

**EBEYE CASE STUDY:
Pacific Islanders Helping One Another**

**From Vision to Action
Towards Sustainable
Water Management in the Pacific**

**PACIFIC REGIONAL CONSULTATION ON
WATER IN SMALL ISLAND COUNTRIES**

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Table of Contents

Table of Contents	2
Abbreviations Used in the Text	5
Opening Remarks and Summary - Abe Malae, CEO, American Samoa Power Authority	6
Chapter 1 - Executive Summary	8
1.1 ASPA/KAJUR	8
1.2 Asian Development Bank (ADB) - Involvement	8
1.3 American Samoa Power Authority (ASPA).....	8
1.4 Pacific Island Management Model (PIMM).....	8
1.4.1 Privatization it is Not	9
1.4.2 Government Intervention it is Not	9
1.4.3 Mission Driven Passion	9
1.4.4 Institutional Strengthening	9
1.4.5 Community Involvement	10
1.4.6 Benchmarking	10
1.4.7 Forming Alliances	10
Chapter 2 Introduction.....	11
2.1 Republic of the Marshall Islands - Physical Setting	11
2.2 Republic of the Marshall Islands - Population.....	11
2.3 Republic of the Marshall Islands - Language.....	11
2.4 Republic of the Marshall Islands - Economic History	11
2.5 Republic of the Marshall Islands - Current Economic Situation	13
2.6 Republic of the Marshall Islands - Environmental Issues	14
2.7 Ebeye - Physical setting	14
2.8 Ebeye - Population	14
2.9 Ebeye - Modern History.....	14
2.10 Ebeye - Situation.....	16
2.11 Ebeye - Economic Base	16
2.12 Ebeye - Schooling	16
Chapter 3 Infrastructure	17
3.1 Water Supply System	17
3.1.1 Water Resources.....	17
3.1.2 Reverse Osmosis	17
3.1.3 Water Availability and Delivery System	17
3.1.4 Water Consumption	17
3.1.5 Water Chlorination.....	17

3.1.6	Water Testing	18
3.1.7	Water Safety	18
3.1.8	Pressure Monitoring.....	18
3.1.9	Water Tariff Structure.....	18
3.1.10	Level of Satisfaction.....	18
3.2	Sewerage and Excreta Management	18
3.2.1	Sewage Disposal System	18
3.2.2	Existing Wastewater Treatment Plant.....	19
3.2.3	Management Issues	19
3.2.4	Cost of Service.....	20
3.3	Solid Waste Management	20
3.3.1	Solid Waste Disposal System	20
3.3.2	Inadequacies of the Disposal System.....	20
3.3.3	Recycling of Solid Waste.....	21
3.3.4	Public's attitude towards Solid Waste Disposal System	21
3.3.5	Hospital and other Hazardous Waste Disposal.....	21
3.3.6	Comparison among different economic groups.....	21
3.4	Housing	21
3.4.1	Buildings	21
3.4.2	Ratio of Households and Occupants to Housing Unit	21
3.4.3	Floor areas of Housing Units.....	22
3.4.4	Tenure Status of Housing Units.....	22
3.4.5	Tenure Status of Lot	22
3.5	Transportation.....	22
3.5.1	Land Transportation.....	22
3.5.2	Water transportation	22
3.5.3	Air transportation	23
3.6	Power Generation and Distribution	23
3.6.1	Collection	23
3.6.2	Improvements	23
3.6.3	Training.....	24
Chapter 4 Public Health		25
4.1	General conditions	25
4.2	Cholera	25
Chapter 5 Poverty Reduction		26
5.1	Identification of Poverty	26
Chapter 6 Summary Evaluation		27

6.1	PIMM at work in Ebeye	27
6.2	Why the ASPA Model Works	28
6.3	Success begets success!	29
Appendix 1 - References Used		31

Abbreviations Used in the Text

ADB	Asian Development Bank
ASPA	American Samoa Power Authority
CIP	Capital Improvement Programs
EPA	Environmental Protection Authority
GDP	Gross Domestic Product
GPD	Gallons Per Day
KADA	Kwajalein Atoll Development Authority
KAJUR	Kwajalein Atoll Joint Utility Resources
RMI	Republic of the Marshall Islands
RO	Reverse Osmosis
STD	Sexually Transmitted Disease
TB	Tuberculosis
TTPI	Trust Territory of the Pacific Islands
UN	United Nation
US	United States
USAKA	US Army Kwajalein Atoll

Opening Remarks and Summary – Abe Malae, CEO, American Samoa Power Authority

It was a godsend to work with the Asian Development Bank and the Government of the Republic of the Marshall Islands on Ebeye because together we fashioned a paradigm for the development of infrastructure in the less developed Pacific islands. This we call the **Pacific Islands Management Model** or **PIMM**.

The successful economic models applicable to large populations were not necessarily successful in the islands. On Ebeye, government intervention was not the answer. Privatization didn't work either. Private companies contracted to operate island utilities necessarily focused on profit, which was understandable. They also gave up too easily and did not train local employees. On the other hand, the Pacific Islands Management Model defers to the **Mission**, which is determined by the key stakeholders—the governments, communities and aid donors.

PIMM is a hybrid of the two approaches, of government and private sector:

- a. Follow commercial principles and practices (e.g., sound management, auditable financial statements).
- b. Strive to meet government social responsibilities (e.g. to meet the needs of the neglected remote-island citizens).

Institutional strengthening is important for the same reasons that long term planning is important. Critical short and medium-term needs of the operations however, must take precedent over IS. For example a water utility should not be investing its valuable resources preparing glossy customer-service brochures when its water treatment plants are inoperable. The water treatment plants must be fixed first.

It shall be the objective of every water utility to strive for the very END product for water...which is..

A GLASS OF WATER THAT IS SAFE TO DRINK.

Community involvement means to live in the community and to empathize with its needs. The community must be an integral part of the organization's mission. Lead by example—if litter abounds, promote a community clean-up program. Raise the standards of the community by example, not by promoting "us" versus "them" neighborhood enclaves. In the 50's the squalor of the workers' camp on Kwajalein was an affront to the middle-class sensibilities of the Americans working on Kwajalein; so the workers' were relocated to Ebeye, out of sight out of mind. On Ebeye the squalor continued. The **Pacific Island Management Model** fixes the infrastructure and, in the process, attempts to bring everyone up to an acceptable standard of living.

Funding sources—national government and aid donors—are eager to work with entities that can complete assignments, commission capital works and institutionalize improvements.

Too many capital works built in the islands fall apart for lack of maintenance. The US Department of Interior provides a useful aid model in its **Capital Improvement Program (CIP)** and **Operations & Maintenance Improvement Program (OMIP)**. Five percent of CIP is set aside with 5% matching from the recipient to be used for maintenance. Incorporated in the PIMM is training in Preventive Maintenance. OMIP is aid specifically targeted for operations and maintenance improvements—the recipient matches the aid dollar for dollar.

The islands and populations are small and geographically remote. The means of economic production are limited. A small labor pool means there is a limited work force from which to choose managers, administrators, teachers, health professionals, engineers, accountants, writers, economists, technicians, computer specialists, trades workers and so forth.

Continuing to import expatriate labor (from first world countries) is not a viable medium or long-term solution for building the knowledge capacity of the community.

The solution is to expand the “island” entity to include the “island region.” We need to locate skilled workers from other islands in the region and share human resources. Skilled workers need to be retained in the region rather than allowing the region to suffer from a brain drain. This can be accomplished by:

- ?? Paying them well
- ?? Hiring those who possess marketable skills and come fired with an uncommon **missionary zeal**.
- ?? Educating and training promising young islanders.
- ?? Creating a work environment that is attractive to them.
- ?? Sending them on field assignments to other islands of the Pacific and engaging them in “real” work.

Integrated training in the Pacific Island Management Model can be described as the controlled shotgun approach to employee training and education.

- ?? Training must include technical as well as supervisory and management skills.
- ?? It must be repetitive, hands-on with classroom, and follow-up must be continual.
- ?? Invest up to 15% of payroll on training and education (where tenured employees are encouraged to complete college degrees at company expense).
- ?? Top management **MUST** believe in staff training and not just lip service.
- ?? Employees engaged in lengthy training & education coursework need to sign non-compete contracts.

The highlights of training in PIMM are Buddy System; Lineman Training; Micronesian Water Training; and Training Within Industry (aka “Results” under Pacific International Center for High Technology Research).

We consider **apprenticeship** training separately because of its singular importance to the organization, institutional strengthening and the community. Only through apprenticeship training can the necessary depth of technical skills be obtained within a reasonable period of time. We follow:

- a. The German model for training technicians that requires the apprentice to sandwich hands-on work experience between classroom and laboratory work.
- b. The Singapore planning model which poses the following questions:
 - ?? What do we need more today, graduate engineers or technicians?
 - ?? How many of each and when should they be employed?

