

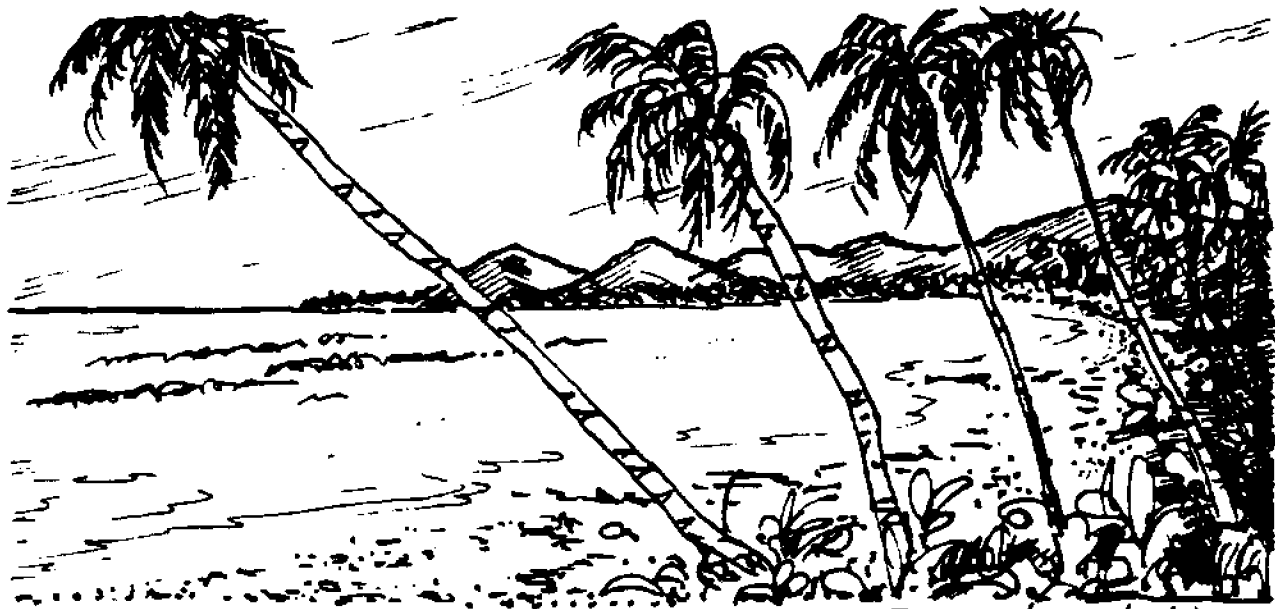
LOAN COPY ONLY

CIRCULATING COPY
Sea Grant Depository

Recommendations for a Kosrae Island Resource Management Program



Preliminary Report



Tafunak Coast, J. Dixon

Submitted to the Government of Kosrae State,
Federated States of Micronesia

by the

University of Hawaii Sea Grant Extension Service

The Community College of Micronesia ❖ The University of Hawaii at Manoa

Recommendations for a Kosrae Island Resource Management Program



Preliminary Report

Project Coordinator and Compiler Kit Dahl

Project Logistics Coordinator Anne M. Orcutt

Based on Reports by

Jan Auyong
Shannon Cripe
Kim Des Rochers
John A. Dixon
Michael L. Ham
Padma Narsey Lal



This project was partially funded through the Pacific Islands Network (PIN). PIN is a consortium of U.S. federal agencies and other Pacific organizations dedicated to encouraging and supporting the wise use and development of coastal resources in the U.S.-affiliated Pacific islands. PIN extension agents have been placed in the Federated States of Micronesia, Guam, Commonwealth of the Northern Mariana Islands, and American Samoa. Negotiations are underway for positions in the Republic of the Marshall Islands and the Republic of Belau.

Special thanks to:

Governor Yosiwo George and the people of Kosrae for their support and participation throughout the planning process
Thomas Goresch, Continental Air Micronesia, for providing discounted tickets for project team members

Bruce J. Miller, Director, Sea Grant Extension Service, University of Hawaii, for writing the original proposal

Talita Bowen and Enid Kagesa (University of Hawaii Sea Grant Extension Service, Pacific Program) for project support in Hawaii.

Drawings: John Dixon

Maps: Manoa Mapworks

Layout: Kit Dahl with assistance from Karen Kald, Naomi Nakakura and Matthew Sanders (Communications, University of Hawaii Sea Grant College Program)

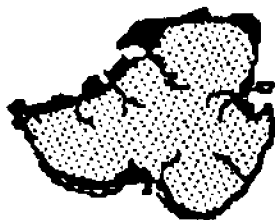
A/C

The National Sea Grant College Program is a network of institutions working together to promote the wise use, development, and conservation of coastal and marine resources. The University of Hawaii Sea Grant College Program, created in 1972, is a unique partnership of university, government, and industry focusing on marine research, education, and advisory/extension.



Preface

This report marks the beginning of efforts in Kosrae to develop an island resource management program. It summarizes the findings of seven technical specialists who visited Kosrae during the summer months of 1989. During their visits, these specialists worked closely with members of the Kosrae State government. While these consultations should ensure that the specialists' recommendations address real concerns, ultimately it is up to the people of Kosrae and their government to decide precisely how to care for their precious coastal resources. That is why this report marks a beginning. The far more formidable task of implementing a management program lies ahead. This will require developing broad support and building consensus. Such a program must both protect and help to wisely develop Kosrae's natural resources. We feel this report will be a useful guide in this task. At the same time, it is recognized that ultimately the people of Kosrae will choose how their island resource management program will function. We will follow this process with interest. Now that we know Kosrae, it is not easy to forget. We hope to experience the beauty of Kosrae and the warmth of her people again.



Contents

<i>Chapter I</i>	Why Kosrae Should Have an Island Resource Management Program.....	1
<i>Chapter II</i>	Project Overview.....	3
<i>Chapter III</i>	Coastal Issues in Kosrae.....	7
<i>Chapter IV</i>	Policies and Objectives of the Management Program	22
<i>Chapter V</i>	Strategies for an Island Resource Management Program.....	24
<i>Chapter VI</i>	Papers Written for the Kosrae Island Resource Management Project	56

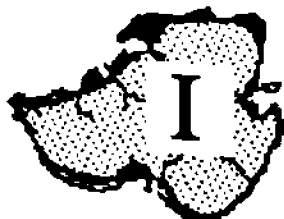
List of Figures

Figure 1.	Kosrae coastal zone	6
Figure 2.	Current environmental issues on Kosrae	8
Figure 3.	Areas of particular concern (APC) for Kosrae	29
Figure 4.	Specified use districts for Kosrae	32
Figure 5.	Protected area districts for Kosrae	35
Figure 6.	Resource planning districts for Kosrae	39
Figure 7.	The comprehensive review process.....	44



List of Tables

Table 1. Priority recommendations for the Kosrae Island Resource Management Program	21
Table 2. Fifteen specific objectives for the Kosrae Island Resource Management Program	23
Table 3. Land use recommendations	27



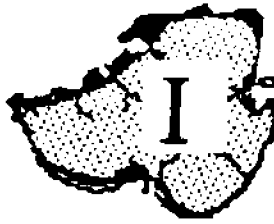
Why Kosrae Should Have An Island Resource Management Program

Coastal resources are Kosrae's most valuable physical asset. The fact that they are largely untapped and undeveloped presents both challenges and opportunities. Opportunities exist for development of various industries, the creation of jobs and income, and a sound basis for future growth. A challenge exists because coastal resources are fragile, easily degraded or spoiled, and frequently subject to competing uses as development proceeds. If Kosrae is to both develop economically and protect its single most valuable natural resources, this challenge will have to be met.

Because Kosrae's resources are inter-related, management must be closely coordinated among government departments. Coordination of government functions is central to coastal resource management. Responsibilities of agencies often overlap. For example, managing the use of mangrove forests is a responsibility of both Agriculture/Forestry and Marine Resources divisions because both kinds of resources are found there.

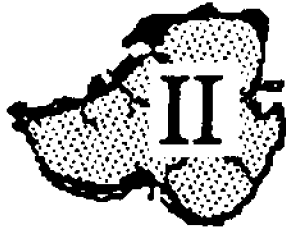
Activities of the government (as well as private individuals), especially in connection with economic development, can have impacts on coastal resources. Planning must take environmental protection into account. This is easier to do early on in the planning process instead of at the end. Those elements of the government responsible for environmental protection and resource management must work closely with planners and public works personnel.

Because Kosrae's resources are limited, there will also be competition over their use. One use, coral dredging for example, may preclude another such as reef fishing. Only rarely can these conflicts be entirely prevented, but they can be minimized. There should be a mechanism that can resolve resource use conflicts in a way that brings the greatest benefits to the greatest number of Kosrae's citizens.



A mechanism must be established for making wise decisions about coastal resource use. This mechanism should coordinate government activities and interests. It should resolve resource use conflicts by effectively balancing the interests of government, the public, and the agents of development. Wise decisions must be based on a broad set of criteria, including the impact of development on society, natural resources, and the environment. This mechanism is the **Kosrae Island Resource Management Program**.

This report stems from the **project** described in the next section. The project identified certain human activities that create conflict. We see these as problems or issues. The Kosrae Island Resource Management Program will address **coastal resource issues**. **Recommendations** based on these issues are made. These recommendations suggest a set of broad **policies** and more specific **objectives** that should guide the program once it is implemented. The program will use six **strategies** to achieve these goals and objectives.

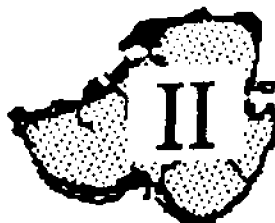


Project Overview

Kosrae is in many ways a pristine island; it has experienced few of the major environmental impacts that often come with economic development. Still, there have been a number of development projects in the past few years that have had significant effects on the local environment. These include the effects of the Okat jetport and dock construction and dredging for fill in Okat and Utwe harbors. In the past, construction of the Lelu causeway and the subsequent blocking of one of its culverts during airfield construction in 1974 significantly reduced the water quality and fisheries productivity of Lelu Harbor. Population growth creates greater demand for coastal resources both as a source of material needs and a place to dispose of wastes. Thus, while the environment is still generally in good shape, Kosraeans have experienced a noticeable reduction in the quality of the marine and coastal environment. Many have begun to worry about the impact of future development on their island.

Some of the issues related to coastal resources and development were brought to light when the U.S. Army Corps of Engineers published the Kosrae Coastal Resource Atlas (1987) and the Kosrae Coastal Resource Inventory (1989). These two publications are based on field work by the Corps' Environmental Resources Section (Pacific Ocean Division). Aside from identifying some of the environmental problems, the Inventory suggested that the Kosrae government more fully develop its system of environmental protection and develop more comprehensive plans for future coastal development and resource conservation.

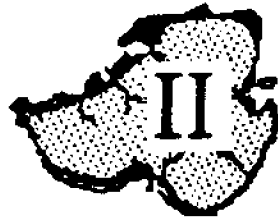
In 1988 Governor Yosiwo George requested that the University of Hawaii Sea Grant College Program offer some recommendations on how best to manage the environmental effects of future development in the



state. In addition, the Kosrae State Legislature issued a resolution requesting Sea Grant to make recommendations on how to deal with the environmental effects of dredging. The UH Sea Grant College Program responded by suggesting that it assist in the preparation of a coastal resource management plan for the state. Sea Grant obtained funding in late 1988 and began project planning in early 1989. Given the restricted budget it was decided that a team of consultants who could come to Kosrae on a voluntary basis would be recruited. Continental Airlines agreed to furnish eight half-fare tickets in recognition of the usefulness such a plan could play in the development of tourism on the island.

The Sea Grant team members visited Kosrae during the months of June and July, 1989. Team members were Dr. Jan Auyong-Titgen, University of Hawaii Sea Grant Extension Service, advising on tourism development and planning; Ms. Shannon Cripe, Department of Ocean Engineering, University of Hawaii, advising on coastal processes and shore protection; Ms. Kim Des Rochers, University of Hawaii Sea Grant, investigating inshore fisheries; Dr. John Dixon, Environment and Policy Institute, the East-West Center, advising on resource economic development; Mr. Mike Ham, Guam Coastal Management Office, advising on institutional arrangements for the proposed program; and, Dr. Padma Narsey Lal, East-West Center, advising on management of coastal wetland resources. The team members prepared reports detailing the findings of their studies. These reports have been used to prepare this summary report. In addition, these reports will be published as a separate document.

