:

Education on Water and Sanitation

2. Location:

All of RMI

3. Surface area:

n/a

4. Context of the site:

4a. Main human activity(ies) related to the site:

Poor overall awareness and education levels leading to poor water/wastewater management, health problems, etc.

4b. Natural conditions/phenomenon related to the site:

n/a

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

Education and awareness campaigns would address all real and potential threats to water resources.

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

Education and awareness campaigns would address all real and potential pollutants.

Value of the Site:	Local	National	Regional/global
Environmental Significance	n/a	n/a	n/a
Socio-economic significance	n/a	n/a	n/a

List any data available in report form:

n/a

Identification Sheet for Sensitive Area 1

1. Title:

Mangrove Forests

2. Location:

Mangrove forests located throughout RMI, mostly in non-urban areas

3. Surface area:

n/a

4. Context of the site:

4a. Main human activity(ies) related to the site:

On some atolls, mangrove forests being threatened by human development

4b. Natural conditions/phenomenon related to the site:

Mangrove forests are threatened habitats, provide coastal protection

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

Human development and coastal erosion threaten mangrove forests.

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

n/a

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:

The National Biodiversity report for RMI (published by EPA) contains information on this habitat.

Identification Sheet for Sensitive Area 2

1. Title:

National Water Policy

2. Location:

All of RMI

3. Surface area:

n/a

4. Context of the site:

4a. Main human activity(ies) related to the site:

Need a national water policy to guide management and govern water resources

4b. Natural conditions/phenomenon related to the site:

n/a

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

A national water policy would address all threats, human and natural.

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

A national water policy would address all pollution sources.

Value of the Site:	Local	National	Regional/global
Environmental Significance	n/a	n/a	n/a
Socio-economic significance	n/a	n/a	n/a

List any data available in report form:

Several water related reports, including reports by SOPAC discuss need for a national water policy.

Identification Sheet for Sensitive Area 3

1. Title:

EPA and Ministry of Health (strengthening ability to monitor water and related health issues)

2. Location:

Main offices on Majuro and Ebeye

3. Surface area:

n/a

4. Context of the site:

4a. Main human activity(ies) related to the site:

n/a

4b. Natural conditions/phenomenon related to the site:

n/a

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

n/a

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

n/a

Value of the Site:	Local	National	Regional/global
Environmental Significance			
Socio-economic significance			

List any data available in report form:

Several reports document capacity issues and other areas for improvement in EPA and Ministry of Health. See EPA and MOH strategic plans.

APPENDIX 3. Aggregate Scores for Hot Spots

AGGREGATED SCORING TABLE FOR HOT SPOT AREAS										
Criteria	Hot Spot	1	2	3	4	5	6	7	8	9
		Laura Village	D.U.D. Area	Education on Water and Sanitation	Majuro Sewer System	Groundwater Assessments	Ebeye Island	Ebeye Island	Utrik Atoll	Office of Disaster Management
1	Size of affected area (as %age of total national land area)	2	1	1	2	5	2	2	2	5
2	Affected population (as %age of national population)	12	6	15	15	15	12	12	6	15
3	Extent to which the natural watershed or aquifer and any associated coastal and marine waters support the livelihood of local communities (e.g subsistence or commercial farming, forestry, mining, tourism, fisheries)	20	20	16	20	16	12	20	16	12
4	Extent to which the natural watershed or aquifer and any associated coastal and marine waters support the national development (e.g commercial farming, forestry)	10	10	8	10	8	4	8	8	6
5	Extent to which the site is a recognised government priority (refer to National Sustainable Development Strategy, or other strategic action plans e.g NEAPS)	15	15	12	12	12	12	3	9	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)	10	10	8	4	6	8	6	6	6
7	Degree of degradation at the site (e.g type of degradation)	12	15	12	12	9	15	15	15	12
8	Extent of degradation on watershed/aquifer and any receiving coastal and marine resources and systems	6	6	8	4	6	10	8	10	6
	TOTAL SCORE	87	83	80	79	77	75	74	72	71
	NORMALISED SCORE (as a percentage of a possible top score of 100)	87%	83%	80%	79%	77%	75%	74%	72%	71%

APPENDIX 4. Aggregate Scores for Sensitive Areas

AGGREGATED SCORING TABLE FOR SENSITIVE AREAS										
Criteria	Sensitive Area	1	2	3	4	5	6	7	8	9
		Mangrove Forests	National Water Policy	EPA/Ministry of Health	Ailuk Atoll	Laura Village	Information and Coordination	Utrik Atoll	D. U.D. Area	Wotho Atoll
1	Size of area at risk	8	2	4	2	4	10	2	4	2
2	Population at risk (please define the population)	12	15	15	12	6	15	6	12	6
3	Extent to which the natural watershed and any associated coastal and marine resources support the livelihood of local communities (for instance, in the case of tourism, fisheries etc)	16	16	16	20	16	12	16	12	16
4	Extent to which the natural watershed, and any associated coastal and marine resources support the national development (for instance, in the case of tourism, fisheries, etc)	16	16	16	16	16	12	16	12	8
5	Extent to which the site is a government priority (refer to NEAP or other strategic environmental action programme)	9	12	12	12	12	6	12	15	6
6	Extent to which the site is of regional and/or global significance and priority (see WWF ecoregions, IUCN categories, etc.)	8	8	8	4	4	6	6	6	4
7	Biodiversity value of the site	12	6	6	12	9	9	9	6	9
8	Cultural value of the site	8	8	4	4	8	6	6	6	4
9	Extent of involvement of communities in local management	8	8	8	6	8	6	6	6	4
	TOTAL SCORE (actual score with multiplications for weighting)	97	91	89	88	83	82	79	79	59
	NORMALISED SCORE (i.e as a percentage of a possible top score of 125)	78%	73%	71%	70%	66%	66%	63%	63%	47%