We are happy to report that two students from Ebeye are performing well in their first year of the apprenticeship training in Auckland, New Zealand.

We reiterate that the Pacific Islands Management Model is a calling for employees imbued with missionary fervor. Those who know what it is like to be without, make for ideal recruits in the PIMM.

Such individuals are those who can sincerely say of the less fortunate, **“There but for the grace of God go I”**.

Chapter 1 - Executive Summary

1.1 ASPA/KAJUR

The availability of water on Ebeye depends largely on the availability of power. The Kwajalein Atoll Joint Utility Resources (KAJUR) was established to manage power generation and distribution as well as the water supply system of Ebeye. However, due to inadequate maintenance, the power plant and generators deteriorated causing the desalination plant to become inoperable in 1997. Water for drinking and cooking was then ferried twice a week from United States Army Kwajalein Atoll (USAKA) and distributed by water tank truck.

In an attempt to remedy the problem, the government and the US Department of Interior hired a general manager and a power plant engineer from the US to take over the managing of the utility and implement some of the needed major improvements to the power supply. This did not work.

As a last resort effort to remedy this situation, the government, in consultation with and financed by the Asian Development Bank (ADB), in 1999 tendered a contract for management of the KAJUR utility on Ebeye. The contract was awarded to the American Samoa Power Authority (ASPA), which was tasked with managing the KAJUR and improving power and water production and distribution as well as the sewer system. The management paradigm adopted is one in which operations personnel from an island utility in the region (ASPA) provide the right mix of managers, professionals and technicians imbued with a sense of mission to help their Pacific neighbors succeed at utility operation and management.

ASPA, the newly appointed management contractor formed a partnership with ADB and Government to implement the improvements.

1.2 Asian Development Bank (ADB) - Involvement

ADB, a multilateral development finance institution dedicated to reducing poverty in Asia and the Pacific region is one of the main donors to the improvement of the quality of life of the people of Ebeye. Because Ebeye is poor with its infrastructure in shambles, it is an excellent candidate for ADB's poverty reduction program. There is hope in Ebeye.

1.3 American Samoa Power Authority (ASPA)

The American Samoa Power Authority (ASPA) is a semi-autonomous island utility mission driven to provide quality, safe, sustainable, and economical utility service in partnership with its customers, its community of American Samoa, and the Pacific region. It is the "Pacific region" that defines the unusual scope of ASPA as a utility. ASPA's involvement in Ebeye came as part of fulfilling this mission. ASPA together with the Asian Development Bank and the Government of the Republic of the Marshall Islands on Ebeye fashioned a paradigm for the development of infrastructure in the less developed Pacific islands. This we call the **Pacific Islands Management Model** or **PIMM**.

1.4 Pacific Island Management Model (PIMM)

PIMM builds on the strengths of a semi-autonomous utility or authority. PIMM is **result** orientated and less study. PIMM is a hybrid of the two approaches to organization, of government and private sector:

- a. Follow commercial principles and practices (e.g., sound management, auditable financial statements);

- b. Strive to meet government social responsibilities (e.g. to meet the needs of the neglected remote-island citizens).

PIMM calls for the management staff to ask difficult, often politically incorrect questions. Such as, “What are we doing wrong to get us into this mess in the first place?” “What are the dysfunctional aspects of our culture that we must overcome first before we can address the technical issues?” “How do we get from idea to implementation?”

The Pacific Islands Management Model defers to the Mission, which is determined by the key stakeholders—the governments, communities, lenders and aid donors or grantors. It focuses on institutional strengthening, benchmarking, apprenticeship training, integrated training for all the island utilities and constantly reminds the staff that it is engaged in a mission of great importance. *This is a mission that has tested the mettle of many before and many have indeed failed.* The Pacific Island Management Model fixes the infrastructure in a methodical manner and, in the process, improves the quality of life of the community.

Some of the salient features of PIMM follow.

1.4.1 *Privatization it is Not*

With a very small economy, generating funds for a private utility service would be a very challenging endeavor. Local customers could not afford to pay for the cost of operating a private or investor owned utility. The local and federal government would be unable or unwilling to subsidize the cost of privately operated utilities. There is no intent to downplay the excellent service that investor owned utilities already provide—it is just that the consumers tend to pay more in the islands, for whatever reason, for that service. Especially in the case of Ebeye, where residential usage makes up about 80% of total consumption. Rest is commercial.

Kaua’i provides an example of an entity that is moving away from a private investor owned utility to a cooperative in the model of members of the National Rural Electric Cooperatives (NRECA). ASPA is a member of the NRECA.

1.4.2 *Government Intervention it is Not*

Sadly, government has a poor record of managing utilities in the Pacific islands and because of that, utilities were encouraged to transform into “authorities”. Whatever its shortcomings, government is necessarily involved as the major stakeholder of the authority. Government promotes the well being of all denizens of the community whether they are customers or not of the utility. Without subsidies from government, there would be no “rural electrification”.

1.4.3 *Mission Driven Passion*

ASPA’s mission as formerly stated is to provide quality, safe, sustainable, and economical utility service in partnership with its customers, the community of American Samoa, and the Pacific region.

It is important to recruit skilled individuals of character who share a missionary zeal because good pay is not enough of a motivator to perform well in physically and psychologically uncomfortable conditions.

Employees imbued with a sense of mission are better able to persuade aid donors and grantors to the cause of the islanders. It helps tremendously if those in Washington, D.C. are passionate about their work as well. Fortunately, at least in ASPA’s experience, such has been the case with the public servants in DOI’s insular affairs office.

1.4.4 *Institutional Strengthening*

Institutional strengthening is important for the same reasons that long term planning is important. Critical short and medium-term needs of the operations however, must take precedence over Institutional Strengthening. For example, a water utility should not be investing its valuable resources preparing glossy customer-service brochures when its water treatment plants are inoperable. The water treatment plants must be fixed first and made to produce potable water. The self-promotion comes later.

1.4.5 Community Involvement

Community involvement means to live in the community and to empathize with its needs. The community must be an integral part of the organization's mission. The utility must lead by example—if litter abounds, promote a community clean-up program. Raise the standards of the community by example, not by promoting "us" versus "them" neighborhood enclaves.

The Pacific Island Management Model repairs and upgrades the infrastructure, leads by example and, in the process, improves the quality of life of the community.

1.4.6 Benchmarking

Benchmarking allows the utility to measure itself against the "curve" of performance standards in the industry. Without the measurements, it is not possible to objectively ascertain the quality of the services provided. Regulatory agencies, consultants, auditors, Department of Labor, trade associations –all serve the purpose of nudging the utility towards improved service at all levels.

ASPA maintains a record of the twenty-two American Public Power Association (APPA) Operating Ratios for electric utilities.

The utility that is successful lives with the danger of believing its own press releases. It takes the informed opinions of the outside consultant to shake a sense of reality into the torpor of smugness that can result from too many incremental successes. The utility must always be on top of the latest technical improvements and implement the best and most sustainable technologies available. Engineering and consulting firms from overseas have been most helpful in this regard to ASPA.

The Pacific Power Association, Pacific Water Association and benchmarking consultants from the US and New Zealand are currently engaged in such projects with ASPA. Electricity and Water-Waste Water are being benchmarked at present, with Human Resources and Solid Waste soon to follow.

1.4.7 Forming Alliances

No single individual or entity, no matter how successful, has all the answers. That is the rationale for forming alliances with other utilities, individuals, consultants or engineering firms. For example, managing and maintaining assets require that you identify them first. An engineering firm may developed an efficient asset management process already and all the utility needs to do is to implement the application.

PIMM has proven successful in the operation of Ebeye's utilities and infrastructure.

Chapter 2 Introduction

Ebeye, is a very small island in the Republic of the Marshall Islands (RMI) The island faces a variety of serious challenges. Underlying all of these is the extreme population density and the lack of land for expansion. Ebeye has a complex land-tenure and social setting in which the majority of inhabitants are not from Ebeye and have little political power. Within this context and despite a relatively high-income level, Ebeye suffers from inadequate utilities service, insufficient education, and poor health care.

Because of Ebeye's high population density, environmental concerns are crucial to the well being of the populace. Proper sanitation, adequate supplies of drinking water, and a dependable power supply are all interconnected and are crucial aspects of improving Ebeye's environment and hence the well being of its people. The Asian Development Bank (ADB), the Republic of the Marshall Islands (RMI) government, and the local government have recognized these linkages and have sought to improve the quality of life for Ebeye's people by contracting the management of Ebeye's utilities to an external entity. The management paradigm adopted is one in which operations personnel from an island utility in the region (American Samoa Power Authority (ASPA)) provide the right mix of managers, professionals and technicians who have a sense of mission in helping their Pacific neighbors to gain skills in managing and operating their utilities.