Prior to the visits by the team of consultants, the Governor organized a Coastal Resources Management Committee to work with the team and develop consultants' recommendations into an implementation plan. This committee is chaired by Mr. Gerson Jackson, director of the Department of Conservation and Development, and has as its members Mr. Likiak Wesley, acting chief, Office of Planning and Statistics; Mr. Mike Molina, acting administrator, Marine Resources Division; Mr. Jack Sigrah, fisheries specialist, Marine Resources Division; Mr. Kosaki William, chairman, Environmental Protection Board; Mr. Katsuo William, acting administrator, Sanitation and Environmental Health Division; Mr. Bruce Howell, chief, Bureau of Construction and Engineering; Mayor Makoto Edmond, chairman, Council of Mayors; Mr. Teddy John, administrator (on leave), Division of History and Culture; Mr. Berlin Sigrah, acting administrator, Division of History and Culture; Mr. Madison Nena, administrator, Division of Tourism; and Mr. Weston Luckymug, acting director, Department of Public Works.

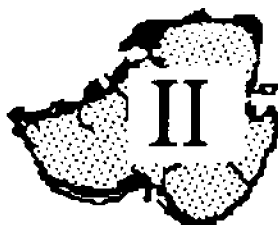


Kosrae Island Overview

Kosrae is the easternmost of the Caroline Islands, situated at 5°20'N and 163°00'E. It is a high, volcanic island. Being in the intertropical convergence zone, it has a warm and moist climate. The mountainous interior is covered with lush tropical rain forest. Much of this forest is relatively undisturbed by humans although subsistent agriculture is practiced in its lower reaches. Most of the population lives on the flat coastal fringe. The coast is dominated by freshwater and mangrove swamp; often a sandy barrier strip is found on the seaward margin of the mangroves. Except for the southern coast, the island is surrounded by a broad fringing reef. Well-developed coral reef communities exist on the outer margin of this reef. Rudimentary lagoons or embayments bisect the reef platform at three places: Lelu Harbor off the east coast, Utwe Harbor off the south coast and Okat Harbor off the north coast.

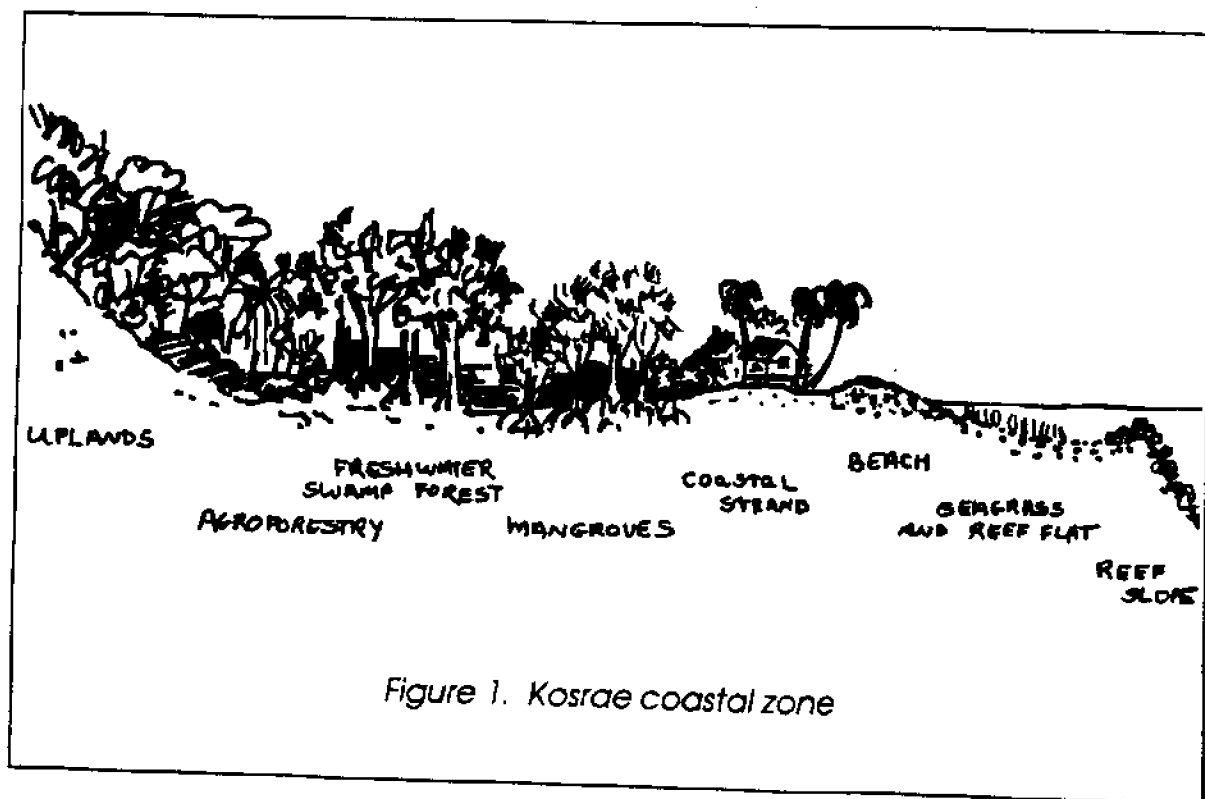
Most of the island's population, estimated in 1989 to be about 6,700, is concentrated in four villages: Tafunsak, Lelu, Malem, and Utwe. A fifth sparsely populated community, Walung, is situated on the relatively isolated western tip of the island. Lelu village is built around and over the most important archaeological site on Kosrae. Located on a human-made island built on the reef flat, the site contains the ruins of more than 100 house compounds. Some of the walls of these compounds, made from natural columns of basalt, are as high as 5 meters.

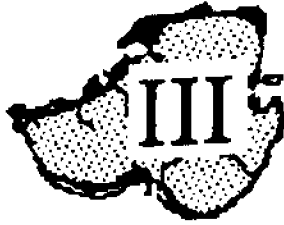
While subsistence production is important to Kosrae's economy, the cash sector, based primarily on government expenditure, has increased significantly in the past decade. Coastal waters provide reef and pelagic fish. Food crops, mainly taro, breadfruit, bananas, yams and citrus, are grown in the lowlands. Limited amounts of citrus and fish are exported, but most food production remains in the subsistence sector. A large trade imbalance exists; 1986 figures show imports amounted to \$3.5 million while exports were less than \$50,000. This imbalance is reconciled almost entirely by transfer payments from the U.S. government. Efforts to increase export revenues will most likely be based on agriculture, fisheries, and tourism.



The Coastal Zone in Kosrae

An early task of the Coastal Resources Management Committee was to determine the extent of Kosrae's coastal zone (Figure 1). The coastal zone is the geographic extent that a coastal management program will have. The committee recommended that the coastal zone include all of the land area on Kosrae and the coastal waters within the state's jurisdiction. By defining the coastal zone broadly, the committee recognized that most natural processes on islands are closely interrelated. Human activities almost anywhere on the island have the potential to affect the coastline and coastal waters. Resource management efforts should recognize that coastal resources are elements in an interrelated system and should be managed accordingly. This is the main concept embodied in coastal resources management. The committee's definition of the coastal zone supports this concept by allowing all of these interrelated resources to be brought within the scope of an integrated management program.





Coastal Issues In Kosrae

The Coastal Resources Management Committee, working with the Sea Grant team, identified 12 coastal issues that are of concern in Kosrae. The issues are grouped into four categories. Recommendations may be similar because the issues in each of these four categories are generally related. Within each of the categories, issues are listed in order of priority. However, this order may change with time as the type of activities on Kosrae change. For example, road alignment is given high priority because the circumferential road is currently being built. In the future dredging may become a more important issue if large amounts of coral fill are needed for construction projects.

Figure 2 depicts current environmental issues.

The Issues

- Construction and Infrastructure Development
 - Road alignment
 - Land clearing and earthmoving
 - Dredging
 - Sand mining
 - Filling of wetlands and reef flat
- Resource Extraction
 - Inshore fishing
 - Harvesting mangrove wood
- Population and Economic Growth
 - Sewage
 - Solid waste
 - Shoreline construction
 - Oil product spills
- Natural Hazard
 - Shoreline erosion

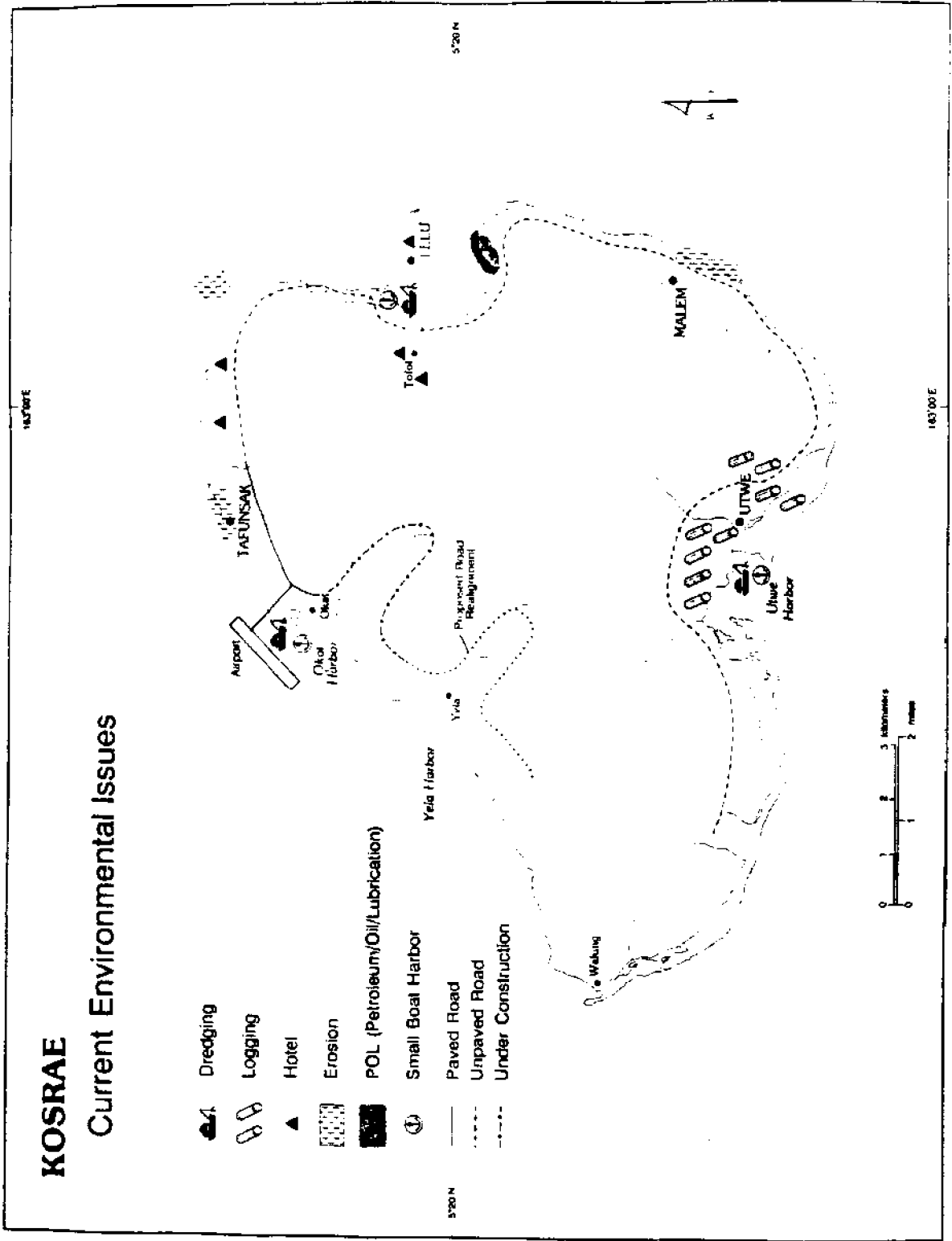
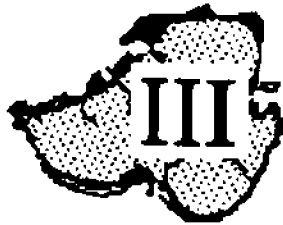


Figure 2. Current environmental issues on Kosrae



Road Alignment

Impacts

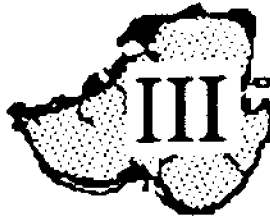
The purpose of roads is to improve access to an area. With easier access there will be more intensive use of the area which can conflict with efforts to conserve resources in the area. Roads along the shoreline are subject to damage in rapidly eroding areas and may conflict with the siting of hotels.

"Careful and ingenious planning is essential to avoid overdevelopment and loss of those features that created tourism potential in the first place."