2.1 Republic of the Marshall Islands - Physical Setting

The Republic of the Marshall Islands (RMI) is an independent country freely associated with the United States of America. The country is located in the tropical north Pacific and comprises 2 million km² of ocean and a total land area of only 181 km². This land area is largely located on 29 atolls. Atolls are rings of coral reef and relatively long narrow islets around a large central lagoon. There are also 5 coralline islands in RMI lacking a central lagoon. Virtually all land in RMI is coralline based and not more than 2 m above sea level. This low elevation makes the atolls vulnerable to storms and high waves, but hurricanes are a rare occurrence.

A note on terminology: Some confusion can occur with the name Kwajalein, because it refers to both the entire atoll as well as to one islet at the south end of that atoll. Here we use "Kwajalein Atoll" to refer to the whole atoll and "Kwajalein Islet" (some sources refer to this as "Kwajalein Island") to refer to the island at the southern end of the atoll that is the site of the US military installation.

The official currency of the Republic of the Marshall Islands is the US Dollar. All monetary figures in this case study are in US dollars.

2.2 Republic of the Marshall Islands - Population

The Republic of the Marshall Islands has a population of about 51,000. The annual growth rate has recently slowed from over 4% to under 2%. Seventy percent of the people live in the two main urban centers, Majuro and Ebeye Internal migration to these locations has caused a localized growth rate higher than the national average. The high growth rate has resulted in a population that is very young; over 50% of the population is under 15 years of age; note percentage slightly lower for Ebeye).

2.3 Republic of the Marshall Islands - Language

English and Marshallese are the official languages.

2.4 Republic of the Marshall Islands - Economic History

As with several of the smaller Pacific countries, the Republic of the Marshall Islands is remote from major markets, deficient in both the quality and quantity of land resource, and acutely short of skilled labor, although it does possess a potentially rich marine resource built on fish

and seabed minerals. The country has a dual economy, with a subsistence sector coexisting with a modern urban cash economy. The Republic of the Marshall Islands has limited productive potential, with a particularly important constraint being the traditional land tenure system that precludes secure access to land.

Little is known about the early history of the Marshall Islands, except that a system of chiefdoms once ruled a relatively unified country. The earliest foreign contacts recorded are by Spanish expeditions. Because the islands were off the main trade routes, they received few visitors, amongst whom was the English captain John Marshall who gave his name to the islands in 1788. The first Protestant missionaries arrived in 1857. Very soon, Christianity was adopted and churches and schools were built. The Marshall Islands became a German colony in 1885, and trade in copra then became an important feature of the economy. German traders developed coconut plantations, copra facilities and built a coconut oil factory.

The Japanese took control of the country in 1914. As rivalry in the Pacific developed, the islands became strategically important and the Japanese used them to develop large military bases that were destroyed during World War II. In 1947, the United Nations established the Trust Territory of the Pacific Islands (TTPI), comprising the Marshall Islands, the Caroline Islands (now the Federated States of Micronesia) and the Northern Mariana Islands, to be administered by the USA. Starting in the 1960s, there was an increasing demand for local autonomy.

The Marshall Islands eventually became a republic in May 1979, following the approval of a constitution through a national referendum. After a long period of negotiations with the USA, the two countries signed a "Compact of Free Association" in 1982, which came into full effect in 1986, when the UN Trusteeship was terminated. The national constitution of 1979 provides for a parliamentary system with legislative, executive and judiciary branches. The political structure is a blend of the American and British systems of government. Legislative power is vested in the House of Representatives, the Nitijela. In addition, the traditional Council of Chiefs, or Iroij, acts as a consultative body, which may request reconsideration of any bill affecting customary law or any traditional practice or land tenure.

The economy of the Marshall Islands at independence was inevitably linked to forty years of US military interests. The articles of the 1947 trusteeship called for the US to promote the development of the inhabitants towards self-government, to protect their health and control traffic in arms and ammunition. Nevertheless, the US, unlike all other UN trustees, was given permission to use the Trust Territory of the Pacific Islands (TTPI) for military purposes. A naval base was established on Kwajalein atoll and from 1946 to 1958, 66 atomic tests were undertaken. The Kwajalein base was later developed as a missile test site and became a part of a US global communications system for monitoring inter-ballistic missiles. Since 1947, the base has provided employment for between 300 to 800 Marshallese who have received wages equivalent to those paid in the US. In the period up to 1986, a small cadre of Marshallese was educated and employed in Majuro, again at wages equivalent to those in the US.

During the first ten years of the trusteeship, little attempt was made to improve social or economic conditions. Although there were annual appropriations of \$7.5 million for the TTPI, less than \$1.5 million a year was disbursed. Following a UN review in 1961, which was critical of the US trusteeship, the Kennedy administration initiated budgetary increases as well as a number of social welfare programs. These included feeding programs, school meals, programs for the aging, sports programs, community support and youth employment programs, all of which were introduced without adaptation to Marshall Island conditions. Wide distribution of free food and the introduction of school meals led to a rapid decline in local food production.

The introduction of 166 different, uncoordinated welfare programs led not only to lack of agricultural incentives and loss of any sense of individual or family responsibility, but also to a quadrupling of employees required to administer the programs and to massive increases in the cost of administration. Two-thirds of the total Trust Territory of the Pacific Islands (TTPI) budget was spent on government salaries, a situation inherited by the newly independent

government. In addition to the introduction of welfare programs, Trust Territory of the Pacific Islands expenditure on capital improvement programs (CPI) jumped from nil in 1968 to \$21 million in 1970, and over the following ten years a total of \$259 million was allocated as on capital improvement program funds.

Under the Trust Territory of the Pacific Islands administration, economic development was not assigned a high priority. Almost none of the US economic assistance was channeled into local investment or into improving local productivity capacity and little was directed towards improving local agricultural, administrative or technical skills. At independence, the Republic of the Marshall Islands inherited a top-heavy bureaucracy, almost no primary production, a population with health and social problems and inadequate skills to plan or implement development policies.

In this setting, the country, and its new leaders, were poorly prepared for the challenge of turning the Marshall Islands into an independent economy that would offer good prospects to its citizens. Management of the country restricted itself to management of the finances, without a clear vision or concept of what development would mean for the Marshall Islands. As the country and its leadership are maturing, such a vision is starting to develop. Unfortunately, harsh measures will be needed in the short and medium term to realize such a vision and give the country direction beyond 2001.

2.5 Republic of the Marshall Islands - Current Economic Situation

The Republic of the Marshall Islands economy is a dual economy, with a subsistence sector coexisting with a public sector and a cash economy supported by substantial transfer payments from the US. Under the Compact of Free Association with the United States, grants accounted for an average of 71 percent of total Government expenditures and 59 percent of total revenue during fiscal year 1991 to fiscal year 1995 underpinning the modest per capita gross domestic product (GDP) of \$1,600. The funding under the Compact of Free Association will be declining over the next two years as the current agreement ends in 2001. Declines in output during 1995-1998 reflected not only the drop in external assistance but also the necessary cuts in government expenditure and employment made under the Public Sector Reform Program. Agriculture and fishing output contracted by 20 percent in fiscal year 1997, and fell again in fiscal year 1998 because of the effects of Typhoon Paka (December 1997) and El Niño. Copra production continued to be adversely affected by low producer prices and inter-island transport problems. Food and livestock production fell. Fisheries production contracted when unprofitable Government-owned long-liner and purse-seiner vessels ceased operations in fiscal year 1996. In line with the economic recession, the inflation rate fell from almost 10 percent in fiscal year 1996 to 5 percent in fiscal year 1997, and an estimated 4 percent in fiscal year 1998. This contractionary pattern is likely to continue as the economy adjusts to tighter budgetary conditions.

In 1990 average compensation (including the value of housing) across the whole public sector was \$7,400 while the average for paid employees in the private sector was \$3,800. The labor force is characterized by a low level of literacy and numeracy, poor work habits, and high absenteeism. Productivity is considered to be low.

The average per capita income on the outer islands is \$468 and derived largely from copra. This compares with the urban centers of Majuro and Ebeye (at \$988 and \$1,482 respectively) where income is largely derived from wage employment.

The level of employment is not increasing. The unemployment rate of 12.5 percent in 1988 is estimated to have increased over the years. It is estimated that unemployment is almost 40 percent among the 15-19 age group and over 80 percent of the unemployed are in the two urban areas of Majuro and Ebeye. These figures do not account for the high levels of underemployment that exists.

2.6 Republic of the Marshall Islands - Environmental Issues

The Republic of the Marshall Islands has a strong legal and institutional framework, however, due to lack of manpower and funding, enforcement and compliance are minimal. The Republic of the Marshall Islands Environmental Protection Authority (RMI EPA) has legislative powers to monitor the quality of water, sewerage, and waste disposal. It is also charged with promulgation and enforcement of regulations. Coastal zone management legislation also exists.

Environmental problems in Ebeye and Majuro are the result of high population densities combined with inadequate treatment and disposal of sewerage, and solid waste. This has been particularly damaging to the inshore environment.

2.7 Ebeye - Physical setting

Ebeye is a small (0.36 km²) islet on Kwajalein Atoll Kwajalein Islet, the site of the US military base--US Army Kwajalein Atoll (USAKA)--is approximately 6.5 km south of Ebeye. The islet is flat and not more than 2 m above sea level. Vegetation is very sparse with almost the entire land surface covered in buildings or pavement.

2.8 Ebeye - Population

In discussing population on Ebeye the following caveat is as applicable today as it was when first noted by the Trust Territory of the Pacific Islands Office of Planning and Statistics seventeen years ago: "It must be noted that it is very difficult to measure the number of people actually living on Kwajalein [Atoll]. Members of the extended families of workers on the Missile Range move between Ebeye and their outer island homes frequently. At any given time, the most knowledgeable observers agree that there are many more people present on Ebeye than shown in official statistics. Many of the people consider one of the outer islands to be their actual place of residence. Frequent moves between outer islands and Majuro are also common, so again there are often more people actually on Majuro than people who claim Majuro as their place of residence. This creates great difficulty in calculating birth, death and other rates for these various areas." (TTPI 1984).

Ebeye's 1999 population was close to 10,000 and expected to reach over 17,000 by 2005. This population on such a small land area makes Ebeye one of the world's most densely populated places with 28,000 persons/km².

2.9 Ebeye - Modern History

After capturing Kwajalein Atoll from the Japanese in 1944, the United States began clearing the remains of the WWII battles from Kwajalein Islet to use it as an American military base. Several hundred Marshallese and Pohnpeians (from Pohnpei or Ponape) were brought in for the job. The Micronesian workers were provided with housing and eating facilities on Kwajalein Islet. The Pohnpeians eventually returned home whereas the Marshallese were joined on Kwajalein Islet by their wives, children, and in accord with Marshallese culture, a variety of extended-family dependents. The resulting community was known as the "Kwajalein Labor Camp."

By 1950, the "Labor Camp" population had grown to a total of 550 people. It was essentially a shantytown and contrasted sharply with the nearby military quarters. Thus, it was decided to relocate the camp to Ebeye Island and orders to that effect were promulgated.

The new camp, planned to accommodate 370, was built and the people moved to Ebeye in 1951. It consisted of 79 simple frame houses, cook and bathhouses, and benjos (over-the-water toilets). The inhabitants themselves erected additional buildings of scrap wood and salvage metal. By 1954 the population grew to 1,000 as the new location provided unrestricted access.

In the early 1960's, Ebeye's population increased dramatically as many more jobs became available on what was now the Kwajalein Missile Range. Many islanders, both from the Marshall's and other districts of the trust territory, went to Ebeye seeking not only jobs but also the chance of a better life for themselves and their families.

In 1961, a large part of Kwajalein lagoon became a target for missile launches. In 1964, the inhabitants of these "mid-corridor" islands were relocated to Ebeye as a precautionary measure.

This explosive growth turned tiny Ebeye into one of the Pacific's most densely populated areas, exhibiting all of the physical ills of an over-populated and under-developed urban community. Existing power and water systems were inadequate and sanitary facilities were almost non-existent.

After months of discussions, the Department of the Interior and the Army reached an agreement on what improvements should be provided for Ebeye. In 1966, the Army began construction of 308 apartment units, a saltwater sewer system, an electrical power plant, public works facilities, and a water system. No funding, however, was provided for the maintenance of the new housing or utility systems.

Over a period of ten years population continued to grow to a level of 8000 by 1978.

The problem of inadequate facility operation and maintenance manifested itself in 1979. Six months after completion of the sewage treatment plant it became inoperative. Additionally, pumps at the sewer lift stations had burned out and mains were backed up. This condition existed for over a year while emergency repairs to the mains and sewage plant took place.

In addition, the power plant had one engine down and the remaining two were operable at only fifty- percent capacity. The water system had significant leaks and the scarcity of water on the island compounded health problems. Water was barged from the Kwajalein test facility and rationed to the community. The hospital suffered deterioration with broken windows, a leaking roof and inoperative mechanical systems. As a result, every aspect of community life was in jeopardy.

Emergency programs were implemented to renovate essential works using TTPI High Commissioner reprogrammed Capital Improvement Programs (C.I.P.) funding along with Fiscal Year 1980 and 1981 United States Congressional Funding for Kwajalein Atoll redevelopment.

This work was completed but only just met the needs of the community, as it existed then. Water was still needed on a rationing basis from the Kwajalein test facility, and could not meet the requirements of non-domestic uses such as agriculture and industry. Available water was less than thirty gallons per week per person, as compared to the U.S. standard of fifty gallons per day per person.

Then (in the mid-1980s) the community consisted of approximately 630 dwellings for a population of about 8500. The housing units other than the 308 government apartments consist of mostly plywood and tin cottages, many without inside plumbing. In these cases as many as sixty people shared a common toilet facility.

As today, the primary source of employment was the Kwajalein Missile Range Facility.

The extended family and attraction of western life style caused Ebeye to be a center of growth. A re-ruralization program to relocate Marshallese to outer islands failed with many people returning to Ebeye within a short period.

Thus, by the mid-1980s Ebeye had become a densely populated urban community, totally reliant on a money economy but still imbued by the traditionally cultural patterns of the Marshall Islands.

2.10 Ebeye - Situation

An Ebeye Councilman summarized the current conditions on Ebeye in the following way:

[Ebeye has] severe communal and infrastructural problems relating to housing, malfunction of drainage, unsanitary in terms of sewage, malfunction of the sewage treatment plant, malnutrition of its young population, constant power outages, insufficient running fresh water, overcrowded and understaffed schools, [hospital] operates with few medicines, no warehouses to store vehicles equipment and aging tools...and unemployment of refugees from the mid-corridor islands brought to Ebeye to make room for the missile defense system of the United States. (Statement by Hon. Councilman Jack Akeang before Kwajalein Atoll Local Government's Council 19 February 2001, at Ebeye, Kwajalein Atoll, Republic of the Marshall Islands; edited for clarity)

In most respects the situation has not improved since the 1980s. Population has continued to grow and services remain inadequate.

2.11 Ebeye - Economic Base

Whereas the RMI economy has been characterized as a "dual economy," the economy of Ebeye is almost entirely dependent on the US military presence on Kwajalein. Approximately 1200 people are employed by United States Army Kwajalein Atoll (USAKA) and account for 74.6% of wage earnings on Ebeye. Others are employed in service-related jobs on Ebeye. The median annual household income on Ebeye is \$15,000.

United States Army Kwajalein Atoll (USAKA) rents Kwajalein Islet and several other islets in what is known as the "Kwajalein mid-corridor." Rental payments by the US to the 84 landowners (relocated to Ebeye) are another substantial source of income in the Ebeye economy. Total annual payments amount to \$8.5 million. Three high-ranking people (*iroij*) receive \$2.7 million of this amount.

Apart from military-related economic activity, the economy of Ebeye has not done well in recent years, partly because of the country's poor economic performance. Following strong growth through the early and mid-1980s, real GDP per capita has declined reflecting strong population growth and reduced Government spending. This pattern is expected to continue as the economy adjusts to tighter budgetary conditions. The population continues to increase as people migrate to Ebeye from the nearby atolls, attracted by the prospect of finding employment at the United States Army Kwajalein Atoll base located on the nearby Kwajalein Islet. The leasing arrangement with the US military installations and missile testing prevents people from living in several parts of the atoll resulting in additional migration to Ebeye. There is no major industry or business activity in Ebeye except for one medium-sized supermarket, two large stores, and one 20-25 room hotel.

2.12 Ebeye - Schooling

Based on the 1999 census, 97.0 percent of the household population 10 years and older are literate.

School attendance for the age group 6-13 years (primary school) was 82.7 percent for Majuro and 83.6 percent for Ebeye.

For the age-range 14 to 18 years, Ebeye posted 72.7 percent secondary school attendance.

Chapter 3 Infrastructure

3.1 Water Supply System

Any human population needs adequate supplies of clean water. On Ebeye the role of the utility company in providing this water is critical. The options for the people to collect natural sources of water are extremely limited. Basic sanitation requires that people have enough water for washing and general household hygiene.