-Jan Auyong

Recommendations

- ✓ New road construction, including rural and farm roads, and road paving should be subjected to the comprehensive review described in Chapter IV. Some specific issues that should be considered during review are:
 - ✓ completing the road (RS-4) from Okat only as far as Mwat. It would be better to not have road access to this part of the island because of Watung's desires.
 - ✓ before paving the Anofokoa-Leku section of the circumferential road, identifying and prioritizing sites where the road should be realigned to allow more space for potential shoreline hotel development. In some cases the old road may be a ready-made site for construction.
 - ✓ as much as possible, routing RS-4 around the large freshwater swamp in the Okat river basin. In the Yeka river basin the road should be built through the swamp to facilitate timber harvests. If the road is built through this swamp, sufficient culverts should be built to maintain hydrological balance in the swamp.
 - ✓ setting road alignment far enough inland to prevent future erosion, surf, and tidal impacts.



Land Clearing and Earthmoving (Including Logging and Road Construction)

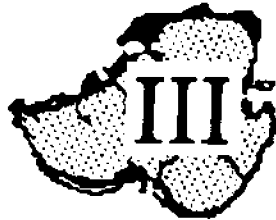
Impacts

Vegetation protects the land from erosion. During rainstorms soil is carried off bare land. The siltation of rivers and coastal waters that results reduces water quality and kills the coral reef. As coral dies the reef can't support as many fish, and fishing becomes worse. Erosion also destroys the value of the land for agriculture and forestry. Clearing may destroy an important or unique habitat. For example, mangroves are valuable in many ways; they are home to fish and shellfish, provide timber and fuelwood, and protect the shoreline from storms. Clearing for aquaculture, construction or other uses destroys this important habitat. Cultural and historic sites and artifacts can be destroyed during land clearing and earthmoving operations. Historic sites are a nonrenewable resource, that is, they cannot be replaced. With their loss Kosraeans lose part of their history and identity.



Recommendations

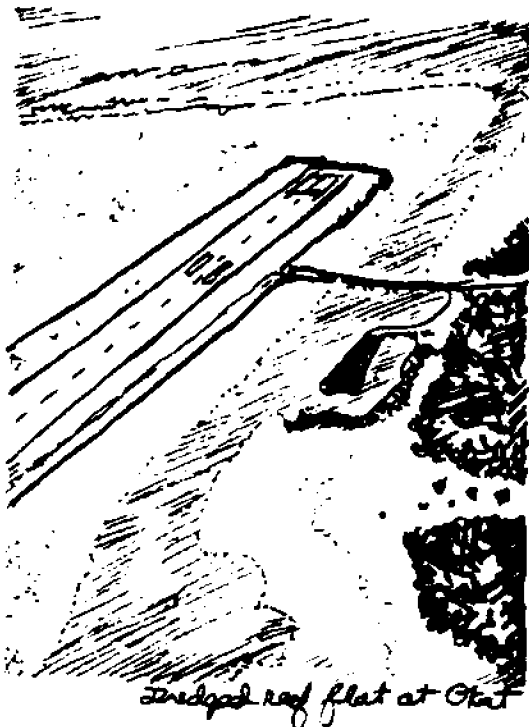
- ✓ Significant land-clearing and earthmoving should be subjected to the comprehensive review described in Chapter V.
- ✓ Harvest management plans requiring environmentally sound and renewable cutting practices should be prepared before commercial timber harvest is allowed.



Dredging on the Reef and in Lagoons to Obtain Coral Fill or Clear Channels

Impacts

Dredging destroys coral reef habitat. Silt produced during dredging can also affect nearby reef areas. Fish catches are reduced because there are fewer fish in the area. The area is also made unsuitable for tourism related activities like snorkeling and scuba diving. Dredging can cause a change in local current patterns, possibly increasing shoreline erosion or siltation. Underwater historic artifacts, such as shipwrecks, can be damaged during dredging operations or by the resulting silt.



Dredged reef flat at Olat

Recommendations

- ✓ Dredging operations for coral fill should be confined to the existing sites in Okat, off the Lelu causeway, and in Utwe. Development of these sites as fishing boat basins should be carefully planned to allow dredging for fill in the future.
- ✓ Retaining walls should enclose coral fill dredging ponds before operations begin. Silt screens should be required during channel clearing dredging operations.
- ✓ If a new dredge site for fill must be opened, a comprehensive review (see Chapter V) should be required. It must be demonstrated that the existing sites are not usable either because they are unusually far from the site where fill is needed (unlikely on Kosrae) or because fill is no longer obtainable at the existing dredge sites. A comprehensive review should be required for all channel clearing.
- ✓ Dredge spill should not be discarded in the mangrove swamps.



Sand Mining to Obtain Building Materials

Impacts

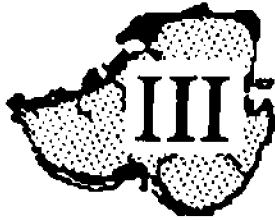
Sand is produced by natural processes at a generally fixed and slow rate. If sand is taken away from the beach at a faster rate than it is produced, shoreline erosion and loss of beach can occur. Borrow pits left after mining are unsightly. Historic and cultural sites can be accidentally destroyed during sand mining operations.

"The important consideration is to use resources unsustainably only when the implications of such patterns have been clearly thought out."

-John Dixon

Recommendations

- ✓ Sand mining should not be allowed up-current of any shoreline that is actively eroding. Ban or restrict mechanized sand mining in the proposed Shoreline APC (see Chapter V).
- ✓ The number of approvals issued for sand mining should be limited and applicants should be required to report the approximate volume of sand taken.
- ✓ Offshore sources of sand should be investigated.



Conversion of Wetlands (Mangroves and Freshwater Swamps) and Reef Flats to Create Land

Impacts

Filling destroys wetlands and reef flats. Wetlands are an especially valuable resource both directly and indirectly. Direct benefits include fuel wood, timber, fishes, and mangrove crabs. Wetlands are an important nursery area for many kinds of reef fish. Wetlands also help to filter silt from runoff, thereby protecting coral reefs. Some wetland areas in Kosrae are not found anywhere else in the Pacific. Filling may also affect the mixing of fresh and saltwater. Because mangrove and swamp tree species are sensitive to salinity, a greater area will be affected if filling blocks water flow.

Recommendations

- ✓ All conversions should be subject to the comprehensive review leading described in Chapter V. If conversion is allowed, measures should be taken to limit siltation on nearby reefs and blockage of water flows during filling operations.
- ✓ Filling should be allowed only in areas identified as suitable for conversion in the Resource Use Plan (see Chapter V). Conversion should be allowed only for projects that demonstrate an absolute need to be located in wetland or reef areas. Because the area available for fill would be fixed and limited, it would be advisable to auction leases to private developers that want to create land. The government should retain fee simple ownership of all filled land. Lease revenues could be dedicated to conservation-related activities, such as the administration of parks and reserves (see Chapter V).
- ✓ Agricultural conversion involves the drainage of swampland. This should be allowed only in areas identified as suitable for agriculture in the Resource Use Plan.



Inshore Fishing (Fishing on the Reef, in Lagoons, and in Mangroves)

Impacts

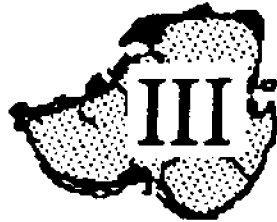
Fish and shellfish are renewable resources. This means that when harvested they are replaced by the colonization and growth of new animals. There is however, a maximum number that can be caught in a year. If more than this number is caught there will be fewer animals to catch in the future. Destructive fishing methods (e.g., poisons) harm marine life and the environment.

"It is important to understand the nearshore fishery not only from a biological perspective but also from the standpoint of economics and social interactions. Without such a holistic understanding of the role of the nearshore (and offshore) fishery within the Kosraean community, any management efforts will necessarily be less effective than they could otherwise be."

-Kim Des Rochers

Recommendations

- ✓ A marine sanctuary should be established at Okara as outlined in the Resource Use Plan. The marine reserve can act as a source of seed fish to replenish the reefs around it.
- ✓ Legislation should be drafted and passed to allow the Marine Resources Division to establish fishing regulations as needed. If considered appropriate, final approval of regulations could be the responsibility of the proposed Island Resource Management Commission.
- ✓ A licensing system should be established for the sales of coastal marine products (e.g., mangrove crab and finfish). Exportation of reef fish is not advisable because of Kosrae's limited reef resources and their importance for local consumption. Accurate reporting of information needed for management should be required as a condition of the license.
- ✓ A special permit or license should be required for the export of all marine products.
- ✓ A stock assessment of mangrove crabs should be completed and used to develop a fisheries management plan. Additional traps for catching mangrove crabs should not be allowed until this plan has been completed. A data gathering program for mangrove fisheries around Lulu Uthwe and Lulu Nefail should be added to ongoing fisheries statistics program.
- ✓ A public education program on fisheries conservation matters should be initiated.



Harvesting Wetland Forest Resources

Impacts

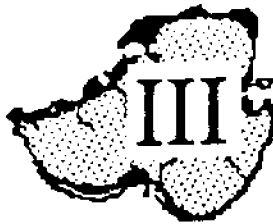
Mangrove wood is a renewable resource like fish. It too can be harvested faster than it grows back. The way in which wood is harvested can also affect regrowth. Clear-cutting and leaving behind slash (felled branches) inhibits seedling growth. Aside from reducing future wood harvests, extensive wood cutting can destroy this habitat. These actions will damage fisheries, ruin the ability of the area to attract tourists and can increase sedimentation on the reef.

"Coastal wetlands, which include mangrove and tidal swamps, can play a vital role in Kosrae's realizing of some of its development goals, such as economic self-sufficiency and opportunities to earn a cash income and improve the quality of life while maintaining cultural values."

-Padma Lal

Recommendations

- ✓ Mangrove and tidal swamp areas should be included in the proposed marine sanctuary at Okat. The mangrove swamp in this area is a unique example of this beautiful ecosystem.
- ✓ A Mangrove Management subcommittee with representatives from the Division of Agriculture and Forestry, Marine Resources Division, and the Production and Marketing Division should be established. Using Dr. Padma Lal's report as a basis, this committee should develop a wetland management plan. In the mean time, any proposals for large-scale commercial harvesting operations involving clear cutting should not be allowed and removal and utilization of slash (e.g., twigs and leaves) should be encouraged or required.
- ✓ Legislation to implement the wetland management plan should be drafted and passed.
- ✓ A public education program on mangrove and forestry conservation matters should be initiated.
- ✓ Harvesting within 30 feet of the shoreline should not be allowed.



Untreated Human and Animal Wastes Entering Coastal Waters

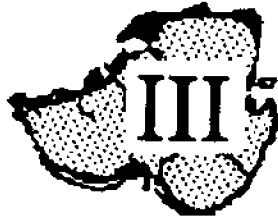
Impacts

Wastes contaminate drinking water, bathing areas, and shellfish, causing illnesses if people use these resources. Sewage also reduces water quality; this damages coral reefs and reduces fisheries yields.



Recommendations

- ✓ The ongoing water seal toilet building program and sanitary waste disposal permit system should be continued.
- ✓ Proper treatment and disposal of animal wastes should be required. Available appropriate, low-cost technologies should be investigated for this purpose.
- ✓ Planned village waste treatment and disposal systems should be constructed.



Solid Waste (Trash) Disposal and Littering

Impacts

Plastics and other non-biodegradable materials are harmful to marine life. Roadside dumps and litter are unsightly and will hurt tourism development. Some kinds of household trash contain dangerous poisons that can escape into coastal waters, killing marine life.



Roadside dump in mangrove

Recommendations

- ✓ The existing recycling program should be continued. Instituting a small refundable deposit on aluminum cans and perhaps glass should be considered. This could be "revenue neutral," the deposit and refund amount are equal or generate a small amount of revenue to offset recycling costs by making the deposit slightly more than the refund. Even if such a program did not offset recycling costs it would help to concentrate the cans at the redemption center and thus reduce litter.
- ✓ The clean up of road side dumps and their relocation to less visible places should be encouraged.
- ✓ Existing municipal dumps should be screened to make them less visible. Waste should be compacted and covered weekly.
- ✓ Municipal dumps should be relocated away from wetland areas to upland sites.
- ✓ Careful disposal of toxic materials such as waste oil, paints, solvents, poisons, and other chemicals at special sites should be required so that these materials may be transported off-island for disposal.
- ✓ Importation of toxic materials should be monitored and importers should be held liable for eventual off-island disposal.
- ✓ An anti-litter campaign and a public education program about disposal of toxic materials should be initiated.