3.1.1 Water Resources

Ebeye has no natural surface water such as streams, rivers, or lakes. The surface elevation seldom exceeds 2 m above sea level, and rainfall soaks rapidly into the porous ground. Ground water collects in the form of a "Ghyben-Herzberg lens" floating atop the denser ocean water underlying the islet. This water is brackish as well as being polluted by the intensive human use of Ebeye for the past several decades. Thus, the community must use rainwater catchment tanks. Although Ebeye has an artificially constructed area dedicated to collecting rainwater the modest rainfall (less than 250 centimeters/year) forces dependence on reverse osmosis system of seawater as primary source of Ebeye's freshwater source.

3.1.2 Reverse Osmosis

ASPA/KAJUR is now operating two new Reverse Osmosis (RO) units producing 200,000 GPD. A third similar size RO machine has been ordered to be installed later this year. Other completed improvements included: new water distribution and transmission system, renovated water tanks, and new chlorination system,

3.1.3 Water Availability and Delivery System

The water supply on Ebeye has never been able to service the total demand of the island and per capita availability of fresh water has been chronically below the minimum requirements. The island is divided into 5 water delivery sections. Currently, water is pumped into the pipe delivery system every other day for one hour to each section one section at a time. Many houses have tanks that are used to store water between pumping episodes.

Fresh water is also available from a tap at the ASPA/KAJUR facility. This tap is normally open from 6:00 AM to midnight except when storage tanks are being filled prior to pumping into the piped delivery system. KAJUR/ASPA also delivers water by tank truck two times a week to Gugeegue and other proximate islets not on the piped delivery system. Table 3 suggests that, due to the intermittent availability of piped water to houses, many households obtain their main supply of water from other sources

3.1.4 Water Consumption

The current per capita water consumption is 8 gallons per day. With the completion of the two new RO units in May, the consumption per capita is expected to increase to 24 gallons per person per day.

3.1.5 Water Chlorination

A chlorination treatment system is installed inside the main fresh water pumping station at the power plant to treat the product water from the two new RO units before it is pumped to the storage tanks in the middle of the island and to the water tap adjacent to the power plant. Hypochlorite solution is periodically added to the storage tanks to replace chlorine lost to evaporation in the tanks. Hypochlorite solution is again added to the system before water is pumped from the tanks to the public homes. Because water is re-chlorinated several times before it reaches the tap, the water quality at the tap is comparable with the water quality at the treatment plant.

3.1.6 *Water Testing*

KAJUR/ASPA takes four water samples weekly. The samples come directly from taps on the water distribution system -- 1 from the south end, 1 from the middle, and 2 from the north end of the island. The samples are sent to the EPA certified lab in USAKA to test for the presence of coliform bacteria and E-Coli. Periodic positive coliform results are randomly distributed in time and space and ASPA/KAJUR suggests that the positive results are due to improper sterile technique in sample collection and not to the presence of coliform bacteria in the water.

3.1.7 *Water Safety*

In principle, water produced by reverse osmosis and chlorinated is clean and safe to drink. However, water may be exposed to sources of contamination after leaving the ASPA/KAJUR distribution system. Such sources of contamination are related to how water is stored in between ASPA/KAJUR pumping events. For example, household water tanks may be used for roof catchment in addition to storage of piped water thus introducing a possible source of contamination. Hence, the public is advised to boil the water for drinking. The ASPA/KAJUR household survey suggests that most people do treat their water in some way before drinking.

3.1.8 *Pressure Monitoring*

In spite of the large increase in quantity of water available on the island, a pressure monitoring system is irrelevant at this time. Water is pumped daily but only at certain times of the day.

3.1.9 *Water Tariff Structure*

Currently KAJUR/ASPA charge flat rates for water service; \$22 per month for residential and \$25 per month for commercial. Customers are not metered. Water is available daily but only pumped at certain times of the day. ASPA/KAJUR has no immediate plans to install water meters on all customers

3.1.10 *Level of Satisfaction*

There has been a vast increase in customers' confidence on ASPA/KAJUR's water service including the quality of water produced from the new RO machines. People no longer cart water from Kwajalein.

3.2 **Sewerage and Excreta Management**

Sewerage and excreta management may be the biggest challenge facing Ebeye. Human excrement is the major pollutant of the Ebeye environment. The incidences of water-borne disease on the island indicate that this a major cause of poor quality of life on Ebeye. Steps are being taken to remedy this situation.

The 1999 census indicates that the vast majority of households on Ebeye use flushing toilets located either inside or outside the house. The ASPA/KAJUR household survey suggests that 88% of houses are connected to the sewer. Another 5% are not and use a neighbor or relative's toilet. Human excrement is a notable feature of the shoreline suggesting that it too is frequently used as a toilet.

3.2.1 *Sewage Disposal System*

The existing sewage disposal system is composed of 4 wastewater lift stations, a wastewater treatment plant, 2 saltwater pump-stations, saltwater distribution system, sewer collection system and an ocean outfall on the lagoon side. The saltwater pump-stations pump seawater from wells for use in toilets and urinals, thereby conserving the scarce potable water supply. The saltwater distribution system is similar to the portable water system. The wastewater is collected by gravity to the lift stations where they then pump to the Wastewater Treatment Plant (WWTP). The treatment plant utilizes an oxidation ditch as its key processing

component using two rotors to aerate the sewer. Treated effluent from the Wastewater Treatment Plant is discharged by gravity through an ocean outfall to the lagoon.

By the beginning of the year 2000, only three of the four wastewater lift-stations were operating, but each lacked a standby (backup) pump. ASPA/KAJUR has installed three standby pumps for these lift stations. The treatment plant was receiving sewage from only one pump station and the rotors of the oxidation ditch have been out of service for at least three years. The largest pump station has been on and off for at least three years due to maintenance problems with the original equipment. The saltwater pump station adjacent to the Wastewater Treatment Plant is in working condition and is not experiencing any known problems.

Currently, all four wastewater lift-stations are operating, but three of them bypass the treatment plant as they have for the last seven years due a frozen main valve. ASPA/KAJUR is now working to replace the frozen bypass valve, so all the flow can be directed into the treatment plant. ASPA implemented regular cleaning of sewer collection pipelines as well smoke test the pipes to find leaks

3.2.2 Existing Wastewater Treatment Plant

The wastewater treatment plant consists of a control building, an oxidation ditch, two aeration rotors, secondary treatment process, and an out-of-service liquid chlorination (sodium hypochlorite or bleach) system for effluent disinfection. The disinfection system has been abandoned. There is no preliminary treatment (screening or grit removal) of raw wastewater since grinders or screens are provided at each lift station. When operated as designed, the oxidation ditch has four passes – three passes dedicated for the activated sludge process and the fourth pass is used for secondary sedimentation.

The existing oxidation ditch rehabilitation for secondary treatment is incomplete. Two new rotors have been installed. The effluent box of the oxidation ditch contains a V-notch weir but no flow meter. The original design did not provide for waste sludge removal or disposal. The KAJUR operators stated that sludge must be removed by manually shoveling the wastewater solids from the oxidation ditch.

For sludge disposal, the island lacks an official solid waste or sanitary landfill. A tidal pond at the north end of the island serves as a dump. It appears to be unlined and open to the atoll's lagoon. Without a lined, sanitary landfill, it is believed that raw wastewater sludge will eventually seep into the lagoon.

Approximately 0.5 million gallons of sewage flows through the system each day. The sewage treatment plant is back in operation, but three of the pump stations bypass the plant and send the untreated wastewater into the lagoon. The outfall pipe was damaged some time ago, and appears to be partially blocked. The outfall runs where the old quarry used to be. It is further believed that the existing outfall ends in a location that might be impacting one of the saltwater well located nearby. No tests have been done to monitor the quality and quantity of discharge at the outfall or saltwater for sewer system and ROs. A separate project to study the effectiveness of the present outfall to diffuse the sewer is scheduled for August this year. Consideration is also given to possible relocation of the wastewater treatment plant away from the residential area.

3.2.3 Management Issues

Original challenges that were facing the Ebeye wastewater disposal system included:

- 1) Weak institutional support for KAJUR;
- 2) Low maintenance budget for spare parts;
- 3) Inadequate staff training; and
- 4) An ineffective operation and maintenance program.

- 5) NO sewer rates to cover operation and maintenance of the system. Government currently provides a subsidy for the sewer operation. Goal is for sewer to be self sufficient in terms of operation and maintenance revenue.

ASPA/KAJUR is currently working on implementing solutions that address each of these challenges.

One of the significant management issues found on Ebeye as well is the lack of support at both a national and local level for a comprehensive Environmental Management Strategy/Plan. Other management issues include a lack of enforcement of existing environmental protection regulations and a lack of community awareness and educational programs on wastewater management.