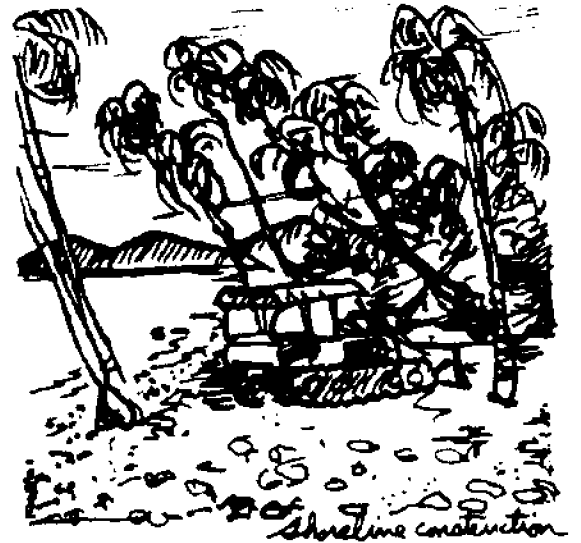
Construction on the Shore

Impacts

Structures that interrupt natural coastal processes, such as the movement of sand, can affect the shape of the shoreline in adjacent areas. Such structures can be seawalls, piers, causeways, and groins (rock "fingers" perpendicular to the shore). Historic and cultural sites can inadvertently be destroyed during construction.

"The natural beach system consists of the reef flat, the sloping beach, the dunes and the backshore sand deposit areas. All of these areas are an integral part of the system and any alterations or use of any one of these areas may have a profound effect on any of the other areas."

-Shannon Cripe



Recommendations

- ✓ In most cases future building construction should not be allowed in the proposed Shoreline APC (see Chapter V). For proposed shore stabilization structures or buildings on high-erosion shorefront, the review should be especially careful to ensure their proper design and construction. In particular, this would apply to stream channelization/stabilization through the use of gabions (longshore transport structures made from mesh filled with large rocks). For buildings, if appropriate, it would be possible to issue a variance after comprehensive review.



Spilling of Oil Products during Transfer and Storage (Especially from Boats)

Impacts

Gasoline and lubricating oil are poisons that, even in small quantities, can kill marine life.



Fishing boats in Zulu harbor

Recommendations

- ✓ The planned petroleum oil lubrication (POL) storage facilities at the Okat port complex should be completed as soon as possible.
- ✓ A spill prevention and control plan for the new POL facility that incorporates both facility design and management measures should be developed.
- ✓ Monitoring procedure for bunkering (fuel storage) operations should be developed to ensure safe fuel transfer at the POL storage facilities.
- ✓ Oil spill contingency plans should be continually updated and improved: regular training and drills based on the contingency plans should be conducted.
- ✓ Oil spill containment equipment should be regularly inspected to ensure that it is adequate and in working order.
- ✓ A public education program to emphasize the importance of properly transferring and disposing of oil products should be initiated.



Shoreline Erosion

Impacts

Erosion is not a human made problem but people make it worse. Coastal construction and dredging are activities that can affect or be affected by erosion. In most places the shoreline is a dynamic environment. Its shape is constantly changing over time because of waves and winds. This process isn't a problem until a person builds something on a changing shoreline or removes material.

Table 1 summarizes the recommendations presented in this chapter.

Recommendations

- ✓ A regular monitoring program should be initiated to measure changes in beach profiles. A set of fixed transect measurements should be collected semi-annually while current and wave pattern measurements should be collected regularly.
- ✓ A coastal management library with reference materials, data, and photographs, especially aerial, that document shoreline changes should be established.



TABLE 1. PRIORITY RECOMMENDATIONS FOR THE KOSRAE ISLAND RESOURCE MANAGEMENT PROGRAM

Construction and Infrastructure Development

- Implement a comprehensive review process and Resource Use Plan.
- Do not allow sand mining up-current of rapidly eroding shoreline.
- Confine dredging to existing sites in Okat, Lelu and Uhu; plan boat basins at these sites to allow dredging in the future.

Resource Extraction

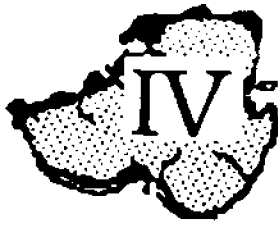
- Establish a marine sanctuary at Okat.
- Develop management plans for mangrove harvesting and commercially important marine species.
- Pass legislation to enable MRD or the proposed Island Resource Management Commission to establish fishing and forestry harvesting regulations as needed.

Population and Economic Growth

- Require proper treatment and disposal of human and animal wastes.
- Begin monitoring toxic material imports and use.
- Develop spill prevention and control plan for new POL facility.
- Consider instituting a refundable deposit on aluminum cans and glass.

Natural Hazard (Shoreline Erosion)

- Initiate shoreline and coastal processes monitoring program.



Policies and Objectives of the Management Program

Policies and objectives guide the decisionmaking process. Once a program is in place there must be some specific standards that can be used to judge whether a given project or activity is acceptable. In turn, policies and objectives can be used to measure the success of the management program in fulfilling its function. The policies and objectives in this report (Table 2) should become a central part of the implementing legislation for the program and thus the "bedrock" on which it is founded. The policies, developed by the Coastal Resources Management Committee, state that the Kosrae Island Resource Management Program should ensure that:

- ❑ **coastal ecosystems will always be maintained to provide optimal benefits to all citizens of the state by balancing resource utilization for economic development, subsistence, and recreation with resource conservation. Important decisions about resource use shall be made with input from the state and municipal governments and the general public;**
- ❑ **the living resources, ecosystems, and environment, including those within shoreline property, mangrove areas, seagrass beds, coral reefs, waterways and air space, will always be maintained in a manner that does not adversely affect future utilization;**
- ❑ **nonliving resources and environment, including air, water, earth, and especially cultural and historic resources, will always be maintained in a healthy and useful condition; and**
- ❑ **a mechanism is established to prevent or minimize conflicts both among users of coastal resources and among the ways in which these resources are used.**

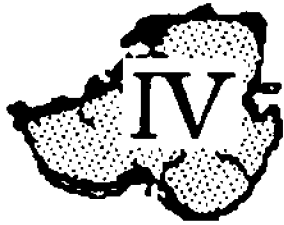
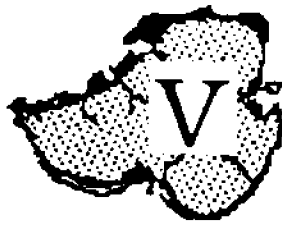


TABLE 2. FIFTEEN SPECIFIC OBJECTIVES FOR THE KOSRAE ISLAND RESOURCE MANAGEMENT PROGRAM

- ✓ Minimize siltation of rivers, streams, and coastal waters resulting from earthmoving activities.
- ✓ Prevent significant coastal erosion due to sand-mining operations.
- ✓ Minimize filling operations that destroy valuable wetland habitats, including mangrove forests, freshwater swamps, and seagrass beds.
- ✓ Minimize damage to coral reef habitats from dredging activities.
- ✓ Prevent significant new construction on rapidly eroding shoreline.
- ✓ Ensure that shoreline construction does not accelerate shoreline erosion and that shore protection structures are built in a non-damaging manner.
- ✓ Prevent pollution.
- ✓ Prevent the overharvesting of renewable resources.
- ✓ Prevent the loss or destruction of important historical and cultural resources.
- ✓ Minimize environmental impacts resulting from the exploitation of mineral resources.
- ✓ Establish and maintain a system of conservation areas, including parks and protected areas.
- ✓ Encourage the restoration of environmentally degraded areas.
- ✓ Recommend planning and management guidelines.
- ✓ Encourage and sponsor public awareness projects for the wise use of island resources.
- ✓ Ensure that new development and land use are compatible with, and do not detract from, existing development.



Strategies for an Island Resource Management Program

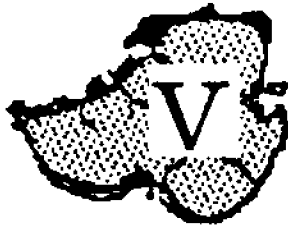
Six strategies are discussed in this section: island resource use planning, project review, community involvement and public education, issuance of resource management-related regulations by agencies, integration of environmental impact criteria into economic planning and long-range planning. Collectively these strategies make up the Kosrae Island Resource Management Program.

Island resource use planning

- Island Resource Use Planning
- Areas of particular concern
 - Specified use districts
 - Protected area districts
 - Resource planning districts

A Resource Use Plan guides the physical development of a community.

Resource use planning is a way of guiding the physical development of a community, reducing conflicts over the use of resources, and making the task of resource management somewhat easier. A resource use plan will be an important adjunct to the comprehensive review process described below. It is an easy way to determine which development projects should be more carefully scrutinized. The resource use plan creates criteria for review based on the location of the project. This is useful because some places or ecosystems are more sensitive to environmental impacts or have multiple uses that might be compromised by a particular use. A master plan can also ensure that incompatible uses, dredging and dive tourism for



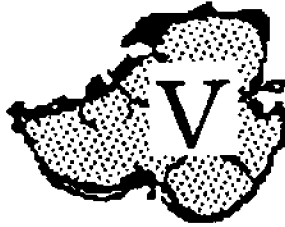
example, are not located in the same place. It can make resource management easier by specifying harvest activities by location. Such a system is generally easier to enforce than one that relies on restrictions of harvest time, number of individuals, or gear used. (This is not to say that in some cases these restrictions might be necessary as well.)

The recommendations made here recognize the strongly held feelings in Kosrae over the rights of private property. For this reason and because Kosrae is still relatively undeveloped, the designations are not overly restrictive. On the other hand, citizens must be willing to accept some restrictions on the use of their land if such a restriction is of overriding benefit to the community. One way of emphasizing the benefits of resource use planning is to argue that it is a way of minimizing the harmful activities of a person's neighbors. Everyone is a neighbor to someone and as such should act responsibly in the use of commonly held resources. Even activities on private property, land clearing for example, can affect commonly held resources such as clean water and healthy reefs. The community, through a resource use plan, can establish a set of rules to guide responsible behavior.

It is important that citizens and communities be actively involved in the formulation of a final resource use plan so that as much as possible it represents their values and aspirations. The plan should be developed through a consultative process where general proposals are discussed with the affected communities and modified accordingly. However, citizens should first be aware of the benefits that can result from carefully planning the use of Kosrae's land and coastal waters. In

Although there are strongly held feelings in Kosrae over the rights of private property, citizens must be willing to accept some restrictions on land use for the benefit of the community.

Citizens should help formulate the Resource Use Plan so it represents their values and aspirations.



addition to consultation, education will be an important part of an effort to implement a land use master plan.

A set of fairly detailed recommendations are made here that can form the basis of a resource use plan. They are shown on the accompanying map and described below. The plan will be a very important document, establishing much of the framework for the management program. Once the Island Resource Management Program is implemented, the proposed Island Resource Management Commission will be responsible for developing this plan, which should be a binding document. The commission will be assisted by the proposed coastal management administrator and the Office of Planning and Statistics. The plan should be updated on a regular basis as conditions change in Kosrae. It may be appropriate for the governor and/or legislature to be given some review authority over the document.

The Island Resource Management Commission will be responsible for developing the Resource Use Plan, which should be a binding document.

Four general types of coastal resource use categories are recommended: Areas of Particular Concern, Specified Use Districts, Protected Area Districts, and Resource Planning Districts (Table 3).

Areas of particular concern

Development within an Area of Particular Concern would be subject to review.

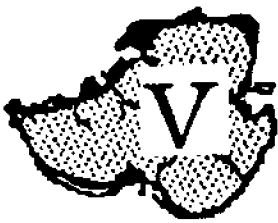
Areas of Particular Concern (APC) support the comprehensive review process described below. Development activities within an APC would be subject to review. APCs would be designated when development in an area should be carefully considered because of biological hazards or economic and social considerations.

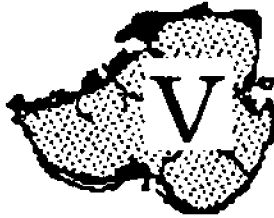
TABLE 3. LAND USE RECOMMENDATIONS

●	primary purpose
✓	suitable use or activity
△	may be suitable but management plan or review required
✗	unsuitable and usually not allowed
■	not allowed
□	not applicable

Land Use Designation	Inshore Water APC	Wetland APC	Shoreline APC	Upland APC	Commercial/Tourism District	Industrial District	Wetlands Sanctuary	Traditional	Conversion	Commercial Logging	Recreation Park
Description of designation	Includes embayments of nearshore waters	Includes mangroves and tidal water swamp	40-ft setback on beach shoreline	land > 30% slope	resorts must be located here	industry must be located here	protected for fisheries management, tourism, education, science	tourism, recreation, culture	wetlands that can be converted	mangrove that can be harvested commercially	tourist water recreation planned here
Restrictions within designations	review required before development/use	review required before development/use	building, mechanized land mining limited	review required before development/use	no restrictions other than resorts	no restrictions other than industry	no resource extraction, land alteration	no commercial recreation, extraction, major land alteration	review required prior to filling	logging in accordance with management plans	mountain area suitable for recreation

Construction	■	■	■	■	■	■	■	■	■	■	■
-drainage	✗	✗	△	■	△	△	■	■	■	■	■
-filling	△	■	✗	■	△	△	■	■	■	■	■
-dredging	△	■	△	■	△	△	■	■	■	■	■
-sand mining	△	■	△	■	△	△	■	■	■	■	■
Wood Cutting	△	■	△	■	△	△	■	■	■	■	■
-commercial	△	■	△	■	△	△	■	■	■	■	■
-subsistence	△	■	△	■	△	△	■	■	■	■	■
Fishing	△	■	△	■	△	△	■	■	■	■	■
-commercial	△	■	△	■	△	△	■	■	■	■	■
-subsistence	△	■	△	■	△	△	■	■	■	■	■
Devalued/aband	△	■	△	■	△	△	■	■	■	■	■
-waste disposal	△	■	△	■	△	△	■	■	■	■	■
-industry	△	■	△	■	△	△	■	■	■	■	■
-resort/hotel	△	■	△	■	△	△	■	■	■	■	■
-recreation	△	■	△	■	△	△	■	■	■	■	■





It is recommended that the following APCs (Figure 3) be designated:



Mangrove forest near Utwe

- **Inshore Waters APC.** The nearshore waters are an important resource for inshore fisheries and recreational activities for residents and visitors. A common practice has been to discharge sewage and other wastes into a nearby water body or into the sea with little consideration of the water's capacity to accept or flush germs and pollutants. Five major pollution problems from inadequately treated human or animal wastes are (1) pathogens in water or shellfish, (2) loss of an area's aesthetic value (visual or olfactory), (3) oxygen reduction of coastal waters, (4) eutrophication (overfertilization) of coastal waters, and (5) poisoning of coastal waters by pesticides, heavy metals, and other toxins. For these reasons, mangrove creeks and nearshore waters, particularly in northern Lelu, Lelu and Utwe harbors, and Utwe Lagoon, should be included in this APC.
- **Wetland APC.** Mangrove swamps have multiple values and should, to the maximum extent possible, be protected from conversion. The tidal swamps on Kosrae are an unusual ecosystem and may play an important part in the hydrological balance on the island. Thus all wetland areas should be included in this APC.
- **Shoreline APC.** Beaches help protect the shore from the effects of wind and waves. The beach is dynamic and subject to change in response to the sea's

KOSRAE

Areas of Particular Concern (APC)

- Inshore Waters
- Upland
- Wetland

Shoreline - The entire shoreline is an APC

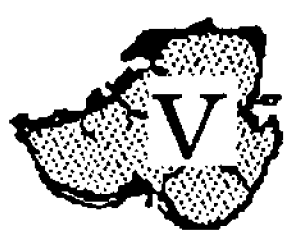
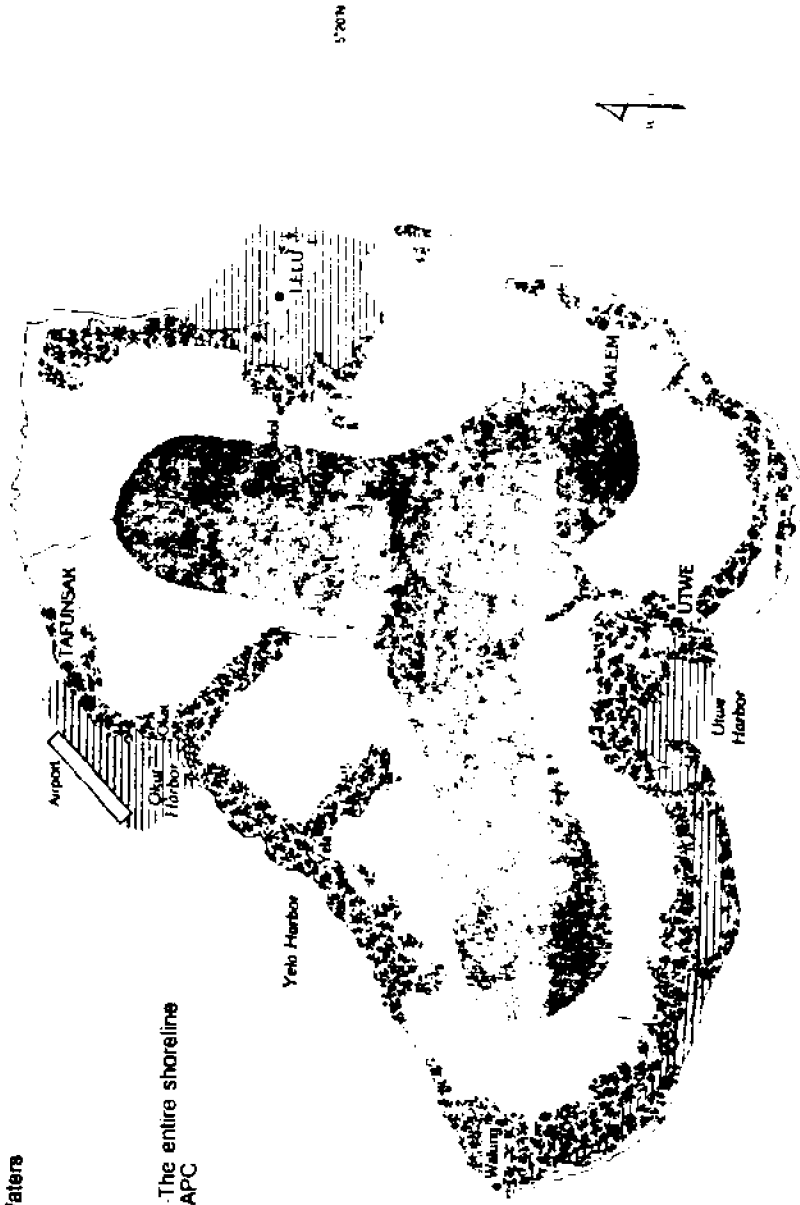
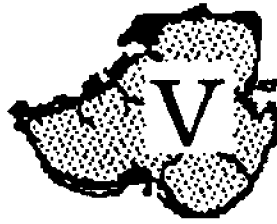
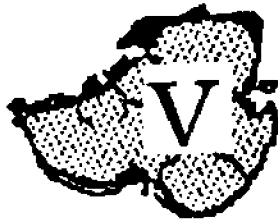


Figure 3. Areas of particular concern (APC) for Kosrae



forces. Beaches are part of a larger physical system that includes the adjacent seagrass beds and the sand behind the narrow unvegetated strip normally thought of as the beach. Structures built close to the beach can increase erosion by placing a rigid structure in a dynamic environment. For this reason, a setback of 40 feet from the high tide mark, where development would not be permitted, is recommended for most open shoreline. Three stretches of shore that are actively eroding have been identified: Tafunsak village, the Civic Action Team shorefront, and Malem village. In these areas the review process should be especially rigorous. Also, it may be advisable to establish a wider setback in these areas. All shore frontage within setbacks would be designated as the shoreline APC. Construction and mechanized sand mining would normally not be permitted within the shoreline APC. Variances could be granted, if permitted, after a comprehensive review.

- **Upland APC.** Soil erosion is more likely to occur when steep slopes are cleared. Special earthmoving and construction techniques are required to minimize erosion. For this reason clearing and/or construction on slopes greater than 30% grade should be subject to a comprehensive review. All activities within the upland APC would be under review. These slopes are identified in the Soil Survey of Kosrae prepared by the U.S. Department of Agriculture.



Specified use districts

Specified use districts identify areas best suited for particular types of development (Figure 4). These districts are designated for certain types of activities that can have a large local impact. Specified use districts are not exclusive; other uses are allowed in these districts. It is only the specified development activity that is confined to the district.

Two kinds of specified use districts are recommended for now: a **commercial/tourism district** and an **Industrial district**. Both of these types of development have certain local requirements such as good infrastructure. Hotels and factories also affect the local environment.

One of the main reasons for creating a commercial district for hotels is in recognition of the social impact of tourism. Kosrae is a socially conservative island. Tourism, obviously, brings in outsiders who will have different values and attitudes and may be insensitive to the social conventions on Kosrae. One solution to this potential conflict is to physically separate tourism from the main population centers. Any extensive tourism development will also have certain requirements: a scenic and attractive location, water access, water and sewerage, good roads, and a nearby pool of labor. A tourism district can also help investors to expend their energies in creative development that will benefit both the investors and Kosrae by being properly located. It is recommended that a tourism district be designated for the coast between Wiya in Tafunsak and Finpukal in Letu.

Smaller, less intensive or noncommercial tourism districts could be established in

Specified use districts are not exclusive; other uses are allowed in these districts.

Tourism has a social impact.

A commercial/tourism district, should be designated along the coast between Wiya and Finpukal.

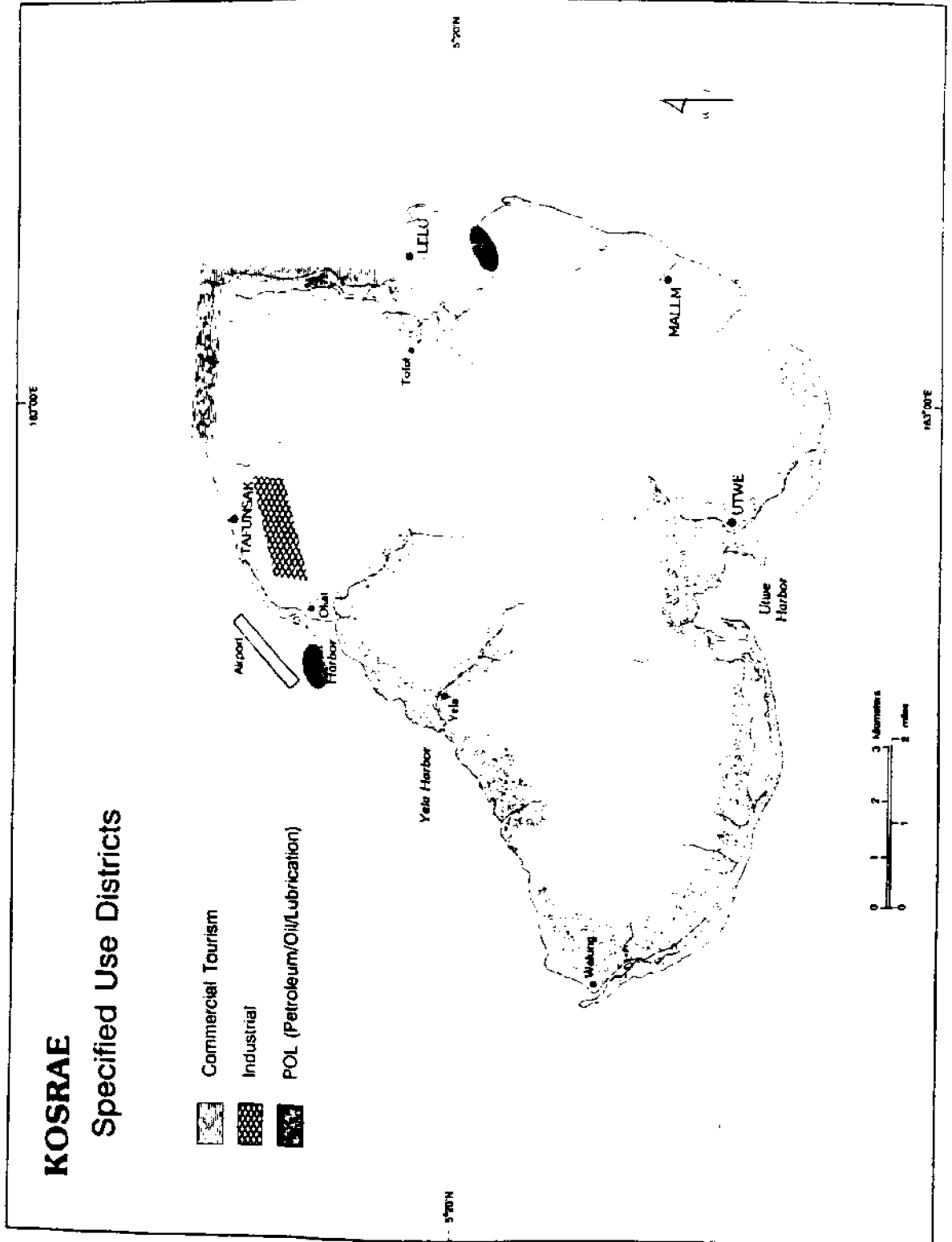
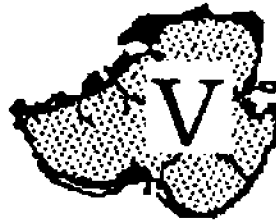
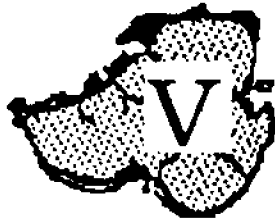


Figure A Specified use districts for M

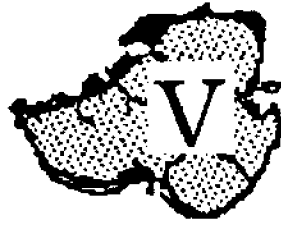


other parts of Kosrae. For example, the upcountry area of western Utwe municipality could support small-scale, cottage-style tourism. These "pockets" of tourism activity would diversify economic development in this region but not strain the capacity of the resource system nor degrade the peaceful, rural atmosphere of the area.