3.2.4 *Cost of Service*

The sewerage system is being fully funded by a subsidy from the Government of the Republic of the Marshall Islands. Therefore, the service is free to the people of Ebeye.

3.3 **Solid Waste Management**

3.3.1 *Solid Waste Disposal System*

The government provides 50-gallon plastic trash bins regularly spaced along the road. The ASPA/KAJUR household survey found that the majority of households dispose of their solid waste in these bins. The Public Works Department is responsible for collecting the trash bins. A dump truck hauls the collected solid waste to a tidal pond on the north side of the island where it is dumped. The collection schedule is sporadic and individuals haul the bins to the dumpsite in their own vehicles when necessary. Some of the survey respondents indicated that they dispose of their solid waste by 'open dumping' – interpreted here as hauling their solid waste to the dump themselves.

Solid waste at the dump is periodically burned. Waste oil from the power plant is added to enhance burning.

Since the 2000 cholera outbreak, the Public Works Department has made efforts to clean up the streets; its employees pick up dispersed litter from the roadside.

All of the solid waste on Ebeye, including waste from the hospital and the power plant is dumped at the tidal pond site. The material dumped is a mixture of metal, paper, plastic, glass, food, textile, plant, and other solid waste. A visual estimate suggests that approximately 35% of the waste is made up of scrap metal, 55% is household waste such as plastic, paper, food, and textile, and 10% is plant, and miscellaneous waste material. The high proportion of metal is due to the regular burning that largely reduces the other kinds of material.

3.3.2 *Inadequacies of the Disposal System*

The present disposal system is relatively efficient at moving the island's solid waste to a defined area, although there is a certain amount of litter found along the roadside. However, the current disposal site posts serious health problems. The dump on the northern end of the island borders a residential area. Children play at the dump. The residents living near the dump complain of strong odor and smoke from the landfill. Other problems encountered at the site are fires, rats, flies, and animals.

A lack of EPA involvement in solid waste management on Ebeye poses an environmental threat to the marine life in the lagoon area. Rubbish, oil, and other hazardous materials at the dump can be assumed to seep into the lagoon.

The amount of toxic material released into the lagoon through open burning of the solid waste has not been determined. The air and soil of the residential area near the dump may also be

contaminated with toxic material released by the open burning. Catchment water from the roofs of this residential area is likewise potentially contaminated.

Currently, there is one dump truck on the island. It is unclear how solid waste would be collected if the dump truck were out of service. Another issue faced by the system is the lack of community awareness and education program on solid waste management. At present, there is no solid waste educational program targeting the public.

3.3.3 Recycling of Solid Waste

No recycling program is present on the island. All recyclable waste is being disposed of at the dump.

3.3.4 Public's attitude towards Solid Waste Disposal System

Ebeye government official stated that most Ebeye residents are not willing to pay the five-dollar fee required by the Public Works Department to collect and dispose of solid waste. Public Works is currently devising a way to collect the five-dollar fee from the public for solid waste disposal. Currently, the local government is subsidizing solid waste collection.

3.3.5 Hospital and other Hazardous Waste Disposal

Hospital and hazardous waste is disposed of in the same manner as all other solid waste on Ebeye – it is dumped in a tidal pond at the northern end of the island and partially burned. No special treatment is used for this kind of waste.

3.3.6 Comparison among different economic groups

All economic groups receive the same solid waste disposal service on Ebeye.

3.4 Housing

Ebeye's growth has not been planned. Housing standards are low with building materials often substandard yet costly. Houses are mostly single-story and very closely spaced – often with no walking space between adjacent houses. The following information on housing is drawn from the 1999 Census.

3.4.1 Buildings

During the 1999 census, a total of 6,411 buildings with living quarters, whether these are occupied or vacant, were counted in the whole Marshall Islands. Of this number, 5,872 or 92 percent were occupied. Single houses constituted 86 percent of all buildings, while multi-unit residential houses accounted for 12 percent. On Ebeye, multi-unit residential houses comprised a much higher percentage (33 percent).

3.4.2 Ratio of Households and Occupants to Housing Unit

The number of occupied housing units counted in the 1999 census is 6,411 – 47.7 percent are located in Majuro, while 18.5 percent (1186 units) are on Ebeye. The total number of households enumerated is 6,478. This translates into a ratio of households to occupied housing units of 1.01, which means that households sharing one housing unit rarely happen.

On Ebeye, housing units with 20 or more occupants constituted around 6.0 percent of all housing units. The ratio of population to occupied housing units is 9.1 for Ebeye and 7.7 for Majuro.

3.4.3 *Floor areas of Housing Units*

Housing units in Majuro and on Ebeye are, in general, bigger than the national average. The median floor area of occupied housing units in Majuro was 375 square feet and in Ebeye, 434 square feet. There are 23.1 percent of housing units with floor areas smaller than 108 square feet in Majuro and 8.5 percent on Ebeye. By contrast, houses with floor areas larger than 1,286 square feet comprised 7.5 percent in Majuro and 9.0 percent on Ebeye, both of which are higher than the national percentage of 6.3.

3.4.4 *Tenure Status of Housing Units*

Less than half of all households on Ebeye (45.8 percent) are owners of the housing units they occupy. Almost two out of five (38.8 percent) households on Ebeye do not pay for their housing units but occupy them with the consent of the owners.

3.4.5 *Tenure Status of Lot*

Ebeye has 35.2 percent of its households owning the lands they occupy. 46.5 percent of households on Ebeye are occupying lands they do not own but occupy for free but with the owner's consent.

3.5 **Transportation**

Ebeye's geography makes land, water, and air transportation each important. Land transportation is important for getting around the islet itself; water transportation connects Ebeye to jobs, potable water, and the airport on Kwajalein Islet; and air transportation links Ebeye with the rest of the Republic of the Marshall Islands (RMI) and the outside world.

3.5.1 *Land Transportation*

There are approximately 4 km of roads on Ebeye. All of the roads have asphalt and coral gravel paving. Most of the roads have adjacent sidewalks. Houses are generally built right to the edge of the sidewalk or road.

Because the island of Ebeye is relatively small, walking is a common mode of transportation. The road taxis are common on the island. The cost for travel to anywhere on the island is a flat rate of \$0.50 per person. There are also a substantial number of private vehicles on Ebeye.

Since the poor tend to walk more than the affluent residents do, they are exposed more to pedestrian hazards. Such hazards found on Ebeye include no pedestrian crosswalks, uneven sidewalks at some parts of the island, and poor lighting at night. Because most of the houses on the island are built to the edge of the road, it is often used as a pedestrian walkway. Throughout the day and especially in the evening, children can be found playing on the road - treating it as a playground.

A causeway and road from Ebeye Islet to Gugeegue Islet with a scheduled completion date of 1995 remains incomplete. A rudimentary road exists on the causeway allowing vehicular transportation. However, due to lack of funds and other reasons, the causeway has not been completed. Currently, the Kwajalein Atoll Development Authority (KADA) is seeking funding to complete the causeway.

3.5.2 *Water transportation*

Because most of the working population of Ebeye is employed on the neighboring US Army Base on Kwajalein Islet (USAKA), water transport is an important means of commuting. Water taxis run frequently between Ebeye Islet and USAKA; the cost is \$4 per person one-way. USAKA operates a ferry service between Ebeye Islet and Kwajalein Islet. Although free of charge, the ferry schedule is restricted and is slower in comparison to the water taxis. Some

of the hazards that the users face traveling on water are 1) not being protected from ocean spray, and 2) no life vests aboard the water taxis or ferry in case of emergency.

3.5.3 *Air transportation*

There is an international airport at United States Army Kwajalein Atoll. Three airlines operate regular flights linking Kwajalein to Majuro, Hawaii, and Kosrae-Pohnpei-Guam.

3.6 **Power Generation and Distribution**

A reliable supply of electrical power is crucial to Ebeye's environment and the quality of life of the people. Each of the other utility services relies on the power supply, as do the hospital and the schools.

Two years ago on Ebeye power generation and distribution was not a functional system. Power would be off for weeks or months at a time. When electricity was available, it was only for a few hours each day. The unreliable power system on Ebeye posed a lot of problems during that time. Overflows of sewerage on the streets (booster pumps are electric), the unavailability of fresh water (electrically produced and pumped), and other problems were causes of major health problems on the island. Because of the serious need for improvements, the Asian Development Bank, the Republic of the Marshall Islands government and the local government sought an outside contractor to manage Ebeye's utilities. The American Samoa Power Authority was awarded the contract and began management in November of 1999.

At present, the service quality has improved markedly. Since Dec. 31, 1999 power has been available continuously on a 24-hour basis with only planned outages or minimal forced outages. ASPA is also responsible for the fee collections and plant operation and maintenance.