Additionally, Walung, particularly from Tukunsru to Soaksa and eastward toward the village center (Leap), is physically attractive for tourism because of its beauty. However, Walung is the most traditional part of Kosrae and has been proposed as a protected area. This area is also far from existing and proposed infrastructure. These factors discourage conventional tourism in the area. The scale and pace of development and the number of tourists brought to the area should be carefully considered, and development should be sensitive to the desires of the community. Tourism in this area could be classified to range from day-use only (no overnight accommodations) to a limited number of bungalow-type guest houses.

Industrial districts can help government to plan infrastructure. Factories need to be close to the port and airport because (it is hoped) they will be exporting products and importing others. Factories also require all the basic infrastructure: roads, power, water, and sewerage. By the same token they will place a heavy demand on these services. Thus, industrial districts make government planning easier because it is known ahead of time where the large infrastructure demands will be. From a resident's perspective, factories make poor neighbors because they pollute and are often ugly. In addition, they often

Industrial districts make government planning easier because it is known ahead of time where large infrastructure demands will be.



require large areas of land. For these reasons, industry should be located away from residential centers.

The area south of Tafunsak village should be designated an industrial district.

It is recommended that the area south of Tafunsak village be designated as an industrial district. The land is flat, near the port and airport, has good road access, and already has some semi-industrial development (Black Construction). Due to this site's location between the airport and visitor districts, visual corridors should be maintained along the main road.

At some point in the future it might be necessary to designate agricultural districts if it appears that prime agricultural land is threatened by conversion to other uses. At the present time this seems unlikely, especially if the districts suggested above are implemented, thus confining those kinds of development.

Protected area districts

There are many different kinds of protected areas (Figure 5). They differ according to the management goal to be achieved. The term "protected area" often conjures up an image of the extreme case where protection is so strict that the site is "off limits" to humans. This level of protection is neither necessary nor desirable in Kosrae. It is important to realize that protected areas can be set up so that people are not "locked out," rather, their use and enjoyment of natural areas are enhanced.

The proposed actions support four major Kosraen goals. First, examples of the varied natural habitats found in Kosrae should

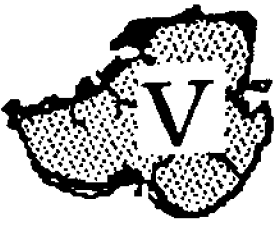
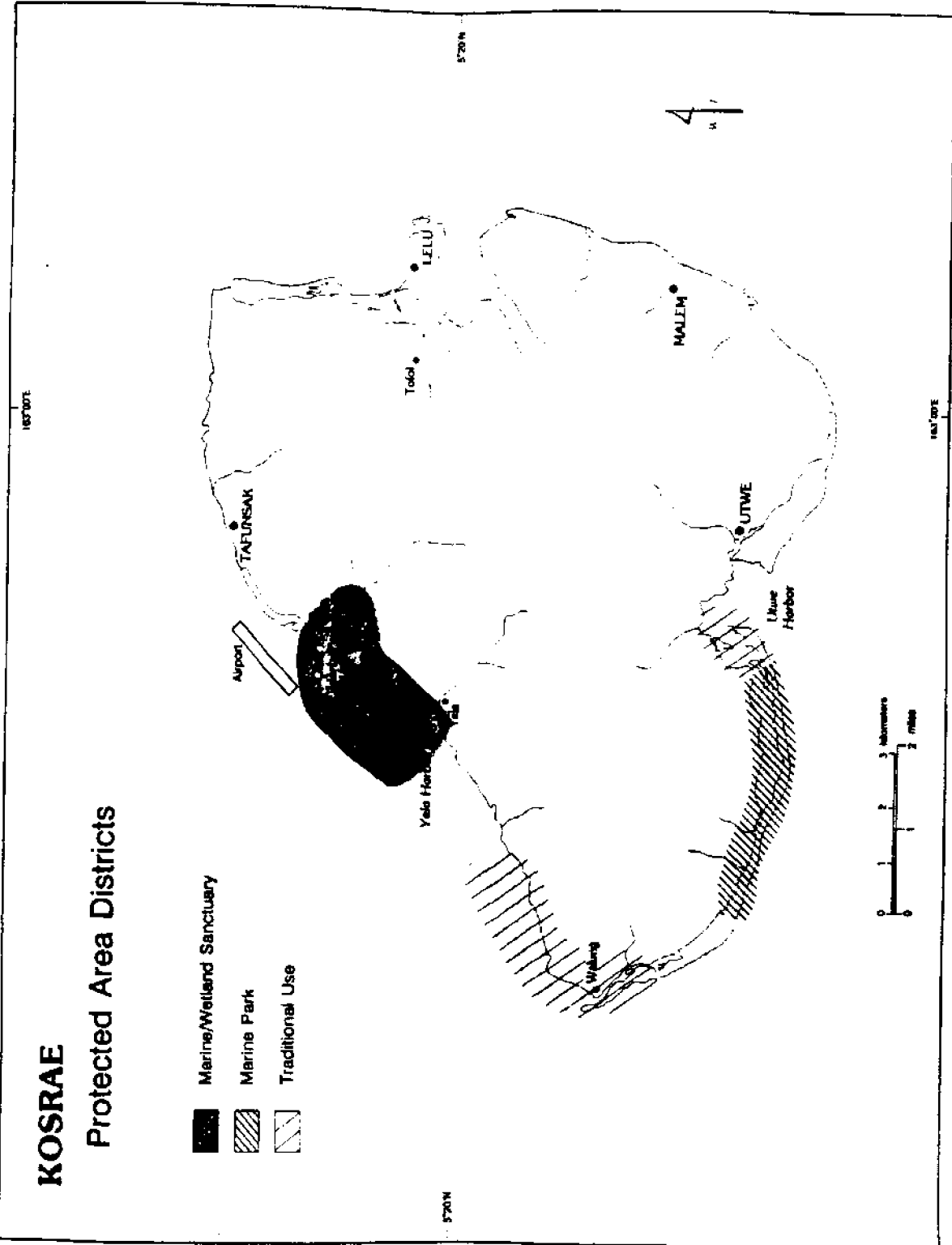


Figure 5. Protected area districts for Kosrae



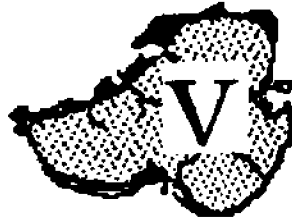
Creating marine sanctuaries can be an easy way to manage subsistence fisheries.

Kosrae's "cultural landscape" should be maintained.

A marine/wetlands sanctuary at Okat.

be preserved. These habitats, such as the coral reefs, mangroves, and rain forest, are beautiful and unique. They may also harbor unusual plants and animals. Second, sanctuaries, where fish harvests are not allowed, should be designated to replenish the surrounding reefs. This is a relatively easy way to manage subsistent fishing. Third, parks should be established to enhance the touristic and recreational appeal of Kosrae. In the near term this will support the development of tourism, but in the future, as the Kosraean lifestyle changes, residents may increasingly appreciate having some totally unspoiled parts of the island to visit. The existence of a park in Kosrae should also be an effective marketing tool because there are almost no parks in the region. Finally, Kosrae is a "cultural landscape" (i.e., people interact with nature in a traditional way), and as much as possible should maintain these traditional interactions. This will help to uphold Kosrae's traditions.

It is recommended that a **marine/wetland sanctuary** be established in the Okat area. This sanctuary would expand on the existing *trochus* sanctuary to include the reef slopes, mangroves, and tidal swamps. Fishing and wood cutting would not be allowed within the sanctuary. On the other hand, recreational use would be encouraged. The mangrove channels of the Okat river are quite beautiful; boat or canoe rides up these channels could become an income-generating tourist service. The sanctuary should be able to provide excellent diving experiences, particularly because this part of the island is protected from the prevailing trade winds. The marine life residing in the sanctuary would naturally seed adjoining reef areas.



To the degree possible, adjoining inland areas, particularly the tidal swamp, should be incorporated into the sanctuary. This would protect the best representative example of a unique swamp ecosystem. Development activities in upland areas adjacent to the sanctuary could also affect it. Because land areas are privately owned, inclusion of lands will only be possible through agreement with local landowners. Areas could be leased from willing landowners or conservation easements negotiated so that upland areas are protected. Realistically, it will probably be most feasible to plan for a system of mixed uses on these lands. Land that may be marginal from a development perspective but biologically valuable could be fully protected. On other areas agreements to limit the scale of development might be negotiated with landowners.

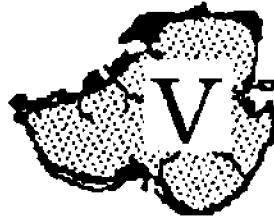
Adjoining inland areas, especially the freshwater swamp, should be included in the sanctuary.

It is recommended that a marine park be established on the coast from Lulu Ufwa westward to Molson Tukunsru or minimally to where Infal Falwe enters Inya Walunga. This park would be managed to maintain the natural landscape while allowing certain resource uses to continue. Visitor amenities, such as campsites, latrines, and walking trails would be developed. Facilities for interpretation (or developing understanding) and recreational services would be other activities supported by the area.

A marine park area would be established at the western end of the island.

Visitor amenities and interpretive displays would be developed.

A traditional-use area or sanctuary should be established around Walung from Molson Tukunsru to Mwot River. This area would, as for the marine park, also be managed to maintain the natural landscape while allowing traditional resource uses to continue. However, resources would be taken only by



traditional methods by residents of the area. One of the concerns that residents of Walung have about the extension of the circumferential road to their community is that it will increase access to local natural resources for non-Walung residents. These resources serve as the primary income generation for this community, which has no other industry and is far from infrastructure services such as electricity and sewerage. This resource conserve could support some limited day-use tourist activities and guest facilities, yet maintain the traditional lifestyle of the local community.

Resource planning districts

Another set of districts can be identified for planning purposes. These areas may not be legally or administratively distinct from the other areas discussed but would help in planning and review decisionmaking. For example, the wetland APC can be divided up into a number of subdistricts according to the most appropriate use of its resources. Development in these areas would still require a comprehensive review, but a permit would more likely be granted if the activity is located in the specified district.

Six types of resource planning districts are identified in wetland APCs: **traditional use, sanctuaries, parks, commercial wood harvest, conversion, and recreational** (Figure 6). Commercial harvesting could occur from Utwe Lulu to Yenseng Infal. More extensive harvesting of timber and firewood by commercial enterprises would be allowed in these areas. Any harvests would be conducted on a sustainable yield basis and to ensure this, a harvest management plan would be developed for the area.

Planning districts would help in planning and review decision-making.