3.6.1 *Collection*

Fee collection was a major problem before with some customers refusing to pay for service. This improvement has been driven largely by the installation of debit meters. Although a high cost solution (about \$400 per installed meter), debit meters have been considered the key to solving the long-standing collection problems on Ebeye. Apart from customers taking time to get used to the system, there appear to be very few problems with it. Also the increase in customers' confidence in ASPA/KAJUR's service resulted in big improvement in the payment of monthly bills.

Some 1,250 debit meters have been installed as of March 2001. Besides guaranteeing 100% collections by pre-payment, the debit meters also allow the collection of payments under conventional metering.

3.6.2 *Improvements*

Major improvements in the system have been accomplished. The power plant has been completely renovated. Overhauling of engines, alternators and associated equipment has been another major improvement. Engine No. 1 and No. 2 are now both running in good condition. Engine No. 2 is currently running online supplying the whole island. The system was designed so that engine No. 2 supplies the load while Engine No. 1 is on standby.

Rehabilitation of the power station and the supply of tools and spares is a big contribution to the improvements of the power supply. The ventilation exhaust fans installed are complete, improving the temperature in the power plant and reducing the de-rating factor on engine load performance.

ASPA/KAJUR has installed auxiliary generators at the hospital for emergency supply in case the power supply goes off. Two 800 kW generator sets have been commissioned and are operating at optimum efficiency.

Due to the pervasive ocean spray conditions found on the island, ASPA/KAJUR is installing underground cables. It is probable that the best way to deal with the ocean-spray problem is to route the power lines underground. The underground installation was completed at the beginning of this year. Commissioning and testing were also completed at the end of March. The system will be ready and operating by June of this year. Due to the uncertainty on the route of the new causeway between the third island and Gugeegue, it has been decided to defer the underground construction until the plan for the causeway is finalized.

3.6.3 Training

The American Samoa Power Authority (ASPA) personnel on Ebeye are actively involved with helping their Marshallese counterparts develop skills for the long-term operation and management of Ebeye's utilities.

The training component of the ASPA model is critical to its success. A 'buddy system' is used in which Ebeye personnel work with and learn from their ASPA counterparts. Follow up and skill-level assessments are important features of this program. Some key Ebeye utility personnel have been sent to American Samoa to receive additional training by working with their ASPA partners there. While in American Samoa they have also benefited by experiencing a utility operation similar to Ebeye's being run in an efficient and integrated manner. This is very empowering as it shows that Pacific islanders can be competent and capable of functioning effectively at all levels of a utility enterprise.

To more fully prepare its employees in job assignments, ASPA/KAJUR is very much involved in training their crews. The "Lineman Certification Training" commenced last year in March and continued to the end of August. Two Marshallese linemen attended this training. Other training included Generator Protection/Control, Trouble Shooting, Preventive Maintenance, Meter Calibration, and Debit Meter Installation and Operation Training.

Chapter 4 Public Health

The Republic of the Marshall Islands Office of Planning and Statistics points out that health statistics are generally incomplete and represent an under-reporting of events. The number of outpatient visits or hospital discharges for a particular disease is also underreported; hence the health problems in the Marshall Islands are probably underestimated.

4.1 General conditions

Understandably, there is a high occurrence health disorders associated with high population density and indicative of crowded living conditions. Poor sanitation-- exacerbated by inadequate water supply, faulty sewerage treatment, and lagoon dumping of solid waste— results in a high incidence of waterborne disease. Diarrhea and other gastrointestinal diseases are especially problematic for young children. With more than 50% of the population under 15 years of age this is a particular concern that can be expected to grow in magnitude. The relative affluence of the Ebeye population with its associated sedentary lifestyle and imported diet has resulted in high levels of lifestyle diseases (e.g. diabetes, cerebrovascular, heart, and cancer diseases) thus increasing the demand for healthcare services.

The most serious health problems are communicable disease and the population is vulnerable to epidemics. Diarrheal diseases are probably the most important health problem being the leading cause of outpatient visits, hospitalizations, and death. Only a small proportion of children are thought to be free of intestinal parasites. Many children also suffer from chronic or acute otitis media.

The Ebeye hospital is faced with handling the following major health challenges:

- 1) Perinatal mortality;
- 2) Youth and their health problems (sexually transmitted diseases, teenage pregnancy, substance abuse, and suicide);
- 3) Chronic diseases (malnutrition, obesity and diabetes, hypertension);
- 4) Communicable diseases (tuberculosis and sexually transmitted diseases).

4.2 Cholera

A cholera outbreak occurred on Ebeye starting at the beginning of November, peaked in the third week of December, and was over by the end of January. There were 6 deaths out of 346 confirmed cholera cases).The cholera outbreak highlights the precarious health position of the Ebeye population. Poor sanitation and utility infrastructure combined with very high population density and inadequate health care services lead to the rapid spread of the disease. That there were not more fatalities is a credit to the dedication of the health-care professionals on Ebeye.

Chapter 5 Poverty Reduction

5.1 Identification of Poverty

Poverty is here defined in terms of quality of life. Although Ebeye has a relatively high median annual household income (\$15,000), inhabitants' health is poor and the educational level is low. There is insufficient information on income distribution on Ebeye to calculate poverty statistics based on income level.

The families with ancient roots on Ebeye dominate the local administration. Generally, they enjoy the best living conditions. They have the most substantial homes as well as conveniences such as electric generators that ameliorate the low level of utilities service.

Families that have recently immigrated from other atolls tend to spend their money on portable goods such as televisions, video players, air conditioning units, etc. The cause of this is the land tenure system. Eight families own all of the land on Ebeye. The majority of the population occupies land that they do not own and to which they have no long-term use rights. This acts as a disincentive to building permanent houses or people spending money to improve their houses.

Infrastructural improvement is the key to improving the quality of life on Ebeye. Three important aspects of this are education, health care, and utilities. To a large extent the first two are dependent on the third. Major and ongoing health care issues (e.g. diarrhea and other gastrointestinal diseases, intestinal parasites, etc.) and critical outbreaks (such as cholera) are directly related to an adequate supply of pure drinking water and proper sewerage disposal and treatment. The water and sewerage systems rely on a dependable supply of electricity. Education is crucial in instructing the population in general sanitation and in changing attitudes.

Ebeye residents cannot rely on resources at the outskirts of the urban area because the urban area occupies the entire landmass of the island.

Chapter 6 Summary Evaluation

6.1 PIMM at work in Ebeye

Ebeye faces a variety of serious problems. A basic underlying factor is the extreme population density and the lack of new land. The situation is complicated by a complex land-tenure and social system with a majority of inhabitants from other islands. Within this context and despite a relatively high-income level, Ebeye suffers from inadequate utilities service, education, and health care.

Adequate supplies of drinking water, proper sanitation and a dependable power supply are crucial to solving Ebeye's quality-of-life issues. The ADB, the RMI government, and the local government have sought to provide these by contracting the management of Ebeye's utilities to an external entity. The management paradigm is one in which operations personnel from an island utility in the region (ASPA) provides the right mix of managers, professionals and technicians imbued with a sense of mission to help their Pacific neighbors succeed at utility operation and management.

ASPA and ADB have been relatively successful in instituting the Pacific Island Management Model in Ebeye.

With so many people in such a small area, resources are often strained and the infrastructure is difficult to maintain. The availability of potable water and a reliable power source is necessary for the survival of such a community. For Ebeye, the availability of water depends largely on the availability of power.

ASPA encountered many setbacks while striving to improve Ebeye's utility services--challenges such as low employee morale, laid back attitude, run down power plant, discrepancies in collection, and the unwillingness of people to pay for services. ASPA was determined through implementation of the Pacific Island Management Model (PIMM) to make things work for Ebeye and improve the standard of living of its people.

The training component of ASPA's PIMM is critical to its success. The "buddy system" was utilized and Ebeye personnel work with and learn from their ASPA counterparts. Follow up and skill-level assessments were important features of this program. The Training Within Industry program focused on developing management capacity to augment the technical skills amongst first-line supervisors. Some key Ebeye utility personnel were sent to American Samoa to receive additional training by working with their ASPA partners there. While in American Samoa they have also benefited by experiencing a utility operation similar to Ebeye's being run in an efficient and integrated manner. This is very empowering as it shows that Pacific Islanders can be competent and capable of functioning effectively at all levels of a utility enterprise.

The Maintenance Management component of ASPA's PIMM has also been implemented. Improvements have been made on work orders, asset management, and maintenance of utilities. Operation and Maintenance Programs (O&M) for all facilities are now in place. The power plant has been upgraded, with engines repaired and extra units installed. Primary distribution lines have been placed underground to mitigate the severe corrosion problem caused by salt spray and high humidity.

Power is now available 24/7 with only planned outages or minimal forced outages. Piped water is available 6 hours every day, produced by Reverse Osmosis units, and disinfected using sodium hypochlorite. A significant reduction is made on water ferried from Kwajalein Islet. The laboratory on Kwajalein is performing weekly water tests.

With extensive improvements in the water and power operations and maintenance, the RMI government together with the Asian Development Bank (ADB) insisted that in addition to power and water, ASPA was to manage the wastewater and solid waste utilities.

ASPA went right to work in fixing the many problems associated with the waste water system. The system composed of 4 wastewater lift stations, a waste water treatment plant (WWTP), and 2 saltwater pump-stations, were in bad condition. Three of the four lift stations were operating, with no standby pumps. The treatment plant was receiving sewage from only one pump station and the rotors of the oxidation ditch have been out of service for at least three years.

The wastewater treatment plant consisted of a control building, an out-of-service oxidation ditch, secondary treatment process, and an out-of-service liquid chlorination (sodium hypochlorite or bleach) system for effluent disinfection. With a non-operating WWTP, about 0.5 MGD of untreated sewerage was being discharged into the lagoon. No tests were done to monitor the quality and quantity of discharge at the outfall.

At present, the WWTP has been placed back in operation. All 4-lift stations are now operating with standby pumps, although three (3) are currently bypassing the wastewater treatment plant. A preventive maintenance program is in place. Sewage is still discharged into the lagoon, but studies will begin in two months to look at extending the outfall point several thousand feet off-shore, and regular discharge tests are being performed.

Initial results are very promising and suggest that this pattern of operation may side step some of the structural conditions that have kept the standard of living low on Ebeye. There is much progress to be made, however potable water is now available on a regular schedule, electricity is on with few interruptions and sewerage disposal system is functioning. More importantly, Ebeye personnel are being trained to eventually assume responsibility for the full management and operation of the island's utility infrastructure, utilizing the PIMM, with support from the ADB, and the RMI government.

The Pacific Islands Magazine recently had this article "...the Marshall Islands government has extended the American Samoa Power Authority (ASPA) a contract to manage Ebeye Island's power plant and related infrastructure operations for two more years. Asian Development Bank project manager Robert Muller said that ASPA has done a tremendous job in not only stabilizing electricity distribution on Ebeye, but also addressing numerous other utility and infrastructure problems on the overcrowded island that serves as the bedroom community for the U.S. Army's Kwajalein missile testing range. In addition to managing the power plant, ASPA and Ebeye power plant staff are working on an urgently needed sewage system upgrade. "

The Managing Editor Giff Johnson, also had some editorial comments about how Accountability brings benefits to American Affiliated Islands. He stated the following:

"It may seem like a well-kept secret. But all the talk about accountability in the Marshall Islands and Federated States of Micronesia in the past couple of years is having an impact. People are discovering an important fact about money: Accountability opens the door to increased funding. Money used properly and accounted for encourages funders to come back and to increase their participation. One development in the Marshall Islands, in particular, demonstrates this."

'An infrastructure development project on Ebeye, run by the Marshall Islands government and Ebeye's power company with the involvement of both the Asian Development Bank and the American Samoa Power Authority, has shown tremendous progress. Six years ago, the U.S. Interior Department halted funding for the Ebeye Hospital over questions of mismanagement of funds. Now the DOI has returned as a funder and is offering greater assistance than in the past, as the new Ebeye Hospital prepares to open its doors.'

6.2 Why the ASPA Model Works

It's like asking, what is the secret behind the reemergence and success of Chrysler, GE, IBM, etc? It is the leadership, the man at the helm! The CEO's vision of making American Samoa a better place. His new ideas and policies, the reorganization (Flatter pyramid),

corporatization, cut down bureaucratic red tapes, removal of non-essential services, streamlining procedures in every department for efficacy and greater productivity, high demand for a lot of hard work, dedication, commitment, loyalty, efficiency, efficiency and efficiency! The stubborn and unbending resolve that non-performance and failure are unacceptable. The mantra of excellence has bred a generation of good, experienced, highly trained and very hard working ASPA employees.

How did it happen, what were the ingredients?:

- ?? Active recruitment of qualified personnel where help is needed, training, training and training!
- ?? Improving the place state-of-the-art equipment, computers, new billing and accounting programs, management information system, new technology, LAN, IS, trucks, tools,....etc. Bringing ASPA into the 21st century.
- ?? Improving employee morale... generous pay scale, recognition and giving credit where credit is due.
- ?? Effective communication...regular staff meetings, dissemination of information, hands-on supervision and involvement. Information is exchanged from the top down and from the bottom up. This atmosphere of openness has created an upwelling of ideas and the feeling of being a part of the team.
- ?? Board and management support...successful shielding of staff from political trappings and interference. This has allowed the staff, especially the managers, to concentrate on their duties and responsibilities.
- ?? Trust and confidence on the staff... management sans micro-management and second guessing has resulted in a lot of initiative and innovation from the staff.
- ?? Challenges...ASPA is not the place for the faint of heart! How many times have we heard from ex-ASPAs the "stress" at ASPA and can't keep up with the challenges to perform. ASPAs ability to make and adopt changes, or get out of their "comfort zones" allows them to meet these challenges and succeed.
- ?? Prompt decision-making & approval process. This is what makes ASPA exemplary, its ability to make quick and prompt decision. Flatter pyramid, empowerment, delegation of duties and authority, absence of bureaucratic red tape (vs. AG's 20 signatures to execute a PO).
- ?? Overcoming adversities..."can do" attitude (arrogance to others but a virtue to ASPAs). We sometimes stumble and fall but never quit.
- ?? Customer service....we know our stakeholders and who we serve.
- ?? Understanding and firmly believing in the goals of ASPA and its mission statement. ASPAs are passionate about their work and truly believe in themselves that they are a part of a team that could make a difference in American Samoa and in the Pacific region.

6.3 Success begets success!

There are many more things we do that make ASPA what it is today. The bottom line on why the model works is that we have a very good leader who has molded, trained and prepared his staff to be knowledgeable, versatile, resilient, take pride in their work and loves what they are doing. ASPA cares!

In Ebeye, the ASPA model works because we are just re-enacting the episode at ASPA 15 years ago, during the power crisis of 1986. The big difference is that we are more experienced and more knowledgeable. In the past 15 years we have learned what works and what doesn't and it was just a matter of implementing all of the above and a little bit more. We work, and train KAJUR staff by example. We show them good work ethics, dedication, commitment and loyalty to KAJUR. We train them to CARE for the customers and the community as a whole. We make them realize and understand the importance of their work and how it affects welfare, health and economic well being of the community.

- ?? Further, the ASPA model works in Ebeye because:

- ?? Similar island-setting as American Samoa
- ?? The ASPA board, CEO, management and staff support the work in Ebeye.
- ?? We have the funding (through the ADB loan) to implement the needed improvements
- ?? We have the support of the RMI government and Iroij of Ebeye to carry on our work without any interference.
- ?? We have the support of the majority of the people of Ebeye. They welcome and appreciate the improvements.
- ?? We have an excellent ADB-RMI Project Management Unit Manager, Bobby Muller, who has assisted and provided all the support needed to successfully complete all improvement projects.
- ?? We have established good rapport with the local who's who in Ebeye that provided help and assistance in the execution of the needed improvements

We have experienced and dedicated ASPA staff providing the leadership in Ebeye that care and believe that they can make Ebeye a better place.

Appendix 1 - References Used

1999 Census Of Population And Housing Data Dissemination Workshop, Analysis Of Results; A Project By The Republic Of The Marshall Islands And The Asian Development Bank; Outrigger Marshall Islands Resort; 28 February 2000

Asian Development Bank, July 1999

Asian Development Bank, Report And Recommendation Of The President To The Board Of Directors; July 1999

ASPA/KAJUR Household Survey; March 2001

Ebeye Health and Infrastructure Project, ADB Loan 1694-RMI, Quarterly Progress Report; October 1, 2000 to December 31, 2001

Ebeye Hospital Cholera Outbreak Report; January 2001

Ebeye Redevelopment and Gugeegue Development; Office Of The High Commissioner Trust Territory Of The Pacific Islands Saipan, Mariana Islands; August 1984

Ebeye Wastewater and Saltwater Systems Condition Assessment Report; R.M. Towill Corporation; May 2000

KAJUR: Mid-Term Review; Deloitte Touche Tohmatsu, Canada; November 2000

Kwajalein Atoll Health Care Bureau PowerPoint Presentation on Kwajalein CHC; January 2001

Marshall Islands 1996 Economic Report; June 1997

Republic of the Marshall Islands, Meto2000; Economic Report and Statement of Development Strategies; December 2000