Commercial wood harvest, conversion, and recreational Planning Districts

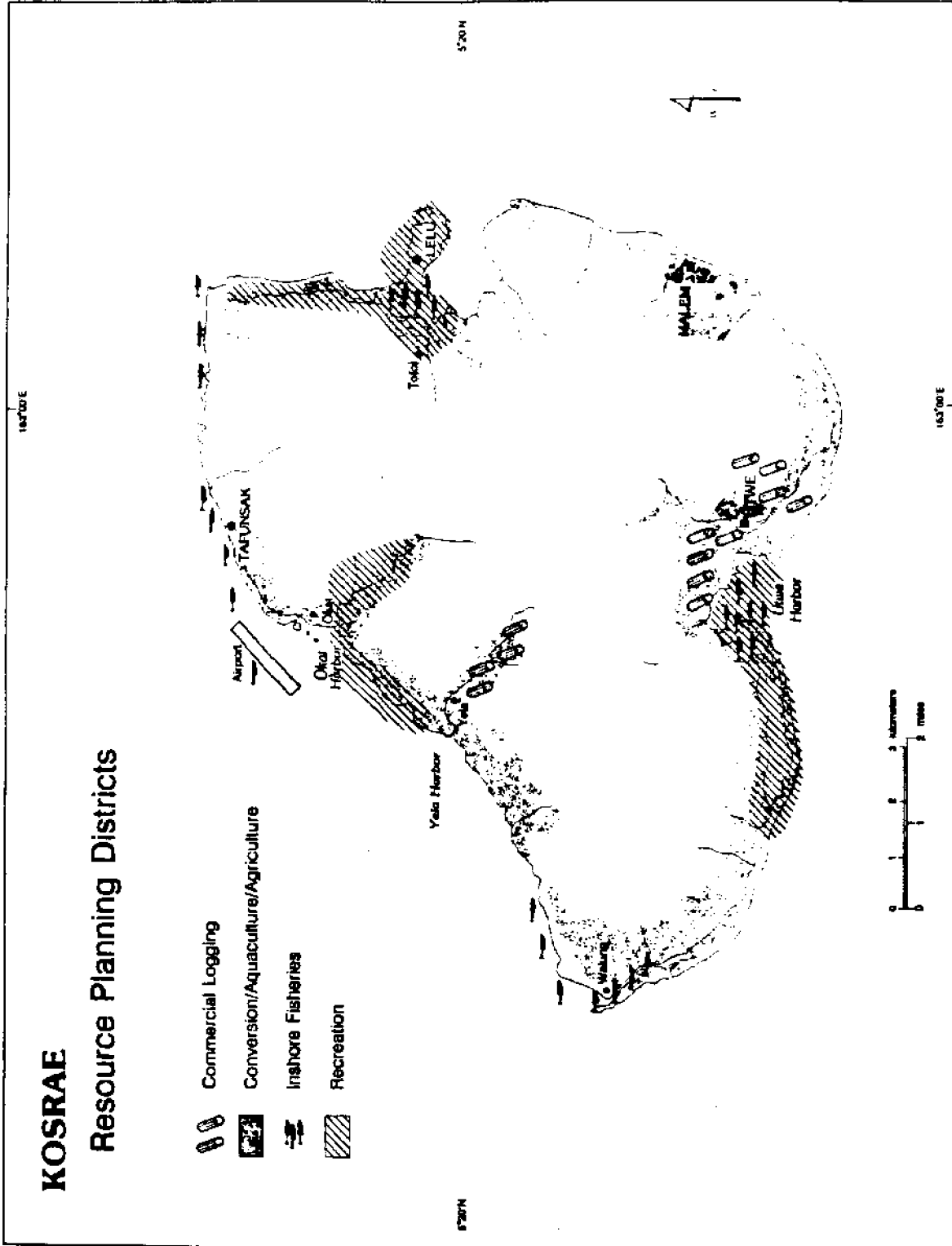
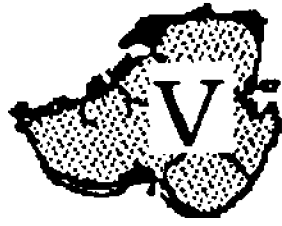
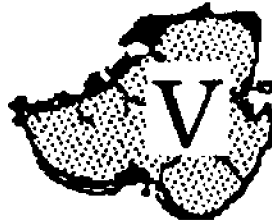


Figure 6. Resource planning districts for Kosrae

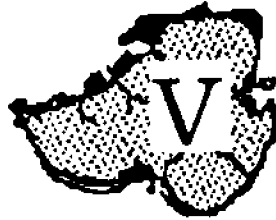


Establishing a conversion district would not preclude conducting a comprehensive review before filling is allowed.

Conversion should be restricted to the swamp between the Yenseng and Ka rivers in Malem. The soils here are suitable for agriculture or fish ponds. A second, smaller conversion district has been identified in Utwe. Establishing these districts would not preclude conducting a review before any conversion projects are started. If plans for large-scale conversion are developed, it would be important to make a careful survey of the whole area. Filling should not be allowed to interrupt the hydrological balance of the surrounding wetlands. In addition, representative examples of this habitat should be protected in equal measure.

Two recreational districts have been identified. The Utwe marine park, including adjacent mangrove areas, is highly suited for recreation. The sheltered stretches of water in Inya Watunga, the Lulus, and Utwe Harbor are suitable for sailing, board sailing (windsurfing), and canoeing. The park also provides easy access to good snorkeling and dive sites from Utwe Harbor.

A second recreational district has been identified in the mangrove channel from Infal Mutunnenea to Inya Inrefusr. Because this mangrove area is adjacent to the coastal commercial hotel district, it could become a tourist attraction with boat trips up and down the channel. The channel should be maintained to make it passable and to preserve its natural beauty. A boardwalk could be built at the northern end of the channel, which is now choked with sand, to the coastal strand at Finfokoa.



Only these types of resource planning districts within the coastal wetland have been identified so far. Other districts could be designated if deemed appropriate in the future. For example, mariculture districts could designate lagoon or reef areas particularly suitable for specific fish and nonfish culture activities.

Project Review

- Administrative structure
- The review process

Project review

The second main strategy embodied in the Island Resource Management Program is a comprehensive development project review process. These reviews are essentially similar to the environmental impact assessment methodology used widely and familiar to environmental protection personnel in Kosrae. A distinction is made because both an administrative structure and a permitting procedure are proposed as an integral part of the whole review process. For these reasons it is termed a **comprehensive review**.

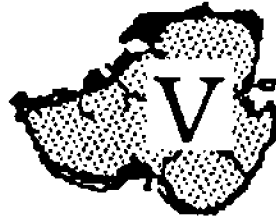
Comprehensive review is based on environmental impact assessment methodology.

Administrative structure

Two administrative mechanisms are proposed for carrying out comprehensive reviews and improving government coordination. These are a **Development Review Committee** and the **Island Resource Management Commission**.

The Development Review Committee's major function would be to advise the commission on matters relating to project review. By meeting regularly it could also help to keep these agencies informed of each other's activities and informally confer and advise.

The Development Review Committee represents the government in the project review.



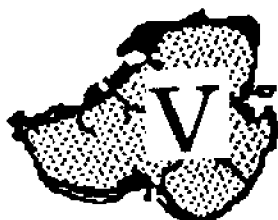
The Development Review Committee would have as members one representative each from the Office of Planning and Statistics, Construction and Engineering; Marine Resources Division; Division of History and Culture; Environmental Health and Sanitation Division; Agriculture and Forestry Division; Land Management Division; and Tourism Division. A new position, **coastal management administrator**, would chair the Development Review Committee. This position would be created within the Department of Conservation and Development.

The Island Resource Management Commission issues permits and licenses associated with environment and resource management.

The Island Resource Management Commission would be composed of five members appointed by the governor with advice and consent from the legislature. In addition, the state planner would sit as a sixth nonvoting (advisory) member. The commission would be responsible for the review of applications and issuance (or denial) of all permits and licenses associated with environment and resource management. A second important function of the commission would be to prepare and finalize the resource use plan discussed above. The Commission could also have final approval of resource management regulations proposed by the Marine Resources Agriculture and Forestry divisions.

Personnel from Environmental Health and Sanitation could become staff to the commission; the environmental protection function of the division would be shifted to the commission.

It would be necessary for the commission to have some permanent staff to carry out administrative matters and field work because the commission itself is responsible for considering permit applications. This could be one of the duties of the coastal management administrator. If additional staff were needed some personnel from the Environmental Health and Sanitation Division could become staff to the commission. From an



administrative perspective it may be advantageous for the environmental protection function of the division to be transferred to the commission while existing public health related duties remain with a reorganized division in the Department of Health.

The review process

One of the major functions of the administrative arrangements would be to review certain development activities to ensure that environmental damage is minimized. By instituting a comprehensive review process (Figure 7) this could be achieved while simplifying the permitting process.

It is envisioned that a new permit system would be created, through legislation, that would be the basis of this review process. The permit would incorporate the concerns of all the agencies participating in the Development Review Committee. Thus, the permit application would be jointly developed by these agencies so that pertinent information could be gathered through the application. This permit could both replace and expand the scope of existing permits for earthmoving, waste disposal, and historical clearance. Because it would be based on new legislation, these agency's concerns would be more effectively addressed.

The criteria for what kinds of activities would require review would be specified in regulations issued pursuant to the implementing legislation for the Island Resource Management Program. At a minimum, applications should be required of projects or activities that would:

A new permit, replacing some existing permits, would be created through legislation.

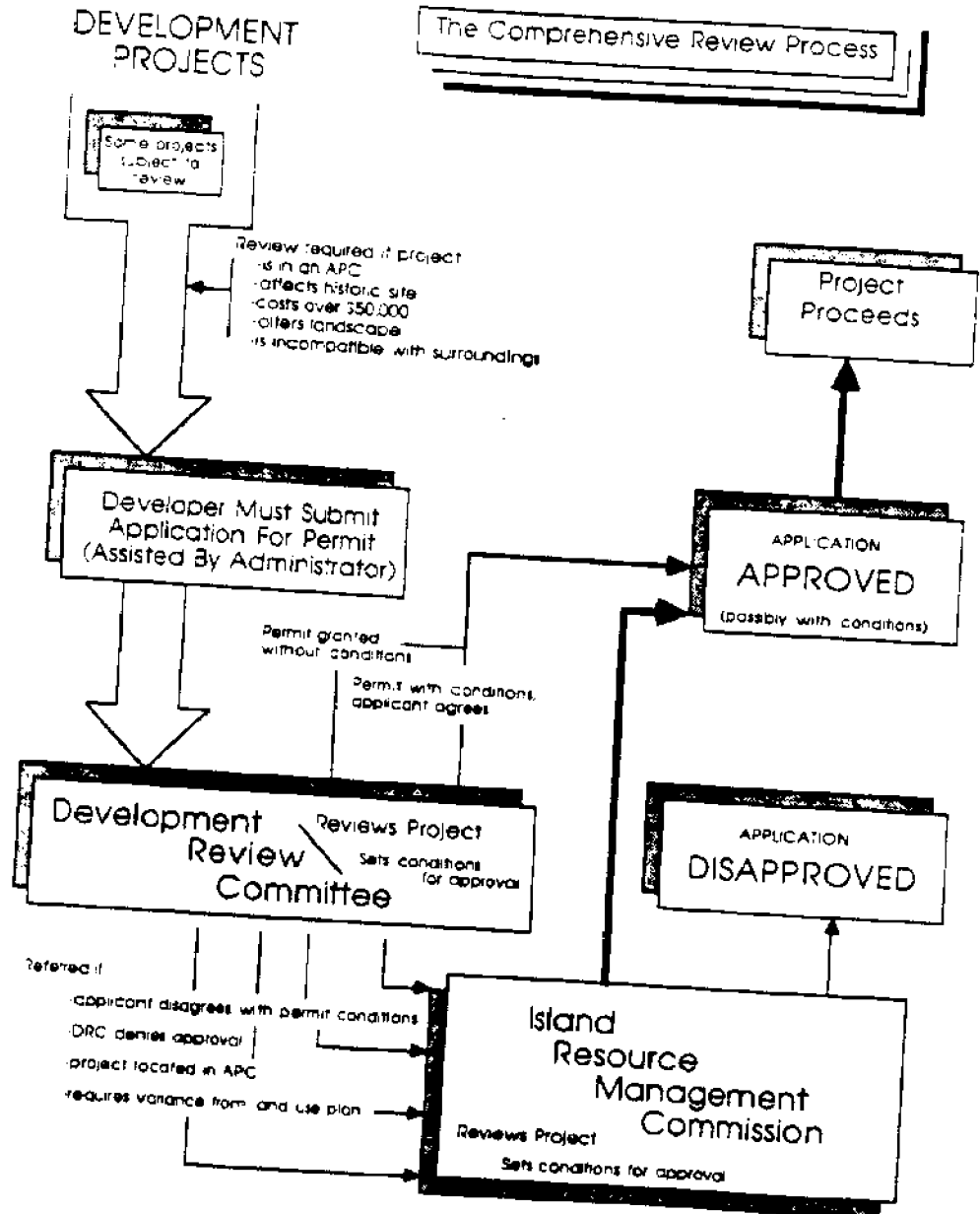


Figure 7. The comprehensive review process



- ✓ be located in Areas of Particular Concern or would significantly affect a nearby APC;
- ✓ affect a cultural/historic site;
- ✓ cost over a specified amount; or,
- ✓ significantly alter the landscape or affect natural resources or be incompatible with the existing uses in the surrounding area.

Projects that would require a review.

Someone engaging in a project meeting these criteria would be required to fill out an application, available at the municipal office, and submit it to the coastal management administrator, one of the municipal offices, or the Department of Conservation and Development. The administrator would visit each municipal office as needed or at least monthly to assist applicants in filling out the application and to collect applications accepted at the office over the past week.

The administrator could assist applicants in filling out applications.

Applications would be reviewed by the members of the Development Review Committee, and the committee would make one of three recommendations: approval of the project as requested, approval with conditions or changes in the project design, or disapproval. The decision would have to be consistent with the Resource Use Plan formulated by the Development Review Committee. If the committee recommends approval or approval with conditions and the project developer does not object to the conditions, permits could be issued for the project at this point. However, any project located in an APC or requesting a variance from the

The Development Review Committee could make one of three decisions.



Resource Use Plan would have to be referred to the Island Resource Management Commission.

Thus the Island Resource Management Commission would review and have final authority over projects that:

- ✓ the Development Review Committee imposed conditions on that the applicant disagrees with;
- ✓ the committee has denied approval of;
- ✓ were located in or likely to significantly affect an Area of Particular Concern; or
- ✓ would require a variance from the Resource Use Plan.

Projects over which the Island Resource Management Commission would have final authority.

The commission would review the Development Review Committee's report, meet with the developer and the public.

The commission would meet on a regular basis and those meetings would be advertised and open to the public. Commission members would review the application and recommendations made by the Development Review Committee prior to a formal meeting. One duty of the coastal management administrator would be to make sure that the Commission members would be fully briefed prior to the meeting. During the public meeting, the Commission members would interview the applicant, ask any questions they feel would be important, and discuss the Development Review Committee's recommendations and possible alternatives with the applicant. At this meeting comments from the rest of the community would be solicited as well.



It is expected that the commission could in most cases make a decision fairly quickly. However, for a particularly large project or one where both benefits and environmental effects are great, it may take some time to render a decision. In any case a time limit (60 days for example) could be set for the commission to decide.

In deciding on an application, the commission may make four decisions: to approve without conditions, approve with conditions, disapprove, and table the application for further information and study. If the commission changes the conditions set by the Development Review Committee it must state **in writing** that:

- ✓ there is no reasonable alternative to the development siting; **and**
- ✓ the stringent application of the law would place an undue hardship on the developer which cannot otherwise be mitigated; **and**
- ✓ the Development Review Committee cannot sufficiently support its position; **and**
- ✓ the community's health, welfare, safety, and cultural heritage will not be irrevocably harmed through approval; **and**
- ✓ the development supports the intent of the Resource Use Plan.

The reasons for changes to conditions set by the Development Review Committee must be stated in writing.

The commission should be obligated to condition development approvals to the maximum extent practicable to achieve the goals of resource conservation and the rights



The Commission should be obligated to condition approvals.

of private property development. For example, to protect historic or cultural resources the commission may require the government to survey the site (perhaps charging a fee to the developer to defray the cost) and impose conditions based on the survey's results. Depending on the commission's decision, a permit may be issued at this point.

Community involvement and public education

These proposals will not succeed without the commitment of the communities that will be affected.

The importance of community involvement for the success of a management program has been mentioned several times in this report. Almost all of the recommendations made here will have a direct effect on the lives of Kosraeans. The resource use planning proposals, in particular the proposed marine and wetland sanctuary, would restrict use of and access to certain coastal resources. Obviously, these proposals will not succeed or even be implemented without commitment to these plans by the communities that will be affected. One way to develop support is to create ways in which communities can participate directly in planning and management. For example, if the people of Tafunsak and Walung see the sanctuary as "their's" they are likely to be supportive of the recommended restrictions. It would also be important for the benefits of proposals such as the sanctuary to accrue foremost to the people who are sacrificing use of the area. Residents should have priority to participate in other income-generating opportunities that might result from the sanctuary, such as tour guiding.

Local residents should see the sanctuary and park as their own.

It is recommended that **Coastal Management Councils** be established in each



community (Tafunsak, Lelu, Malem, Utwe, and Walung). These councils would be a point of contact for and information channel to the Island Resource Management Commission. They could participate on an advisory basis in the development and updating of the Resource Use Plan. Council membership should include individuals who are actively involved in resource use. Often these resource users will have a good idea of the condition of local resources. Therefore, they would be a useful source of information and could even suggest needed management regulations. If the proposed sanctuary and park are created, these councils should be involved in the day-to-day management of these areas.

Coastal Management Councils would be a point of contact in the community for the Commission.

Quite a number of recommendations have been made for areas that need public education: natural resource use, littering, and disposal of toxic materials. Part of the reason coastal resources become degraded is that people may not know that their actions are harmful or that there are better alternatives. Thus public education can be a very important tool in sustaining natural resources. The commission staff and the coastal resource administrator should work with relevant agencies, including the Department of Education and Public Information Office to develop public education campaigns.

Public education

Issuance of resource management-related regulations by agencies

Currently there is no well-developed framework for agencies to use to impose



A resource management regime must be able to respond quickly and flexibly to changes in the resource and its use.

management controls on the use of Kosrae's natural resources. Typically laws are drafted and passed by the legislature in response to resource use issues. It is understandable that the legislature would like to retain primary authority in this area because resource use regulations would directly affect the lives of Kosrae's citizens. However, resource management by law making can be a cumbersome process; often the condition of the resource or the way it is used can change rapidly. There should be a management regime that can respond quickly and flexibly to these changes. This is particularly true if exploitation of coastal resources becomes increasingly commercialized. Currently, the state would have a limited, unclear basis to respond to large-scale commercial export of mangrove wood, mangrove crabs, reef fish, or aquarium fish. Export of natural resources can be part of Kosrae's economic development strategy. But, given the island's limited resources, it must be managed wisely to ensure that Kosrae is really benefiting. For example, there has been a recent upsurge in exports of live coral from other islands in the Pacific. It is doubtful, given the impact of this activity on other sectors of the economy, that this practice creates a net benefit. But the local governments are often ill prepared or legally unable to bring this kind of activity under any kind of management control.

Reliable data on harvest effort are an important basis for effective resource management.

Regulations must be predicated on the gathering of reliable information on resource use. Kosrae has a good start with its fisheries statistics program for inshore fishing. Data collection and analysis should be expanded and refined. In particular, a stock assessment needs to be carried out for the mangrove crab because this animal is currently being



exported. Resources, such as mangrove tree species need to be assessed, silvaculture practices need to be developed, and harvest rates need to be monitored.

As a start, it would be advisable to begin developing management plans for both inshore fisheries and mangrove and freshwater swamps. The development of these plans could be initiated by the interdepartmental Wetland Management subcommittee. It is not expected that initial efforts would be comprehensive. Rather, these plans would identify needs, such as information needed to effectively manage these resources; the species in greatest short-term need of management; administrative arrangements that should be established for management; and necessary legislation. It may be appropriate to set up a management regime in which the Island Resource Management Commission has the authority to review and promulgate management regulations based on recommendations from agencies.

Formation of a Wetland Management Subcommittee of the Development Review Committee to develop a wetland resource management plan is recommended. This mangrove management subcommittee would have one representative each from the Agriculture/Forestry, Production and Marketing and Marine Resources divisions. The Marine Resources Division should include a section on recommendations for inshore fisheries management needs in the fisheries development plan they will be drafting.

Develop management plans for species with commercial potential.

A Wetland Management Subcommittee is recommended.



Integration of environmental impact criteria into economic planning

Government economic planning and support of economic development are of paramount importance in Kosrae. Because Kosrae's private sector is not very developed, the expenditures created by the state and national government, and the Compact of Free Association funds that make the expenditures possible account for almost the entire money economy. Thus, infrastructure development and government-sponsored economic development projects represent a major sector of activity. It is important that development be planned and executed in an environmentally sound manner. Thus government development efforts should be closely coordinated with coastal resource management and land use planning.

This coordination could be accomplished by giving the Island Resource Management Commission responsibility for reviewing the State Five-Year Economic Development Plan. The likely environmental impacts of proposed projects and the total impact of all of the proposed projects would be assessed and documented in an **environmental impact assessment**. The commission would advise the Office of Planning and Statistics on these impacts and recommend how they might be minimized or mitigated. This would allow projects to be appropriately modified early in the planning cycle. Coordination of this review should be fairly simple because the state planner would be a non-voting member of the commission.



Long-range planning

Most of the recommendations in this report deal with current or recurrent issues. But both Kosrae and the world will likely experience significant environmental and social change over the next 50 years. While it is difficult to plan in detail today for unknown or poorly understood changes in the future, some form of contingency planning should be included in the planning and management initiatives that have been discussed here. Global warming, sometimes referred to as the "greenhouse effect," is an issue that has begun to receive increasing attention worldwide and to cause some concern locally.

Global warming refers to the steady increase in the earth's average temperature. While the earth has been slowly warming over many millennia, in the past century the rate of warming has greatly increased because of the discharge of certain waste gases, primarily carbon dioxide, into the atmosphere. These gases trap heat at the earth's surface; because heat is radiated into space more slowly, average temperatures rise.

While this warming trend is well documented, its effects are poorly understood. Of most concern to Pacific islanders are reports that suggest global warming may cause a rise in sea level through the melting of polar ice and thermal expansion of seawater. Changes in weather patterns are also predicted. Kosrae would be seriously affected if either of these predictions came to pass. Unfortunately, there exists a high degree of uncertainty about the precise magnitude of sea level rise and weather pattern changes; this makes planning especially difficult.

The impacts of projects in the 5-year economic development plan should be assessed.

Kosrae is likely to experience significant environmental and social change over the next 50 years.

Global warming may cause sea level rise or changes in the weather.



An effort should be made by personnel within the Office of Planning to keep abreast of information produced by regional and international organizations such as the South Pacific Environmental Programme and the United Nations Environmental Programme. Monitoring coastal processes, particularly beach profiles, on Kosrae (as recommended) will create a valuable data base that can be used in future years to estimate the local impacts of sea level changes. Reference material on global warming can be included in a coastal resource management library housed at Conservation and Development offices or the high school. (This library could also house general information on coastal management and local information, such as transect data, soil maps, and management plans.)

In planning infrastructure some consideration should be given to the impact of sea level rise. At this point there are too many unknowns to justify major changes in planned infrastructure development. But in the future as our understanding of this phenomenon increases, it may be possible to effectively plan for expected impacts. At this stage it might make sense, perhaps with outside assistance, to begin developing contingency plans or scenarios based on a range of estimates of the effects of global warming. It may be that these sorts of projections can be integrated into the Resource Use Plan through the designation of flood prone or other natural hazard APCs.

There are other less catastrophic issues that would be lessened with long-range planning. Solid waste disposal, and in particular toxic wastes have become a major problem

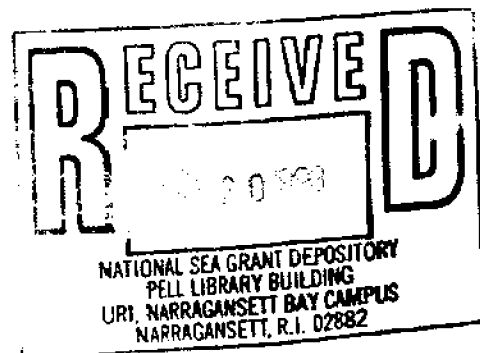


in developed countries. It is likely that Kosrae will eventually have to deal with these problems, and, being an island, Kosrae will have worse problems than continental areas. The existing municipal dumps are clearly inadequate, especially because they are located in wetland areas. Plans should be formulated now for their eventual relocation to upland areas.

Finally, Kosrae's population growth is another issue that may cause significant future impacts (especially if coupled with sea level rise). Currently the island is sparsely populated so population effects — heavier pressure on resources and greater demand for infrastructure — won't be felt in the near term. Population size, however, could spawn numerous coastal resource problems unless the growth rate slows or significant emigration occurs. It might be wise to develop population growth scenarios based on different projections of population size and economic growth, to determine the potential demand for and effects on coastal resources.

Plans to relocate the municipal dumps should be made.

Population growth will place heavier demand on coastal resources.





Papers Written for the Kosrae Island Resource Management Project

Recreation, Tourism, and Marine Protected Areas in Kosrae
by Jan Auyong, Sea Grant Extension Service, University of Hawaii

Coastal Processes on Kosrae, Federated States of Micronesia:
Implications to the State's Coastal Zone Management Policy
by Shannon Cripe, Department of Ocean Engineering, University
of Hawaii

Women's Use of the Nearshore Zone in Kosrae
by Kim Des Rochers, Sea Grant Extension Service, University of
Hawaii

Coastal Resources in Kosrae: An Undeveloped Economic
Resource
by John A. Dixon, Environment and Policy Institute, East-West
Center

Possible Coastal Management Scenarios for Kosrae
by Michael L. Ham, Guam Coastal Management Office

Utilization and Management of Coastal Wetland Resources
by Padma Narsey Lal, Environment and Policy Institute, East-West
Center

(These papers will be collected and published in a separate volume.)